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TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS (TSMO) WORKFORCE GUIDEBOOK

FINAL GUIDEBOOK

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Contents

Chapter 1. Getting Started: Using This Guidebook 1
- Introduction 1
- What is TSMO? 1
- Why Use TSMO? 1
- Who Should Use This Guidebook? 2
- How Should This Guidebook be Used? 2
- How Was This Guidebook Developed? 3

Chapter 2. Recruiting a TSMO Workforce 4
- Introduction 4
- Transitioning Existing Traffic Engineering, Transportation Planning and ITS Positions 4
- Guidance for Hiring Specific TSMO Positions 9

Chapter 3. Model TSMO Position Descriptions 14
- Introduction 14
- Computer Engineer 16
- Systems Engineer 18
- Telecommunications Engineer 20
- Traffic Incident Management Program Manager 22
- Transportation Management Center Manager 24
- Connected and Automated Vehicles Program Manager 26
- Cyber Security Engineer 28
- Data Management Specialist 30
- Emerging Technologies Industry Liaison 32
- Integrated Corridor Management Manager 34
- Traffic Data Scientist/Statistician 36
- Transportation Data Ethicist 38
- Transportation Systems Performance Manager 40
- TSMO Modeling Specialist 42
- TSMO Program Manager 44
- Visualization Specialist 46
- Artificial Intelligence Scientist 48
- Surface Weather Specialist 50

TSMO Manager/Chief/Bureau Director 52
Chapter 4. Developing a TSMO Workforce 54
Introduction 54
Crafting a TSMO Professional Development Plan 54
Available Education and Training Programs 57
Other Areas of Investment to Strengthen TSMO Workforce 62
Chapter 5. TSMO Workforce Retention 64
Introduction 64
Best Practices in TSMO Workforce Retention 64
References 68
List of Abbreviations, Acronyms, Initialisms, and Symbols 69
Appendix A. Catalog of TSMO-related Undergraduate Courses A-1
Appendix B. Catalog of TSMO-related Graduate Courses B-1
Appendix C. Catalog of TSMO-related Professional Development Courses and Training Programs C-1
Appendix D. Example TSMO Position Descriptions D-1

List of Tables

Table 1. Where to Find Information in this Guidebook ... 2

Table 2. Evolution of Existing Traffic Engineering, Transportation Planning and ITS Positions 4

Table 3. Relationships between TSMO Job Positions and Typical DOT Business Areas ... 8

Table 4. TSMO Capability Maturity Dimensions and Levels (American Association of State Highway and Transportation Officials 2018) ... 10

Table 5. Where to Find Each Position Description ... 14

Table 6. Key Elements of the TSMO Workforce Professional Development Framework ... 54

Table 7. Sample Workforce Development Plan ... 55

Table 8. Organization TSMO Related Training and Research ... 58

Table 9. Topic Areas Analyzed for College and Professional Development Courses ... 59

Table 10. Inventory of Existing TSMO Training ... 61

Table 11. Best Practices for Retaining a TSMO Workforce ... 64

List of Figures

Figure 1. TSMO Job Positions and CMM Improvement Potential per CMM Level 11
Figure 2. The Improvement Potential at a DOT When Hiring a Computer Engineer 12
Figure 3. Computer Engineer KSAs 17
Figure 4. Systems Engineer KSAs 19
Figure 5. Telecommunications Engineer KSAs 21
Figure 6. Traffic Incident Management Program Manager KSAs 22
Figure 7. Transportation Management Center Manager KSAs 25
Figure 8. Connected and Automated Vehicles Program Manager KSAs 27
Figure 9. Cyber Security Engineer KSAs 29
Figure 10. Data Management Specialist KSAs 31
Figure 11. Emerging Technologies Industry Liaison KSAs 33
Figure 12. Integrated Corridor Management Manager KSAs 35
Figure 13. Traffic Data Scientist/Statistician KSAs 37
Figure 14. Transportation Data Ethicist KSAs 39
Figure 15. Transportation Systems Performance Manager KSAs 41
Figure 16. TSMO Modeling Specialist KSAs 43
Figure 17. TSMO Program Manager KSAs 45
Figure 18. Visualization Specialist KSAs 47
Figure 19. Artificial Intelligence Scientist KSAs 49
Figure 20. Surface Weather Specialist KSAs 51
Figure 21. TSMO Manager/Chief/Bureau Director KSAs 53
Figure 22. Modal Focus of Undergraduate Civil Engineering Courses in ABET Accredited Colleges and Universities in the United States 60
Figure 23. Course Topics of Undergraduate Civil Engineering Courses in ABET Accredited Colleges and Universities in the United States 61

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Chapter 1. Getting Started: Using This Guidebook

Introduction

The intent of this guidebook is to provide practitioners with a tool to understand what is needed and how to develop a strong Transportation Systems Management and Operations (TSMO) workforce. While a basic understanding of TSMO is beneficial to the reader, this guidebook focuses on workforce development practices rather than the specific details of TSMO, so readers without a background in TSMO will find the information within useful.

This guidebook goes into detail on the hiring and workforce development practices recommended through literature and currently in place within existing and successful TSMO programs. It clearly identifies specific job positions required for a robust TSMO program, the knowledge, skills, and abilities required for those job positions, and recommendations tailored to hiring each position. Information on training and professional development is presented, including specifics on training providers and courses. Finally, recommendations for ways to maximize workforce retention are provided.

What is TSMO?

Traditionally, DOTs focus on infrastructure to maximize capacity, building roads to carry as many people and goods as needed. But research has revealed new applications of data and technology to operate and manage existing roads in new ways. This research and related initiatives have led the way to the concept of TSMO. TSMO represents a set of integrated strategies developed to manage, maintain, and improve the performance of existing transportation systems using a systematic approach. Many state departments of transportation (DOT) and other transportation agencies are already implementing various levels of TSMO programs. Three common TSMO-related strategies include active transportation and demand management, traffic incident management, and work zone management.

Why Use TSMO?

In many urban areas with high levels of demand, there is limited space to build new transportation infrastructure. Further, this traditional approach to building new capacity is often significant both in cost as well as time required to complete the improvements. Transportation agencies looking for approaches or solutions to increasing performance on the existing transportation system using low cost measures should consider implementing TSMO strategies or a TSMO program.

As transportation agencies increase their capabilities within TSMO, they can begin to harness advancements in technology and research to collect and use new sources of data that better describe how people and goods, as opposed to passenger and commercial vehicles, are moving across the transportation system. This insight allows agencies to focus on enhancements to the customer experience and make improvements to this experience in addition to traditional areas of improvement such as safety, mobility, and reduction of adverse environmental impacts. Finally, as research and industry continue to move forward with connected and automated vehicles, having a TSMO program in place within a transportation agency will help the agency to be in position to maximize the benefits from these new technologies.

Who Should Use This Guidebook?

This guidebook presents guidance for transportation agencies, consultants, and other employers to assist with TSMO workforce education, training, recruitment, retention, and development. Users of this guide include individuals interested or involved in recruiting, hiring, or training in the transportation field, individuals at transportation agencies looking to begin or develop a TSMO program, consultants working with TSMO programs, and educators at the undergraduate and graduate levels.

How Should This Guidebook be Used?

This guidebook outlines information in three areas considered critical to a healthy TSMO workforce: recruitment, professional development, and retention. Table 1 describes the key information presented in this guidebook as well as the locations within the guidebook where this information is shared.

Table 1. Where to Find Information in this Guidebook

Desired Information	Guidebook Section
• An understanding of the evolving skillsets and backgrounds needed for successful and innovative approaches to TSMO. • Understanding when an agency is ready to hire TSMO personnel. • Recommendations and best practices for hiring TSMO positions.	Chapter 2. Recruiting a TSMO Workforce
• A description of 19 TSMO-related positions and the knowledge, skills, and abilities required by each position. • Information on when, where, and how to recruit for each of the TSMO-related 19 positions.	Chapter 3. Model TSMO Position Descriptions
• Crafting a professional development plan for the TSMO workforce. • Information on TSMO-related educational programs at the undergraduate and graduate level. • Information on TSMO-related professional development courses. • Areas of investment to strengthen a TSMO workforce.	Chapter 4. Developing a TSMO Workforce
• Recommendations and best practices for TSMO workforce retention through improvements to training and professional development, human resource benefits, and workplace culture.	Chapter 5. TSMO Workforce Retention
• List of TSMO-related educational programs at the undergraduate and graduate level. • List of TSMO-related professional development courses and training programs. • Example TSMO-related position descriptions.	Appendices

This guidebook is written and organized to describe the overarching process of developing a workforce; however, the sections of the guidebook were developed to be self-contained and can be read independently. In addition, several appendices are included with more detailed information regarding TSMO-related education, training, and example position descriptions.

The focus of this guidebook is on emerging TSMO positions at the professional and management levels of an organization. Technician and para-professional level positions (e.g., TMC operators or freeway service patrol staff) who support the advancement of TSMO are not included within the scope of this guidebook.

How Was This Guidebook Developed?

The information and recommendations presented within this guidebook were developed through the National Cooperative Highway Research Program's (NCHRP) Project No. 20-07/Task 408. A literature review and stakeholder interviews were used to identify issues, needs, and best practices for a TSMO workforce. A scan of existing professional education and training programs detailed more than 1,500 existing TSMO-related training programs and educational courses. The combination of the literature and stakeholder interviews allowed the development of 19 model position descriptions for TSMO-related positions. Knowledge, skills, and abilities (KSA) were defined for each of the 19 emerging position descriptions to help practitioners understand what is needed to attract and retain TSMO personnel. Finally, a strategic management framework was developed for identifying new positions, recruiting, and retaining TSMO staff. This framework incorporates position descriptions, KSAs, triggers for hiring new positions, and best practices for workforce recruitment and development.

Chapter 2. Recruiting a TSMO Workforce

Introduction

DOTs are recognizing the need to be flexible and responsive to changing needs in order to remain competitive and to build a robust TSMO workforce. They traditionally focused on hiring civil engineers, but now see a need to expand their hiring practices and diversify recruiting strategies to reflect the evolving skillsets and backgrounds needed for successful and innovative approaches to TSMO. This chapter provides guidance on identifying what roles and job positions are typically found in successful TSMO programs, how these positions fit into the typical DOT business practices, and recommendations on how to recruit for these positions.

Transitioning Existing Traffic Engineering, Transportation Planning and ITS Positions

Transportation agencies, especially state DOTs, have been historically organized to expand and deliver infrastructure capacity. As society begins to place more value on system performance and reliability, the use of technology to better manage the existing infrastructure and share information quickly has become more important. Over the past decade, transportation agencies have advanced different approaches to organizing and creating a program structure for TSMO to effectively manage and operate the transportation system. For example, research conducted under the second Strategic Highway Research Program (SHRP2) in the Reliability focus area played a pivotal role in the concept of TSMO program planning by examining both technical and organizational support needed to enhance highway operations and travel time reliability at State DOTs and metropolitan planning organizations (MPOs). The research developed a capability maturity model (CMM) consisting of six key dimensions to help transportation agencies improve the effectiveness of their TSMO activities. The CMM specifically included organization and workforce in terms of organizational structure, staff development, and recruitment and retention. This and other efforts have enabled DOTs to slowly adopt and transition more positions related to management and operations of the transportation system (Grant, et al. 2017). Table 2 provides a description of traditional positions and includes suggestions for future incremental evolution to support TSMO.

Table 2. Evolution of Existing Traffic Engineering, Transportation Planning and ITS Positions

Job Title	General Summary of Position	Future Roles and Responsibilities
Traffic Engineer	Position is primarily responsible for applying principles and practices from civil engineering for the traffic operations of roads, streets, highways, and their networks to achieve a safe, efficient, and convenient movement of people and goods. This position is also responsible for traffic operations studies, such as safety studies, intersection operations studies, traffic impact studies, interstate operation studies, interchange modification report, traffic signal timing studies, and signal warrant studies.	• Use spatial data, such as geographic information system and relevant spatial analyses and statistics, for data-driven decision making. • Advocate for the appropriate TSMO countermeasures during the planning, design, and construction of highway projects as appropriate. • Consider connected and automated vehicles impacts on traffic operations.

Job Title	General Summary of Position	Future Roles and Responsibilities
Traffic Signal Engineer	Position is responsible for all aspects of traffic signals, from design to operation. The successful candidate will have extensive experience in the field of traffic signal design, implementation, maintenance, and operations. This position may also be responsible for operating the Traffic Management Center and coordinating the activities of assigned staff to respond to citizens' complaints regarding traffic signal issues. This position is also responsible for emergency traffic signal operations within the region.	• Incorporate integrated corridor management techniques into the operations of traffic signals. • Consider connected and automated vehicles impacts on traffic signal operations. • Effectively use geographic information system and other analytical tools, such as Excel, SPSS/STATA, traffic simulation and signal timing software (e.g. VISSIM, CORSIM, Synchro), etc., to create information from data that enhances operational decision making.
Freeway Operations Engineer	Position is primarily responsible for development, evaluation, and deployment of new technology related to traffic engineering and ITS along the freeway system. This position is also responsible for overseeing and monitoring the continued deployment and enhancement of incident management, and other active traffic management techniques with an emphasis on system efficiency, cost effectiveness, and community acceptance.	• Incorporate integrated corridor management techniques into the operations of freeway facilities. • Consider connected and automated vehicles impacts on freeway operations. Consider and manage new techniques such as automated vehicle only lanes. • Take a multimodal approach to freeway operations. • Use real-time data to make real-time operational decisions. Implement and use prediction software to make operational decisions.
Arterial Operations Engineer	Position is primarily responsible for development, evaluation and deployment of new technology related to traffic engineering and ITS along the arterial network. The successful candidate will provide liaison with other governmental agencies and the public for coordination of active arterial management projects/programs in the region. This position is also responsible for performing field observations of traffic conditions to validate concerns or inquiries and evaluate/make recommendations relating to the application of new technology to support the agency's vision and mission.	• Incorporate integrated corridor management techniques into the operations of arterial facilities. • Consider connected and automated vehicles impacts on arterial operations. • Take a multimodal approach to arterial operations. • Use real-time data to make real-time operational decisions. Implement and use prediction software to make operational decisions. • Identify, analyze, and interpret trends or patterns in complex data sets.
ITS Design Engineer	Position is primarily responsible for the design of ITS projects. The successful candidate will prepare project plans and specifications related to ITS elements such as fiber optic cable systems, Closed Circuit Television (CCTV) cameras, Microwave Vehicle Detection System (MVDS), Dynamic Message Signs (DMS), etc., while applying the systems engineering process.	• Integrate connected vehicles into ITS design. For example, add dedicated short-range communication or 5G connectivity as needed. • Use modern technology in ITS design.

Job Title	General Summary of Position	Future Roles and Responsibilities
ITS Planner	Position is responsible for planning and developing ITS projects, including preparing documents that follow the Federal Highway Administration (FHWA) systems engineering process. The successful candidate will be responsible for completing transportation planning and feasibility studies for DOTs, MPOs, and local municipalities.	• Utilize big data to analyze benefits of TSMO strategies and implement if feasible. • Mainstream TSMO into the project planning process. • Implement modeling for analysis, visualization, planning, and training related to TSMO programs. • Perform scenario planning to plan for connected and automated vehicles.
Transportation Planner	Position is responsible for long-range transportation planning and considering safety, environmental, and efficiency issues in areas such as land use, infrastructure analysis, environmental compliance, and corridor planning. This position allocates resources to initiate and develop projects, and is responsible for the identification of needs, the preparation of plans and estimates, and adherence to regulations.	• Mainstream TSMO into the project planning process. • Integrate management and operations strategies into the metropolitan transportation planning process to maximize the performance of the existing and planned transportation system. • Implement modeling for analysis, visualization, planning, and training related to TSMO programs. • Take a multimodal approach to transportation planning. • Use scenario planning to understand range of potential TSMO impacts

Eventually, the positions in Table 2 will need to evolve for DOTs and other transportation organizations to adjust to the changing environment enabled by evolving technologies.

Emerging TSMO Positions in DOT and Other Agencies

The research conducted to develop this guidebook identified a set of emerging professional-level positions that should be considered by DOTs and many of the consultants they hire in the evolution of the TSMO workforce. These 19 positions were identified based on stakeholder feedback, literature review, and workforce research and reflect conversations around TSMO needs, emerging technologies, and broad workforce projections. Developing these positions within TSMO will move transportation agencies toward innovation and adaptability and create an opportunity to develop successful, highly effective, and state-of-the-art TSMO programs. The emerging TSMO positions include:

- Traffic Data Scientist/Statistician
- TSMO Manager/Chief/Bureau Director
- TSMO Program Manager
- Computer Engineer
- Artificial Intelligence Scientist
- Telecommunications Engineer
- Data Management Specialist
- Visualization Specialist
- Cyber Security Engineer
- Transportation Data Ethicist
- Surface Weather Specialist
- Systems Engineer
- TSMO Modeling Specialist
- Emerging Technologies Industry Liaison
- Transportation Systems Performance Manager
- Integrated Corridor Management Manager

- Connected and Automated Vehicles (CAV) Program Manager
- Traffic Incident Management (TIM) Program Manager
- Transportation Management Center Manager

How to Integrate TMSO into DOT Business Practices

There is no one size fits all approach for organizing a DOT. While traditional units or divisions, such as a construction division, are commonly found across DOT organizational structures, the design of these organizational structures varies from state to state. Additional considerations about an agency's organization structure include how resources are allocated (e.g., centralized vs. decentralized) and by whom work activities are typically performed (e.g., in-house vs. outsourced).

This range in designs makes it difficult to prescribe how to integrate a TSMO program into a DOT's organizational structure. Focusing on common business practices within a DOT highlights several activities performed by all DOTs, regardless of organizational structure. Table 3 highlights the relationships between the 19 emerging TSMO position descriptions identified in this research and 9 common business areas within DOTs. Most of the 19 TSMO-related positions are expected to have significant roles in activities related to traffic and safety, TSMO, and research. Management-level positions (e.g., TSMO Program Manager) are expected to have involvement cutting across all major business areas.

As a DOT is beginning to develop its TSMO program, it is likely that TSMO-related positions will exist in the divisions or units that align with their role (e.g., a Traffic Data Scientist/Statistician may be found in the traffic and safety unit or operations unit). Because many of the TSMO program functions are crosscutting, these functions could be conducted in various DOT divisions or units.

As TSMO programs evolve, the DOT may consider consolidating the TSMO-related roles into a standalone TSMO unit. Having a standalone TSMO unit could allow the DOT to better define processes and workflows that cross traditional DOT business areas, which will increase efficiencies of the program.

Table 3. Relationships between TSMO Job Positions and Typical DOT Business Areas

Job Position	**Admin.**	**Planning**	**Design**	**Construction**	**Maint.**	**Asset & Perf. Management**	**Permitting & Enforcement**	**Traffic & Safety**	**Operations**	**Research**
Traffic Data Scientist/Statistician	○	◐	◐	◐	◐	◐	○	●	●	●
TSMO Manager/Chief/Bureau Director	●	●	●	●	●	●	●	●	●	●
TSMO Program Manager	●	◐	◐	◐	◐	●	◐	●	●	●
Computer Engineer	○	○	○	○	○	◐	○	◐	◐	●
Artificial Intelligence Scientist	○	○	○	○	○	◐	○	◐	◐	●
Telecommunications Engineer	○	○	○	○	○	◐	○	◐	◐	●
Data Management Specialist	○	○	○	○	○	●	◐	◐	●	●
Visualization Specialist	○	◐	◐	◐	◐	●	○	●	●	●
CAV Program Manager	●	◐	◐	◐	◐	◐	○	◐	●	●
TIM Program Manager	○	○	○	○	◐	◐	●	●	●	○
Cyber Security Engineer	○	○	○	○	○	◐	○	◐	◐	●
Transportation Data Ethicist	◐	○	○	○	○	◐	○	○	◐	●
Surface Weather Specialist	○	○	○	○	◐	○	○	●	●	○
Systems Engineer	○	◐	◐	◐	◐	●	○	●	●	●
TSMO Modeling Specialist	○	●	◐	◐	◐	◐	○	●	●	●
Emerging Technologies Industry Liaison	◐	○	○	○	○	◐	○	○	◐	●
Transportation Systems Performance Manager	●	◐	◐	◐	◐	●	◐	◐	◐	◐
Integrated Corridor Management Manager	●	●	●	●	●	●	◐	●	●	●
Transportation Management Center Manager	◐	○	○	○	●	●	●	●	●	●

<u>Legend</u>
○ represents not typically involved
◐ represents some involvement
● represents frequent involvement

<u>Abbreviations</u>:
Admin: Administration
Maint: Maintenance
Perf: Performance

Guidance for Hiring Specific TSMO Positions

Developing a Recruitment Plan

Most DOTs have long established processes that may need to be modified to reflect the nature of some of the emerging positions. It is suggested that a formal recruitment plan be developed for each new TSMO position that considers:

- When to recruit
- Where to recruit (traditional and non-traditional, internal to the agency or open, union vs. non-union)
- Use of recruitment specialist
- Screening and interview process
- Incentives

In addition, the emerging use of e-portfolio resumes and electronic resume screening should be considered, especially for positions that are recruited out of technology-based industries. These considerations and the recruitment plan in general should be done in cooperation with human resources (HR) staff to address potential changes in hiring policies and processes.

Determining When to Recruit

One of the greatest workforce challenges DOTs are experiencing may be identifying KSAs and positions they cannot currently foresee or envision. If an agency cannot foresee the need for a position, they will not be able to understand when to begin to recruit for a position. This foresight requires a broad understanding of current and future TSMO staffing needs, adapting current positions to incorporate new KSAs and creating new positions. It may be appropriate in some situations to evolve positions from their current focus and in others to add new positions with different KSAs. New positions should be considered in areas not easily addressed within the current DOT workforce and in circumstances that may trigger the need for new positions. Examples of such triggers might include the decision to formalize a new program, such as traffic incident management, or implement decision support software in a traffic management center. Triggers may also be externally activated through the emergence of technology in the private sector, such as connected and automated vehicles or mobility on-demand applications, or in response to cyber threats and malware attacks. This guidebook helps identify and provide example triggers for hiring new positions; however, to be effective it is important that someone within the transportation agency be responsible for monitoring these triggers and acting as appropriate.

The TSMO CMM framework can also be used to help identify when agencies are ready to develop or hire new positions. Shown in Table 4, the TSMO CMM capability maturity dimensions and levels can be used to quickly self-assess the current capabilities of an agency, as well as determine where an agency strives to achieve. While an agency's level will likely differ depending on the dimension, for this guide an agency's overarching CMM level is the level with which most of their dimensions align. For example, if an agency's self-evaluation found one dimension as a level 3, one dimension as a level 1, and the remaining dimensions as a level 2, that agency should consider their overall CMM level a 2. This CMM structure is used to identify triggers that can help an agency understand when it is time to begin recruitment for a new position.

Table 4. TSMO Capability Maturity Dimensions and Levels (American Association of State Highway and Transportation Officials 2018)

Dimension	Level 1	Level 2	Level 3	Level 4
Business Processes (Planning, programming, budgeting, implementation)	Processes related to TSMO activities ad hoc and un-integrated	Multiyear statewide TSMO plan and program exists with deficiencies, evaluation, and strategies	Programming, budgeting, and project development processes for TSMO standardized and documented	Processes streamlined and subject to continuous improvement
Systems & Technology (Systems engineering, standards and technology interoperability)	Ad hoc approaches outside systematic systems engineering	Systems engineering employed and consistently used for Concept of Operations, architecture, and systems development	Systems and technology standardized, documented, and trained statewide, and new technology incorporated	Systems and technology routinely upgraded and utilized to improve efficiency performance
Performance Measurement (Measures, data & analytics and utilization)	No regular performance measurement related to TSMO	TSMO strategies measurement largely via outputs, with limited after-action analyses	Outcome measures identified and consistently used for TSMO strategies improvement	Mission-related outputs/outcomes data routinely utilized for management, reported internally and externally, and archived
Culture (Technical understanding, leadership, outreach, and program authority)	Value of TSMO not widely understood beyond champions	Agency-wide appreciation of the value and role of TSMO	TSMO accepted as a formal core program	Explicit agency commitment to TSMO as key strategy to achieve full range of mobility, safety, and livability/sustainability objectives
Organization/ Workforce (Organizational structure and workforce capability development)	Fragmented roles based on legacy organization and available skills	Relationship among roles and units rationalized and core staff capacities identified	Top level management position and core staff for TSMO established in central office and districts	Professionalization and certification of operations core capacity positions including performance incentives
Collaboration (Partnerships among levels of government and with public safety agencies and private sector)	Relationships on informal, infrequent, and personal basis	Regular collaboration at regional level	Collaborative interagency adjustment of roles/responsibilities by formal interagency agreements	High level of operations coordination institutionalized among key players – public and private

Figure 1 organizes the 19 emerging TSMO positions presented in this guidebook into three groups of CMM levels, and a detailed example of how to use this figure follows. These groupings do not indicate that all of the job positions in a single grouping must be present within a TSMO program before the program can move on to the next CMM level; rather, these groupings show common job positions found at the different CMM levels. A chart is included for each job position that shows the improvement potential for each of the six CMM dimensions.

The more filled the chart's dimension, the greater potential for improvement the job position adds to the dimension.

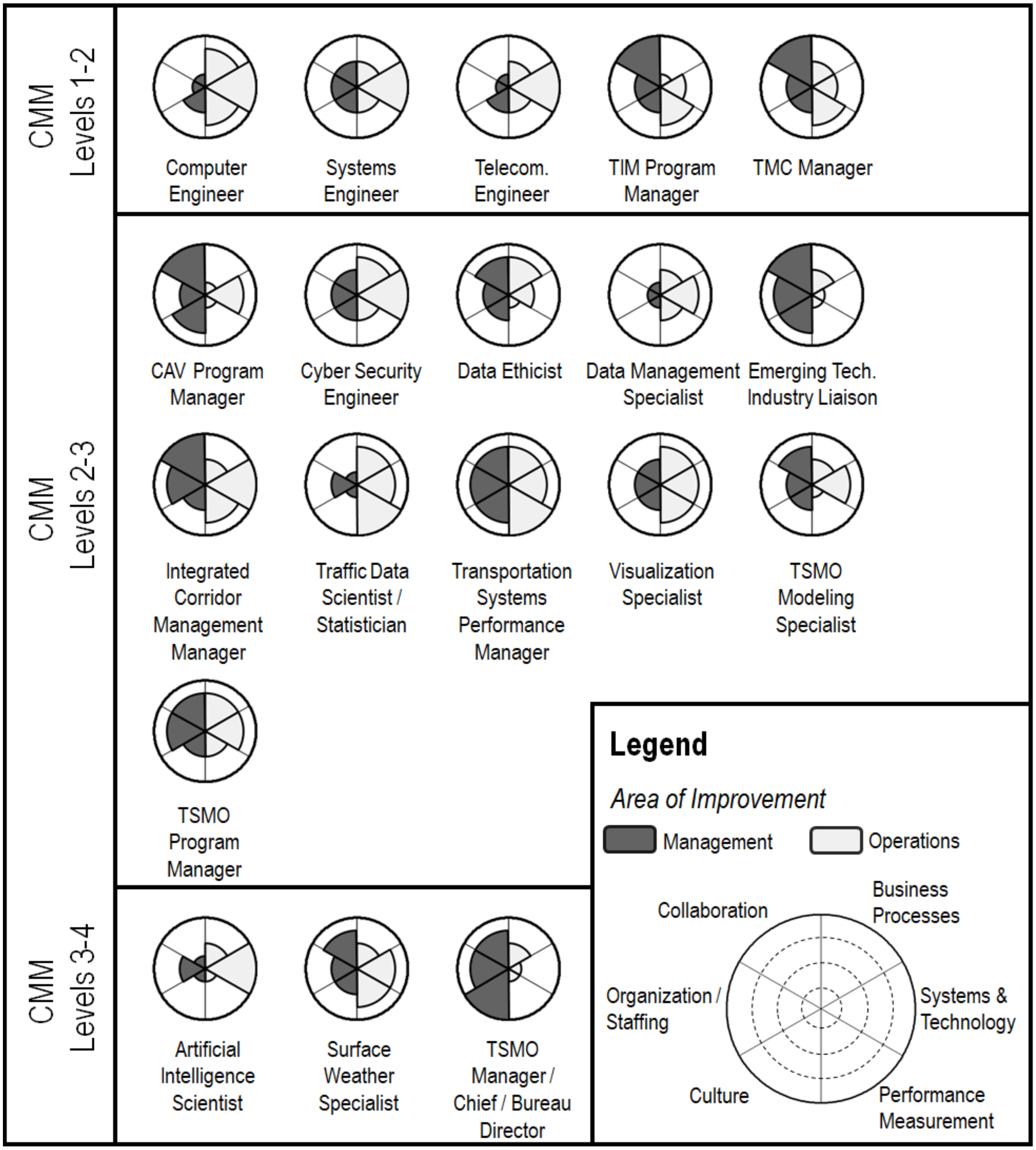


Figure 1. TSMO Job Positions and CMM Improvement Potential per CMM Level

To help understand the information presented in Figure 1, Figure 2 is provided as an example focusing on a single job position (Computer Engineer). Both figures illustrate at what level of maturity the job position is typically found at the transportation agency. Using the Computer Engineer as an example, this job position is typically found in TSMO programs with a CMM level of 1 or a 2. Next, each figure lists six areas of improvement (e.g., business processes) and describes the significance of the improvement when hiring the job position. These six areas are arranged in a circle, with the three areas on the left of the circle representing management, and those on the right representing operations.

As shown by the dotted concentric circles in the legend of Figure 1, a higher rating (i.e., more area filled in) represents a job position providing higher potential benefit to that area of improvement. Using the Computer Engineer example in Figure 2, hiring a Computer Engineer will have the highest potential for improving the agency's systems and technology dimension, but a low potential for improving the agency's collaboration or organization/staff dimensions. Looking at the distribution of the improvement potential, one can see that overall a Computer Engineer is expected to have a higher improvement potential on operations than on management, and this is shown by those areas shaded of improvement on the right side of the circle are larger than those on the left side of the circle.

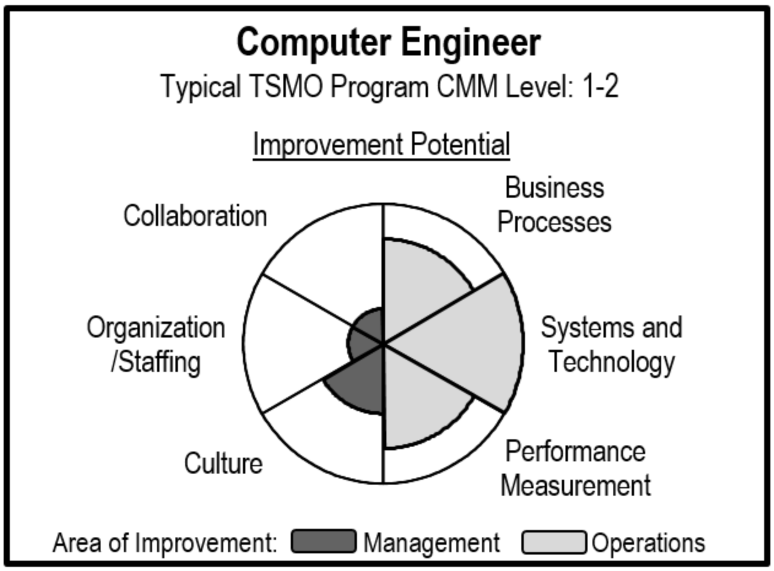


Figure 2. The Improvement Potential at a DOT When Hiring a Computer Engineer

Determining Where to Recruit

Traditional DOT positions are generally recruited from within the agency, the transportation industry or civil engineering schools. A number of the emerging TSMO positions, such as Artificial Intelligence Scientist, Transportation Data Ethicist, and Emerging Technologies Industry Liaison, require specialized training and experience in areas not traditionally recruited by DOTs. Other positions require experience in areas that have traditionally been addressed in other departments or partner agencies, such as Computer Engineer or Traffic Incident Management Program Manager. The consideration of where to recruit can also take a geographic focus of internal to the agency, locally, regionally, and nationally. Some of the emerging positions may require a broader regional or national search to find the KSAs needed.

Considering the Use of Recruitment Specialists

In some instances, a third-party recruitment specialist may be needed to solicit potential candidates. Positions that may benefit from the use of a recruiter include the higher-level management positions, such as TSMO Manager/Chief/Bureau Director, or are highly specialized and unaware of the emerging need for their KSAs within transportation, such as Visualization Specialist or Artificial Intelligence Scientist. Recruitment specialists can be helpful in hiring in competitive markets, or in areas where the cost of living impacts the availability of candidates. Recruiters may cost the hiring agency 10-20 percent of the first year hiring salary for a position.

Developing the Screening and Interview Process

Standard DOT applicant screening generally checks to see if the applicant provides some level of verification for the level of education, the number of years of experience, required licensure or other certifications, and KSAs as noted in the job posting. Some of the emerging TSMO positions do not have equivalency in traditional transportation agencies, making it difficult for DOT HR personnel to readily identify examples of KSAs or experience that may be similar or parallel to those required in the posting. For example, a visualization specialist who has worked in manufacturing or public utility agencies may have skills that directly translate into the visualization of systems operations or traffic flows but may be so nontraditional to agency HR staff that they are not readily identified as meeting the posting requirements. It is important to develop a range of example KSAs for each position to be used in applicant screening.

Interview structure and questions face similar challenges to applicant screening and should be tailored to the specific job responsibilities and desired KSAs for the position. Examples of previous work may be requested for certain positions, such as sample products for Visualization Specialists or Traffic Data Scientist/ Statistician. These should be identified as part of the recruitment plan and requested of the applicant prior to the interview. Collaboration and communication skills are critical to a number of TSMO positions. Interviews should include interactive discussions, behavioral competency questions, scenarios or role-play exercises to determine candidates' interpersonal and collaborative skills.

Determining Incentives

As a number of emerging TSMO positions do not currently exist in transportation agencies or exist in limited numbers, it may be difficult to attract top talent into the specialized areas without offering competitive incentives. Potential incentives tied to dollars may be limited in government agencies, but incentives such as salaries, bonuses, moving expenses, and other incentives should be considered appropriate to the talent the agency is trying to recruit. More pragmatic and realistic incentives might include training, professional organization involvement, flexible work schedule, office space, remote work options, and extended leave opportunities. For example, discussions with a consulting firm that provides services to DOTs revealed a dramatic increase in unpaid leave of absence requests from younger staff. Another important incentive, especially for more specialized jobs that do not fit in the traditional DOT career tracks, are defined opportunities for career advancement within the organization. Advancement opportunities are critical to employee retention.

Chapter 3. Model TSMO Position Descriptions

Introduction

The following sections present information for each of the 19 emerging TSMO-related positions. For each position, information is provided to guide agencies to answer the following questions: When is the position needed? What knowledge, skills, and abilities are required for the position? Where and how should agencies recruit for the position?

Table 5 shows the organization of this chapter and the page number where each position description can be found. This chapter organizes the positions by CMM level to help identify those positions for the current level of maturity of an agency's TSMO program. The four CMM levels are defined as:

- Level 1: Activities and relationships largely ad hoc, informal and champion-driven, substantially outside the mainstream of other DOT activities.
- Level 2: Basic strategy applications understood; key processes support requirements identified and key technology and core capacities under development, but limited internal accountability and uneven alignment with external partners.
- Level 3: Standardized strategy applications implemented in priority contexts and managed for performance; technical and business processes developed, documented, and integrated into DOT; partnerships aligned.
- Level 4: Full, sustainable core DOT program priority, established on the basis of continuous improvement with top level management status and formal partnerships. (Federal Highway Administration 2017)

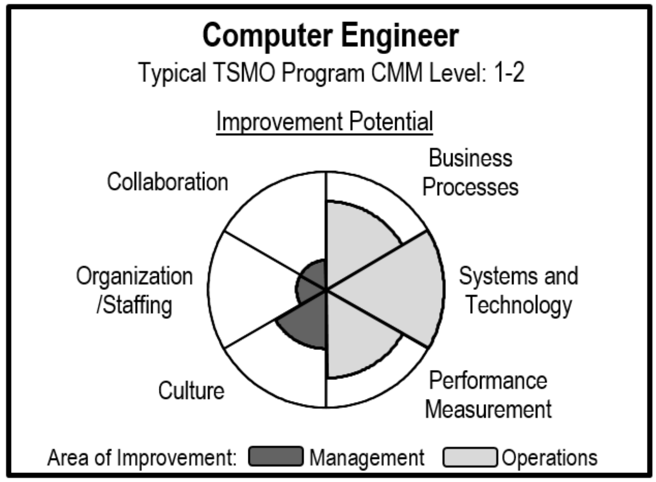
Table 5. Where to Find Each Position Description

Relevant CMM Level	Job Position	Page Number
1 to 2	Computer Engineer	16
	Systems Engineer	18
	Telecommunications Engineer	20
	Traffic Incident Management Program Manager	22
	Transportation Management Center Manager	24
2 to 3	Connected and Automated Vehicles Program Manager	26
	Cyber Security Engineer	28
	Data Management Specialist	30
	Emerging Technologies Industry Liaison	32
	Integrated Corridor Management Manager	34
	Traffic Data Scientist/Statistician	36
	Transportation Data Ethicist	38
	Transportation Systems Performance Manager	40
	TSMO Modeling Specialist	42

Relevant CMM Level	Job Position	Page Number
	TSMO Program Manager	44
	Visualization Specialist	46
3 to 4	Artificial Intelligence Scientist	48
	Surface Weather Specialist	50
	TSMO Manager/Chief/Bureau Director	52

Computer Engineer

When is a Computer Engineer Needed?



A Computer Engineer leads computer support and serves as a specialist that gets the everyday work done. Hiring a Computer Engineer has the most significant impact on the system and technology dimension, especially as the rate of technology advancement increases. Whether it is improved decision support systems, big data, or virtual and augmented reality, the role of a computer engineer within a TSMO organization is only going to increase. The potential to improve business processes and performance measurement is relatively high because IT systems need to be developed and supported to enable improvements. Typically, this position is required for those TSMO programs with a CMM level of 1-2. Specific motivation for hiring a Computer Engineer include:

- The need for in-house IT expertise required specific to emerging technologies and hardware; traditional or external IT support becomes insufficient.
- Multiple systems/applications require continual integration and change management.
- The program is responsible for staying abreast of mobile, cloud, or edge computing.

What Knowledge, Skills, and Abilities are Required?

The Computer Engineer is a specialist who provides advanced engineering and technical guidance for computer systems used in TSMO. As such, core knowledge requirements include competency in computer science/engineering and coding languages. Skillsets necessary for this position include general computer, analytical, and communication skills (written and verbal). Required abilities for this position are data analysis, professional judgment, and teamwork. It is expected that knowledge of TSMO systems (hardware and architecture), local agency procedures, technical communication and report skills, interpersonal skills, and teamwork should also be included. TSMO challenges are complex and require much collaboration.

Knowledge

- Knowledge of Computer Science, Engineering, Software Engineering
- Knowledge of Relevant Coding Languages
- Knowledge of Microsoft Office Programs
- Knowledge of TSMO Systems (hardware and architecture)
- Knowledge of Local Agency Procedures

Skills

- General Computer Skills
- Communication Skills, Written/Verbal
- Analytical, Mathematical, or Problem-Solving Skills
- Interpersonal Skills
- Technical Communication, Report Development Skills
- Time and Task Management Skills

Abilities

- Ability to Collect, Enter, or Analyze Data
- Possess Professional Judgment
- Ability to Work Well on a Team

Figure 3. Computer Engineer KSAs

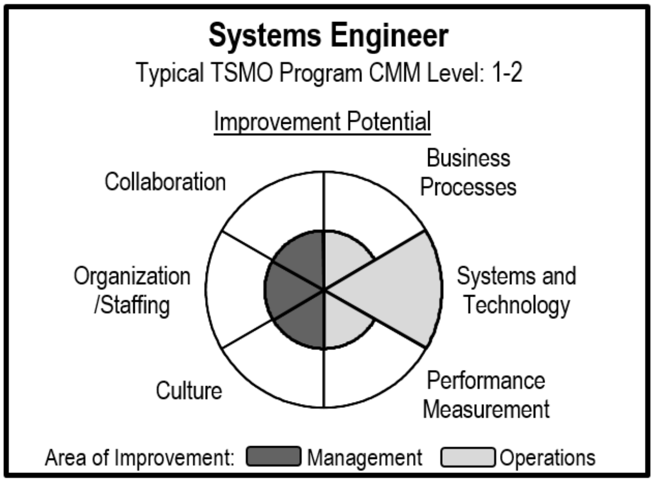
Where and How Should Agencies Recruit for this Position?

When recruiting potential hires, agencies should look to other transportation agencies, consulting firms, the software industry, and academic or research institutions for potential hires with experience in developing and coding computer programs, in system engineering, and in TSMO and ITS applications.

A recruiter will be somewhat helpful to find the most qualified individuals to fill this position. Agencies could consider offering incentives in the form of a flexible work schedule, remote work options, and professional organization involvement.

Systems Engineer

When is a Systems Engineer Needed?



System engineers have the responsibility to design and develop the software, hardware, computer systems and networks associated with TSMO. From end to end, they need to have basic knowledge in Advanced Transportation Management System (ATMS) computer hardware and software, ITS communications networks and field device hardware and software/firmware requirements. The systems and technology dimension offers the highest CMM improvement potential when hiring a Systems Engineer. Typically, this position is required for those TSMO programs with a CMM level of 1-2. Specific motivation for hiring a Systems Engineer include:

- The systems engineering development process continues to be a critical and beneficial practice for TSMO.
- Classical architecture has evolved along with connected and cooperative systems, and expertise is needed to stay current with the tools.
- Stakeholder coordination is a growing challenge with how diverse and multidisciplinary TSMO is becoming.

What Knowledge, Skills, and Abilities are Required?

The Systems Engineer provides advanced engineering and technical guidance for systems engineering applications in TSMO. Core requirements include knowledge of transportation industry and of local agency procedures, project management, and civil, electrical, and systems engineering. Skillsets important for this position include communication, interpersonal, leadership, and problem-solving skills. The ability to work well on a team is also essential. Future position descriptions should include knowledge of ITS system architecture and strong abilities related to data analysis, professional judgement, and innovation.

Knowledge

- Knowledge of Transportation Industry Operations
- Knowledge of Local Agency Procedures, Standard Design Principles
- Knowledge of Civil, Electrical, Systems Engineering Principles
- Knowledge of Project Management Practices
- Knowledge of ITS and System Architecture

Skills

- Communication Skills, Written/Verbal
- Technical Communication and Report Development
- Interpersonal Skills
- Analytical, Mathematical, or Problem-Solving Skills
- Managerial/Supervisory Experience, Leadership

Abilities

- Ability to Work Well on a Team
- Ability to Collect, Enter, or Analyze Data
- Possess Professional Judgment
- Ability to be Innovative or Creative

Figure 4. Systems Engineer KSAs

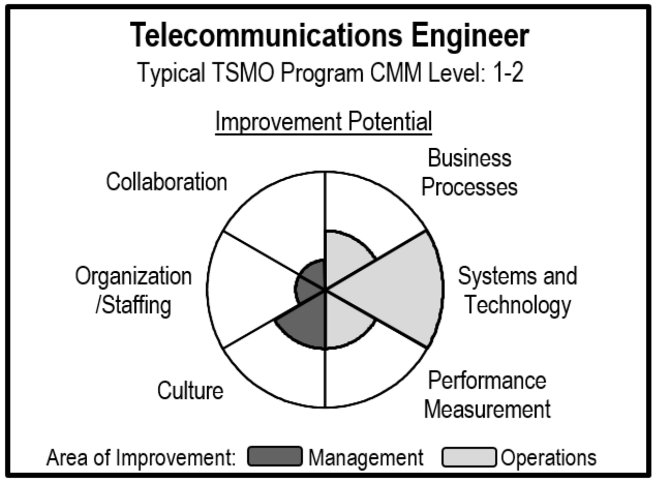
Where and How Should Agencies Recruit for this Position?

When recruiting potential hires, agencies should look to the other transportation agencies, consulting firms, and the software industry for individuals with experience in system engineering, in ITS architecture and planning, and in TSMO and ITS applications.

A recruiter will be somewhat helpful to find the most qualified individuals to fill this position. Agencies could consider offering incentives in the form of a training and professional organization involvement.

Telecommunications Engineer

When is a Telecommunications Engineer Needed?



The telecommunications engineer has the most significant impact on the system and technology dimension, especially as the rate of technology advancements increases. Increasingly, the networks that support and enable regional and statewide ITS systems are becoming complicated, using multiple forms of telecommunications. Many DOTs and other agencies are deploying backup communications to ensure proper messages are being disseminated to motorists (e.g., variable speed limits). The need for increased telecommunications knowledge will only increase as dedicated short-range communication (DSRC) and 5G technologies evolve in the connected and automated vehicle space. Typically, this position is required for those TSMO programs with a CMM level of 1-2. Specific motivation for hiring a Telecommunications Engineer include:

- All of TSMO depends on data communications, much of it with real-time safety and mobility implications
- In-house expertise is required for wire, fiber, and wireless communications, including DSRC and 5G connectivity
- There is a growing demand for network capacity planning and resiliency

What Knowledge, Skills, and Abilities are Required?

The Telecommunications Engineer is a specialist who provides advanced engineering and technical guidance for telecommunications systems used in TSMO. Core requirements include competency in data/computer science, telecommunications hardware and software, and Microsoft Office. Skillsets important for this position include computer skills, management skills, communication and technical reporting, interpersonal skills, time management, and analytical skills. Abilities important for success in this role include teamwork, professional judgment, and good work ethic. Future position descriptions should include knowledge of specialized hardware and software or protocols specific to TMCs and of licensed electromagnetic spectrum as wireless telecommunications become more dominant.

Knowledge

- Knowledge of Data/Computer Science, Programming, Software Engineering
- Knowledge and Experience in the Design and Use of Telecommunications Hardware and Software
- Knowledge of Microsoft Office Programs
- Knowledge of Licensed Electromagnetic Spectrum
- Knowledge of Transportation Operations and relevant hardware, software, and protocols

Skills

- General Computer Skills
- Managerial/Supervisory Experience and Leadership Skills
- Communication Skills, Written/Verbal
- Technical Communication, Report Development Skills
- Interpersonal Skills
- Analytical, Mathematical, or Problem-Solving Skills
- Time and Task Management Skills

Abilities

- Ability to Work Well on a Team
- Possess Professional Judgment
- Possess Good Attitude/Work Ethic

Figure 5. Telecommunications Engineer KSAs

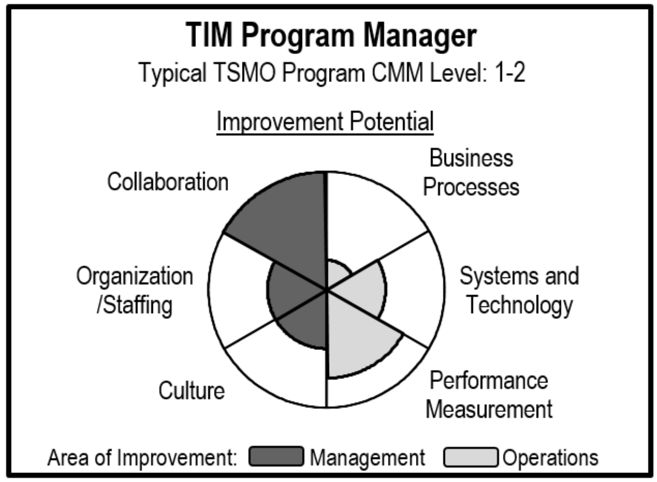
Where and How Should Agencies Recruit for this Position?

When recruiting potential hires, agencies should look to the telecom industry, other transportation agencies, and the computer and software industries for individuals with experience in the design and use of telecommunications hardware and software, in system engineering, and in TSMO and its applications.

A recruiter will be somewhat helpful to find the most qualified individuals to fill this position. Agencies could consider offering incentives in the form of a flexible work schedule, remote work options, and professional organization involvement.

Traffic Incident Management Program Manager

When is a Traffic Incident Management Program Manager Needed?



With a CMM level recommendation of 1-2, the TIM Program Manager is needed for many TSMO programs. The TIM Program Manager oversees the organization's statewide or regional TIM program and provides advanced guidance for TIM operations. The motivation for an agency to hire a TIM Program Manager include:

- Need to bring together traditional first responder practice with new technology applications such as predictive analytics.
- Among the most safety-critical dimensions of TSMO, the need for a role to bring strong attention to detail, policy, and protocols.
- Need for continual improvement while balancing competing priorities from other business areas.

What Knowledge, Skills, and Abilities are Required?

Core knowledge requirements include competency in TMC operations and business software. Skillsets important for this position include general computer skills, communication skills, technical report skills, and interpersonal skills. Professional judgment and the ability to work in a fast-paced environment are crucial skills for this position. Future position descriptions should include ITS technology and traffic incident and congestion management knowledge, time and task management skills, and the ability to work well on a team.

Knowledge	Skills	Abilities
•Knowledge of TMC Operations	•Communication Skills, Written/Verbal	•Possess Professional Judgment
•Knowledge of Microsoft Office Programs	•Technical Communication and Report Development	•Ability to Work in Fast-Paced or Stressful Environment
•Knowledge of ITS Technology, Operations	•General Computer Skills	•Ability to Work Well on a Team
•Knowledge of Traffic Incident/Congestion Management	•Interpersonal Skills	
•Knowledge of Emergency Management	•Time and Task Management Skills	

Figure 6. Traffic Incident Management Program Manager KSAs

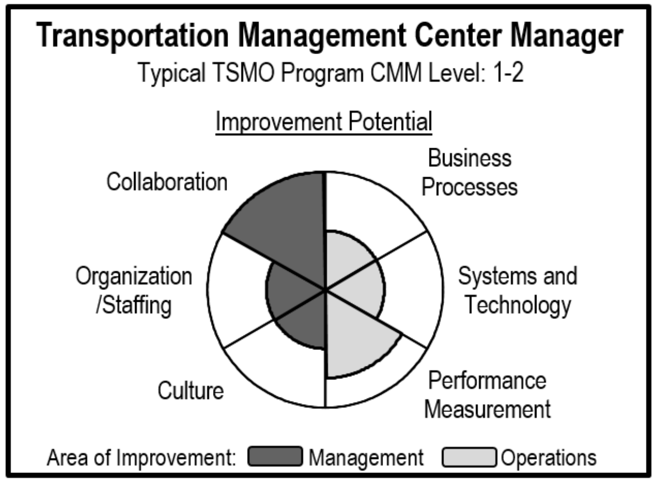
Where and How Should Agencies Recruit for this Position?

When recruiting for hires, agencies looking to hire a TIM Program Manager should focus recruitment efforts on other transportation agencies, public safety agencies, and consulting firms for those with experience in incident response as well as National Incident Management System (NIMS) and Incident Command System (ICS) experience, in emergency management, and in TSMO and ITS applications.

A recruiter may be helpful to fill this position. Agencies could consider offering incentives in the form of training and professional organization involvement when recruiting a TIM Program Manager.

Transportation Management Center Manager

When is a Transportation Management Center Manager Needed?



The Transportation Management Center Manager is responsible for providing support and supervision in the TSMO Control Room. The purpose of this role is to oversee the day-to-day operations of the TSMO Program strategies deployed within the geographical area covered by the TMC. The organization/staffing and collaboration dimensions have the most significant impact on CMM improvement potential. This is due to the enhanced interaction with external stakeholders, including the public, partner agencies, emergency responders, etc. Typically, this position is required for those TSMO programs with a CMM level of 1-2. Specific motivation for hiring a Transportation Management Center Manager include:

- The agency is establishing a new TMC
- Desire to improve TMC operations and/or better manage TMC personnel
- Operator staff works in shifts and are sometimes contracted for fixed terms, making continuity through an agency manager position critical to their effectiveness

What Knowledge, Skills, and Abilities are Required?

The Transportation Management Center Manager is responsible for providing support and supervision in the TMC. The purpose of this role is to oversee the day-to-day operations of the TSMO Program strategies deployed by the TMC. This role requires specific knowledge, skills, and abilities that enable smooth operations, not only in daily operations and general traffic management, but particularly in response to emergencies and coordination across a variety of staff and stakeholders. Core knowledge requirements include understanding of the regional highway system under the jurisdiction of the TMC, congestion and incident management practices, equipment and machinery operations, and traffic engineering operations. Skillsets important for this position include communication skills, managerial and leadership skills, interpersonal skills, computer skills, and problem-solving skills. Abilities critical for success in this role include the ability to work in a stressful environment, possess professional judgment, and work well both on a team and independently. Future position descriptions should include knowledge of ITS/emerging technologies and particularly knowledge of CAV integration into transportation operations.

Knowledge

- Knowledge of Traffic Engineering & Operations
- Knowledge of Regional Highway Systems
- Knowledge of Traffic Incident/Congestion Management
- Knowledge of Operations of Relevant Machinery/Equipment
- Knowledge of Microsoft Office Programs
- Knowledge of ITS/CAV/Emerging Technologies
- Knowledge of Multi-modal and Intermodal Operations

Skills

- Communication Skills, Written/Verbal
- General Computer Skills
- Managerial/Supervisory and Leadership Skills
- Interpersonal Skills
- Time and Task Management Skills
- Analytical, Mathematical, or Problem-Solving Skills

Abilities

- Ability to Work in Fast-Paced or Stressful Environment
- Possess Professional Judgment
- Ability to Work Well on a Team
- Ability to Work Well Independently

Figure 7. Transportation Management Center Manager KSAs

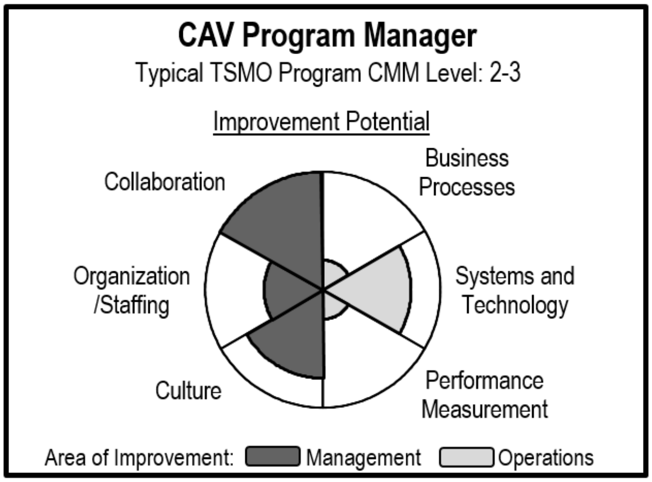
Where and How Should Agencies Recruit for this Position?

When recruiting potential hires, agencies should look to the other transportation agencies and consulting firms for individuals with experience with TMC management, traffic operations and systems management, and in TSMO and ITS applications.

A recruiter is not necessary to find the most qualified individuals to fill this position. Agencies could consider offering incentives in the form of a training and professional organization involvement.

Connected and Automated Vehicles Program Manager

When is a Connected and Automated Vehicles Program Manager Needed?



Many DOTs have created a position to deal with issues associated with the emergence of connected and automated vehicles. Similar to the TSMO program manager, the CAV program manager strengthens the collaboration dimension, because a significant part of the work is partnering with the private sector to test and evaluate CAV technologies. The position also includes improvements in systems and technology, especially within the context of connected vehicles and culture, because DOTs and other agencies are elevating the discussion on the wide-ranging policy issues related to CAV (e.g., insurance, liability, vehicle ownership models, land use impacts). Typically, this position is required for those TSMO programs with a CMM level of 2-3. Specific motivation for hiring a Connected and Automated Vehicles Program Manager include:

- TSMO programs may not have ultimate authority for CAV application, but should be knowledgeable about CAV and how they function within the transportation system.
- CAV has substantial implications on regulation and policy, and the TSMO program is looking to stay abreast of the interactions among many opposing interests.
- The need to couple technical familiarity with skill in communication and management.

What Knowledge, Skills, and Abilities are Required?

The CAV Program Manager manages the strategic approach of an agency to develop an integrated, safe, and efficient CAV system. Core knowledge requirements include competency in project management, data/computer science, and CAV technologies. Skillsets important for this position include managerial skills, communication skills, analytical skills, and interpersonal skills. Abilities that are essential for the position include professional judgement and the ability to work well on a team. Future position descriptions should include local and state policy knowledge, time and task management, research, and technical communication skills, and the ability to analyze data. Research skills are considered important because of the need to keep at the forefront of technology advances and to examine benefits, costs, and applicability of potential solutions.

Knowledge	Skills	Abilities
• Knowledge of Project Management Practices • Knowledge of Data/Computer Science, Programming • Knowledge of CAV Technology • Knowledge of Local and State Policies and Procedures • Knowledge of Multi-modal and Intermodal Operations	• Managerial/Supervisory Experience, Leadership Skills • Communication Skills, Written/Verbal • Interpersonal Skills • Analytical, Mathematical, or Problem-Solving Skills • Time and Task Management Skills • Research Skills • Technical Communication and Report Development • Entrepreneurial skills to develop non-traditional relationships	• Possess Professional Judgment • Ability to Work Well on a Team • Ability to Collect, Enter, or Analyze Data

Figure 8. Connected and Automated Vehicles Program Manager KSAs

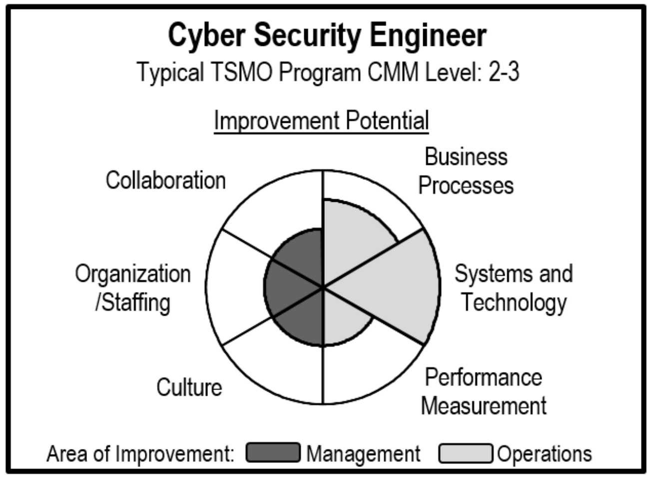
Where and How Should Agencies Recruit for this Position?

When recruiting potential hires, agencies should look to the other transportation agencies, consulting firms, the auto manufacturing industry, and the software industry for individuals with experience in project management, in TSMO and ITS applications, and in data curation and analysis.

A recruiter will be somewhat helpful to find the most qualified individuals to fill this position. Agencies could consider offering incentives in the form of a flexible work schedule, remote work options, and professional organization involvement.

Cyber Security Engineer

When is a Cyber Security Engineer Needed?



The need for a Cyber Security Engineer increases as the agency's TSMO IT infrastructure grows. The primary purpose of this role is to provide technical expertise, knowledge, and to drive cybersecurity to support other TSMO programs. Typically, this position is required for those TSMO programs with a CMM level of 2 or 3. Specific motivation for hiring a Cyber Security Engineer include:

- Presence of connected vehicle technology at the agency or used on the agency's transportation network.
- Need to assess existing systems, address vulnerabilities, and work with others on emerging systems and applications while ensuring security risk is minimized.

Increasingly, computer systems are under assault from various cyber-related attacks. Over the last 25 years as DOTs and other agencies have installed ITS systems, many have accumulated operational technology (OT) equivalent to the size of a small telecom network with thousands of roadside devices using a variety of wireline and wireless telecommunications. The CMM dimensions of Systems and Technology has the most significant improvement potential from hiring a Cyber Security Engineer, because most of the countermeasures will be a hardware or software-based solution. Business processes will likely need to be modified to establish policies and procedures for cyber security related issues (e.g., cabinet access, field equipment passwords, cyber-attack recovery playbooks).

What Knowledge, Skills, and Abilities are Required?

The Cyber Security Engineer assists in building cybersecurity into critical operations systems to ensure safe TSMO activities. These engineers will be responsible for the design, development, implementation, and integration of architectures, systems, and system components. This position will ensure that the architecture and design of development and operational systems are functional and secure, and it will also assist in the development of innovative approaches to drive change in cybersecurity risk management across the agency to prevent or minimize disruptions to critical information infrastructure. Core requirements include cybersecurity policy, information technology security, vulnerability assessment, and relevant hardware, software, and coding languages. Skillsets important for this position include analytical skills, communication skills, and research skills. Abilities essential for success in this role include the ability to work well on a team. Future position descriptions should include knowledge of commercial and open source information security technology. Language processing will also have application to security and management tasks.

Knowledge	Skills	Abilities
• Knowledge of Cyber Security Policy, Regulations, Standards • Knowledge of Information Technology/Security, Computer Science • Knowledge of Cyber Security, Risk, Vulnerability Assessment • Knowledge of Cyber Security Hardware/Software • Knowledge of Commercial and Open Source Information Security Technology • Knowledge of Linguistic Analysis/Language Processing and Data Mining Techniques	• Communication Skills, Written/Verbal • Technical Communication and Report Development • General Computer Skills • Interpersonal Skills • Analytical, Mathematical, or Problem-Solving Skills	• Ability to Work Well on a Team

Figure 9. Cyber Security Engineer KSAs

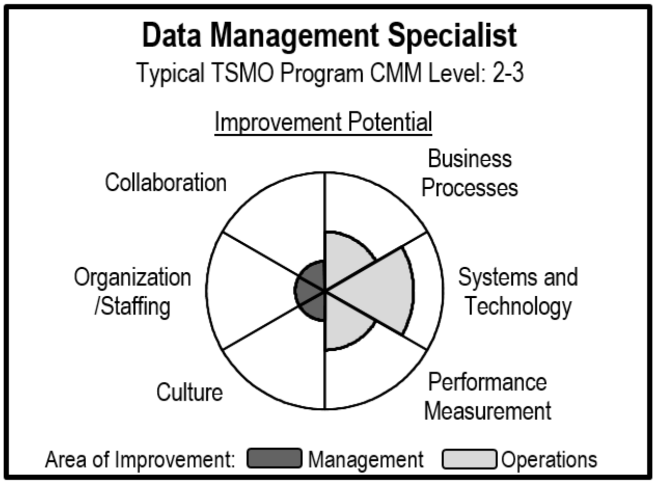
Where and How Should Agencies Recruit for this Position?

When recruiting potential hires, agencies looking to hire a Cyber Security Engineer should focus recruitment efforts in the industries of computer, software, technology, banking, and defense, looking for those with experience in cyber security risk and vulnerability assessment, in developing and coding computer programs, and in system engineering.

A recruiter will likely be needed to find the most qualified individuals to fill this position. Agencies could consider offering incentives in the form of a flexible work schedule, remote work options, and professional organization involvement when recruiting a Cyber Security Engineer.

Data Management Specialist

When is a Data Management Specialist Needed?



Data Management Specialists are important in enabling several activities within a TSMO organization. While not responsible for building and maintaining systems and technology, they ensure data move from one system to another to enable improved decision making. They also ensure data being collected are adequate to support business processes and/or performance measures by applying data quality assurance procedures so users have an understandable level of confidence in how it is applied. Typically, this position is required for those TSMO programs with a CMM level of 2-3. Specific motivation for hiring a Data Management Specialist include:

- As the volume of data being collected at a TSMO Program grows, so does the need for dedicated data management positions.
- TSMO is already replete with "medium" data (i.e., exceeding traditional desktop tools and requiring databases)and the demand for data management is growing exponentially with "big" data entering the field, especially from connected vehicle applications.
- The TSMO program is beginning to move beyond traditional database architecture and towards virtualization and cloud storage.

What Knowledge, Skills, and Abilities are Required?

The Data Management Specialist is responsible for using a wide variety of information, knowledge, and tools to develop, modify, and administer databases used to store and retrieve data and to develop standards for the handling of data. This work often involves difficult and complex problems in the administration of databases, in the modification of data elements, in the retrieval and reporting of information from the databases, and insuring the security of data. The role requires the ability to lead projects related to data management and to work across disciplines. Core requirements include competency in data/computer science, database software and programming languages, and knowledge of Microsoft Office. Skillsets important for this job include communication and interpersonal skills. Future position descriptions should include knowledge of specialized hardware/software specific to TMCs from which data are likely to be extracted.

Knowledge	Skills	Abilities
• Knowledge of Data/Computer Science, Programming, Software Engineering • Knowledge of Access, SQL, or other Database Languages • Knowledge of Microsoft Office Programs • Knowledge of Transportation Operations and relevant hardware and software	• Communication Skills, Written/Verbal • Interpersonal Skills • Analytical, Mathematical, or Problem-Solving Skills • Technical Communication, Report Development Skills	• Ability to Work Well on a Team • Ability to Work Well Independently • Ability to Collect, Enter, and Analyze Data • Ability to Work in a Fast-Paced or Stressful Environment

Figure 10. Data Management Specialist KSAs

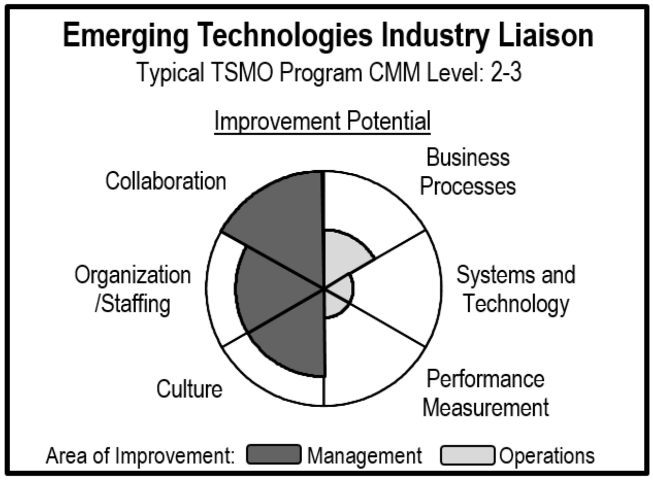
Where and How Should Agencies Recruit for this Position?

When recruiting potential hires, agencies should look to other transportation agencies, consulting firms, the data management and analytics industry, and academic or research institutions for individuals with experience in computer programming and software development, in data curation and analysis, and in TSMO and ITS applications.

A recruiter will be very helpful to find the most qualified individuals to fill this position. Agencies could consider offering incentives in the form of a flexible work schedule, remote work options, and professional organization involvement.

Emerging Technologies Industry Liaison

When is an Emerging Technologies Industry Liaison Needed?



Many entrepreneurs and businesses find it intimidating to work with a government agency. Establishing a position that can serve as an agency "storefront" for industry can help accelerate innovation. The collaboration dimension offers the most CMM improvement potential because the industry liaison is tasked with connecting business, academic/research, and government to help promote economic development while achieving the organization's goals. Typically, this position is required for those TSMO programs with a CMM level of 2-3. Specific motivation for hiring an Emerging Technologies Industry Liaison include:

- The TSMO / CAV ecosystem is rapidly expanding and increasingly private sector driven.
- The transportation agency has interest in, but is not able to stay abreast of the myriad new technologies available to them.
- A growing need to identify the good and viable technologies, manage risk of implementation, and effectively and efficiently communicate with internal decision-makers and external collaborators.

What Knowledge, Skills, and Abilities are Required?

The Emerging Technologies Industry Liaison will lead and manage the strategic approach of the agency to collaborate with the private sector and other public agencies for the testing and eventual integration of CAV and Smart Cities initiatives into the transportation system. The role requires creativity, innovation, and a willingness to address a variety of challenges. Core knowledge requirements include competency in transportation industry and knowledge of ITS/emerging technologies. Skillsets important for this position include communication, leadership, problem-solving, and interpersonal skills. Professional judgment and the ability to work on a team is crucial. Future position descriptions should include local and state agency policy knowledge and the ability to be innovative or creative.

Knowledge

- Knowledge of Transportation Industry Operations
- Knowledge of ITS/Emerging Technologies
- Knowledge of Local and State Business Policies and Procedures

Skills

- Communication Skills, Written/Verbal
- Interpersonal Skills
- Analytical, Mathematical, or Problem-Solving Skills
- Managerial/Supervisory Experience, Leadership
- Entrepreneurial Skills

Abilities

- Possess Professional Judgment
- Ability to Work Well on a Team
- Ability to be Innovative or Creative

Figure 11. Emerging Technologies Industry Liaison KSAs

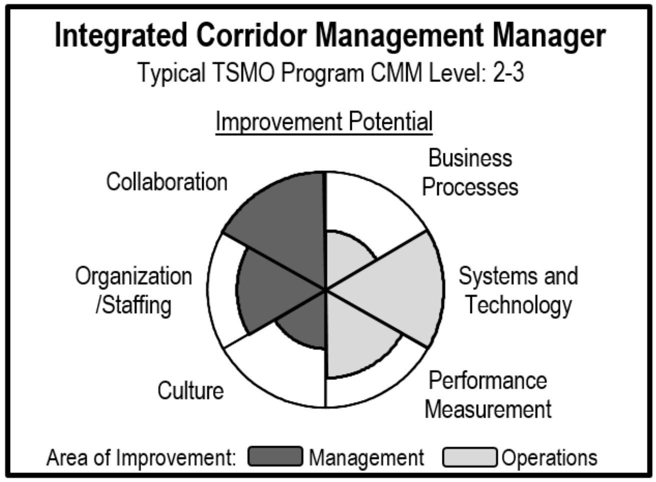
Where and How Should Agencies Recruit for this Position?

When recruiting potential hires, agencies should look to the the auto manufacturing industry, the telecom industry, other transportation agencies, the computer and software industry, and the information technology sector for individuals with experience in emerging technologies, in the Internet of Things (IoT) and vehicle-to-everything (V2X) technology, and in TSMO and ITS applications.

A recruiter will be somewhat helpful to find the most qualified individuals to fill this position. Agencies could consider offering incentives in the form of a flexible work schedule, remote work options, and professional organization involvement.

Integrated Corridor Management Manager

When is an Integrated Corridor Management Manager Needed?



As DOTs and other agencies overcome jurisdictional issues, the opportunities to improve corridor operations improve significantly. There are significant safety and mobility benefits to operating freeway, arterial, and transit systems in concert with one another. Systems and technology and collaboration dimensions offer the highest CMM improvement potential with the addition of an Integrated Corridor Management Manager, because more advanced decision support systems and additional collaboration with external agencies (e.g., local traffic engineers, transit agencies) will be required. Typically, this position is required for those TSMO programs with a CMM level of 2-3. Specific motivation for hiring an Integrated Corridor Management Manager include:

- More than elsewhere, corridors with integrated corridor management (ICM) strategies bring together numerous TSMO needs and applications.
- There is a need to obtain KSAs related to the multimodal and active management aspects of ICM not found in traditional transportation or traffic engineering.
- The agency is looking to improve their capability of interfacing with experts in telecommunications, systems engineering, integration, and security/resiliency.

What Knowledge, Skills, and Abilities are Required?

The Integrated Corridor Management Manager is responsible for better leveraging underutilized capacity in the form of parallel roadways, single-occupant vehicles, and transit services to improve person throughput and reduce congestion. The purpose of this role is to manage corridors as a multimodal system and make operational decisions for the benefit of the corridor as a whole that will result in more efficient movement of people and goods. The Integrated Corridor Management Manager must lead institutional collaboration and visionary/innovative strategies for proactive integration of existing infrastructure along major corridors. As this position is aspirational and does not currently exist, research was conducted related to the vision of ICM and national demonstration projects. A strong technical background in systems engineering and advanced technologies, performance measurement, and management and modeling are required for success in this role. As such, core competencies suggested for the position are related to transportation industry operations, engineering, project management, ITS, and public policy/regulatory knowledge. Essential skillsets include managerial skills, communication and interpersonal skills, and analytical skills. An Integrated Corridor Management Manager must also be able to work well in a team given the need to coordinate across multiple agencies and a variety of public and private sector partners. The Integrated Corridor Management Manager should also be innovative, possess professional judgment, and must be highly capable of analyzing data.

Knowledge	Skills	Abilities
• Knowledge of Transportation, Traffic Engineering, Operations • Knowledge of Project Management Practices • Knowledge of Local Agency Procedures, Standard Design Principles • Knowledge of ITS Technology, Operations	• Managerial/Supervisory Experience and Leadership Skills • Communication Skills, Written/Verbal • Technical Communication and Report Development • Interpersonal Skills • Time and Task Management Skills • Analytical, Mathematical, or Problem-solving Skills	• Ability to be Innovative or Creative • Ability to Work Well on a Team • Possess Professional Judgment • Ability to Collect, Enter, or Analyze Data

Figure 12. Integrated Corridor Management Manager KSAs

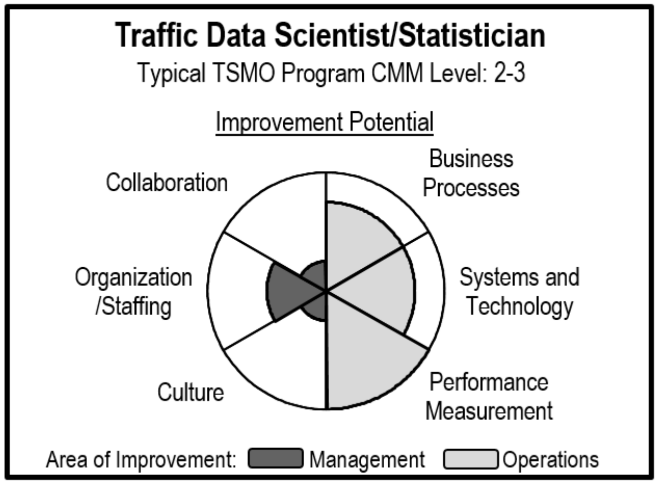
Where and How Should Agencies Recruit for this Position?

When recruiting potential hires, agencies should look to the other transportation agencies and consulting firms for individuals with experience in program management, traffic operations and systems management, and TMC and decision support systems.

A recruiter is not necessary to find the most qualified individuals to fill this position. Agencies could consider offering incentives in the form of a training and professional organization involvement.

Traffic Data Scientist/Statistician

When is a Traffic Data Scientist/Statistician Needed?



The Traffic Data Scientist/Statistician position is key to the performance measurement function of an organization both for real-time operations decision making as well as longer-term trends analysis. Data is a critical element to drive and improve business processes. Enabling more powerful use of data management techniques should also translate into improved business processes and likely require enhanced use of systems and technology.

Typically, this position is required for those TSMO programs with a CMM level of 2-3. Specific motivation for hiring a Traffic Data Scientist/Statistician include:

- TSMO relies on effective extraction and manipulation of "big data."
- Growing opportunity and expectation for data-driven decision-making, including advanced pattern recognition and statistical methods.
- Spatial data requires combining expertise in GIS, statistics, data science, visualization, and web applications.

What Knowledge, Skills, and Abilities are Required?

The Traffic Data Scientist/Statistician is responsible for extracting, organizing, integrating, analyzing, and communicating information obtained from a variety of traffic data sources. The purpose of this role is to develop predictive analytics and performance measures, to enhance the planning process and to enable data-driven decision-making for the TSMO Office. As such, core knowledge requirements include competency in computer/data science, key database languages and relevant software, and statistical analysis and modeling. Skillsets necessary for this position include those related to communication (written and verbal), mathematics and problem solving, interpersonal relationships, time and task management, and organization. Required abilities for this position are data collection and analysis, professional judgment, teamwork, and a good attitude and work ethic.

Knowledge	Skills	Abilities
• Knowledge of Statistical Analysis, Modeling, Optimization • Knowledge of Data/Computer Science, Programming, Software Engineering • Knowledge of Access, SQL or other database languages • Knowledge of Microsoft Office Programs • Knowledge of Machine Learning, Deep Learning Tools • Knowledge of Geospatial Analysis Techniques and Software • Knowledge of Relevant Programming Languages	• Communication Skills, Written/Verbal • Analytical, Mathematical, or Problem-Solving Skills • Time and Task Management Skills • Interpersonal Skills • Organizational Skills, Attention to Detail • Technical Communication, Report Development Skills • Research Skills	• Ability to Work Well on a Team • Ability to Collect, Enter, or Analyze Data • Possess Professional Judgment • Possess Good Attitude/Work Ethic

Figure 13. Traffic Data Scientist/Statistician KSAs

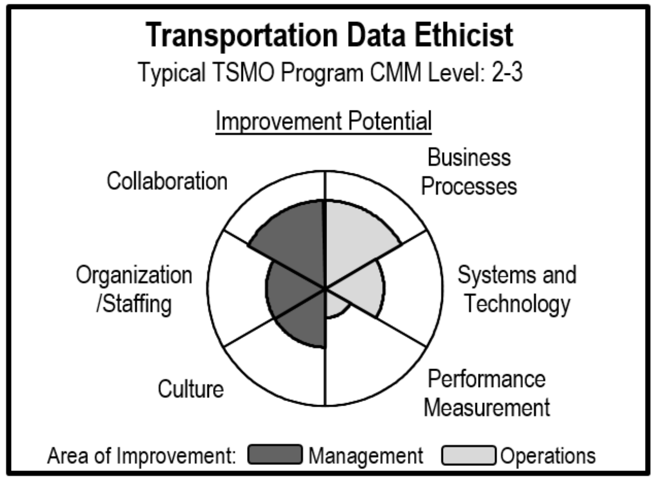
Where and How Should Agencies Recruit for this Position?

When recruiting potential hires, agencies should look for experience in big data curation and analysis; experience with machine learning, deep learning tools, geospatial analysis, computer programming; and experience leading software development and modeling efforts. Agencies looking to hire a Traffic Data Scientist/Statistician should focus recruitment efforts on other transportation agencies, consulting firms, academic or research institutions, and the data management and analytics industry.

A recruiter will be very helpful to find the most qualified individuals to fill this position. Agencies could consider offering incentives in the form of a flexible work schedule, remote work options, and professional organization involvement.

Transportation Data Ethicist

When is a Transportation Data Ethicist Needed?



As privacy concerns continue to persist due to amounts of data and more sophisticated data analytics that are rapidly evolving, positions that can understand intended and unintended consequences of data sharing and algorithmic decision-making issues is becoming more important. Business processes and collaboration dimension offer the most significant CMM improvement potential because increased coordination will be required to discuss potential ethical issues that may ultimately result in a change on business processes. Typically, this position is required for those TSMO programs with a CMM level of 2-3. Specific motivation for hiring a Transportation Data Ethicist include:

- Emerging TSMO applications and data introduce issues with privacy, consent, and ownership.
- Regulations for data and roles of public and private sector will continue to change and evolve.
- New applications, artificial intelligence, data connections, etc. bring unintended consequences related to data or liability.

What Knowledge, Skills, and Abilities are Required?

The Transportation Data Ethicist position is a specialist who provides technical guidance, training and support for data ethics related to TSMO. As this position does not currently exist within transportation agencies and is only now emerging in the private sector, very few relevant examples were available for review. Thus, research was conducted into general KSA requirements in the medical data, financial, and institutional research settings, since privacy, data management, and confidentiality have long been a topic of focus in these fields. While not completely translatable, the findings from reviews in these areas, plus more detailed examination of the very few directly related postings, were synthesized to develop a core set of KSAs for this position. The position requires technical acumen as well as ethics, public policy, and legal knowledge related to data management. The Transportation Data Ethicist must be able to lead vulnerability and risk assessments, research relevant policy and take a leadership role in decision-making relevant to data management, critically analyze data, and communicate effectively to both technical and general audiences. As such, core competencies suggested for the position are related to transportation industry operations, data or computer science, cyber security, data compliance and risk management, and public policy/regulatory knowledge. Essential skillsets include communication and interpersonal skills, leadership skills, analytical and research skills, and general computer skills. A Transportation Data Ethicist must be able to work independently and in a team, possess professional judgment, and must be able to analyze data.

Knowledge

- Knowledge of Transportation Industry Operations
- Knowledge of Data/Computer Science or Related Field
- Knowledge of Cyber Security Policy, Regulations, Standards
- Knowledge of Data Ethics, Compliance and Risk Management
- Knowledge of Public Policy and Regulations Relevant to TSMO and Data Management

Skills

- Communication Skills, Written/Verbal
- Technical Communication and Report Development
- General Computer Skills
- Interpersonal Skills
- Analytical, Mathematical, or Problem-Solving Skills
- Research Skills
- Managerial/Supervisory Experience, Leadership Skills

Abilities

- Ability to Work Well on a Team
- Possess Professional Judgment
- Ability to Collect, Enter, or Analyze Data
- Ability to Work Well Independently

Figure 14. Transportation Data Ethicist KSAs

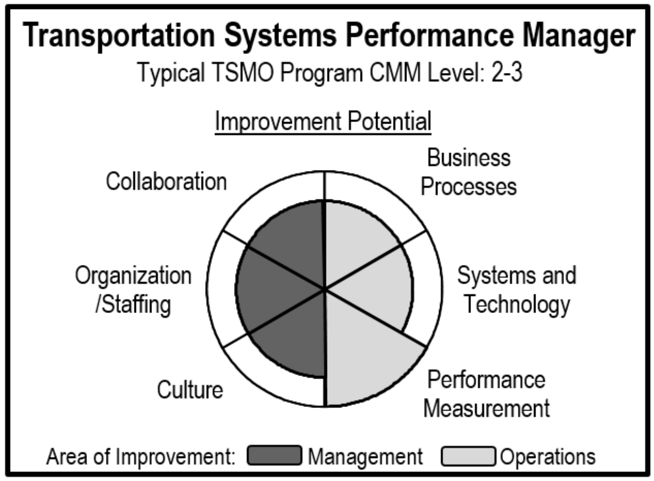
Where and How Should Agencies Recruit for this Position?

When recruiting potential hires, agencies should look to the the computer and software industry, the public policy sector, academic or research institutions, and the healthcare industry for individuals with experience with data ethics and risk management, in developing and using computer programs, and in system engineering.

A recruiter is necessary to find the most qualified individuals to fill this position. Agencies could consider offering incentives in the form of a flexible work schedule, remote work options, and professional organization involvement.

Transportation Systems Performance Manager

When is a Transportation Systems Performance Manager Needed?



Creating a position to help the organization transition from performance measurement to performance management can realize significant savings when coupled with continuous improvement principles. The performance measurement dimension offers the highest CMM improvement potential. Of all the positions, the performance manager offers the highest overall CMM improvement potential. Typically, this position is required for those TSMO programs with a CMM level of 2-3. Specific motivation for hiring a Transportation Systems Performance Manager include:

- Performance measurement and management is expanding and evolving in areas of safety and mobility.
- Growing recognition and performance management provides beneficial gains and is central to maintaining a defensible TSMO program.
- Federal requirements necessitate a point person to manage and coordinate the program and deliverables.

What Knowledge, Skills, and Abilities are Required?

The Transportation Systems Performance Manager is responsible for analyzing and communicating information obtained from a variety of traffic data sources to different stakeholders. The purpose of this role is to use this data to enhance the planning process and to enable data driven decision-making for the TSMO Office. Core knowledge requirements include competency in transportation industry operations, local agency procedures and policies, engineering practice, and performance metrics and systems analysis. Skillsets important for this position include communication skills, technical reporting, and problem-solving skills. Future position descriptions should include knowledge of ITS/emerging technologies, data analytics skills, the ability to develop credible performance measure analyses and the ability to work well on a team and to be innovative or creative.

Knowledge

- Knowledge of Transportation Industry Operations
- Knowledge of Local and State Policies
- Knowledge of Engineering Practice and Design Principles
- Knowledge of Performance Testing, Metrics, Systems Analysis
- Knowledge of ITS/Emerging Technologies

Skills

- Analytical, Mathematical, or Problem-Solving Skills
- Communication Skills, Written/Verbal
- Technical Communication, Report Development Skills
- Data Analytics Skills

Abilities

- Ability to Develop Credible Conclusions from Data Analytics for Performance Measure Analysis
- Professional Judgment
- Ability to Work Well on a Team
- Ability to be Innovative or Creative

Figure 15. Transportation Systems Performance Manager KSAs

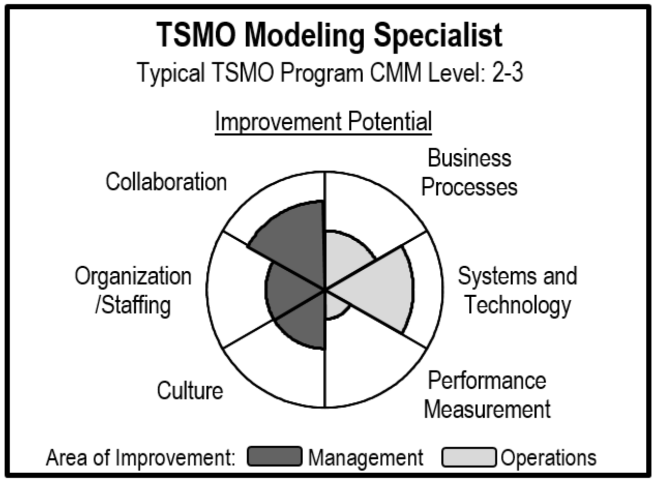
Where and How Should Agencies Recruit for this Position?

When recruiting potential hires, agencies should look to other transportation agencies, consulting firms, and the data management and analytics industry for individuals with experience in strategic planning and performance-based management, in data curation and analysis, and in TSMO and ITS applications.

A recruiter will be somewhat helpful to find the most qualified individuals to fill this position. Agencies could consider offering incentives in the form of a flexible work schedule, remote work options, and training.

TSMO Modeling Specialist

When is a TSMO Modeling Specialist Needed?



Modeling at the mesoscopic scale allows an organization to test various integrated corridor management techniques prior to deployment. Hiring a TSMO Modeling Specialist has the highest CMM improvement potential for the systems and technology dimension because the modeling tools are increasingly sophisticated and collaboration because the output of the models will need to be shared broadly internally and externally (especially if including other jurisdictions). Typically, this position is required for those TSMO programs with a CMM level of 2-3. Specific motivation for hiring a TSMO Modeling Specialist include:

- Interest in obtaining specialized skills to enhance planning for operations and assessing costs and benefits of various TSMO strategies.
- The need to combine expertise in traditional modeling and simulation with TSMO strategies familiarity.
- Interest in improving the program's ability to evaluate and critique internal and external initiatives.

What Knowledge, Skills, and Abilities are Required?

The TSMO Modeling Specialist provides advanced engineering and technical guidance for traffic and transportation modeling used in TSMO focused on mesoscale analyses. Core requirements include competency in knowledge of transportation industry, transportation/traffic engineering software, and knowledge of engineering practices. Given the highly technical nature of the position, the need to communicate with a variety of stakeholders and manage projects, and the need to train others on the use of modeling tools, several skills and abilities are important for TSMO Modeling Specialists to possess. Skillsets crucial for this position include communication skills, leadership skills, problem-solving and interpersonal skills. Specialists should possess professional judgement and the abilities to work on a team and to analyze data. Future position descriptions should also include specific reference to knowledge of mesoscale modeling tools.

Knowledge	Skills	Abilities
• Knowledge of Transportation Industry Operations • Knowledge of Transportation/Traffic Engineering Software • Knowledge of Engineering Practices, Design Principles • Knowledge of Macroscopic, Mesoscopic, and Microscopic Modeling Tools	• Communication Skills, Written/Verbal • Interpersonal Skills • Analytical, Mathematical, or Problem-Solving Skills	• Possess Professional Judgment • Ability to Collect, Enter, or Analyze Data • Ability to Work Well on a Team

Figure 16. TSMO Modeling Specialist KSAs

Where and How Should Agencies Recruit for this Position?

When recruiting potential hires, agencies should look to the other transportation agencies and consulting firms for individuals with experience in macroscopic, mesoscopic, and microscopic modeling, experience in computer programming and data analysis, and experience in TSMO and ITS applications.

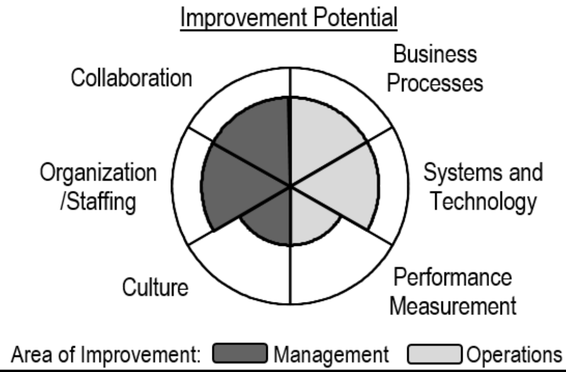
A recruiter is not necessary to find the most qualified individuals to fill this position. Agencies could consider offering incentives in the form of a flexible work schedule, training, and professional organization involvement.

TSMO Program Manager

When is a TSMO Program Manager Needed?

TSMO Program Manager

Typical TSMO Program CMM Level: 2-3



A TSMO Program Manager helps an agency by providing TSMO program leadership, direction, knowledge, and developing partnerships. A TSMO Program Manager provides a good cross section of CMM improvement potential. For example, a TSMO Program Manager works across the various subareas within a TSMO division or bureau that includes TMC operations, signal system management, work zone management, tolling, and traffic incident management. Also, because of the crosscutting nature of the position, TSMO Program Managers may have TSMO group policy development and budgeting responsibilities. Typically, this position is required for those TSMO programs with a CMM level of 2-3. Specific motivation for hiring a TSMO Program Manager include:

- New challenges in bridging disparate business areas and staff unfamiliar with other aspects of TSMO.
- Requiring personnel with an engineering background spanning safety, traffic, and systems.
- The need to improve the ability to both plan and execute program development and project delivery.

What Knowledge, Skills, and Abilities are Required?

The TSMO Program Manager is a professional, licensed transportation engineer who provides advanced engineering and technical guidance for the TSMO Office. Core knowledge requirements include competency in traffic engineering and operations, agency procedures and design standards, and project management. Skillsets important for this position include those related to management and leadership, time and task management, and interpersonal relationships. Future positions should also include ITS technology knowledge, presentation and problem-solving skills, the ability to work well on a team, the ability to work in a fast-paced environment, and the ability to be innovative.

Knowledge	Skills	Abilities
• Knowledge of Transportation, Traffic Engineering, Operations • Knowledge of Project Management Practices • Knowledge of Local Agency Procedures, Standard Design Principles • Knowledge of ITS Technology, Operations • Knowledge of Multi-modal and Intermodal Operations	• Communication Skills, Written/Verbal • Interpersonal Skills • Time and Task Management Skills • Managerial/Supervisory Experience and Leadership Skills • Presentation Skills • Analytical, Mathematical, or Problem-solving Skills	• Ability to be Innovative or Creative • Ability to Work in Fast-Paced or Stressful Environment • Ability to Work Well on a Team

Figure 17. TSMO Program Manager KSAs

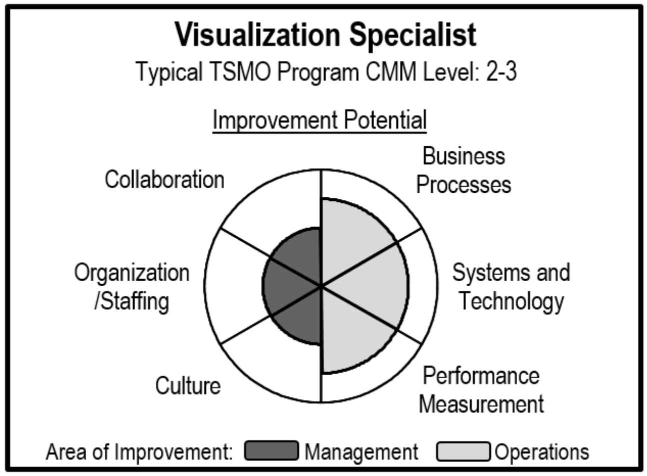
Where and How Should Agencies Recruit for this Position?

When recruiting potential hires, agencies should look at other transportation agencies or consulting firms for individuals with experience in management or supervising, ITS, traffic operations and safety, and program management.

A recruiter could be somewhat helpful to find the most qualified individuals to fill this position. Agencies could consider offering incentives in the form of training and professional organization involvement.

Visualization Specialist

When is a Visualization Specialist Needed?



With the massive amount of data being used to manage ITS systems now and in the future, the ability to illustrate the synthesized information is important. Whether it is increased use of infographics, or interactive websites that allow users to visualize data, providing tools that help illustrate the importance of TSMO and strengthen the business case for continued investment is critical. Typically, this position is required for those TSMO programs with a CMM level of 2-3. Specific motivation for hiring a Visualization Specialist include:

- The increasing need to show TSMO practitioners, decision-makers, the public, and other stakeholders what is occurring with the transportation network using data collected by the TSMO program.
- Interest in automating technical communication via visualization in concert with databases and TSMO applications.
- The need to improve communication of TSMO performance management.

What Knowledge, Skills, and Abilities are Required?

The Visualization Specialist is responsible for providing technical guidance, training and support for various visualization tools used in TSMO including augmented and virtual reality (AR/VR), data visualization, data analytics, and others. As such, core knowledge requirements include competency in computer science and data modeling, graphic design, and relevant software. Skillsets necessary for this position include those related to communication (written and verbal), technical communication, mathematics and problem solving, and time and task management. Required abilities for this position are the ability to work independently and to be innovative or creative. Future position descriptions should also include knowledge of AR/VR software, programming languages, and the ability to analyze data.

Knowledge

- Knowledge of Data Modeling, Visualization, and Computer Science
- Knowledge of Deliverables and Graphic Design
- Knowledge of Visualization Software Suites
- Knowledge of AR/VR Software
- Knowledge of Relevant Programming Languages

Skills

- Communication Skills, Written/Verbal
- Technical Communication, Report Development Skills
- Analytical, Mathematical, or Problem-Solving Skills
- Time and Task Management Skills

Abilities

- Ability to Work Well Independently
- Ability to be Innovative or Creative
- Ability to Collect, Enter, or Analyze Data

Figure 18. Visualization Specialist KSAs

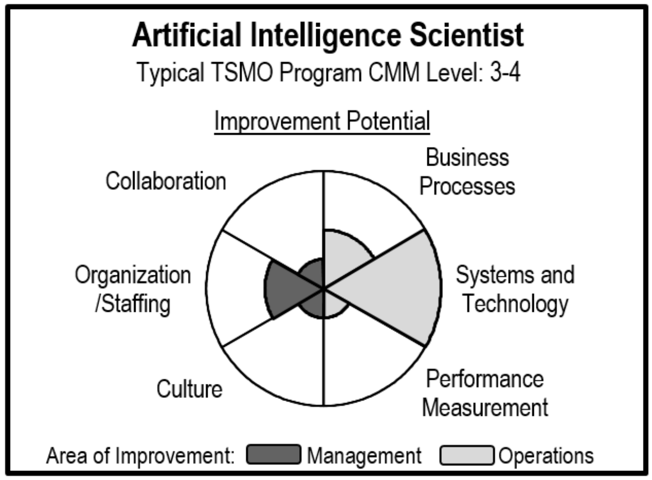
Where and How Should Agencies Recruit for this Position?

When recruiting potential hires, agencies should look to the the computer and software industry, the gaming industry, the defense industry, and academic or research institutions for individuals with experience in graphic design, in data modeling and visualization, and in TSMO and ITS applications.

A recruiter will be very helpful to find the most qualified individuals to fill this position. Agencies could consider offering incentives in the form of a flexible work schedule, remote work options, and professional organization involvement.

Artificial Intelligence Scientist

When is an Artificial Intelligence Scientist Needed?



An Artificial Intelligence Scientist is a technical specialist that gets the everyday work done. As technology rapidly advances, the use of artificial intelligence is increasing in the transportation space. Having one or more Artificial Intelligence Scientists who understand how artificial intelligence works will help in several areas such as applying deep learning to transportation data, CAV algorithms, and TMC decision support systems that are Artificial Intelligence (AI) and machine learning (ML) enabled. Typically, this position is required for those TSMO programs with a CMM level of 3-4. Specific motivation for hiring an Artificial Intelligence Scientist include:

- AI is rapidly evolving but just now entering the TSMO.
- TSMO program performance improvement to be increasingly driven by AI, and must be well versed in machine learning and agent-environment principles.
- AI introduces new types of risks to security and privacy to the agency.

What Knowledge, Skills, and Abilities are Required?

The Artificial Intelligence Scientist leads the selection and development of next generation AI/ML enabled IoT solutions for traffic systems operations and management/ITS. Areas of focus include traffic data analysis, traffic flow theory, traffic signal operation/control, traffic network management, and CAV. As this is a highly technical occupation, there are extensive knowledge requirements. Core requirements include competency in data/computer science, machine learning and AI, statistical analysis, big data analytics, and coding languages. Skillsets important for this position include analytical skills, communication skills, technical report skills, and research skills. Abilities important for success in this role include data analysis, professional judgment, and good work ethic. Future position descriptions should include knowledge of natural language processing and the ability to work well on a team. Language processing abilities will have application to security and performance management tasks. As technologies advance and challenges become more complex, teamwork will undoubtedly be an absolute requirement.

Knowledge	Skills	Abilities
• Knowledge of Data/Computer Science, Programming, Software Engineering • Knowledge of Machine Learning, Deep Learning, AI Applications • Knowledge of Statistical Analysis, Modeling, Optimization • Knowledge of Big Data Analytics • Knowledge of Relevant Programming Languages • Knowledge of Natural Language Processing	• Communication Skills, Written/Verbal • Technical Communication, Report Development Skills • Analytical, Mathematical, or Problem-Solving Skills • Research Skills, Application and Publications	• Ability to Collect, Enter, or Analyze Data • Possess Professional Judgment • Possess Good Attitude/Work Ethic • Ability to Work Well on a Team

Figure 19. Artificial Intelligence Scientist KSAs

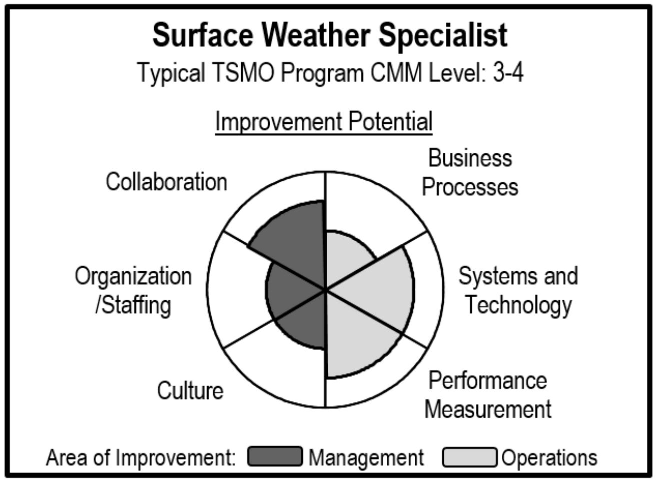
Where and How Should Agencies Recruit for this Position?

When recruiting potential hires, agencies should look to the computer and software industry, the gaming industry, the defense industry, and academic or research institutions for potential hires with experience in machine learning, deep learning tools, geospatial analysis, and computer programming; experience in natural language processing; and experience in big data analytics.

A recruiter will be necessary to find the most qualified individuals to fill this position. Agencies could consider offering incentives in the form of a flexible work schedule, remote work options, and professional organization involvement.

Surface Weather Specialist

When is a Surface Weather Specialist Needed?



Historically if a DOT or other agency hires weather specialists, they have been associated with the organization's maintenance function. Increasingly, weather specialist expertise is needed in more of a real-time operations environment (i.e., TMC) in order to react more quickly to rapidly changing road surface conditions. Areas that stand to find the highest levels of CMM improvement potential include systems and technology, as prediction models continue to get better; performance measurement, as recovery times are a major drive in snow and ice management; and collaboration, because of anticipated improved coordination with field forces. Typically, this position is required for those TSMO programs with a CMM level of 3-4. Specific motivation for hiring a Surface Weather Specialist include:

- The agency is looking to enhance their TSMO program by improved weather condition connectivity.
- Weather data needs integration with other TSMO activity for performance assessment and improvement.
- Interest in improving TSMO applications by adapting to real-time and predictive weather effects.

What Knowledge, Skills, and Abilities are Required?

The Surface Weather Specialist provides advanced transportation systems management and operations support as it relates to weather applications. Core requirements include transportation industry knowledge, weather research and forecasting/modeling, basic programming and data visualization, and knowledge of technologies and equipment applicable to roadway maintenance and operations under a variety of surface weather conditions. Skillsets important for this position include communication, interpersonal, leadership, and computer skills. The ability to work in a fast paced or stressful environment and teamwork are ability requirements. Future position descriptions should include problem-solving and research skills as the Surface Weather Specialist will need to research new technologies and identify innovative approaches to weather-responsive traffic management.

Knowledge	Skills	Abilities
• Knowledge of Transportation Management Centers • Knowledge of Weather Research, Forecasting, or Modeling Techniques • Knowledge of Scripting, Programming, or Data Visualization • Knowledge of Relevant Equipment, technology operation/maintenance	• General Computer Skills • Managerial/Supervisory Experience, Leadership Skills • Communication Skills, Written/Verbal • Interpersonal Skills • Analytical, Mathematical, or Problem-Solving Skills • Research Skills	• Ability to Work Well on a Team • Ability to Work in Fast-Paced or Stressful Environment

Figure 20. Surface Weather Specialist KSAs

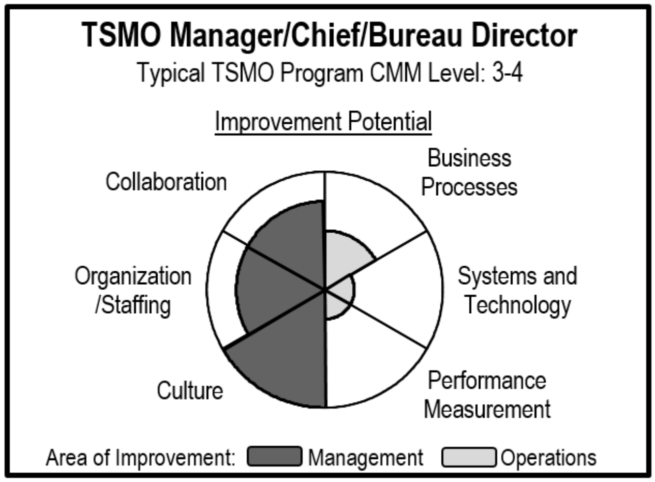
Where and How Should Agencies Recruit for this Position?

When recruiting potential hires, agencies should look to the other transportation agencies, meteorologists, airport management, and academic or research institutions for individuals with experience in weather research, forecasting, or modeling, in traffic operations or roadway maintenance; and in ITS weather technology.

A recruiter is not necessary to find the most qualified individuals to fill this position. Agencies could consider offering incentives in the form of a flexible work schedule, training, and professional organization involvement.

TSMO Manager/Chief/Bureau Director

When is a TSMO Manager/Chief/Bureau Director Needed?



Establishing positions related to TSMO at the highest levels of an organization has a significant impact on organizational culture. Organizational leadership roles within an organization with TSMO responsibilities reflect the relative importance of the activity and allow topics to be discussed and resolved at management committees or executive groups routinely across divisions and bureaus. Other benefits include ability to influence organizational policy and improve budget allocation because TSMO leadership is at a level in the organization to routinely make the business case for changes in the way services are provided. Typically, this position is required for those TSMO programs with a CMM level of 3-4. Specific motivation for hiring a TSMO Manager/Chief/Bureau Director include:

- Need combination of management skill and technical / engineering familiarity with breadth of TSMO
- Must advocate for institutional / organizational change, often necessary to navigate resistance
- Need to continually educate and facilitate leadership, public, and other stakeholders

What Knowledge, Skills, and Abilities are Required?

The TSMO Manager/Chief/Bureau Director is responsible for the planning, development, and administration of a program designed to reduce congestion and improve the safety, security, mobility, and efficient utilization of existing highway system. Core knowledge requirements include competency in transportation operations and knowledge of agency procedures and design standards. Skillsets important for this position include those related to management and leadership, time and task management, and interpersonal relationships. Future positions should also include knowledge of ITS technology, program management practices, and multi and intermodal operations. Skillset requirements should also include presentation and problem-solving skills. For success in this role, the ability to interpret laws, work across an organization, work well on a team, work in a fast-paced environment, and the ability to be innovative are also crucial.

Knowledge	Skills	Abilities
• Knowledge of Transportation Industry Operations • Knowledge of Local Agency Procedures, Standard Design Principles • Knowledge of Project Management Practices • Knowledge of ITS Technology, Operations	• Managerial/Supervisory Experience and Leadership Skills • Communication Skills, Written/Verbal • Analytical, Mathematical, or Problem-Solving Skills • Interpersonal Skills • Time and Task Management Skills • Presentation Skills	• Ability to be Innovative or Creative • Ability to Work in Fast-Paced or Stressful Environment • Ability to Work Well on a Team

Figure 21. TSMO Manager/Chief/Bureau Director KSAs

Where and How Should Agencies Recruit for this Position?

When recruiting potential hires, agencies should look for experience in management, developing new initiatives and programs, and strategic planning. Personnel with experience for this position can typically be found at other transportation agencies and consulting firms.

A recruiter will be very helpful to find the most qualified individuals to fill this position. Agencies could consider offering incentives in the form of an executive level career path and professional organization involvement.

Chapter 4. Developing a TSMO Workforce

Introduction

Ongoing professional development is essential in the quickly evolving field of TSMO. Management practices, including performance-based management, data analytics, and business intelligence, are changing rapidly in transportation. Technical applications and emerging technologies associated with connected vehicles, mobility on demand, crowdsourcing, data collection, and ITS technology require continuous training for staff to be able to meet changing professional demands and maximize the efficient use of technology. These needs are partially addressed by post-secondary educational courses offered through a variety of sources, such as professional organizations and government agencies. This chapter discusses ways agencies can strengthen their TSMO workforce through the development of a professional development plan as well as training providers, training sources, and other investments.

Crafting a TSMO Professional Development Plan

Transportation agencies should develop a professional development plan for their agency that addresses TSMO training needs by job category. This should include training needs for both traditional and emerging TSMO positions. Crafting this plan should be a collaborative effort that involves a number of roles within the transportation agency, including TSMO program managers or other champions within the agency who may assist in finding resources for professional development, technical managers who may recognize the triggers for new training, technical staff who may have the skills to help develop training or may be participants of the training, and HR staff who need to understand what KSAs are required for a successful TSMO program and potentially assist in designing the training.

The professional development plan should outline the delivery formats that would be most effective for the content and intended audience and include both technical and managerial skills. Table 6 shows the key elements of the professional development framework that should be addressed in an agency's development plan.

Table 6. Key Elements of the TSMO Workforce Professional Development Framework

Element	Options
TSMO training guidelines by position	• Organization-wide • TSMO-focused staff • By staff level
Content	• Technical • Managerial • Other (e.g., communication skills, interpersonal skills)
Delivery method	• Academy-style • Lecture • Interactive workshops • Job sharing • Online • Immersion

Element	Options
Source	• In-house • Training consultants • Professional societies • Universities

Table 7 shows a sample training and professional development program. The proposed plan illustrates the need for a basic level of TSMO understanding for all new and existing staff within the DOT, with more in-depth, focused training for those working within the TSMO field.

Table 7. Sample Workforce Development Plan

Basic Training	Advanced Training
New DOT Employee Orientation *Duration*: 1.5 hours *Format*: Webinar logged in DOT Knowledge Management System (KMS) *Description*: Provide a brief overview of TSMO at a very high level	**New TSMO Employee Orientation** *Duration*: 24 hours *Format*: ½ Immersion and ½ self-guided tutorial *Description*: Immersion training including visits to TMC, Statewide Emergency Operations Center (EOC), Maintenance Garage, Safety Service Patrol ride along, Snow Removal ride along (as weather permits) and university partner.
Co-Op/Intern Experience *Duration*: 8 hours *Format*: Lecture and site visits *Description*: ½ day lecture on TSMO and ½ visiting TMC and Safety Service Patrol	
TSMO 101 On-Line Training *Duration*: A series of about 6-30-minute modules that cover the basis of TSMO *Format*: Webinar with scored quizzes *Description*: Preliminary list of modules include: Introduction to TSMO, the role of the TMC, how TSMO impacts how we plan projects, how TSMO impact how we design projects, how TSMO impacts how we manage the transportation network	**TSMO 201 Advanced On-Line Training** *Duration*: A series of about 12-30-minute modules on advanced TSMO topics *Format*: Webinar with scored quizzes *Description*: Example topics include: Work Zone Management, Traveler Information, ITS Field Device Design, ITS Maintenance, Planning for TSMO, ITS Data Management

Basic Training	Advanced Training
District Awareness Training *Duration*: 3.5 hours *Format*: Lecture *Description*: A series of 20-minute modules that provide an overview of DOT's TSMO Program	**District TSMO Practitioner Training** *Duration*: 8 hours *Format*: Lecture *Description*: Provide an overview of how District TSMO staff are expected to coordinate activities with Central Office including: budgeting, planning for operations, TSMO project Design, Traffic Incident Management, and Emergency Management
Basic State DOT Operations Academy *Duration*: 2 days *Format*: Combination of lectures, group exercises, and at least one field visit *Description*: A series of one-hour lectures by different regional subject matter experts Modeled after National Operations Academy	**Advanced State DOT Operations Academy** *Duration*: 4 days *Format*: Combination of lectures, group exercises, and at least one field visit *Description*: In-depth training on all aspects of TSMO including a presentation by national subject matter experts Modeled after National Operations Academy

Professional development can be used to support existing staff and recruit from within an organization by supporting the development of KSAs within traditional positions and allowing employees to evolve into new and emerging positions. Professional development focused on specialized TSMO KSAs within more traditional positions can be used to support the evolution of TSMO programs in smaller agencies. For example, a traditional traffic engineer position can be expanded to take on the responsibilities of integrated corridor management by developing KSAs that include advanced traffic management, transit management, and traffic incident management.

In addition to formal training sessions and workshops, experiential learning, service learning, mentoring/coaching, and problem and context-based learning are important elements to developing the TSMO workforce. These experiences should be integrated within secondary, post-secondary, and professional settings in order to achieve both career awareness and development goals. At the secondary and post-secondary levels, problem and context-based learning opportunities can help students better understand TSMO career paths and connections between content they are learning in academic coursework and real-world operations tasks. National examples relevant to TSMO include the NOCoE Transportation Technology Tournament (post-secondary) and the Operations Challenges developed as part of the National Transportation Career Pathways Initiative (secondary and post-secondary, expected release June 2019). Experiential learning, such as through internships, co-ops or apprenticeships can provide even greater opportunities for students, as the 'learning by doing' approach creates deeper understanding and a more expansive knowledge base for students, as well as provides interaction with industry mentors. The US Department of Labor's (DOL) pre-apprenticeship programs for high school students now include numerous STEM options relevant to TSMO, including engineering and computer science. The added flexibility to DOL apprenticeship programs through recent changes in the Registered Apprenticeship process and expansion of the apprenticeship model into nontraditional occupations (such as engineering) also allow apprenticeships to be established in conjunction with Universities and 4+ year degree programs. These programs create opportunities for more intentional development of potential TSMO workers from early in the career exploration process. Strategic partnerships between DOTs, K-12 districts, and higher education can establish well-structured development programs for TSMO prior to workers entering full-time, permanent positions.

For incumbent workers, experiential learning, service learning and mentoring/coaching are also extremely important for broadening and strengthening TSMO knowledge. Several DOTs have established rotation options for employees that enable them to gain experience within multiple areas. For example, the Tennessee DOT's Graduate Transportation Associate program engages entry-level civil engineers in hands-on experience in maintenance, construction, design, and project management while also providing additional training in leadership and team-building. The Virginia DOT offers a similar program through its Core Development Program (CDP) with both engineering and business tracks. The CDP cross-trains staff throughout the agency, while also providing participants with a formal mentor. VDOT has also instituted 30-, 60-, and 90-day positions swaps to temporarily fill vacant positions and provide employees with cross-training and varied perspectives. Experiential learning does not have to take a formal rotational approach, and can also be provided through thoughtful assignment of TSMO employees to relevant projects (including complex team projects for even entry-level staff) and committees. Formal mentoring or coaching programs can also help staff better understand career pathways and develop a career advancement strategy. Mentors or coaches may be within the agency (but outside the employee's current supervisory chain) or outside through programs established through professional organizations. Formal mentoring/coaching programs are demonstrated to be more effective than informal, and may be particularly helpful for retaining and advancing diverse TSMO professionals.

Service learning has been proven to be effective in both secondary/post-secondary and professional environments. For secondary/post-secondary students, service learning strengthens commitment to the discipline, increases understanding of academic content through hands-on application and creates better connections to societal impact (important for both recruitment and development). In a professional setting, service learning results in greater employee engagement, connection to the organization, career fulfillment and broadened knowledge/skillsets. Service learning integrates meaningful community engagement into an experiential learning experience that may be based within a formal context (e.g., an academic course) or tied to an organizational mission. Service learning projects often include partnerships between community organizations, local school districts or institutes of higher education, and industry partners, and ultimately provides a valuable community service in concert with a development opportunity.

Available Education and Training Programs

Investments in training to support TSMO include the training itself, which should include a basic level of understanding of TSMO and what it offers to the organization for all management employees, more specific TSMO training for employees who work in TSMO-related functions (e.g. traffic operations, maintenance, performance management, ITS), and specialized training for specific TSMO functional areas. Basic training should be developed and offered in-house as part of ongoing professional development. More specialized training can be provided in-house or obtained through outside sources such as professional organizations, universities, or Federal Highway Administration (FHWA) workshops. A strategic approach to TSMO training will require the development of a formal training plan, which will require an investment in time by TSMO management and HR staff to determine the specific and general training needs, sources, and associated policies for training. Existing training and certification programs should be used to augment TSMO workforce professional development. Given the wide spectrum of knowledge required to operate a TSMO program, there are many organizations that provide training, certification, and research related to TSMO. Table 8 lists organizations that offer TSMO-related training, certification, or conduct TSMO-related research.

Table 8. Organization TSMO Related Training and Research

Organization	**Training Provider**	**Certification**	**Direct TSMO Research**	**Indirect TSMO Research**
American Association of State Highway and Transportation Officials	✓		✓	✓
America Consulting Engineers Companies	✓			
American Public Transit Association	✓			
American Road & Transportation Builders Association	✓			✓
American Society of Civil Engineers	✓			
American Traffic Safety Services Association	✓			
Consortium for ITS Training and Education	✓	✓		
Community Transportation Association of America	✓	✓		
Connected Vehicle Trade Association /Mobile Comply/ Society of Automotive Engineers International	✓	✓		
Council of Supply Chain Management Professionals	✓			✓
Eno Center for Transportation	✓			✓
International Municipal Signal Association		✓		
Institute of Transportation Engineers	✓			
Intelligent Transportation Society of America	✓			
ITS Standards Training				
National Academy of Sciences/ Transportation Research Board	✓		✓	✓
National Highway Institute	✓			
National Operations Center of Excellence			✓	✓
National Institute for Certification in Engineering Technologies		✓		
National Transit Institute	✓			
Occupational Safety Institute	✓			
PDH Source	✓			
Small Urban and Rural Transit Center	✓			✓
United States Department of Transportation Federal Highway Administration Office of Operations	✓		✓	✓

Organization	Training Provider	Certification	Direct TSMO Research	Indirect TSMO Research
United States Department of Transportation ITS Joint Program Office	✓		✓	✓
United States Department of Transportation Volpe Center			✓	✓

A review of all Accreditation Board for Engineering and Technology, Inc. (ABET) accredited civil engineering programs in the United States (based on ABET program listing as of October 2018) revealed nearly 800 transportation-related undergraduate courses and almost 550 graduate courses being offered in civil engineering departments across the country. Course descriptions were analyzed and courses were categorized by both modal focus and topic area. Topic areas were aligned with the categories from the professional development program assessment where possible. However, many of the topics assessed for professional development programs were not found in the review of undergraduate and graduate courses. This may be due to the fact that course descriptions did not provide the level of detail necessary to fully assess course content or that many of the topics required for professional development are emerging as the field of transportation operations evolves and this content has not yet made its way into college-level courses. Thus, a more concise and somewhat broader set of topics was used to analyze the undergraduate and graduate courses. Table 9 shows the topic areas examined for professional development and college courses.

Table 9. Topic Areas Analyzed for College and Professional Development Courses

Civil Engineering College Level Courses	TSMO Professional Development Courses
• Data Management • Engineering/Design • Operations • Planning • Safety • Technologies/ Applications • Network or System Analysis • Economics or Policy	• Systems Architecture • Connected Vehicles • Data Management • Decision Support • Engineering/Design • Leadership • Legal • Operations • Performance Management • Planning • Procurement • Safety • Standards • Strategy/Challenges • System Security • Systems Engineering • Technologies/ Applications • Traffic Maintenance

The results of the review indicate that the vast majority of undergraduate courses have a multi-modal focus, and the majority concentration on engineering/design, followed by planning and operations. Given that most civil engineering programs require only one course in transportation, these results are not surprising as the introductory course typically provides a survey of topics, with a primary focus on design. Figure 22 provides results of the analysis of modal focus, and Figure 23 presents topical focus for the 774 undergraduate courses reviewed as part of this project. As some courses provided content for more than one content area, the summation of percentages is greater than 100%.

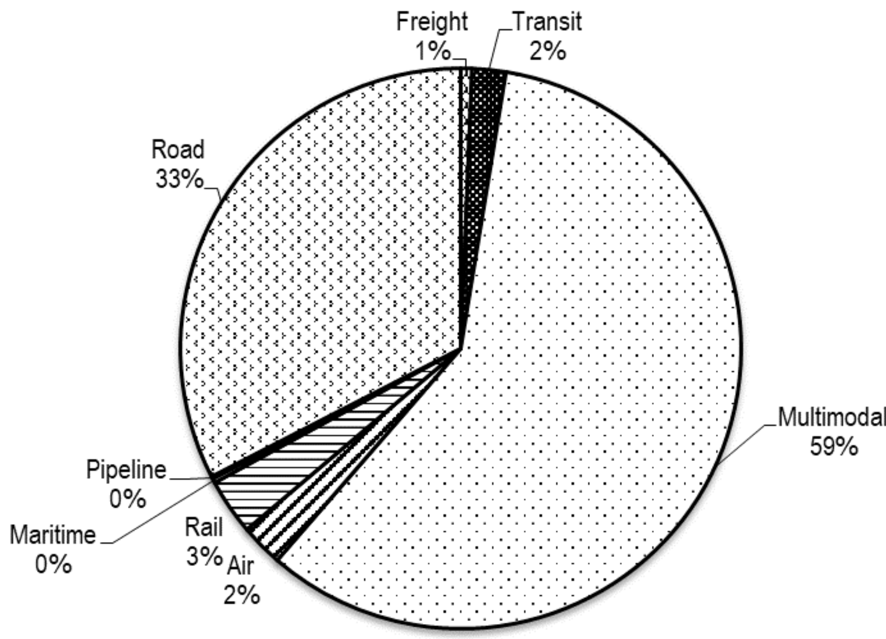


Figure 22. Modal Focus of Undergraduate Civil Engineering Courses in ABET Accredited Colleges and Universities in the United States

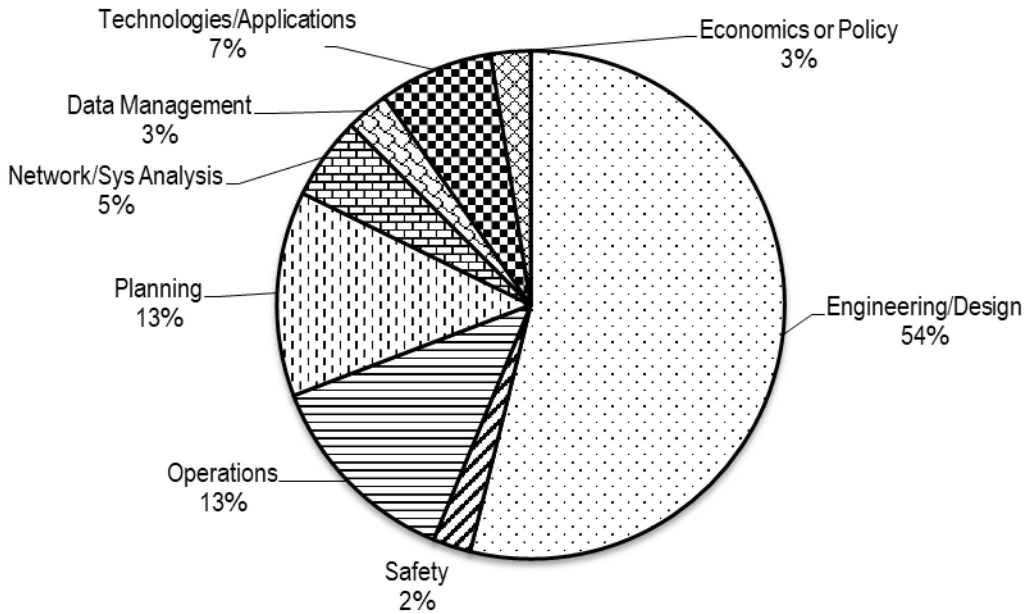


Figure 23. Course Topics of Undergraduate Civil Engineering Courses in ABET Accredited Colleges and Universities in the United States

Somewhat different results were found for graduate programs. Of the 543 courses, the majority provided a multimodal or road (traditional traffic/highway) focus. For course topic areas, courses in design and planning comprised less of graduate offerings, while more emphasis was found in operations, safety, technologies and applications, and network or systems analysis than in undergraduate programs. Appendix A provides a full listing of undergraduate courses and Appendix B a full listing of graduate courses reviewed as part of this project.

There are currently more than 300 post-secondary education programs available for TSMO-related professional development or post-secondary training offered outside of a formal collegiate setting. Table 10 describes the training available by category. It is apparent from this analysis that there are several topics with limited resources available for professionals, particularly training related to legal procurement and system security for TSMO. Advanced training on all TSMO topic areas is sparse. The topics that have received the greatest attention are those related to engineering/design, operations, safety, and technologies/applications in TSMO.

Table 10. Inventory of Existing TSMO Training

Topic Area	**Training Level**			**Total**
	Advanced	*Basic*	*Introductory*	
System Architecture	1	4	6	**11**
Connected Vehicles	-	22	1	**23**
Data Management	2	8	-	**10**
Decision Support	-	12	-	**12**

Topic Area	Training Level			Total
	Advanced	*Basic*	*Introductory*	
Engineering/Design	1	32	2	**35**
Leadership	4	9	-	**13**
Legal	-	3	-	**3**
Traffic Operations	6	22	2	**30**
Performance Management	2	15	3	**20**
Planning	3	25	3	**31**
Procurement	-	4	-	**4**
Safety	1	27	1	**29**
Standards	-	13	4	**17**
Strategy/Challenges	-	12	-	**12**
System Security	-	5	-	**5**
Systems Engineering	1	9	2	**12**
Technologies/ Applications	-	25	5	**30**
Traffic Maintenance	9	28	2	**39**
Grand Total	**30**	**275**	**31**	**336**

Other Areas of Investment to Strengthen TSMO Workforce

There are several other areas that agencies can invest in that help strengthen the TSMO workforce. In addition to strengthening the TSMO workforce, investments in these areas are often far-reaching and may also improve the non-TSMO workforce. The areas of investment discussed below include: improving HR systems, formalizing career paths, enhancing employee morale, establishing relationships with educational entities, and ensuring adequate hardware and software.

To strengthen the TSMO workforce across transportation agencies, investments should be made in training, development, and the systems that support the hiring and retention of TSMO professionals. Meeting changing needs for a TSMO workforce requires investing in HR systems that are capable of tracking time, professional education, and certifications. HR policies and procedures must become more flexible than traditional systems around time, travel, training, and expenses, and HR staff will need to focus on new ways to support recruiting and training TSMO professionals who do not fit traditional agency functions of design, build, and maintain. This will require new software systems, training for HR staff, and an investment in reviewing and revising current policies and procedures.

Agencies should consider investments in developing and formalizing career paths for new and emerging specialties in TSMO. Without defined paths for nontraditional and emerging jobs, it is often difficult to attract and retain employees whose KSAs may be more closely aligned with career paths in other industries. For example, if a Cyber Security Engineer position does not offer clearly articulated advancement opportunities within a transportation agency, it will be difficult to recruit and retain talented applicants. Investments in professional development and advancement opportunities should be defined within the agency for emerging and nontraditional positions.

An important aspect of enhancing employee morale in today's workforce is defining and highlighting a sense of purpose, particularly among younger and non-traditional transportation employees. Although it is not generally considered a strategy to enhance workforce satisfaction, a clearly defined agency mission supported by performance measures and specified outcomes provides a sense of purpose for employees. Investing in strategic planning and performance management provides a benefit not only to the agency as a whole, but it also benefits TSMO workforce and staff morale by articulating the importance of the work to the community, society, and the economy. This is an important aspect of retaining employees in public sector agencies, especially those in emerging areas that may offer higher pay and benefits in other fields.

An important area for investment is in developing strong, long-term relationships with universities for the development and recruitment of future TSMO professionals. This requires active engagement of TSMO professionals with future professionals to promote TSMO and build interest and enthusiasm for TSMO careers. This can include kindergarten through 12th grade students as well to help shape their understanding of possible career choices. Identifying schools with which to engage, developing a regular program of outreach, and defining the subjects and techniques for engagement should be part of a strategic effort to build strong relationships.

As new technology-based positions are established, investment in associated technology is needed to support these new positions. To properly equip employees to do their jobs, new hardware, software, systems, and updates will be needed. Just hiring a new TSMO Modeling Specialist or Visualization Specialist, for example, without the tools needed to effectively perform the job functions is not only ineffective, but frustrating to the new employee.

Each of the areas of investment should be considered at the agency level as emerging TSMO positions are established. They should also be considered at the national level as potential areas for additional research.

Chapter 5. TSMO Workforce Retention

Introduction

Retaining a workforce is critical to continued success and development of an agency's TSMO program. Throughout the workforce development cycle, agencies spend a significant amount of resources on their existing employees, both in terms of upfront costs for recruitment and onboarding as well as recurring costs such as on-going training. As such, when an existing employee changes roles or leaves the organization, there can be both a loss of knowledge as well as a financial drain as more resources are needed to identify, recruit, and hire a replacement. As such, workforce retention is a vital part of a successful TSMO program. This chapter discusses strategies and best practices to help agencies retain their workforce.

Best Practices in TSMO Workforce Retention

Adopting a culture of workforce retention and developing a personalized retention plan for each employee will address career and personal needs to enhance job satisfaction and greater commitment to the organization. Personalized retention plans should address job responsibilities, how the position supports the agency mission, training and advancement opportunities, salary and benefits, work conditions (workspace, flex-time, etc.), and employee recognition. It should address the specific needs of the employee in a way that is consistent with agency policies.

Emerging TSMO positions are often recruited from outside the transportation, public agency arena, and it may be challenging to retain employees more familiar and comfortable with the practices in the emerging technology fields. Government agencies may be constrained by law and policy in terms of compensation and benefit packages, but often the only constraint to creating effective work environments for emerging TSMO professionals is tradition. The following is a list of retention strategies that should be considered across the organization and specifically for TSMO.

The best practices in TSMO workforce retention, discussed below, focus on three categories: training and professional development, HR benefits, and workplace culture.

Table 11 lists each of the best practices described below and highlights how the practice was identified (i.e., from the literature or from stakeholder interviews).

Table 11. Best Practices for Retaining a TSMO Workforce

Best Practice	Category	Literature	Interviews
Enhance on-boarding processes	Trainings and Professional Development	✓	
Offer ongoing professional development	Trainings and Professional Development	✓	✓
Offer mentorship programs and opportunities	Trainings and Professional Development		✓
Provide training, including cross-functional training	Trainings and Professional Development	✓	✓
Offer performance-based compensation	Human Resource Benefits	✓	
Provide flexible work arrangements	Human Resource Benefits	✓	✓
Ensure employee recognition	Human Resource Benefits	✓	

Best Practice	Category	Literature	Interviews
Provide regular and effective feedback	Human Resource Benefits		✓
Clearly articulate mission and vision	Workplace Culture	✓	
Clearly define expectations and policies	Workplace Culture	✓	✓
Provide clear internal organization communication	Workplace Culture		✓
Ensure organizational integrity	Workplace Culture		✓
Host team celebration and events	Workplace Culture	✓	
Increase diversity	Workplace Culture		✓
Provide leadership opportunities	Workplace Culture		✓
Promote and ensure workplace safety	Workplace Culture	✓	
Support professional organization involvement	Workplace Culture		✓
Allow appropriate and creative office space	Workplace Culture	✓	
Offer extended leave opportunities	Workplace Culture		✓
Define career path and advancement opportunities	Workplace Culture	✓	✓

Trainings and Professional Development

New Hires

Orientation is a one-time event that provides essential information and protocols for new hires. Onboarding is an ongoing process that helps new employees adapt to the organizational culture and become successful in their new position as quickly as possible. Onboarding may include training, mentoring, social events, and other supportive activities. Recently, private sector companies have recognized the importance of the on-boarding process and have refocused the activity around the employee experience and less around completing paperwork. DOTs need to evolve onboarding processes to remain competitive. Within TSMO, some states have used the on-boarding process to allow for a broad introduction to quickly be exposed to various activities such as the TMC, safety service patrols, traffic signal shop, etc.

Mentorship programs are an effective part of onboarding new employees and enabling more seasoned professionals to guide and support development of less experienced employees. Mentoring can be used to support professionals moving from more traditional transportation positions into emerging positions where on-the-job learning can be essential. In addition to in-house mentoring, professional organizations offer mentoring programs that can be used to provide mentoring in specialized TSMO areas. The Institute of Transportation Engineers (ITE), Women's Transportation Seminar (WTS), and the Transportation Research Board (TRB) offer mentoring opportunities to members.

On-going Professional Development

Ongoing professional training may be a combination of internal and external training, and focus on technical, managerial, communication, regulatory, and other important aspects of the job. It may also include nontraditional training opportunities such as hackathons, consumer electronics shows, or events like the Electronic Entertainment Expo (E3) to bring technology applications from other industries into the transportation field.

Cross-functional training is one the most effective ways to develop and advance existing staff into new and emerging TSMO functions and positions. It can provide support to career advancement and be part of a formal career path for non-traditional employees looking to develop into higher managerial positions within the agency. An example cross-functional training strategy is to implement temporary assignments for staff (e.g., 90-day, by task, by project). This approach allows staff to get a firsthand experience at roles that they may not have been qualified for when going through the normal recruitment process. Cross-functional training often provides the individual with a different perspective and can help them see how different roles fit together and ultimately help improve efficiencies and coordination at the agency.

Human Resource Benefits

When considering employee compensation, it is important to remember that total compensation is the combination of both salary and other benefits, such as paid time off with separate sick leave, disability insurance, and a defined benefit pension. Increased flexibility in terms of options and pre-tax flexible spending accounts can allow employees to design a package that best meets their needs. While transportation agencies rarely have the ability to vary the package and the options to attract or retain specific positions, they can offer other benefits. Such benefits can include work location and schedule options or unpaid leave to be more competitive with the private sector. Transportation agencies should recognize the value of the benefits they offer (e.g., paid leave, pension) and articulate value of these benefits to attract potential employees.

Performance-based compensation ties compensation to specific performance goals and outcomes. It motivates employees to deliver high-level products and advance the organization's mission and objectives. Pay-for-performance is generally more effective in the private sector than in government agencies due to budgeting restrictions and the motivations of public sector employees. However, there may be specific situations in which performance-based compensation and bonuses can be effective in transportation agencies for retaining the best talent.

Employee recognition can be a low-cost opportunity to retain TSMO talent by letting them know their contributions are valued. This can include awards, monthly recognition of projects or activities, thank you notes, celebration events, certificates of achievement, reserved parking, gift cards, and other visible perks or recognition.

Regular and effective feedback can motivate employees by reducing confusion and frustration and acknowledging accomplishments. It can also allow the employee to feel part of a larger effort and more engaged in the team.

Workplace Culture

There are a number of ways to improve the workplace culture to assist in retaining the workforce. This section lists several best practices and provides a brief overview of each.

- **Clearly articulated mission and vision**. Transportation agency employees often choose government employment with a strong sense of public service. Clearly articulating the TSMO mission and vision and how each employee contributes to them can build strong affinity to the agency and support retention.
- **Clearly defined expectations and policies**. A clear understanding of job expectations and agency policies is an important part of effective employee orientation and onboarding. These can be supported through ongoing training, regular employee feedback and mentoring.

- **Internal organization communication**. Internal communication supports a clearly articulated mission and vision, enhances an understanding of agency culture and policies, and encourages employees to feel part of the larger organization.
- **Ensure organizational integrity**. Organizational integrity is integral to employees feeling good about where they work. This is especially important to agency employees who are motivated by public service.
- **Host team celebrations and events**. Team celebrations and events build camaraderie, acknowledge successes, and reinforce positive outcomes.
- **Increase diversity and inclusion**. Workforce diversity and inclusion benefits organizations through enhanced creativity, innovation, collaboration, and a reputation as a good place to work. This can help not only in retaining but in recruiting talent.
- **Provide leadership opportunities**. Opportunities to lead teams, initiatives, or programs can motivate personal growth and skill development. Leadership opportunities can be an important part of a defined career path and advancement in an organization.
- **Promote and ensure workplace safety**. Providing a safe workplace is essential to employee retention. Workplace safety includes employee training and increases a sense of appreciation for the welfare of employees.
- **Support professional organization involvement**. Encouraging and supporting employee involvement in professional organizations enhances employee development through training opportunities, sharing information, and experience; and advancing the national TSMO dialogue can enhance motivation and commitment.
- **Allow appropriate and creative office space**. Office spaces that encourage collaboration or allow focused concentration are important to meeting the specific needs of employees and their job functions. Providing appropriate and creative office space can improve employee satisfaction and retention.
- **Offer remote work options.** Like flexible work schedules, the opportunity to work remotely can increase retention through improved work-life balance and flexibility.
- **Offer extended leave opportunities**. Despite limitations in most organizations on paid leave, unpaid or extended leave options allow employees the opportunity to pursue study, travel, and family activities. These can improve employees' knowledge, perspective, and general morale.
- **Define career path and advancement opportunities.** Defined career paths and advancement opportunities are important for employee retention. Articulating how an employee can move up in the organization encourages him/her to stay and grow with the agency. This may be particularly challenging for some of the more specialized, emerging TSMO positions, and can include cross-training and mentoring to provide needed KSAs for advancement.

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List of Abbreviations, Acronyms, Initialisms, and Symbols

AI .... Artificial Intelligence
AR/VR .... Augmented and Virtual Reality
ATMS .... Advanced Transportation Management System
CAV .... Connected and Automated Vehicles
CEUs .... Continuing Education Units
CITE .... Consortium for Innovative Transportation Education
CMM .... Capability Maturity Model
DOT .... Department of Transportation
DSRC .... Dedicated Short-Range Communication
E3 .... Electronic Entertainment Expo
FHWA .... Federal Highway Administration
FWA .... Flexible Work Arrangement
GIS .... Geographic Information Systems
ICM .... Integrated Corridor Management
ICS .... Incident Command System
IMSA .... International Municipal Signal Association
IoT .... Internet of Things
IT .... Information Technology
ITE .... Institute of Transportation Engineers
ITS .... Intelligent Transportation Systems
KSAs .... Knowledge, Skills and Abilities
LMS .... Learning Management System
LTAP .... Local Transportation Assistance Program
ML .... Machine Learning
MPO .... Metropolitan Planning Organization
NCHRP .... National Cooperative Highway Research Program
NIMS .... National Incident Management System
NNTW .... National Network for the Transportation Workforce
NOCoE .... National Operations Center of Excellence
NTCPI .... National Transportation Career Pathways Initiative
OT .... Operational Technology
PATH .... Partners for Advanced Transportation Technology
PDHs .... Professional Development Hours
PP .... Performance Pay
SHRP2 .... Second Strategic Highway Research Program
STEM .... Science, Technology, Engineering and Mathematics

TIM .... Traffic Incident Management
TMC .... Transportation Management Center
TRB .... Transportation Research Board
TSMO .... Transportation Systems Management and Operations
V2X .... Vehicle-to-Everything
WTS .... Women's Transportation Seminar

Appendix A. Catalog of TSMO-related Undergraduate Courses

College/University	State	Course Name	Description	Credits Earned
Alabama A&M University	Alabama	**Transportation Engineering and Design**		3
Alabama A&M University	Alabama	**Transportation Systems**		3
Angelo State University	Texas	**Geometric Design of Highways**	Students taking this class will study the criteria controlling geometric design of highways including design speed, design volume, vehicle requirements and capacity design standards for different highway types; design of sight distance, alignment, grade; cross-section design; access control, frontage roads; intersection design elements, and design of intersection and exchanges.	3
Angelo State University	Texas	**Introduction to Transportation Engineering**	Introduction to Transportation Engineering is an entry level transportation engineering course. The course covers general knowledge in all the transportation fields including: traffic characteristics and flow theory, transportation planning, geometric design of highways, traffic safety, highway materials, and pavement design.	3
Angelo State University	Texas	**Traffic Operations**	Basic characteristics of traffic, such as drivers, vehicles, volumes, speeds, delay, origins and destinations, intersection performance, capacity, termination and accidents; techniques for making traffic engineering investigations; traffic laws and ordinances, regulations, design and application of signal systems; curb parking control; enforcement and traffic administration; and public relations.	3
Arizona State University	Arizona	**Highway Geometric Design**	Design of visible elements of roadway, design controls, at-grade intersections, freeways, and interchanges.	3
Arizona State University	Arizona	**Transportation Engineering**	Fundamental background of highway and traffic engineering in the areas of planning, design, and operations.	3
Arizona State University	Arizona	**Transportation Systems Planning**	Transportation systems modeling procedures, travel characteristics analysis, traffic predictions, transportation systems management, and transit planning methods.	3
Arkansas State University	Arkansas	**Transportation Engineering II**		3
Arkansas State University	Arkansas	**Transportation Engineering l**		3
Auburn University	Alabama	**Airport Design**	Departmental approval. An analysis of the elements affecting the design of airports including forecasting, runway configuration, capacity analyses, geometric design of runways and taxiways, pavement design and airfield drainage.	3
Auburn University	Alabama	**Geographic Information Systems in Civil Engineering**	Basic principles and the development of geographic information systems and practical experiences in the field of civil engineering.	3
Auburn University	Alabama	**Geometric Design**	An analysis of the elements affecting the location and design of rural highways, urban highways and arterial streets including design controls and criteria.	3
Auburn University	Alabama	**Intelligent Transportation Systems II**	Introduction to intelligent transportation systems, covering applications of information and communications technologies to transportation, with emphasis on operations of traffic management and traveler information systems. Departmental approval.	3
Auburn University	Alabama	**Intelligent Transportation Systems l**	Departmental approval. Introduction to intelligent transportation systems, covering applications of information and communication technologies to transportation, with emphasis on operations of traffic management and traveler information systems.	3
Auburn University	Alabama	**Planning for Multimodal Transportation Systems II**	The planning process for urban and regional transportation development. Topics include planning objectives and data requirements; planning inventories; modeling of trip-making behavior, development and evaluation of alternate plans; multimodal applications, including railway operations.	3

College/University	State	Course Name	Description	Credits Earned
Auburn University	Alabama	**Planning for Multimodal Transportation Systems I**	The planning process for urban and regional transportation development. Topics include planning objectives and data requirements; planning inventories; modeling of trip-making behavior, development and evaluation of alternate plans; multimodal applications, including railway operations.	3
Auburn University	Alabama	**Public Transportation**	Technology and characteristics of public transportation; transportation demand analysis; transit users; innovative technologies.	3
Auburn University	Alabama	**Roadside Design**	Concepts of roadside design that can prevent or reduce crash severity. Topics include design, selection, placement and construction of longitudinal barriers, crash cushions, bridge rails, transitions, end terminals, sign posts, and other roadside features.	3
Auburn University	Alabama	**Traffic Control Systems Design**	Fundamental design concepts for highway traffic control systems. Control requirements and warrants; hardware operation and equipment selection; development and implementation of timing plans for isolated intersections and intersection networks.	3
Auburn University	Alabama	**Traffic Engineering Analysis II**	Fundamental design concepts for highway traffic control systems. Control requirements and warrants: hardware operation and equipment selection; development and implementation of timing plans for isolated intersections and intersection networks.	3
Auburn University	Alabama	**Traffic Engineering Analysis I**	Capacity analysis of rural and suburban highways, 2-lane highways, freeways, weaving sections, ramps and intersections.	3
Auburn University	Alabama	**Traffic Engineering Fundamentals**	The fundamental elements of traffic engineering including traffic operations and traffic control devices.	3
Auburn University	Alabama	**Traffic Flow Theory**	Basic phenomena underlying traffic stream movement and individual vehicle behavior. Topics include flow parameters and relationships; microscopic and macroscopic flow models; equations of motion and state; single and multi-regime flow models.	3
Auburn University	Alabama	**Transportation Design Project**	Individual senior design project requiring the development of plans for a roadway over a large land segment: horizontal and vertical curves in accord with State and AASHTO standards; topographic terrain features; historical preservation area; minimum elevation; intersection design; earthwork balance.	3
Auburn University	Alabama	**Transportation Engineering**	Introduction to transportation engineering practice with emphasis on highway facility design, traffic operations, and life-cycle costing.	4
Auburn University	Alabama	**Transportation Safety**	Transportation safety problems and the engineer's role in developing and administering safety programs. Topics include hazardous location identification; analysis of accident data; development and evaluation of accident countermeasures and safety programs.	3
Boise State University	Idaho	**Highway Systems Design**	Design of urban and rural highway systems. Use of software is required.	3
Boise State University	Idaho	**Traffic Systems Design**	The course covers the design of operations, control, and management of traffic systems. Use of software is required.	3
Boise State University	Idaho	**Transportation Engineering Fundamentals**	Planning, design, and operations of multi-modal transportation systems.	3
Boise State University	Idaho	**Transportation Planning**	Theory and practice of transportation planning at the metropolitan as well as regional levels. Use of software is required. Recent advances in transportation planning will be introduced.	3
Bradley University	Illinois	**Transportation Engineering**	Introduction to transportation engineering and planning as it relates to highways. Characteristics of highway systems: the driver, vehicle and roadway, traffic engineering studies, highway safety, traffic flow fundamentals, capacity and level of service concepts, intersection traffic control, transportation planning and site impact analysis, geometric design of highways.	3

College/University	State	Course Name	Description	Credits Earned
Bridgevalley Community and Technical College	West Virginia	**Highways III**	Highway planning and design including the study of surveys and plans. Topics include design characteristics and standards, surveying and mapping, geometric design, pavements, earthwork, drainage, safety and environmental considerations.	
Brigham Young University	Utah	**Introduction to Transportation Engineering**	Transportation system characteristics, traffic engineering and operation, transportation planning, geometric design, pavement design, transportation safety, freight, public transport, sustainable transportation.	
Brigham Young University	Utah	**Traffic Engineering: Characteristics and Operations**	Traffic stream characteristics, traffic flow theory, traffic control devices, capacity and level of service, warrants, signal timing and optimization, signal coordination.	
Brigham Young University	Utah	**Urban Transportation Planning**	Urban transportation planning and decision making, intermodal transportation, land-use transportation interrelationships, transportation demand modeling, site impact analysis, sustainable transportation; livable cities.	
Bucknell University	Pennsylvania	**Advanced Topics in Transportation**	Topics will vary. Prerequisite: permission of the instructor.	1
Bucknell University	Pennsylvania	**Advanced Traffic Engineering**	Introduction to traffic engineering elements, including traffic flow theory, queue theory, geometric design and signal design. Students will learn to use traffic design and simulation software. Prerequisite: CEEG 330 or permission of the instructor.	1
Bucknell University	Pennsylvania	**Fundamentals of Transportation Safety Data Analysis**	Application of statistical techniques to analyze transportation safety data and predict crash events/characteristics; topics include crash data availability, data manipulation techniques, statistical model selection/implementation, use of safety performance functions, and advanced network screening methods.	1
Bucknell University	Pennsylvania	**Introduction to Roadside Safety**	Fundamentals of roadside safety design and analysis: topics include traffic barrier warranting and selection, crash data analysis, hardware performance evaluation, and benefit/cost analysis. Prerequisites: CEEG 330 or permission of the instructor.	1
Bucknell University	Pennsylvania	**Introduction to Transportation**	Transportation systems, operations, planning, and design for highways and other modes; sustainability, safety, social, and economic issues; traffic studies in the local community.	1
Bucknell University	Pennsylvania	**Sustainable Transportation Planning**	Multimodal design principles, urban and regional planning approaches, and capacity analysis methods are used to analyze and design transportation systems in order to enhance mobility while simultaneously reducing impacts on the environment, society, and the economy. Prerequisite: CEEG 330 or third or fourth year engineers with permission of the instructor.	1
California Polytechnic State University, San Luis Obispo	California	**Airport Planning and Design**	Historical background of aviation and airport development; financing; estimating demand; aircraft characteristics; airport capacity; airspace and air traffic control; site selection; airport configuration; geometric design of landing area; planning and development of terminal areas; lighting; pavement design and drainage. 1 laboratory.	4
California Polytechnic State University, San Luis Obispo	California	**Fundamentals of Transportation Engineering**	The characteristics and functions of highway, air, rail, transit and other modes of urban and intercity transportation. Fundamentals of transportation design, operations, and planning. Evaluation of costs, benefits, and environmental considerations.	3
California Polytechnic State University, San Luis Obispo	California	**Fundamentals of Transportation Engineering Laboratory**	Application of principles of transportation planning, operations, and design. Emphasis on urban transportation planning and operations, and the design of urban and intercity highway and rail facilities. Experimental determination of the physical and mechanical properties of pavement materials through laboratory and field testing. Analysis of data and preparation of testing reports.	2
California Polytechnic State University, San Luis Obispo	California	**Highway Geometrics and Design**	Alignment location and safe geometric design of highways. Earthwork and drainage related to highway. Theory and practice in design of alignments, highway cross-sections, intersections, interchanges, and freeways in urban and rural areas. Application of advanced computer software to highway geometrics. 2 laboratories.	4

College/University	State	Course Name	Description	Credits Earned
California Polytechnic State University, San Luis Obispo	California	**Intelligent Transportation Systems**	Specification and operation of Intelligent Transportation Systems (ITS). Traffic surveillance and control systems including applications to freeways, urban streets, rural highways, and public transportation. Standards include the National Architecture for ITS. 1 laboratory.	4
California Polytechnic State University, San Luis Obispo	California	**Introduction to Railway Engineering**	Introduction to railroad and railway system analysis and design. Railroads, rail transit and high speed rail applications. Track foundation design for various conditions. Approaches to railway analysis and design and an introduction to railway traffic control and signaling.	4
California Polytechnic State University, San Luis Obispo	California	**Public Transportation**	Interdisciplinary aspects of public transportation problems, systems-team design approach to solutions. History and present state of public transportation; role of public transportation in urban environment; legislative, political, social, and economic aspects of public transportation systems. Methodology and procedures for transit planning. Review of transit studies. 1 laboratory.	4
California Polytechnic State University, San Luis Obispo	California	**Traffic Engineering**	Principles of traffic circulation on highway systems and other modes. Traffic control. Traffic data collection and analysis. Capacity analysis. Traffic modeling. New technologies. 1 laboratory.	4
California Polytechnic State University, San Luis Obispo	California	**Transportation Safety**	Introduction to nature and extent of transportation safety problem worldwide and in the United States. Several sub-areas of transportation safety: road safety, human factors, vehicle safety; crash data collection and management; safety planning; hot spot identification; methodologies for conducting transportation accident studies; statistical applications to accident data; predictive model building; 'before-after' studies; countermeasure design. 1 laboratory.	4
California Polytechnic State University, San Luis Obispo	California	**Transportation Systems Planning**	Planning of urban and regional multimodal transportation systems. Modeling of transportation networks and travel demand. Travel survey design. Urban data systems. Evaluation of alternatives based on economic, social, technological, and other factors. 2 laboratories.	4
California State Polytechnic University, Pomona	California	**Design of Transportation Facilities**	Advanced study of design of transportation facilities. It includes geometry, drainage, soils, materials, and other topics of streets and non-motorized facilities, highways, railroads, transit, and harbor/port facilities. Software such as InRoads or Civil 3D will be used for facility design.	3
California State Polytechnic University, Pomona	California	**Design of Transportation Facilities Laboratory**	Advanced study of design of transportation facilities. It includes geometry, drainage, soils, materials, and other topics of streets and non-motorized facilities, highways, railroads, transit, and harbor/port facilities. InRoads or Civil 3D will be used for facility design.	1
California State Polytechnic University, Pomona	California	**Intelligent Transportation Systems**	Historical overview of ITS development; ITS system architecture and Systems Engineering (SE) process; hands-on practice on ITS technologies through case studies and projects.	3
California State Polytechnic University, Pomona	California	**Multimodal Traffic Analysis**	Highway capacity analysis of basic freeway segment and signalized intersection. Performance measurement selection for pedestrian, bicycle and transit facilities. Level of service for vehicular driver, pedestrian, bicyclist and transit user. Overview of Highway Capacity Manual. Countermeasure evaluation of transportation facilities for different road users.	3
California State Polytechnic University, Pomona	California	**Traffic Engineering**	Driver and vehicle characteristics. Origin and destination studies. Volume, speed and accident studies. Traffic control devices. Channelization design. Parking facilities design. Intersection design. Roadway lighting. Traffic Simulation.	3

College/University	State	Course Name	Description	Credits Earned
California State Polytechnic University, Pomona	California	**Traffic Engineering Laboratory**	Driver and vehicle characteristics. Origin and destination studies. Volume, speed and accident studies. Traffic control devices. Channelization design. Parking facilities design. Intersection design. Roadway lighting. Traffic Simulation.	1
California State Polytechnic University, Pomona	California	**Transportation Engineering**	Understanding of the history and operation of several principal modes of transportation including highways, air, inland waterways, railroads, coast shipping and ocean transportation. Application of various design principles to carry out basic aspects of transportation engineering design. Introduction to the fundamental concepts behind the design of transportation modes such as operational and vehicular characteristics, traffic control, transportation planning and human factors.	3
California State Polytechnic University, Pomona	California	**Transportation Engineering Laboratory**	Understanding of transportation engineering in terms of planning and design. The focuses are on the interchange geometric design, traffic impact study consisting of highway capacity calculation and traffic volume forecast and distribution, design of traffic signal including phasing and timing optimization and pole and conductor schedule, and parking facility design per ADA guidelines. The software packages used include Inroads, Synchro Studio and MicroStation.	1
California State Polytechnic University, Pomona	California	**Transportation Planning and Management**	Study and design of transportation in the urban environment, primarily transit; includes history, nature of problems, alternative solutions, costs of modernization, mass transit trends, the subsidy debate, role of the State and Federal governments, rideshare planning, ADA services, financial plans, the nature and importance of planning and transit planning process.	3
California State Polytechnic University, Pomona	California	**Transportation Planning and Management Laboratory**	Study and design of transportation in the urban environment, primarily transit; includes history, nature of problems, alternative solutions, costs of modernization, mass transit trends, the subsidy debate, role of the State and Federal governments, rideshare planning, ADA services, financial plans, the nature and importance of planning and transit planning process.	1
California State Polytechnic University, Pomona	California	**Transportation Systems Design and Operation**	Introduction to traffic control systems. Types of traffic control methods. Warrants for placement of various intersection controls. Selection and placement of traffic control equipment. Signal system design and preparation of signal plans and specifications. Signal timing methods. Analysis of signalized intersection capacity and performance. Ramp metering.	3
California State University Fresno	California	**Traffic Operations and Control**	Transportation studies. Highway traffic characteristics. Highway system traffic analysis. Highway system capacity design. Traffic regulations and control.	3
California State University Fresno	California	**Transportation Geographic Information Systems (GIS)**	This course covers basic and advanced concepts of Transportation GIS, introduces basic applications of two ArcGIS extensions (spatial and network analysts), and enables advanced applications of user-defined functions through the usage of the Model Builder and Python scripting.	3
California State University Fresno	California	**Transportation Planning and Design**	Geometric design of land transportation facilities, primarily road/street systems. Traffic theory and analysis, including statistical analysis of traffic parameters. Freeway and intersection capacity. Simple transportation demand forecast.	3
California State University, Chico	California	**Advanced Transportation Engineering Design**	This course presents selected topics in advanced transportation engineering techniques, design, and analysis. These topics cover the advanced technologies in the areas of transportation pavements, transportation materials, traffic engineering, and travel demand modeling. The course is also designed to equip students with practical design oriented experience with comprehensive knowledge learned through previous transportation related classes. 2 hours discussion, 2 hours activity. This course requires the use of a laptop computer and appropriate software.	3

College/University	State	Course Name	Description	Credits Earned
California State University, Chico	California	**Advanced Transportation Engineering Design Capstone**	This course presents selected topics in advanced transportation engineering techniques, design, and analysis. These topics cover the advanced technologies in the areas of transportation pavements, transportation materials, traffic engineering, and travel demand modeling. The course is also designed to equip students with practical design oriented experience with comprehensive knowledge learned through previous transportation related courses. 2 hours discussion, 2 hours activity. This course requires the use of a laptop computer and appropriate software.	3
California State University, Chico	California	**Traffic Engineering**	Traffic engineering fundamentals, traffic control signs, markings, and signals. Intersection and highway capacity. Highway safety and accident investigations. Design of streets and parking facilities. Assessment of the environmental impact of traffic. 3 hours discussion.	3
California State University, Chico	California	**Transportation Engineering**	Transportation systems and facility planning, design, construction, operations, and maintenance. Pavement design and traffic engineering fundamentals. Laboratory includes field studies, design exercises, and modeling/forecasting tasks. 3 hours discussion, 3 hours laboratory.	4
California State University, Chico	California	**Transportation Planning, Surveying, and Graphics**	This course introduces civil engineering design standards, concepts, and procedures related to transportation engineering and construction management. Topics include the standards and design of horizontal curves, vertical curves, and earthwork related to transportation projects in addition to survey staking, state plane coordinates, geographic information systems, and global positioning systems related to project surveying. The laboratory portion of this course includes the application of 3-dimensional graphic modeling software requiring creativity in design, development of construction plans, and operation of modern surveying equipment, such as total stations and GPS systems. 2 hours discussion, 3 hours laboratory.	3
California State University, Long Beach	California	**Advanced Traffic Engineering**	Analysis of arterial streets traffic operations. Queuing Analysis; Signal timing coordination and optimization; Use of traffic optimization and simulation computer models to solve problems.	3
California State University, Long Beach	California	**Highway Design**	Geometric design of highways and streets. Route location and earthwork computation. Introduction to roadside and pavement design. Design problems in highway engineering.	2
California State University, Long Beach	California	**Highway Design Laboratory**	Geometric highway design project, horizontal alignment, vertical alignment, cross section, earthwork calculation, environmental impact, use of software application.	1
California State University, Long Beach	California	**Traffic Engineering**	Capacity and level of service analyses of highway facilities. Intersection signal timing design. Introduction to traffic control devices. Volume, speed and delay studies. Use of traffic data for design, planning and operational levels of analyses.	2
California State University, Long Beach	California	**Traffic Engineering Laboratory**	Laboratory activities on traffic flow theory, capacity and level of service analyses, signal timing, parking lot design, and travel demand forecasting; traffic volume, speed and delay studies. Use of traffic engineering software.	1
California State University, Long Beach	California	**Traffic Operations**	Principles of traffic flow. Highway traffic operations. Evaluation of quality of traffic operations including long-range impact on efficient use of the systems and on safety. Identification and evaluation of measures of effectiveness. Travel demand management strategies and intelligent transportation system applications.	3
California State University, Long Beach	California	**Transportation Engineering**	Integrative learning course on transportation engineering. Characteristics of driver, pedestrian, vehicle, and road; traffic flow; intersection design and control, planning, and geometric design; safety issues. Team project, oral presentations, and written reports required.	3

College/University	State	Course Name	Description	Credits Earned
California State University, Long Beach	California	**Transportation Engineering Honors**	Integrative learning course on transportation engineering. Characteristics of driver, pedestrian, vehicle, and road; traffic flow; intersection design and control, planning, and geometric design; safety issues. Team project, oral presentations, and written reports required.	3
California State University, Long Beach	California	**Transportation Planning**	Planning of transportation facilities in urban setting; application of travel forecasting and analytical models in the planning process; evaluation of transportation alternatives and impacts; transportation system and demand management techniques.	3
California State University, Long Beach	California	**Transportation Safety and Sustainability**	Introduction to transportation systems and various modes of transportation: land, air, and water; legislations affecting transportation practices; transportation safety; impacts of transportation on the environment; sustainable transportation: transit, bicycles, and pedestrians.	3
California State University, Los Angeles	California	**Highway Engineering**	Introduction to principles of highway design including route location, geometric of horizontal and vertical curves, earthwork computations, drainage designs; computer applications.	3
California State University, Los Angeles	California	**Traffic Engineering**	Elements of traffic engineering; vehicle, driver, and road characteristics; capacity and flow determination; signalized intersections; parking and accident studies; street, freeway, and mass transit operations.	3
California State University, Los Angeles	California	**Transportation Engineering**	Fundamental principles for analysis, planning, design, and operation of transportation systems.	3
California State University, Northridge	California	**Highway Design**	The course covers basic highway design and traffic circulation principles. Study of design elements of alignment, profile, cross-section and controlled-access highways. Investigation of functional highway classification, traffic volume, signs and measurements, intelligent transportation systems, and Caltrans standard drawings and specifications. 2 hours lecture, 3 hours of technical activity/laboratory per week.	2
California State University, Northridge	California	**Highway Design Laboratory**	The course covers basic highway design and traffic circulation principles. Study of design elements of alignment, profile, cross-section and controlled-access highways. Investigation of functional highway classification, traffic volume, signs and measurements, intelligent transportation systems, and Caltrans standard drawings and specifications. 2 hours lecture, 3 hours of technical activity/laboratory per week.	1
California State University, Sacramento	California	**Traffic Analysis and Design**	Spring only. Introduction to the fundamental principles of traffic operations, traffic data collection methods, intersection control, signal design and analysis techniques. Methods and software for designing and optimizing signalized and unsignalized intersection operation.	3
California State University, Sacramento	California	**Transportation Engineering**	Fall, Spring. Introduction to the fundamental topics in Transportation Engineering. Focus on roadway geometric design, layout considerations, pavement materials and design, traffic operations and analysis. Lecture three hours; laboratory three hours.	4
California State University, Sacramento	California	**Transportation Systems**	Spring only. Transportation systems evaluation and management. Focus on transportation planning methods, including data analysis, estimation of future demand, evaluation of travel demand impacts on existing systems, and transportation system decision-making.	3

College/University	*State*	*Course Name*	*Description*	*Credits Earned*
Carnegie Mellon University	Pittsburgh	**Smart Cities: Growth and Intelligent Transportation Systems**	Cities all around the world are being built and re-invented as smart cities utilizing information systems and innovative applications of data analytics. One major smart cities component is transportation. The Intelligent Transportation Systems (ITS) industry is expected to grow at a rate of 19% per year and reach $5.5 Billion in annual investment by 2020. This shifting dynamic provides great opportunity for improved transportation safety and efficiency but also poses challenging information systems and public policy challenges. Furthermore, there are new opportunities for professional-school graduates outside of engineering schools for employment in transportation planning and policy. This course is supported by CMU's Traffic21 Initiative and Technologies for Safe and Efficient Transportation (T-SET) University Transportation Center. Classes will feature guest lectures provided by T-SET faculty and industry and government ITS professionals.	
Carnegie Mellon University	Pittsburgh	**Traffic Engineering**	Introduction to traffic engineering providing practical experience that can be used directly in the workforce. Course material will provide a solid foundation in preparing for the Transportation portion of the Professional Engineer exam. The course incorporates the initial planning side of transportation engineering with tasks such as traffic analyses, traffic studies and transportation/traffic engineering report writing.	
Carroll College	Montana	**Transportation Engineering II**	This course covers the basics of traffic engineering, traffic control, human characteristics as they relate to transportation, engineering transportation standards, planning, public policy, and contemporary and future transportation issues. Three class hours per week.	3
Carroll College	Montana	**Transportation Engineering l**	This course covers vehicle characteristics, geometric design of highways, earthwork calculations, pavement design, networks, and statistical applications in transportation. Two class hours per week.	3
Central Connecticut State University	Connecticut	**Introduction to Transportation Engineering**	Engineering for the planning, design, construction and maintenance of surface transportation projects. Driver and vehicle characteristics, highway geometric design, intersection design and control, traffic flow and capacity, safety, and travel forecast modeling. Two hours of lecture and two hours lab per week.	3
City University of New York, City College	New York	**Highway and Airport Construction**	Overview of highway and airport engineering and construction; highways vs. airports; urban vs. rural highways. Construction planning, organization and cost estimating; construction scheduling using computer packages, e.g., Primavera; construction tracking. Construction operations: mobilization, removal, disposal, placement; management of equipment, material, labor, money; cash flow accounting. Construction specifications: quality assurance/quality control (QA/QC); investigation of environmental impacts and mitigation measures. Site investigation and project preparation. This course is cross listed with CE H4100 Highway and Airport Construction, and therefore is not available to students who have already completed CE H4100.	3
City University of New York, City College	New York	**Highway Engineering**	The design of highway alignment and route location. Basic elements of highway design, including pavement type, earthwork and drainage. Importance and consequences of maintenance and engineering economics; life-cycle cost analysis. This course is cross listed with CE H4000 Highway Engineering, and therefore is not available to students who have already completed CE H4000.	3
City University of New York, City College	New York	**Rail System Design**	Design of light and heavy rail facilities for passenger and freight operations. Track structure. Alternative technologies for construction, guidance and communications. Maintenance of way. This course is cross listed with CE H2600 Rail System Design, and therefore is not available to students who have already completed CE H2600.	3

College/University	***State***	***Course Name***	***Description***	***Credits Earned***
City University of New York, City College	New York	**Traffic Engineering**	Traffic flow theory, including fundamental diagram, microscopic models, and macroscopic models. Analysis of traffic data, including capacity and performance assessment. Network models and simulation. Advanced technology applications for data collection, traffic control, and real-time system management. This course is cross listed with CE H2000 Highway Engineering, and therefore is not available to students who have already completed CE H2000.	3
City University of New York, City College	New York	**Traffic Systems: Planning and Operations**	Basic techniques of service area analysis, route development, scheduling, revenue estimation, and service improvements for fixed route bus and rail transit. Integration of fixed route transit with paratransit, matching mode with service area, relationship of transportation department with other departments, budgeting, and policy setting also will be discussed. This course is cross listed with CE H4800 Transit Systems: Planning and Operation, and therefore is not available to students who have already completed CE H4800.	3
City University of New York, City College	New York	**Transportation Planning**	Introduction to transportation planning concepts and methods. Travel demand forecasting. Transportation economics. Quantitative techniques in transportation planning: discrete choice models, regression methods and optimization techniques. Societal impacts including environmental, land use, safety and quality of life issues. Project evaluation.	3
City University of New York, City College	New York	**Transportation Systems Engineering**	Principles and practice of transportation engineering. Introduction to traffic engineering concepts including traffic flow theory, multimodal level of service analysis, and traffic control. Fundamentals of geometric and pavement design. Influence of modern technologies on transportation systems.	3
City University of New York, City College	New York	**Urban Freight and City Logistics**	Core concepts, challenges and methods of urban freight and city logistics. Fundamentals of urban spatial structure, drivers of urban changes. Freight distribution methods and stakeholders. Externalities of freight operations. Urban freight data sources and data collection strategies. Policies and mitigation strategies, and analytical methodologies supporting decision-making. Illustrative case studies. This course is cross-listed with CE H4700 Urban Freight and City Logistics, and therefore is not available to students who have already completed CE H4700.	3
City University of New York, City College	New York	**Urban Transportation**	Historical development of urban surface transportation systems. Stakeholders, user and operating characteristics, and infrastructure elements for passenger motor vehicle, transit, bicycle, pedestrian, and freight modes. Safety, environmental, and financial considerations. Regulations and technology applications. This course is cross listed with CE H4500 Urban Transportation, and therefore is not available to students who have already completed CE H4500.	3
Clarkson University	New York	**Geographical Information Systems**	An introductory course in the concepts and uses of Geographic Information Systems (GIS) including analysis of GIS-based local and global geographic datasets. Provides basic knowledge of GIS theory and applications using existing state-of-the-art GIS software and current spatial data resources. Applications include: overlay analysis, spatial data query, map generation and terrain surface analysis. Students will also learn the basics of GPS data collection, remote sensing, 3D visualization, probability, statistics, and error analysis.	3

College/University	State	Course Name	Description	Credits Earned
Clarkson University	New York	**Railroad Engineering**	This course focuses on principles of railroad transportation and covers the following topics: Railroad engineering efficiency, economics, and energy; Cost-benefit analyses of rail transportation systems; Route selection; Geometric design of railroad alignment; Train speed, power, and acceleration requirements; Railroad engineering materials characterization (rail, crosstie, ballast, sub-ballast, and subgrade); Subgrade design and construction and drainage; and High Speed Rail (HSR) design and construction.	3
Clarkson University	New York	**Traffic Engineering**	This course focuses on the collection and synthesis of information to aid in the planning, design, and operation of traffic engineering systems. Major aspects of the course include capacity and level of service analysis, traffic studies, and the design of traffic signal control systems.	3
Clarkson University	New York	**Transportation Systems Design**	Planning and design of transportation systems with emphasis on highway geometric design components, highway pavement, airport and other selected topics. (3 credits of design) Prerequisites: At least junior standing.	3
Cleveland State University	Ohio	**Highway Engineering**	Senior standing. Properties of materials used in highway construction. Effects of loading and the environment on pavement life. Design of flexible and rigid pavement systems. Construction methods and management.	3
Cleveland State University	Ohio	**Traffic Flow Theory**	Student must have senior standing. The Traffic Flow Theory course provides the basic concepts and theories of traffic flow characteristics and the associated analytical techniques. This course reviews the foundations of traffic science and presents the major classes of models derived for traffic flow. Recent developments and topics of current research are introduced. The course also addresses the implications of the models and the traffic system properties for traffic operations and control.	3
Cleveland State University	Ohio	**Transportation Engineering**	Senior standing. Survey of transportation development, characteristics, and planning; traffic characteristics capacity of various systems, including basic procedures, controls, and criteria in highway design; environmental considerations.	3
Cleveland State University	Ohio	**Urban Transportation Planning**	Focus on factors involved in the process of urban planning and regional transportation systems, encompassing all modes. Provides students with theory and applications of urban transportation planning studies, traffic models, investment models, programming and scheduling.	3
Colorado State University	Colorado	**Infrastructure and Transportation Systems**	Principles of infrastructure systems, transportation systems, applications of spatial data and GIS, project management and engineering economy.	3
Colorado State University	Colorado	**Transportation Engineering**	Principles of highway engineering, transportation engineering and bridge engineering with a focus on design.	3
Colorado State University, Pueblo	Colorado	**Highway Design**	A study of highway planning and design	3
Columbia University	New York	**Big Data Analytics in Transportation**	Major elements of transportation analytics. Develop basic skills in applying fundamentals of data analytics to transportation data analysis. Apply coding languages (e.g., MATLAB, Python) and visualization tools (e.g., Excel, Carto, R, Processing) to analyze transportation data. Infer policy implications from analytics results.	3
Columbia University	New York	**Transportation Engineering**	An overview of the planning, design, operation, and construction of urban highways and mass transportation systems. Transportation planning and traffic studies; traffic and highway engineering; rapid transit and railroad engineering.	3

College/University	State	Course Name	Description	Credits Earned
Dordt College	Iowa	**Introduction to Transportation Engineering**	An introduction to transportation engineering and design. Students will study geometric design of highways, pavement design, traffic flow theory, highway capacity, traffic control devices, and transportation planning. A primary aim of the course is to introduce students to fundamental principles and approaches in transportation engineering. Secondary objectives of the study include gaining a better understanding of how to be an active steward in God's creation, how to care for the safety of fellow citizens, and learning the basic concepts behind transportation and why it is so important in our culture today.	3
Embry-Riddle Aeronautical University - Daytona Beach	Florida	**Airport Design II**		3
Embry-Riddle Aeronautical University - Daytona Beach	Florida	**Airport Design l**		3
Embry-Riddle Aeronautical University - Daytona Beach	Florida	**Civil Transportation Elective**		3
Embry-Riddle Aeronautical University - Daytona Beach	Florida	**Computer Applications in Transportation**		2
Embry-Riddle Aeronautical University - Daytona Beach	Florida	**Introduction to Transportation Engineering**		3
Fairleigh Dickinson University (Metropolitan Campus)	New Jersey	**Transportation Engineering**	Highway and urban transportation systems. Organizations and associations. Planning, Driver, vehicle, traffic and road alignment, sight distances. Intersection and interchange design. Drainage details. Earthwork: calculations of volumes. Materials for roads and surfaces, bearing qualities. Computer Applications. Term and laboratory projects assigned.	3
Fairmont State University	West Virginia	**Highway Design and Transportation**		
Florida A&M University	Florida	**Highway Geometric Design**	This course covers principles and procedures for the geometric design of highways and streets, consideration of traffic, land use, and aesthetic factors.	3
Florida A&M University	Florida	**Intelligent Transportation Systems**	This course covers advanced traffic management systems (ATMS), advanced traveler information systems , advanced vehicle control systems, commercial vehicle operations, rural ITS, human factors, institutional issues, architecture and standards, as well as simulation and modeling.	3
Florida A&M University	Florida	**Traffic Engineering**	This course covers nature, characteristics, and theories of traffic problems. Topics include traffic survey procedures, origin-destination studies, as well as an introduction to theory and design of automatic control of traffic systems.	3
Florida A&M University	Florida	**Traffic Operations**	This course covers operation of transportation systems, monitoring, regulation, and control traffic.	3
Florida A&M University	Florida	**Transportation Engineering**	This course is an introductory study of transportation engineering in the United States with special emphasis on highway and traffic engineering, planning and design, construction, operation, management, and safety.	3

College/University	*State*	*Course Name*	*Description*	*Credits Earned*
Florida Atlantic University	Florida	**Highway Engineering**	Course covers planning, design and operation of highway geometric design, modern methods for traffic control, traffic flow capacity, highway location and design, highway engineering economics, traffic measurement devices and technologies; signal systems, corridor control, automatic driver information; incident detection; and autonomous vehicle operation.	3
Florida Atlantic University	Florida	**Introduction to Transportation Engineering**	Introduction to transportation engineering, including planning, permitting, and environmental considerations; design calculations; capacity analysis and simulation; presentation skills necessary for the proper development of transportation improvements.	3
Florida Atlantic University	Florida	**Transportation Operations and Logistics Management**	Provides multimodal solutions that relieve congestion, optimize infrastructure investments, promote travel options and reduce greenhouse gas emissions. Modeling of complex interactions and causal relationships among current issues. Topics include transportation modes and technologies, vehicle dynamics, basic facility design, capacity analysis, transportation planning, evaluation and choice, network analysis, logistics and ITS. Additional topics include transportation risk assessment and computation, evacuation modeling, reliability analysis, infrastructure interdependency analysis and network impact assessment.	3
Florida Atlantic University	Florida	**Transportation Planning and Logistics**	Fundamental concepts for multimodal transportation engineering, planning, and systems analysis. Topics include transportation demand and supply system simulations, impact estimation, linear and integer programming, and the evaluation of competing transportation alternatives.	3
Florida Institute of Technology	Florida	**Transportation Engineering**	Modes of transportation are reviewed with emphasis on highways, including vehicle characteristics, geometric alignment, traffic analysis, queuing theories, signal timing, levels of service, traffic forecasting, pavement design and airport runway design and layout.	3
Florida International University	Florida	**Geometric Design of Highways**	Parameters governing geometric design of highways; curve superelevation, widening of highway curves, intersection design; highway interchanges, use of AASHTO design guidelines.	3
Florida International University	Florida	**GIS Application in Civil and Environmental Engineering**	Introduction to the basics of geographic information systems and their applications in civil and environmental engineering, landscape architecture, and other related fields.	3
Florida International University	Florida	**Highway Capacity Analysis**	Procedures involved in the capacity analysis of interrupted and uninterrupted flow highway facilities. Applications of highway capacity analysis software.	3
Florida International University	Florida	**Traffic Engineering**	Speed and volume studies, traffic operations and characteristics, traffic flow theory, accident characteristics.	3
Florida International University	Florida	**Transportation and Traffic Engineering**	Transportation characteristics; transportation planning, traffic control devices, intersection design, network design, research.	3
Florida International University	Florida	**Transportation Seminar**	Oral presentations made by students, guests, and faculty members on current topics and research activities in traffic and transportation engineering.	3
Florida International University	Florida	**Urban Transportation Planning**	Introduces the fundamental concepts, theory, and history in transportation planning, the connections between transportation system and other components in the society, and basic planning methods.	3
Geneva College	Pennsylvania	**Transportation Engineering**		

College/University	State	Course Name	Description	Credits Earned
George Fox University	Oregon	**Transportation Engineering**	Course is an introduction to planning, design and operation of transportation systems. Covers concepts of human factors and vehicle characteristics in design. Topics include traffic stream variables and their measurement techniques, basic traffic flow models, highway and street intersection capacity and level of service, traffic control concepts, transportation systems management and geometric design of highways. Also includes application of statistical analysis on transportation problems. Additional course fee is required.	3
George Mason University	Virginia	**Highway Design and Construction**	Provides a survey of the tools, techniques, and methods used by the various civil engineering disciplines to design and construct highways. Combines lectures, individual readings, and hands-on exposure to the tools and processes used in design and construction of highways. All facets of a project are covered including planning, project management, survey and mapping, preliminary design, geotechnical, pavements, environmental, hydraulics, bridge design, PS&E design, materials, and construction. Notes: Course meets off-campus at the Federal Highway Administration Eastern Federal Lands Highway Division in Sterling, VA.	3
George Mason University	Virginia	**Introduction to Transportation Engineering**	Introduces transportation systems and the factors that influence their planning, design, and operation. Topics include fundamentals of urban travel, travel demand forecasting, and traffic flow; principles of highway design; highway capacity and level of services; introduction to traffic control; traffic signal control systems; intersection design; speed zoning and control; and introduction to Intelligent Transportation Systems and travel demand management. Requires laboratory, field work on selected topics.	3
George Mason University	Virginia	**Traffic Engineering**	Elements of traffic engineering analysis; system components of traffic operations: driver, vehicle, and roadway; traffic flow design elements including volume, density, and speed; intersection design elements including traffic control device warrants, signal timing, delay, capacity, and accident countermeasures; and terminal design elements including inflow, outflow, and circulation.	3
George Mason University	Virginia	**Urban Transportation Planning**	Technical and qualitative aspects of urban transportation planning process. Topics include urban travel characteristics and data collection methods; urban transportation modeling system, including land use, trip generation, trip distribution, mode choice, and trip assignment models; site traffic impact studies; environmental impacts; project and plan evaluation; and technology options for urban transport.	3
Georgia Institute of Technology	Georgia	**Freeway and Interchange Design**	An introduction to the planning and design of freeways and interchanges. Topics include various interchange forms, HOV lanes, ramp metering, tolling, and truck by-pass ramps.	3
Georgia Institute of Technology	Georgia	**Multimodal Transport**	Planning, design, and operation of systems of air, rail, water, and highway facilities, including those for bicycles and pedestrians.	3
Georgia Institute of Technology	Georgia	**Site Design in Transport**	An introduction to the planning and design of site developments. Topics include site traffic analysis and driveway, parking lot, drive-thru facility, site circulation, delivery facility and residential neighborhood design.	3
Georgia Institute of Technology	Georgia	**Transportation Planning and Design**	Introduction to transportation engineering with specific emphasis on the planning, design, and operation of transportation facilities.	3
Georgia Southern University	Georgia	**Highway Design**	This course provides an introduction to highway design based on conventional constraints including: vertical and horizontal geometry, traffic, safety, drainage, economic, and human factors.	3

College/University	***State***	***Course Name***	***Description***	***Credits Earned***
Georgia Southern University	Georgia	**Highway Design Lab**	This course provides an introduction to highway design based on conventional constraints including: vertical and horizontal geometry, traffic, safety, drainage, economic, and human factors.	0
Gonzaga University	Washington	**Traffic Engineering**	Fundamentals of traffic engineering including traffic flow, capacity analysis, traffic signs and signals, and traffic engineering studies.	3
Gonzaga University	Washington	**Transportation Engineering**	The course will cover general knowledge in all the transportation fields including; traffic characteristics and flow theory. transportation planning. geometric design of highways, traffic safety, highway materials, and pavement design.	3
Gonzaga University	Washington	**Transportation System Design**	Application of national and local standards to transportation system design situations from a multimodal perspective. Course emphasizes geometric design of roadway facilities but also incorporates design considerations for pedestrians, bicycles, and transit.	3
Idaho State University	Idaho	**Transportation Engineering**	Fundamentals of earthwork, route location, drainage, and pavement materials with application to geometric and pavement design of highways, streets and rural roads.	3
Illinois Institute of Technology	Illinois	**Facility Design of Transportation Systems**	Design and analysis of facilities of transportation systems. Integration of select transportation components and their interrelationships. Design of specific facilities: guide ways, terminals, and other elements for railroads, airports, and harbors.	3
Illinois Institute of Technology	Illinois	**Introduction to Transportation Engineering and Design**	Highway functions, design controls and criteria, element of design, cross-section elements, local roads and streets, at-grade intersections, grade separation and interchanges, highway capacity analysis, and introduction to pavement management.	3
Illinois Institute of Technology	Illinois	**Railroad Engineering and Design**	History of railroad industry. Train operation, train make-up, and handling. Design and analysis of railroad track structure, track irregularities, and their representation. Vehicle/track interaction and dynamic problems associated with it. Performance of railway vehicles.	3
Illinois Institute of Technology	Illinois	**Traffic Engineering Studies and Design**	Basic traffic engineering studies including traffic volume, speed, accident, and parking studies. Capacity and analysis for various traffic facilities. Design of traffic control devices.	3
Indiana State University	Indiana	**Air Traffic Control Systems**	This course includes basic traffic control procedures and phraseology. Areas covered include a description of the National Airway System including centers, approach control, towers, and flight service stations. Also included are controller responsibilities and techniques, current equipment familiarization, and aircraft control adjustments.	3
Indiana State University	Indiana	**Air Transportation**	Development of air transportation facilities; state and federal regulations; DOT, FAA, and NTSB organizations; organization of commercial air transportation to include air carrier management, marketing, and pricing procedures.	3
Indiana State University	Indiana	**Airport Planning**	Special problems and current status of legislation in airport system planning and forecasting; demand/capacity analysis; terminal and airside planning; and airport layout plans.	3
Indiana State University	Indiana	**Transportation Engineering**	This course serves as an introductory course in the fundamentals and concepts of transportation engineering. The course serves to provide a broad overview of the field of transportation engineering and expose students to the tools and concepts needed to practice transportation engineering and/or undertake advanced study in the field of transportation engineering.	3
Indiana University Purdue University Fort Wayne	Indiana	**Introduction to Transportation Policy, Planning, and Implementation**	This class is an introduction to transportation policy and planning in urban areas. The course will cover the history of urban transportation planning, local and federal regulations and policies, funding issues, transportation planning and environmental issues, transportation data sources and surveys, fundamentals of travel demand and network modeling, and contemporary issues.	3

College/University	State	Course Name	Description	Credits Earned
Indiana University Purdue University Fort Wayne	Indiana	**Traffic Engineering**	Introduction to traffic engineering analysis, operation and control including traffic capacity analysis, introduction to traffic studies, basics of traffic signal design and phase timing, analysis and design of pre-timed and actuated signalized intersections, signal coordination for arterials, and traffic modeling, including computer applications.	3
Indiana University Purdue University Fort Wayne	Indiana	**Transportation Engineering**	Transportation functions; transportation systems, including land, air, and marine modes; transportation system elements, including traveled way, vehicle, controls, and terminals; techniques of transportation system planning, design, and operation.	3
Indiana University Purdue University Fort Wayne	Indiana	**Transportation Policy and Planning**	This class is an introduction to transportation planning in urban areas. The course will cover the history of urban transportation planning, transportation data sources and surveys, fundamentals of travel demand and network modeling, financial issues, transportation planning and environmental issues, local and federal regulations and policies, and contemporary issues.	3
Iowa State University	Iowa	**Highway Design**	Introduction to highway planning and design. Design, construction, and maintenance of highway facilities. Level-of-service, stopping sight distance, highway alignment, earthwork and pavement design. Design project, oral reports and written reports. Computer applications.	3
Iowa State University	Iowa	**Principles of Transportation Engineering**	Introduction to planning, design, and operations of transportation facilities. Road user, vehicle and roadway characteristics. Technological, economic and environmental factors. Asset management, transportation planning, capacity analysis, traffic control, geometric design, traffic safety.	3
Iowa State University	Iowa	**Urban Transportation Planning Models**	Urban transportation planning context and process. Project planning and programming. Congestion, mitigation, and air quality issues. Transportation data sources. Travel demand and network modeling. Use of popular travel demand software and applications of geographic information systems.	3
Jackson State University	Mississippi	**Introduction to Transportation Engineering**	Introduction to planning practice and procedure, design, operation, management, and maintenance of transportation systems, with emphasis on urban issues. General characteristics of transportation engineering systems including streets, highways, transit, airways. Capacity considerations including time-space diagrams. Elementary dynamics of traffic and functional consideration of routes and terminals. Components of transportation engineering facility design including geometric design, earthwork, and pavements.	3
Jackson State University	Mississippi	**Traffic Engineering**	Study of fundamentals of traffic engineering; analysis of traffic stream characteristics, capacity of urban and rural highways; design and analysis of traffic signals and intersection; traffic control; traffic impact studies; and traffic accidents.	3
Jackson State University	Mississippi	**Urban Transportation Engineering System Design**	Advanced design of highway systems, vehicle and driver characteristics, highway capacity, design of urban streets and expressways. Design constraints. Individual and team design projects oriented toward the solution of local urban transportation problems, societal and economical considerations.	3
Kansas State University	Kansas	**Activity Center Traffic**	The planning and design of any activity center (shopping mall, business center, sports stadium) must consider vehicular access/egress and parking. If not properly planned and designed, the impact on the surrounding streets and the center can be chaotic. The course will cover techniques of determining parking needs, parking layout, internal and external circulation design, and design of access/egress and the adjacent street system to minimize the impact on the surrounding street network.	3

College/University	State	Course Name	Description	Credits Earned
Kansas State University	Kansas	**Highway Engineering, Planning, and Management**	Applications of the principles of traffic engineering and capacity analysis techniques to analyze, design and maintain street and highway systems. Fundamentals of transportation planning; site planning and design; traffic impact studies; fundamentals of pavement design and management.	3
Kansas State University	Kansas	**Traffic Engineering**	Traffic operations of roads, streets, and highways; traffic engineering studies; use of signs, signals, and pavement markings as traffic control devices; highway and intersection capacity, design and operations of traffic signals; current microcomputer models and applications.	3
Kansas State University	Kansas	**Transportation Planning**	Fundamentals of transportation planning. Historical development and current status of techniques used in travel demand forecasting; trip generation, trip distribution, mode choice, and traffic assignment. Current microcomputer models and applications.	3
Kansas State University	Kansas	**Transportation Systems**	A study of transportation systems with emphasis on traffic operations and control, planning, design, and drainage for highways, and urban roadways.	3
Kansas State University	Kansas	**Travel Demand Modeling**	Historical development and current status of techniques used in urban transportation planning and travel demand forecasting; trip generation, trip distribution, mode choice, and traffic assignment.	3
Kennesaw State University	Georgia	**Highway Design and Construction**	This course addresses many challenges facing engineers when designing and constructing highways. Areas of study include the design of horizontal and vertical alignments, roadside features, parking facilities, intersection design elements, traffic control devices, traffic signal operations and vehicle detection design, and the socioeconomic impacts of the roadway design.	3
Kennesaw State University	Georgia	**Traffic Analysis and Road Design**	An overview of transportation engineering as it applies to land, air, and sea systems is presented. Course emphasizes the design factors required in planning and constructing roads and highways including traffic analysis and capacity; intersection design and signalization; location, geometrics and drainage; and materials and pavements. The lab focuses on the preparation of highway design plans, as well as data measurement techniques unique to transportation analysis.	2
Kennesaw State University	Georgia	**Traffic Analysis and Road Design Lab**	This course emphasizes sound data collection and analysis techniques. Industry accepted techniques for several traffic engineering topics are presented. Studies are organized to facilitate preparation of formal transportation engineering reports. Each study follows conventional formats to aid the student in quality data collection and appropriate analysis procedures.	1
Kennesaw State University	Georgia	**Transportation Engineering**	This course provides an introduction to the highway engineering and traffic analysis. Principle topics covered in this course include: introduction to the significance of highway transportation to the social and economic underpinnings of society, road vehicle performance, geometric design of highways, pavement design, traffic flow and queuing theory, highway capacity and level of service analysis, traffic control and analysis at signalized intersections..	3
Kennesaw State University	Georgia	**Transportation Engineering Laboratory**	This laboratory exposes students to a variety of traffic studies commonly conducted in the field, including spot speed study, turning movement counts, vehicle delay study, parking study, saturation flow rate study, queue length study, headway study, traffic compliance study, and verification of Poisson distribution. In addition to the field studies, the students will learn how to conduct traffic analysis and simulation using traffic analysis software (HCS+ and Synchro/SimTraffic).	3

College/University	State	Course Name	Description	Credits Earned
Kennesaw State University	Georgia	**Transportation Network Design**	A study of the principles and concepts employed in the design of multi-model transportation networks. Topics include: interaction of multi-model systems, terminal design, ports and harbors, airport design, and mass transit. Design projects will look at solutions to network problems facing metropolitan Atlanta.	4
Lafayette College	Pennsylvania	**Introduction to Transportation Systems**	Technical and policy related aspects of transportation systems. Topics include traffic analysis and control, traffic flow theory, geometric design, capacity analysis and level of service, transportation demand analysis, and transportation planning. Computer applications. Design projects include oral presentations and written reports. Lecture/discussion.	
Lamar University	Texas	**Introduction to Transportation Engineering**		3
Lawrence Technological University	Michigan	**Applied Geographic Information Systems**	This course will introduce students to the theory and practice of geographic information systems. Topics include: coordinate systems and transformations; raster and vector data; mapping; spatial databases; topology; analyzing patterns; spatial relationships; data queries; and decision making with spatial data. The concepts will be applied to the fields such as environmental and water resources, transportation/urban planning, land development, and infrastructure management. State-of-the practice software is implemented in the course.	3
Lawrence Technological University	Michigan	**Highway Engineering**	Introduction to highway location, design, materials, and pavements. Study highway surveys and location; physical dimensions of highway facilities; highway drainage; material engineering for highway design; design of flexible pavements; design of rigid pavements.	3
Lawrence Technological University	Michigan	**Highway Safety Engineering**	This course addresses concepts of highway safety engineering. Major topics include crash data analysis, statistical methods, site investigation methods, and principles and evaluation of effectiveness of highway safety improvements.	3
Lawrence Technological University	Michigan	**Traffic Engineering**	This course addresses concepts of traffic engineering, traffic studies and traffic control. Major topics include introduction to traffic flow theory, traffic control devices, traffic data analysis, freeway and multilane highway traffic management, signalized intersection analysis and emerging technologies in traffic management.	3
Lawrence Technological University	Michigan	**Transportation Engineering**	A systems approach to transportation for decision-making by the engineer. The five major modes of transportation are introduced to achieve modal balance for person and product transport. Evaluation of public transit for intra-urban travel. Elements for system design are identified, operational analysis and the coordinate use of modes emphasized.	3
Lehigh University	Pennsylvania	**Transportation Engineering**	Principles of the design of transportation facilities with emphasis on highways and airports in the areas of geometric, drainage, and pavement design. Design problems.	3
Lipscomb University	Tennessee	**Transportation Engineering II**	Integrating transportation engineering principles into the design of multimodal transportation systems, including an overview of transportation design tools often utilized in the industry. Analysis of geometric design and operations management strategies to improve safety and performance; including design for non-motorized and public transport, intelligent transportation systems, signal systems and simulation.	3

College/University	***State***	***Course Name***	***Description***	***Credits Earned***
Lipscomb University	Tennessee	**Transportation Engineering I**	Planning, operation and design of transportation systems with an emphasis on highway transportation. Contemporary issues in transportation policy, transportation planning models, and project evaluation and selection techniques. Fundamental principles of traffic flow theory, shockwaves, delay at intersections, queuing systems traffic control and use of the Highway Capacity Manual. Design of horizontal and vertical alignment. Introduction to transportation engineering with emphasis on highway systems, highway design and traffic flow. Applications of engineering economic analysis.	3
Louisiana State University and A&M College	Louisiana	**Geometric Design of Highways and Airports**	Principles of design and practice for rural and urban highway facilities and airport installations; design criteria and controls, capacity analysis, cross-section selection, design of horizontal and vertical alignment, intersections, interchanges and computer applications to design problems.	3
Louisiana State University and A&M College	Louisiana	**Principles of Highway and Traffic Engineering**	Basic traffic characteristics; highway capacity analysis; geometric design of highways; route location, traffic operations and signalized intersection design.	3
Louisiana Tech University	Louisiana	**Highway Engineering II**	Design of culverts and ditches, construction contracts and plans, design pavements using suitable materials, and select procedures for construction and maintenance of pavements and rights-of-way.	3
Louisiana Tech University	Louisiana	**Highway Engineering I**	Introduction to highway engineering, planning, economic analysis of alternatives, traffic engineering, capacity analyses, traffic signal timing and progression, geometric design for at-grade intersections and interchanges.	3
Maine Maritime Academy	Maine	**Freight Transportation**	Theory and case analysis pertaining to modal, intermodal and multimodal freight transportation with coverage of road, rail, air and water modes of transportation. Course focuses on the role of transportation in the logistics and supply chain processes including industry structure, capabilities, financial performance, key player analysis, and the contractual and pricing interface between shippers and carriers.	3
Maine Maritime Academy	Maine	**Marine Transportation Operations**		3
Marquette University	Wisconsin	**Airport Planning and Design**	Introduction to airport planning and design parameters, aircraft characteristics, payload versus range, runway length requirements, air traffic control, wind analysis, airside capacity and delay, airside separation criteria, terminal analysis and delay, airport access flow and capacity, ramp charts. Economic analysis of facility improvements.	3
Marquette University	Wisconsin	**Geographical Information Systems in Engineering and Planning**	Fundamentals of GIS, databases, data management, map projections, representations of spatial attributes, GIS analysis and GIS software systems such as ARC Info, ARC View, Grass. GIS use and expanded capabilities are taught. Case studies including environmental, transportation and economic applications are discussed.	3
Marquette University	Wisconsin	**Highway Planning and Design**	Emphasis on highway planning, alternate highway alignments and alternate evaluation. Geometric design of highways including horizontal and vertical alignment, cross-section design. Projects on detailed design of reverse curves (plan and profile views); intersection design; cross-section and earthwork quantities. Legal aspects of engineering. Use of American Association of State Highway and Transportation Officials design guidelines.	3

College/University	State	Course Name	Description	Credits Earned
Marquette University	Wisconsin	**Traffic Characteristics and Design**	Components of the traffic system: vehicle and road user characteristics, geometric design and traffic controls. Intersection types, cross-section design elements and typical dimensions. Basic variables of traffic flow, observed traffic flow values. Freeway operations. Signalized intersections: flow, capacity, level of service. Projects addressing: intersection existing conditions (traffic, geometry, signalization); approach delay; safety performance; capacity; suggestions for improvements. Use of the Highway Capacity Manual and the Highway Capacity Software. Emphasis on technical report-writing and presentation.	3
Marquette University	Wisconsin	**Transportation Engineering**	Airport airside systems based on FAA guidelines. Road user and vehicle characteristics, applications of equations of motion, geometric design of roadways including horizontal and vertical alignment and cross-sectional elements. Traffic calming. Signalized intersections. Parking lot design. Traffic flow models. Emphasis on explaining technical details in writing.	3
Marquette University	Wisconsin	**Urban Planning for Civil Engineers**	Concepts and principles underlying urban planning and development. Land use, transportation, utility, community facility planning problems, procedures, and techniques. The master plan and implementation devices such as zoning, subdivision control, official mapping, capital budgeting, and urban renewal.	3
Marshall University	West Virginia	**Transportation Engineering**		3
Marshall University	West Virginia	**Transportation Systems Design**		
Massachusetts Institute of Technology	Massachusetts	**Transportation Systems Modeling**	Introduces basic concepts of transportation systems modeling, data analysis and visualization techniques. Covers fundamental analytical and simulation-based methodologies. Topics include time-space diagrams, cumulative plots, queueing theory, network science, data analysis, and their applications. Provides students with an understanding of the current challenges and opportunities in different areas of transportation.	
McNeese State University	Louisiana	**Transportation Engineering**	Transportation systems planning; highway, air, rail and water transportation to include economy, location, design and safety considerations.	3
Merrimack College	Massachusetts	**Traffic Engineering**	Engineering principles for safe and efficient movement of goods and people on streets and highways, including characteristics of users, vehicles and traffic facilities; data collection; traffic control; operational analysis; design; management; safety; parking and related aspects of transportation planning and geometric design.	4
Merrimack College	Massachusetts	**Transportation Engineering**	An introduction to the engineering of transportation systems in the context of one mode: highways. The major aspects of highway engineering are covered in a framework of the highway planning and design process in the US and include: history and description of the US system of highways, its administration and finance, the planning process, alternatives evaluation, traffic engineering, traffic operations and safety, geometric design, and structural pavement design. Laboratories involve a community design project in which field studies are conducted and used in developing alternative design strategies, provided in a final design submission.	4
Merrimack College	Massachusetts	**Transportation Planning and Systems Analysis**	Review and critique of techniques used to plan transportation facilities and services in urban areas; application of selected techniques to forecast demand and evaluate transportation alternatives.	4

College/University	State	Course Name	Description	Credits Earned
Messiah College	Pennsylvania	**Transportation Engineering**	Introduction to highway and transportation engineering, planning, traffic, and geometric design of transportation facilities. Theory and application of motorist-vehicle-road-pedestrian interaction, roadway capacity, traffic flow/queue theory, and traffic signal timing. Design calculations for horizontal and vertical alignment of roadways, design vehicle, design speed, super-elevation and sight distance. Offered Spring term.	3
Metropolitan State University of Denver	Colorado	**Highway Engineering and Surveying**	This course is a specialized course in requirements, functional characteristics, and system characteristics of highway design, incorporating surveying essentials for the civil engineering field. The course develops design methods, procedures, and analysis for pavement design, roadway alignment, and user information for freeways, city arterials, and rural roadways.	3
Michigan State University	Michigan	**Highway Design**	Geometric design of highways. Operation, capacity, safety, and geometric features. Alignment, drainage and pavement design. Use of CAD systems in preparing contract plans.	3
Michigan State University	Michigan	**Principles of Traffic Engineering**	Driver and vehicle characteristics affecting traffic flow and safety. Speed, density, capacity relationships. Signal control in street networks. Freeway management systems. Risk management and liability.	3
Michigan State University	Michigan	**Transportation Engineering**	Overview of transportation system issues and problems. Fundamentals of highway design and operations. Planning and evaluation of transportation system alternatives.	3
Michigan State University	Michigan	**Transportation Planning**	Transportation planning process and procedures. Estimation of travel demand using traditional models of trip generation, trip distribution, modal split, and traffic assignment. Use of "quick-response" procedures. Traffic impact of new facilities.	3
Boise State University	Idaho	**Highway Systems Design**	Design of urban and rural highway systems. Use of software is required.	3
Boise State University	Idaho	**Traffic Systems Design**	The course covers the design of operations, control, and management of traffic systems. Use of software is required.	3
Boise State University	Idaho	**Transportation Engineering Fundamentals**	Planning, design, and operations of multi-modal transportation systems.	3
Boise State University	Idaho	**Transportation Planning**	Theory and practice of transportation planning at the metropolitan as well as regional levels. Use of software is required. Recent advances in transportation planning will be introduced.	3
Bradley University	Illinois	**Transportation Engineering**	Introduction to transportation engineering and planning as it relates to highways. Characteristics of highway systems: the driver, vehicle and roadway, traffic engineering studies, highway safety, traffic flow fundamentals, capacity and level of service concepts, intersection traffic control, transportation planning and site impact analysis, geometric design of highways.	3
Bridgevalley Community and Technical College	West Virginia	**Highways III**	Highway planning and design including the study of surveys and plans. Topics include design characteristics and standards, surveying and mapping, geometric design, pavements, earthwork, drainage, safety and environmental considerations.	
Brigham Young University	Utah	**Introduction to Transportation Engineering**	Transportation system characteristics, traffic engineering and operation, transportation planning, geometric design, pavement design, transportation safety, freight, public transport, sustainable transportation.	
Brigham Young University	Utah	**Traffic Engineering: Characteristics and Operations**	Traffic stream characteristics, traffic flow theory, traffic control devices, capacity and level of service, warrants, signal timing and optimization, signal coordination.	
			Urban transportation planning and decision making, intermodal transportation, land-use	

College/University	State	Course Name	Description	Credits Earned
Michigan Technological University	Michigan	**Transportation Planning**	An introduction to urban transportation planning, planning data collection, transportation planning models, and development and evaluation of transportation plans. Includes extensive use of transportation planning software to evaluate transportation plans in multimodal networks.	3
Milwaukee School of Engineering	Wisconsin	**Traffic Engineering**	This course provides an in depth assessment of traffic related issues on transportation infrastructure. Students analyze traffic demands and design systems to efficiently manage traffic flow. Course topics include traffic flow theory, data collection and analysis techniques, traffic control and intersection design.	4
Milwaukee School of Engineering	Wisconsin	**Transportation Engineering**	The class will give an overview of the characteristics and functions of highway, air, rail and other modes of urban and intercity transportation. The class will concentrate on the design of roadways and intersections. The planning process, the evaluation of costs, benefits and environmental considerations are covered.	4
Minnesota State University, Mankato	Minnesota	**Transportation Engineering**		4
Mississippi State University	Mississippi	**Freight Transportation Systems and Logistics**	Definition, taxonomy and emerging issues for multi-modal transportation systems with focus on freight transportation and mathematical models for complex logistics and supply chain systems.	3
Mississippi State University	Mississippi	**Geographic Design of Highways**	Highway finance, organization and planning, economic analysis, elements of highway and street design, computer applications to highway engineering.	3
Mississippi State University	Mississippi	**Traffic Engineering**	Human and vehicular characteristics as they affect highway traffic flow; traffic regulation, accident cause/prevention; improving flow on existing facilities; planning traffic systems.	3
Mississippi State University	Mississippi	**Transportation Engineering**	An introduction to the general modes of transportation, the planning processes associated with the modes of transportation and design of transportation facilities.	3
Mississippi State University	Mississippi	**Urban Transportation Planning**	This course will provide an understanding of the nature of travel demand and methods and computer software used to plan for future transportation systems.	3
Mississippi State University	Mississippi	**Water Transportation**	Navigation vessels and their characteristics. Planning and design of Marine Transportation System facilities including navigation ports, channels and locks.	3
Missouri University of Science and Technology	Missouri	**Traffic Engineering**		
Missouri University of Science and Technology	Missouri	**Transportation Engineering**	A study of operating characteristics of transportation modes including highways, railways, inland waterways, airways, and pipelines. Consideration of traffic control devices, safety, system capacity, design of routes, planning of urban transportation systems, and economic evaluation of transportation alternatives.	3
Missouri University of Science and Technology	Missouri	**Transportation Engineering**		
Missouri University of Science and Technology	Missouri	**Transportation Engineering Lab**		
Missouri University of Science and Technology	Missouri	**Urban Transportation Planning**		
Montana State University - Bozeman	Montana	**Highway Geometric Design**	Advanced geometric design of highway systems including two-lane, interstate roadways, roundabouts, and intersection design elements.	3
Montana State University - Bozeman	Montana	**Public Transit System Design**	Design, implementation and management of public transit systems including paratransit, bus and light rail; including an overview of funding sources, legislation, public relations and other issues with coverage or route optimization strategies and demand estimation techniques.	3

College/University	State	Course Name	Description	Credits Earned
Montana State University - Bozeman	Montana	**Survey Data Collection & Analysis for Transportation Engineering**	Course introduces students to the principles and practice of survey and data analysis for transportation engineering and elevates students' ability to design and apply scalable approaches to analyze transportation-related data. Transportation survey design, implementation and analysis are covered. Methods and techniques for anticipating traffic events (crashes, congestion, etc.) are studied .	3
Montana State University - Bozeman	Montana	**Traffic Engineering and ITS**	Application of driver, vehicle, and roadway characteristics to principles of traffic control, operations, and safety. Traditional and advanced technology solutions will be explored.	3
Montana State University - Bozeman	Montana	**Transportation Engineering**	Junior standing. Introduction to vehicle operating characteristics, geometric and pavement design, traffic flow theory, signal design and analysis, capacity analysis and planning. Laboratory work will introduce various in-practice software packages.	3
Montana State University - Bozeman	Montana	**Transportation Planning**	Transportation planning process and travel demand forecasting including trip generation, trip distribution, mode split and traffic assignment. Laboratory work will introduce TransCAD software.	3
Morgan State University	Maryland	**Advanced Transportation Planning**	The course will reinforce the subjects covered in the Transportation Planning course with case studies and hands-on applications. Discussions will include the 3-C process, travel demand simulation, transportation plan development and project programming, noise and air quality analysis, and environmental justice.	3
Morgan State University	Maryland	**Economics of Transportation**	This course reinforces the microeconomic tools necessary for understanding, analyzing, and managing transportation firms and industries. The subjects covered will include costs, pricing behavior, inter-modal competition, and strategic decision making.	3
Morgan State University	Maryland	**Freight Transportation Systems and Logistics**	The course will provide basic concepts of supply chain management, including customer service, transportation, inventory, location theory, etc. The relationship between components of supply chain management is also examined.	3
Morgan State University	Maryland	**Highway Engineering**	This course will be designed to provide the basic concept of highway systems performance analysis and design. Topics covered will include human factors; vehicle and roadway characteristics; engineering properties of highway materials; highway geometric, structural and drainage design; and capacity analysis of freeway, multilane and two-lane highways.	3
Morgan State University	Maryland	**Intelligent Transportation Planning**	This course will be designed to expose the student to the role of new technology in transportation particularly in the areas of travel information, traffic and incident management, public transportation, freight transportation, and inventory control. The history and cross-cutting issues in intelligent transportation systems deployment in the U.S. will be examined.	3
Morgan State University	Maryland	**Introduction to Transportation Systems**	This is the introductory course for transportation systems. It will discuss the basic concepts and strategies in the study of systems, key issues pertaining to the different areas of transportation including planning, engineering, management, and logistics. The historical, physical, economic, social, and environmental aspects of transportation will be covered.	3
Morgan State University	Maryland	**Management of Transportation Systems**	This course will discuss managerial issues and problems in the transportation industries, including economic, marketing, operational, financial, labor relations, and institutional components.	3
Morgan State University	Maryland	**Microcomputer Applications in Transportation**	This course will discuss a collection of state-of-the-art software packages that are commonly used in the different transportation professional areas including the Highway Capacity Software (HCS), and software for traffic engineering, transportation planning and distribution logistics.	3

College/University	State	Course Name	Description	Credits Earned
Morgan State University	Maryland	**Public Transportation Systems**	The role of the various types of public transportation systems including bus, rail, and other new modes will be examined. The technology, planning, operation, management, and policy aspects of public transportation will be covered.	3
Morgan State University	Maryland	**Senior Transport Project**	This course will provide the student the opportunity to apply engineering, planning, and management tools in defining and solving a credible transportation problem, and presenting a final report to a panel of faculty members and invited transportation professionals.	3
Morgan State University	Maryland	**Senior Transportation Seminar**	This is a seminar arrangement intended to expose students to the art of developing research proposals, including identifying topics for senior projects; using statistical and other quantitative methods for data collection and analysis; and making oral presentation. The concepts and experience gained from TRSS 105, including ethical, contemporary, and global issues in transportation will be reinforced.	1
Morgan State University	Maryland	**Traffic Engineering**	This course will cover the basic concept of traffic flow theory, collection and analysis of traffic data, level of service concept, capacity analysis of interrupted and uninterrupted flows, traffic control devices, accident analysis and countermeasures, traffic impact studies, and pedestrian and parking facilities analysis.	3
Morgan State University	Maryland	**Traffic Engineering**	The principles of traffic engineering involving the analysis, planning and design of roads, streets and highways, and their related networks. Coverage includes the dynamics of traffic flows; traffic studies and data collection; capacity analysis of freeways and arterials; the analysis and design of traffic control systems, including signalized and unsignalized intersections.	3
Morgan State University	Maryland	**Transportation Engineering**	Engineering and planning for transportation facilities with emphasis on ground transportation. Topics include: vehicle motion, vehicle flow models, human factors, geometric de- sign, safety, capacity analysis and transportation planning.	3
Morgan State University	Maryland	**Transportation Infrastructure/ Asset Management**	This course will be designed to discuss the use of geo-spatial analytical tools, inventory control and equipment replacement models to develop decision support systems for making informed decisions in maintaining and replacing transportation infrastructure and assets.	3
Morgan State University	Maryland	**Transportation Models and Simulation**	The theory, development and application of models and modeling systems commonly used in the planning, design and operational analysis of transportation systems. Students are expected to apply existing software in the analysis of transportation data sets and to develop models using one of the common high level languages. Applications will include: travel demand estimation, modal choice, terminal and servicing phenomena and traffic performance evaluation	3
Morgan State University	Maryland	**Transportation Planning and Policy**	This course will cover the relationship between land use and transportation, landmark transportation planning-related policies, traditional four-step planning process and the respective mathematical models and algorithms, noise and air quality issues, and transportation systems capacity analysis.	3
Morgan State University	Maryland	**Transportation Practicum**	This course will provide practical experience in the field of transportation by placement with a transportation agency or a faculty mentor. The student will have the opportunity to work on and complete a real project under the direct supervision of a transportation planner, engineer, manager, or faculty for a minimum period of three months.	3
Morgan State University	Maryland	**Transportation Systems Evaluation**	This course will focus on analytical methods commonly used in transportation planning. Discussions will include transit, highway and traffic-intersection capacity analysis, the transportation planning process, benefit-cost analysis, and environmental impact assessment process.	3

College/University	State	Course Name	Description	Credits Earned
Morgan State University	Maryland	**Urban Land Use Planning**	This course deals with the basic concepts, principles, strategies, and tools of urban land use planning. Emphasis will be on the interaction between transportation and land use variables, including modeling requirements, impacts, and data needs within the context of good community planning and economic development.	3
Murray State University	Kentucky	**Transportation Systems and Design**	Fundamentals and concepts of transportation engineering, including abroad overview and introduction of design tools and concepts.	3
New Mexico Institute of Mining and Technology	New Mexico	**Introduction to Transportation Engineering**	Overview of the field of Transportation Engineering. Topics covered include: description of transportation systems; traffic engineering studies; highway safety studies; traffic flow characteristics; transportation planning; travel demand; geometric design of highways; characteristics of drivers, pedestrians, vehicles, and roads and their applications to the determination of braking distance, stopping sight distance, passing sight distance, sign placement, and timing of change and clearance intervals.	3
New Mexico State University	New Mexico	**Transportation Analysis**	Transportation Analysis of land-based transportation modes	3
New Mexico State University	New Mexico	**Transportation Engineering**	Highway and traffic design and systems.	3
North Dakota State University	North Dakota	**Airport Planning and Design**	System planning and demand forecasting; siting and configuration of airports; aircraft characteristics; air traffic controls; standards for geometric design, pavement design, drainage and safety. 2 one-hour lectures.	3
North Dakota State University	North Dakota	**Fundamentals of Oil & Gas Pipeline: Design, Operations, Inspection & Maintenance**	This course introduces the fundamentals to design, operate, inspect, and maintain oil & gas pipelines, including basics for pipeline materials, design, network, construction, measuring and detection technology, maintenance, and repair.	3
North Dakota State University	North Dakota	**Geometric Highway Design**	Location and design of highways and streets; design controls, elements of design; cross-section design; design of intersections, interchanges, safety appurtenances, and 3R projects. 2 one-hour lectures, 1 two-hour session.	3
North Dakota State University	North Dakota	**Railroad Planning and Design**	Rail planning and location analysis, track/rail structure, track layout and control system, locomotives and train resistance, track safety standards and geometrics, terminal design.	3
North Dakota State University	North Dakota	**Transportation Engineering**	Location, analysis, modeling, and design of multi-modal facilities including highways, railways, airports, terminals, harbors, ports, canals, waterways, pipelines, and conveyor systems. 3 one-hour lectures, 1 two-hour session.	4
Northeast Wisconsin Technical College	Wisconsin	**Highway Surveying**	...develop the knowledge, skill process and understanding of vertical curve calculations, road design principles, volume calculations, site planning, use of AutoCAD and Carlson Software, astronomical observations, contour mapping and construction staking.	
Northeastern University	Massachusetts	**Design for Sustainable Transportation: Netherlands**	Examines how the design of Dutch transportation infrastructure promotes travel by foot, bicycle, and public transportation as opposed to private automobile and how it promotes urban livability and traffic safety. Topics include bicycling infrastructure planning and design; Vision Zero traffic safety principles and design treatments for safe roads, intersections, and crossings; and high-quality transit service planning and design. Through design projects, offers students an opportunity to apply lessons learned to the U.S. context. Taught in a study-abroad format in the Netherlands.	4
Northeastern University	Massachusetts	**Highway Engineering**	Concentrates on highway design including route selection, geometric design, foundation and pavement design, drainage design, and construction issues. Analyzes highway traffic including traffic flow fundamentals and capacity and level of service analysis for freeways and rural highways. Covers the environmental impact and public review process for highway construction. Includes project component.	4

College/University	State	Course Name	Description	Credits Earned
Northeastern University	Massachusetts	**Planning and Policy for Sustainable Urban Transportation: Netherlands**	Examines urban transportation planning practices and policies in the Netherlands that promote travel by bicycling, public transportation, and foot and help prevent urban mobility from degrading urban livability. Topics include land-use planning at the site, neighborhood, and regional scale; transit- and bicycle-oriented development, including both land-use and transportation infrastructure planning and policies for large-scale urban expansions; and traffic-circulation planning and policies to promote safety, prevent roads from becoming barriers to walking, cycling, or transit, and to create car-free and car-lite zones. Taught in study-abroad format in the Netherlands.	4
Northern Arizona University	Arizona	**Advanced Concepts in Traffic Safety**	Students will be introduced to engineering aspects of traffic safety including motorized and non-motorized modes. Topics include identification of hazardous locations, development of countermeasures, evaluation of safety improvements, statistical analysis of safety data, human factors, road safety audits, and crash reconstruction. Letter grade only.	3
Northern Arizona University	Arizona	**Advanced Traffic Signals**	Advanced traffic concepts including signal phasing, signal system coordination, and traffic signal hardware and software operation. Students develop design drawings and signal timings for a signalized arterial and deploy these timings on industry standard hardware and software. Letter grade only. Course fee required.	3
Northern Arizona University	Arizona	**Highway Engineering**	Highway capacity analysis and geometric design, including driver-roadway-vehicle model, traffic characteristics, level of service, human factors, safety, drainage, and specs. Letter grade only. Course fee required.	3
Northern Arizona University	Arizona	**Intelligent Transportation Systems**	This course will present of a survey of various Intelligent Transportation System (ITS) technologies. Students will be required to take part in various field surveys of Intelligent Transportation System deployments, as well as develop and complete an individual ITS project design. Letter grade only.	3
Northern Arizona University	Arizona	**Traffic Study and Signal Honors**	Basic concepts including driver-roadway-vehicle systems, traffic studies, capacity analysis, and traffic-control devices. Lab introduces traffic-engineering studies and signal-system operations and design, including computer applications. 2 hrs. lecture, 3 hrs. lab. Letter grade only. Course fee required.	3
Northern Arizona University	Arizona	**Traffic Study/Lab**	Basic concepts including driver-roadway-vehicle systems, traffic studies, capacity analysis, and traffic-control devices. Lab introduces traffic-engineering studies and signal-system operations and design, including computer applications. 2 hrs. lecture, 3 hrs. lab. Letter grade only. Course fee required.	3
Northern Arizona University	Arizona	**Urban Transportation Planning**	Examines techniques and methodology of transportation planning applications, emphasizing interrelationship of land use and trips. Lab overviews different methodological approaches, with detailed study of travel demand forecasting models. 2 hrs. lecture, 3 hrs. lab. Letter grade only. Course fee required. Prerequisite: 3 hours CENE or GSP coursework at 300-level or above.	3
Northwestern University	Illinois	**Advanced Theories of Traffic Flow**	This course is concerned with the behavior of vehicular and multimodal traffic as a complex system. It seeks to convey a conceptual understanding of traffic processes through the development of mathematical models of these processes.	3
Northwestern University	Illinois	**Introduction to Transportation Planning and Analysis**	Analysis and design of solutions to transportation problems; introduction to selected operations research and statistical analysis techniques; use of case studies in urban transportation, intercity passenger transport, and freight movements.	3

College/University	*State*	*Course Name*	*Description*	*Credits Earned*
Northwestern University	Illinois	**Transportation System Operations**	Traffic flow theory; vehicle and human factors, capacity analysis, intersection performance and control; management and control of arterial streets and networks; neighborhood traffic restraint, urban transit operations. Operations concepts and theories applied to actual problems through laboratory practice.	3
Northwestern University	Illinois	**Transportation Systems Analysis II**	Applications of optimization methods to analysis, design, and operation of transportation and logistics networks. Network equilibrium; flow prediction in congested multicommodity networks; vehicle routing and fleet management; dynamic and stochastic transportation network modeling.	3
Northwestern University	Illinois	**Transportation Systems Analysis l**	Applications of optimization methods to analysis, design, and operation of transportation and logistics networks. Network equilibrium; flow prediction in congested multicommodity networks; vehicle routing and fleet management; dynamic and stochastic transportation network modeling.	3
Northwestern University	Illinois	**Transportation Systems Operations and Control II: Scheduled Modes and Real-Time Systems**	Concepts and advanced methodologies for the design of service networks, operating plans and control strategies for scheduled transportation modes and real-time services; focus on public transportation systems, airlines, and fleet management for trucking operations.	3
Northwestern University	Illinois	**Transportation Systems Operations and Control l: Urban Networks**	Concepts and advanced methodologies for the design of control strategies for transportation systems operations, focusing on urban traffic networks (signalized street networks and freeways); special attention to the advanced technology applications and intelligent transportation systems.	3
Northwestern University	Illinois	**Transportation Systems Planning and Management**	Functional and structural description of transportation systems; characteristics of major US transportation modes; transportation analysis, planning, problem-solving, and decision-making methods illustrated through urban, freight, and intercity case studies.	3
Northwestern University	Illinois	**Travel Demand Analysis and Forecasting II**	Introduction and application of statistical, econometric, and marketing research techniques to study and forecast travel behavior. First Quarter: Introduction to theory, analysis, and model development. Second Quarter: Advanced theory, disaggregate choice models, and prediction methods.	3
Northwestern University	Illinois	**Travel Demand Analysis and Forecasting l**	Introduction to the theory and practical application of discrete choice demand models including model formulation, estimation, specification testing and use of models in travel prediction. The course will also make an introduction to the statistical programming languages R and Biogeme. Practical problems are assigned to provide experience in handling real choice data, model estimation and model interpretation.	3
Norwich University	Vermont	**Introduction to Transportation Engineering**	An introduction to different modes of transportation with emphasis on roadway and traffic engineering. Topics include transportation planning, highway geometric and pavement design, drainage, construction, traffic-control devices, traffic operations and management, and highway capacity analysis.	3
Norwich University	Vermont	**Transportation Engineering**	The planning, design, and construction of transportation systems to meet the mobility requirements of society while considering economic, environmental, and societal constraints. System maintenance and administration are also included. Classroom 3 hours.	3
Ohio Northern University	Ohio	**Introduction to Highway Safety**	Aspects of highway safety, identification of highway safety problems, and design/implementation/evaluation of highway safety improvement projects and programs.	3
Ohio Northern University	Ohio	**Traffic Signal Systems**	Traffic parameters, traffic data collection, capacity analysis of freeways, signalized intersection design, hardware, communication and detection systems, and coordinated signal system analysis and design.	3

College/University	State	Course Name	Description	Credits Earned
Ohio Northern University	Ohio	**Transportation Engineering**		3
Ohio Northern University	Ohio	**Transportation Engineering**	Introduction to Transportation Engineering with emphasis on transportation planning concepts and multi-modal design elements.	3
Ohio Northern University	Ohio	**Transportation Planning Fundamentals**	Introduction to urban transportation planning, characteristics of urban travel, travel demand models, decision models, and future issues.	3
Oklahoma State University	Oklahoma	**Design and Planning of Airports**	Nature of civil aviation. Aircraft characteristics and performance related to airport planning and design. Air traffic control and navigation systems. Basics of airport planning and airport demand forecasting. Analysis of airport capacity and delays. Runway length requirements. Configuration and geometric design of runways, taxiways, holding aprons, and landing areas. Airport lighting, marking, and signing. Drainage and noise control.	3
Oklahoma State University	Oklahoma	**Design of Traffic Control Systems**	Traffic control systems design, available technological options, and range of agency needs. Design of vehicle detectors, controllers, communications links, signal display hardware, and wiring. Development of timing plans using computer simulation models. Freeway surveillance and control: ramp metering, incident detection, and motorist information systems. Preparation of contractual documents and construction supervision.	3
Oklahoma State University	Oklahoma	**Geometric Design of Highways**	Geometric, functional, and aesthetic aspects of roadway design. Alignment, sight distance, at-grade intersections, interchanges, and freeway systems. Design tools and techniques.	3
Oklahoma State University	Oklahoma	**Highway Traffic Operations**	Level of service, capacity and service volume concepts. Operational characteristics of uninterrupted-flow and interrupted-flow of traffic facilities. The 1985 HCM procedures for analyzing the capacity of freeways, multi-lane and two-lane rural highways, urban arterials, signalized and unsignalized street intersections, and transit and pedestrian facilities. Administrative and planning actions for congestion management. Design alternatives and improvement strategies for effective use of urban arterial street width.	3
Oklahoma State University	Oklahoma	**Transportation Engineering**	Planning, design and operations of transportation facilities. Vehicle characteristics and human factors in design. Traffic stream variables and their measurement techniques. Basic traffic flow models. Highway and street intersection capacity and level of service. Traffic control concepts. Transportation systems management. Application of statistical analysis and operations research to analyze transportation problems.	3
Oklahoma State University	Oklahoma	**Urban Transportation Planning**	Determinants of demand for transportation and models for demand forecasting. Performance characteristics of transportation systems and models for performance. Quantitative analysis of multimodal transportation networks including prediction of flow patterns and service quality. Evaluation of social, environmental, and political impacts of transportation decisions. Application of systems analysis techniques to the generation, evaluation, and selection of alternative transportation systems.	3
Oklahoma State University Institute of Technology	Oklahoma	**Transportation**		
Old Dominion University	Virginia	**Geographic Information Systems in Civil and Environmental Engineering**	Geographic Information Systems as they apply to civil and environmental engineering. Spatial data acquisition, generation and analysis methods from terrestrial, aerial and satellite sources. Modeling of terrain, land, and hydrographic information using CADD. Use of GIS software in the creation and application of GIS spatial data bases to engineering problems.	3

College/University	State	Course Name	Description	Credits Earned
Old Dominion University	Virginia	**Transportation Data Analytics**	This course presents the basic techniques for transportation data analytics. It will discuss statistical modeling, prominent algorithms, and visualization approaches to analyze both small- and large-scale data sets generated from transportation systems. Practices of using different data for various real-world traffic/transportation applications and decision making will also be discussed. Prerequisites: Basic probability and statistics (e.g., STAT 330); any programming language such as C, Python or Java is beneficial but not required.	3
Old Dominion University	Virginia	**Transportation Fundamentals**	This course surveys the current practice of transportation engineering in the United States. It focuses on various ground transportation modes and covers policy, institutional planning and operational issues. Students are introduced to planning models, capacity analysis, and traffic impact analysis.	3
Old Dominion University	Virginia	**Transportation Operations I**	This is the first course in transportation operations and traffic flow theory. Topics include traffic engineering studies, capacity analysis, intersection control, traffic flow models, shockwave analysis, signal warrant analysis, and safety analysis. Course includes applications of modeling and simulation to isolated intersections.	3
Olivet Nazarene University	Illinois	**Transportation Planning and Analysis**	Analysis and design of solutions to transportation problems; introduction to selected operations research and statistical analysis techniques; use of case studies in urban transportation, intercity passenger transport, and freight movements. Offered spring of odd years.	3
Oregon Institute of Technology	Oregon	**Introduction to Transportation Engineering**	Introduction to the design, planning, operation, management and maintenance of transportation systems with a focus on the highway and railway modes. Principles for planning multi-modal transportation systems, layout of roadways, traffic flow modeling and capacity analyses.	4
Oregon Institute of Technology	Oregon	**Traffic Engineering**	Principles of traffic engineering and operation, traffic engineering studies, signalized intersection design, traffic analysis software.	3
Oregon Institute of Technology	Oregon	**Transportation and Land Development**	Study of interactions between land development activity and the transportation network. Application of planning and engineering design techniques to manage the impacts of development upon the transportation system.	3
Oregon Institute of Technology	Oregon	**Transportation Safety**	Safety concepts in highway engineering including highway design, operation, and maintenance, as well as human factors, statistical analysis, traffic control and public policy. Design concepts of intersections, interchanges, signals, signs and pavement markings.	4
Oregon Institute of Technology	Oregon	**Transportation Structures**	Design and analysis of common transportation structures including culverts, sign structures, light poles, and railings according to current AASHTO provisions and ODOT procedures. Software applications.	3
Oregon Institute of Technology	Oregon	**Travel Demand Modeling**	Introduction to travel demand analysis and forecasting. Models studied from a theoretical, applied and practical perspective. Students will become familiar with the traditional four-step travel forecasting process, including model development, application and interpretation of outputs.	4

College/University	*State*	*Course Name*	*Description*	*Credits Earned*
Pennsylvania State University	Pennsylvania	**Highway Engineering**	Highway engineering principles, vehicle and driver characteristics; geometric and pavement design; highway drainage; traffic engineering, capacity analysis, and signal timing. C E 321 Highway Engineering (3) This course provides an introduction to highway engineering and is designed for civil engineering students. It includes topics such as vehicle motion, highway cross-sections, horizontal and vertical alignment, and sight distance. Other topics are pavement design, drainage analysis, traffic engineering and highway capacity. The students will also have a CAD lab where they design a highway using computer software. The semester project provides hands-on highway design experience. This course serves as a prerequisite for advanced highway engineering study.	3
Pennsylvania State University	Pennsylvania	**Traffic Operations**	The highway capacity manual, concepts and analyses, freeway operations, signalized and unsignalized intersections, signal coordination, traffic impact studies.	3
Pennsylvania State University	Pennsylvania	**Transportation Design**	Design of streets and highway facilities; emphasis on geometric elements, intersections and interchanges, roadway drainage, and pavement design. C E 421W C E 421W Transportation Design (3)This course provides advanced study in highway engineering and is designed for civil engineering students who are interested in Transportation Engineering careers. It includes topics such as functional classification, highway cross-sections, horizontal and vertical alignment and sight distance. Other topics are pavement design, drainage intersection and interchange design and highway signs. The students will also have a CAD lab where they design a complete highway system. The semester project provides hands-on highway design experience and includes the planning and operational aspects of a new highway design. This course serves as a capstone design course with writing projects. Students are expected to do in-class presentations of their projects.	3
Pennsylvania State University	Pennsylvania	**Transportation Planning**	Transportation systems planning, programming, and management; modeling and simulation, data collection, analysis, and forecasting. C E 422 C E 422 Transportation Planning (3)In this course, students acquire basic knowledge on the history and recent developments in transportation planning problems and quantitative methods. They will develop an understanding of transportation planning, transportation modeling, transportation system simulation, data collection techniques, and gain laboratory experience with each. Students will use mathematical/statistical models and GIS software to analyze, simulate, and forecast the demand for transport services. They will gain familiarity with the software used in transportation planning practice.	3
Pennsylvania State University, Altoona Campus	Pennsylvania	**Railroad Communications and Signals**	Principles of the separation of trains, including signals, interlocking, and communications.	3
Pennsylvania State University, Altoona Campus	Pennsylvania	**Railroad Industry Overview and Economic Regulation**	This course explores the relationship between railroads and customers, competitors, and the political, regulatory, and economic environment.	3
Pennsylvania State University, Altoona Campus	Pennsylvania	**Railroad Mechanical Practicum**	Practicum (lectures, labs, supervised field experiences) examining the repair of locomotives and cars.	3
Pennsylvania State University, Altoona Campus	Pennsylvania	**Railroad Operations and Safety**	Basics of rail operations, including the role of terminals and safety principles.	3

College/University	*State*	*Course Name*	*Description*	*Credits Earned*
Pennsylvania State University, Altoona Campus	Pennsylvania	**Railroad Operations Practicum**	Practicum (lectures, supervised field work, laboratories) exploring practical problems in rail operations and safety.	3
Polytechnic University of Puerto Rico	Puerto Rico	**Highway and Transportation Engineering L**	Data collection techniques and use of equipment associated with different types of transportation studies. Application of statistics and probability in transportation data presentation and analysis. Application of computer software.	1
Polytechnic University of Puerto Rico	Puerto Rico	**Highway Engineering**	Roadside design principles. Traffic control devices. Pavement design. Traffic flow theory principles. Capacity and level of service of two-lane highways. Capacity and level of service of multilane highways. Capacity and level of service of basic freeway segments. Freeway weaving analysis. Interchange design principles. At-grade intersection design principles.	3
Polytechnic University of Puerto Rico	Puerto Rico	**Public Transportation**	Transit modes. Transit planning. Passenger demand, route choice, and assignment. Frequency and headway determination. Scheduling. Network analysis, level of service, and reliability control.	3
Polytechnic University of Puerto Rico	Puerto Rico	**Transportation Engineering and Urban Planning**	Intersection capacity and level of service. Planning and design aspects of transportation systems. Urban transportation planning models. Development principles of transportation facilities. Design and operational analysis of pedestrian and bicycle facilities. Public transportation.	3
Polytechnic University of Puerto Rico	Puerto Rico	**Urban Transportation Planning**	Urban transportation planning modeling. Origin and destination trip assessment. Transportation mode use analysis. Traffic forecasting and assignment. Impact analysis.	3
Portland State University	Oregon	**Freight Transportation and Logistics**	Components and performance characteristics of the U.S. freight transportation system, with emphasis on data needs, planning, design, and operation of the entire supply chain. Discussion of impact of freight on passenger transportation system and economy. Modal emphasis includes freight rail, motor freight, ocean freight, and air freight. Terminal operations. Roles of public and private actors in freight system.	4
Portland State University	Oregon	**Intelligent Transportation Systems**	Introduction to intelligent transportation systems, including enabling surveillance, navigation, communications, and computer technologies. Application of technologies for monitoring, analysis, evaluation, and prediction of transportation system performance. Intervention strategies, costs and benefits, safety, human factors, institutional issues, and case studies.	4
Portland State University	Oregon	**Public Transportation Systems**	Performance characteristics of public transportation systems, with emphasis on urban systems. Planning, design, and operational issues related to public transportation systems. Emerging technologies.	4
Portland State University	Oregon	**Sustainable Transportation in the Netherlands**	Introduction to transportation engineering and planning applications in the Netherlands, focusing on pedestrian, bicycle and public transport. Contrasts between U.S. and Dutch engineering principles, policies and standards. Design principles and practice will be explored through field trips and guest lectures while abroad and in Portland. Faculty led study abroad course.	4
Portland State University	Oregon	**Traffic Engineering Applications and Signal Timing**	Theory and practice of traffic signal timing. Focuses on terms associated with signal timing, relating practice in the field with analysis completed using the Highway Capacity Manual and other traffic engineering software. A significant portion of the class is focused on applications, specifically focused on multimodal applications.	4
Portland State University	Oregon	**Transportation and Logistics Organization and Modeling**	Introduction to mathematical modeling techniques including linear programming, integer programming, basic network models (network flows and shortest paths), and their application to transportation and logistics problems. Focus on civil engineering systems and applications on transportation and logistics problems.	4

College/University	State	Course Name	Description	Credits Earned
Portland State University	Oregon	**Transportation Operations**	Operation, modeling, and control of unscheduled and scheduled transportation modes; elementary traffic flow concepts; flow, density and speed; scheduling; route and bottleneck capacities; networks; data interpretation; analysis techniques; diagrams; simulation queuing; optimization.	4
Portland State University	Oregon	**Transportation Safety Analysis**	Incorporating safety in highway engineering and transportation planning that includes highway design, operation, and maintenance, as well as human factors, statistical analysis, traffic control and public policy. Design concepts of intersections, interchanges, signals, signs and pavement markings; analyzing data sets for recommendations and prioritization; principles of driver and vehicle characteristics in relation to the roadway.	4
Portland State University	Oregon	**Transportation Seminar**	This weekly seminar features a different speaker each week covering various topics in transportation research and practice. The topics cover all modes of transportation, with a focus on current practice. Course is cross-listed course with USP. This course may be taken for credit up to three times.	1
Portland State University	Oregon	**Urban Transportation Systems**	Urban street patterns and transportation demand, highway capacity analysis, process of urban transport planning, travel-demand forecasting and its application to traffic studies. Development of transport models, multiple regression analysis, models of land use and trip generations, stochastic trip distribution models, applications and case studies. Route assignment analysis and traffic flow theory.	4
Prairie View A&M University	Texas	**Transportation Asset Management**	This course covers the principles, techniques, and tools used to managing transportation assets; reviews the most cutting-edge strategies designed to help agencies advance the management of their transportation assets; provides an understanding performance measures and concepts related to cost-effective resource allocation among competing asset needs; and applies a strategic framework to produce an action plan for transportation related agencies.	3
Prairie View A&M University	Texas	**Transportation Engineering**	Principles of transportation engineering. Topics include: basic concepts in the planning, operation, management, and design of air, surface, and water transportation modal facilities; an introduction into the major aspects of regulatory requirements and economics related to transportation issues; and laboratory sessions in the various sub-areas of transportation engineering.	3
Prairie View A&M University	Texas	**Transportation Engineering Design**	Introduction of the transportation design process through a series of comprehensive transportation design projects. Emphasis is placed on the utilization of existing facilities and creation of efficient new facilities through transportation systems management techniques. Energy, environment, mobility and community impacts are considered as measures of effectiveness in the design process.	3
Purdue University at West Lafayette	Indiana	**Highway Transportation Characteristics**	Analysis of basic characteristics of highway transportation systems and the elements influencing these characteristics: drivers, vehicles, pedestrians, flow, density, speed, travel time, delay, stream flow, intersection performance, capacity, accidents, traffic demand, and parking. Techniques used include experimental observation, deterministic and probabilistic queueing theory, probability and statistics, and graphical analysis. Typically offered Fall.	3
Purdue University at West Lafayette	Indiana	**Roadway and Pavement Design**	Design of highway and airport pavement systems, subgrades, subbases and bases, soil stabilization, flexible and rigid pavements; cost analysis and pavement selection; quality control; drainage; earthwork; pavement evaluation and maintenance. Typically offered Fall.	3

College/University	State	Course Name	Description	Credits Earned
Purdue University at West Lafayette	Indiana	**Transportation Engineering**	Transportation functions; transportation systems, including land, air, and marine modes; transportation system elements, including traveled way, vehicle, controls, and terminals; techniques of transportation system planning, design, and operation. Typically offered Fall Spring.	3
Quinnipiac University	Connecticut	**Transportation Engineering**	This course provides students with a solid introduction to the principles of transportation engineering with a focus on highway engineering and traffic analysis. The material learned provides the basic skill set that enables students to solve transportation problems that are likely to appear in professional practice, on the Fundamentals of Engineering exam (FE), and on the Principles and Practice of Engineering exam (PE). Prerequisite: MER 220; As Needed	3
Rice University	Texas	**Urban Transportation Systems**	Survey of operation characteristics of transport modes the elements of transportation planning, and the design of stationary elements.	
Roger Williams University	Rhode Island	**Transportation Engineering**		
Rose-Hulman Institute of Technology	Indiana	**Railroad Engineering**	Provides an overview of rail transportation: history, organizations, economics, safety, freight operations, track-train dynamics, signals and communications, motive power and equipment, track components, construction and maintenance. The basic objective of the course is to gain an understanding of railroads as a transportation industry that merges a number of engineering fields as well as other disciplines that contribute to the success of a complex, growth- oriented industry.	4
Rose-Hulman Institute of Technology	Indiana	**Traffic Analysis and Design**	Study of fundamentals of traffic engineering; components of the traffic system; intersection types and design elements; basic variables of the traffic system (flow, capacity, level of service, delay); design and analysis of traffic signals and intersections; traffic control and traffic impact analysis; safety performance and traffic crash analysis; use of the Highway Capacity Manual and traffic analysis software.	4
Rose-Hulman Institute of Technology	Indiana	**Urban Transportation Planning**	Applies general principles of planning, evaluation, selection, adoption, financing, and implementation of alternative urban transportation systems to urban and regional planning; formulation of community goals and objectives, inventory of existing conditions; transportation modeling-trip generation, distribution, modal choice, assignment, technological characteristics and operation of modern transit and other movement systems.	4
Rutgers, The State University of New Jersey	New Jersey	**Introduction to Transportation Planning**	Discusses the various aspects of transportation demand forecasting problems. Introduces the classic four-step modeling process and the new activity-based modeling approach. Students will have the chance to use some of the state-of-the-art transportation planning software packages, such as Cube, VISUM, and TRANSCAD to conduct case studies of transportation planning problems during labs.	3
Rutgers, The State University of New Jersey	New Jersey	**Transportation Engineering**	A study of the principal modes of transportation, with emphasis on the planning, design and construction of facilities for modern transportation systems.	3
Rutgers, The State University of New Jersey	New Jersey	**Transportation Engineering**	Principles of transportation engineering with application to various modes; planning, selection, formulation, and administration of transportation systems. Economic, environmental, and political constraints; land-use studies; applications.	3
Rutgers, The State University of New Jersey	New Jersey	**Transportation Engineering II**	Training in state-of-the-art transportation planning and operations software such as HCS, Synchro, VISSIM, and CUBE. Students will work in teams to conduct traffic studies at given sites/corridors. Traffic improvement alternatives will be used to address the identified transportation problems. Such alternatives to study may include redesigning geometric layout, signal optimization, adding traffic signs and control, and ITS (intelligent transportation) equipment and systems.	4

College/University	State	Course Name	Description	Credits Earned
Saint Martin's University	Virginia	**Transportation Engineering with Laboratory**		
San Diego State University	California	**Mass Transit Engineering**		3
San Diego State University	California	**Seminar in Transportation Engineering**		2 or 3
San Diego State University	California	**Traffic Flow and Control**		3
San Diego State University	California	**Transportation Demand Analysis**		3
San Francisco State University	California	**Transportation Engineering**	Principles, theories, and practice of transportation planning and design. (Plus-minus letter grade only)	3
San Jose State University	California	**Highway and Street Design**	Geometric design of highways and streets. Discussion of design policy. Safety and operational features as well as the evaluation of improvements.	3
San Jose State University	California	**Traffic Engineering**	Design of traffic control systems to include traffic signals and other traffic control devices for safe and efficient vehicular flow; traffic surveys; traffic operations.	3
San Jose State University	California	**Transportation Engineering**	Principles, theories, practices in transportation engineering design; planning surveys and data analysis; traffic flow characteristics; location and geometric design of systems to include highways, rail, airports, waterways and pipelines. Problems in planning, design and operations.	3
Santa Clara University	California	**Transportation Engineering Design**	Transportation systems analysis. Traffic flow. Highway geometric design, traffic control, transportation planning. Transportation policies and economics.	3
Savannah State University	Georgia	**Data Analytics in Transportation and Logistics**	The purpose of this course is to provide students with a solid foundation in theory and application of transportation systems with a focus on data analytics. Data characteristics from a wide ranges of transportation areas including traffic flow, safety, and planning will be investigated, along with well-suited modeling and analysis techniques. Topics to be covered include sampling and data collection, descriptive statistics and data representation, fitting data to distributions, and regression analysis.	3
Savannah State University	Georgia	**Highway and Transportation Engineering**	A study of several transportation modes. Emphasis will be placed on the linkage of these modes for the effective and economic movement of people, materials, and equipment. It will also include the fundamentals of highway design, layout, foundations, and pavements; grade intersections and separations; highway cross-sections, traffic and safety requirements.	4
Savannah State University	Georgia	**Introduction to Transportation Planning**	This course introduces the fundamentals of transportation planning and explores a broad range of topics that touch on method, policy, process, and design. Different aspects of transportation planning as well as different modes of transportation and their components will be discussed. The course also covers basic knowledge of network modeling, travel demand forecasting, and systems evaluation. The interaction and contribution of transportation planning to other disciplines such as energy, economics, and health, and social life will be discussed. There will be a class project on how to use PTV Visum software for regional transportation planning	3
Seattle University	Washington	**Transportation Engineering**	Introduction to the fundamentals of highway transportation systems. Methods of predicting travel demand and capacity supply. Use of field surveys and statistical representation of traffic characteristics. Urban transportation planning and design. Roadway design.	3

College/University	State	Course Name	Description	Credits Earned
South Dakota School of Mines and Technology	South Dakota	**Highway Engineering**	The course addresses transportation systems; traffic flow theory; planning and traffic operations; design, construction, and maintenance of highways and pavements.	3
South Dakota State University	South Dakota	**Highway and Traffic Engineering**	Highway administration, traffic characteristics, highway standards, drainage, geometric design, construction methods.	3
South Dakota State University	South Dakota	**Transportation Engineering**	Engineering principles in various common modes of transportation.	3
Southern Illinois University Carbondale	Illinois	**Transportation Engineering**	Introduction to geometric design, earth work, drainage and traffic. Basic design principles for each area and their application to typical problems. Prerequisite: completion of or concurrent enrollment in 330.	3
Southern Illinois University Edwardsville	Illinois	**Computer Simulation in Traffic Engineering**	Highway capacity software (HCS), signal timing software (SYNCHRO), and micro-simulation software (TSIS).	3
Southern Illinois University Edwardsville	Illinois	**Traffic Studies**	Acquisition, evaluation, statistical analysis and reporting of traffic engineering data used to design, evaluate and operate transportation systems.	3
Southern Illinois University Edwardsville	Illinois	**Transportation**	Planning and design of air, highway, rail, water, and pipeline transportation facilities (geometric and structural).	3
Southern Illinois University Edwardsville	Illinois	**Transportation Engineering Facilities Design**	Transportation facilities geometric design and structural design of load-carrying elements; and human factors as related to physical design criteria.	3
Southern Illinois University Edwardsville	Illinois	**Transportation Planning**	Covers the basis for transportation planning process; modeling transportation demand and supply; project evaluation for decision making, and transportation sustainability.	3
Southern Illinois University Edwardsville	Illinois	**Travel Demand Forecasting**	Transportation engineering principles for estimating the impact of new development on specific facilities and on a region using travel demand forecasting tools.	3
Southern Methodist University	Texas	**Transportation Engineering & Traffic Planning**		
Southern University and Agricultural and Mechanical College	Louisiana	**Introduction to Geographic Information Systems**		3
Southern University and Agricultural and Mechanical College	Louisiana	**Railway Engineering**		3
Southern University and Agricultural and Mechanical College	Louisiana	**Transportation Engineering I**		3
Southern University and Agricultural and Mechanical College	Louisiana	**Transportation Engineering II**		3
St. Cloud State University	Minnesota	**Geographic Information Systems**	Concepts of GIS, including the capture, preprocessing, storage, manipulation, and display of spatial data.	3
St. Cloud State University	Minnesota	**Principles of Geographic Information Science**	Basic principles, concepts and technology that are universal to all parts of Geographic Information Science and geographic information systems software. Integrated Lab. The department offers an examination for credit option for this course.	3
Stevens Institute of Technology	New Jersey	**Sustainable Transportation Systems**		
Temple University	Philadelphia	**Transportation Engineering**	The principal modes of transportation including highway, rail, and air; analysis of elements of transport technology; transportation system development, planning, design, construction, and maintenance.	3
Tennessee Technological University	Tennessee	**Highway Engineering**	Theory and practice of highway geometric design; highway plans; construction practices; computer applications to highway design.	3

College/University	State	Course Name	Description	Credits Earned
Tennessee Technological University	Tennessee	**Traffic Engineering**	Techniques of traffic engineering measurements, investigations, and data analysis; design, application, and operation of traffic control systems and devices.	3
Tennessee Technological University	Tennessee	**Transportation Engineering I**	Introduction to transportation engineering; planning, location, design, and operation of transportation facilities	3
Tennessee Technological University	Tennessee	**Transportation Engineering II**	System planning and evaluation. Characteristics, impacts, and costs. User patterns. Alternative analysis.	3
Texas A&M University	Texas	**Transportation Engineering**	Fundamental principles and methods in planning, design, and operation of transportation systems; driver and vehicle performance capabilities; highway geometric and pavement design principles; traffic analysis and transportation planning.	3
Texas A&M University	Texas	**Urban Planning for Engineers**	Urban planning from an engineering point of view; determinants of land use patterns, planning data collection and analysis; location and design requirements for various land uses; interrelationship of transportation and land use; and methods of plan development.	3
Texas A&M University	Texas	**Urban Traffic Facilities**	Driver, vehicle and roadway characteristics related to design and operation of traffic facilities; selection and design of traffic control devices and information systems for streets and highways; accident analysis and tort liability related to traffic engineering.	3
Texas A&M University Kingsville	Texas	**Transportation Engineering**		
Texas Tech University	Texas	**Geometric Design of Highways**	Study of geometric design of highways and streets, sign and marking of roadways, and application of computer software in highway design.	3
Texas Tech University	Texas	**Transportation Engineering**	Transportation modes; railway and airport runway design; basic design and analysis concepts of highway systems; transportation planning; traffic engineering; intersection control; geometrics; pavement engineering.	3
The College of New Jersey	New Jersey	**Transportation Engineering**		
The College of New Jersey	New Jersey	**Transportation Engineering II**		
The George Washington University	Washington, D.C.	**Highway Engineering and Design**	Road vehicle performance. Principles of highway design: horizontal and vertical alignments, roadside design; drainage and drainage structures, earthwork, intersections, interchanges, parking facilities; basic traffic models; highway materials. Application of safety standards. APSC 3115 and CE 2220 may be taken as a corequisite.	3
The George Washington University	Washington, D.C.	**Introduction to Transportation Engineering**	Transportation system components; roadway traffic capacity and network performance measures; signalized and un-signalized intersections; monitoring techniques, instruments and data processing. Sustainability issues and environmental impact of transportation systems with focus on urban design, planning and regulation.	3
The George Washington University	Washington, D.C.	**Sustainable Urban Planning Dynamics**	Human and physical processes shaping urban environments; human–environment interactions in the context of an urban region; urban design, materials, transport, planning, and regulation.	3
The Ohio State University	Ohio	**Introduction to Highway Safety**	Aspects of highway safety, identification of highway safety problems, and design/implementation/evaluation of highway safety improvement projects and programs.	
The Ohio State University	Ohio	**Traffic Signal Systems**	Traffic parameters, traffic data collection, capacity analysis of freeways, signalized intersection design, hardware, communication and detection systems, and coordinated signal system analysis and design.	
The Ohio State University	Ohio	**Transportation Engineering**	Introduction to Transportation Engineering with emphasis on transportation planning concepts and multi-modal design elements.	

College/University	State	Course Name	Description	Credits Earned
The Ohio State University	Ohio	**Transportation Planning Fundamentals**	Introduction to urban transportation planning, characteristics of urban travel, travel demand models, decision models, and future issues.	
The University of Akron	Ohio	**Transportation Engineering**		
The University of Alabama	Alabama	**Introduction to Transportation Engineering**	An introduction to different modes of transportation with emphasis on roadway and traffic engineering. Topics include transportation economics and planning, highway geometric and pavement design, drainage, construction, traffic control devices, traffic operations, and management and highway capacity analysis.	3
The University of Alabama	Alabama	**Roadway and Intersection Design**	Application of the principles of geometric design and traffic signal layout: vertical and horizontal alignment, intersections, traffic control, and traffic signal layout. Design projects will be prepared to illustrate standard techniques.	3
The University of Alabama	Alabama	**Safety Engineering**	An introduction to safety management and accident prevention, including state and federal laws related to general and construction projects. Topics include accident theories, safety regulations, Construction Safety act, hazards and their control, human behavior and safety and safety management.	3
The University of Alabama	Alabama	**Traffic Engineering**	Vehicle operating characteristics, traffic flow, geometric design of road and intersections, and methods of traffic control.	3
The University of Alabama	Alabama	**Urban Transportation Planning**	The course will provide a foundation in urban transportation planning, including an introduction to the planning process, software associated with transportation modeling and conducting transportation planning and traffic impact studies.	3
The University of Alabama at Birmingham	Alabama	**Transportation Engineering**	Function, influence, characteristics and operation of transportation systems and facilities, focusing primarily on highway systems. Geometric design, operations, and transportation planning are covered.	3
The University of Alabama in Huntsville	Alabama	**Introduction to Transportation Engineering**	Theory, design, and operation of various modes of transportation with emphasis on traffic flow.	3
The University of Alabama in Huntsville	Alabama	**Traffic Engineering Design**	Driver, pedestrian and vehicle characteristics. Principles of traffic flow for improved highway traffic service and safety. Design freeways, rural roads, urban streets, traffic signals, signs, channelization, and other traffic control measures.	3
The University of Alabama in Huntsville	Alabama	**Urban Transportation Planning**	Planning of highways systems and terminals as part of a complete planning approach; public transportation system planning; transportation planning studies, projection analysis, plan formulation, and programming.	3
The University of Arizona	Arizona	**Highway Geometric Design**	Study of geometric elements of streets and highways, with emphasis on analysis and design for safety. Offered every third semester.	3
The University of Arizona	Arizona	**Public Transit Planning and Operations**	[Taught odd-numbered years] Development, operation, management, financing, evaluation and travel demand estimation for urban public transportation systems.	3
The University of Arizona	Arizona	**Special Topics in Transportation Engineering**	Selected advanced topics will be covered in the field of transportation engineering, with emphasis on analysis and design of transportation systems.	3

College/University	*State*	*Course Name*	*Description*	*Credits Earned*
The University of Arizona	Arizona	**Traffic Engineering and Operations**	Two-thirds of urban vehicle-miles of travel in the U.S. are on signal-controlled roadways. Traffic control systems are designed and installed to achieve two primary goals -- safety and efficiency -- by providing orderly movement in all directions. However, present traffic control systems are by no means a perfect solution for delay or crash problems on urban roads. A poorly designed traffic control system can have a negative impact on traffic operations by lengthening vehicle delay, increasing the rate of vehicle crashes, and introducing disruptions to traffic progression. On a national average, poor signal timing causes up to fifteen percent excess vehicle delay, sixteen percent excess vehicle stops, seven percent excess travel time, and nine percent excess fuel consumption. A previous study reported that there are roughly 300,000 traffic signals in the U.S. and about 75 percent of them could be improved easily and inexpensively. This indicates that huge benefits are potentially obtainable through traffic control system optimizations. In recent years, traffic detectors have been intensively deployed in major highway systems across the country. These sensors generate tremendous traffic data that are extremely valuable for traffic management, forecast, and control. How to manage the data efficiently and produce the most useful information out of them have been crucial challenges faced by traffic professionals. Therefore, this course introduces important concepts and principles of traffic system design, geometric characteristics, and operation of streets and highways, including planning aspects, traffic design and control, and highway safety. Simulation modeling and application of these concepts and principles to actual situations will be emphasized to evaluate traffic system performance.	3
The University of Arizona	Arizona	**Traffic Flow and Capacity Analysis**	Methods for the efficient and safe operation of transport facilities through analysis of capacity, safety, speed, parking, and volume data. Usually offered every third semester beginning Fall 2001.	3
The University of Arizona	Arizona	**Traffic Safety**	The following course is intended to introduce topics in traffic safety. Included will be information on how to understand and utilize crash data, safety analysis methods described in the Highway Safety Manual, statistical methods in safety analysis, human factors and crash causality, and an overview of other emerging safety issues and resources.	3
The University of Arizona	Arizona	**Transportation Data Management and Analysis**	This course introduces important concepts of database design and application. Popular database and analytical tools are introduced and demonstrated using traffic sensor data, roadway geometric data, and traffic accident data. The objective is to introduce modern concepts, algorithms, and tools for transportation data management and analysis. With the instructions, assignments, and projects in this course, students are expected to learn database design theories; analytical methods for capacity, safety, and time series analyses; and skills on popular software tools for transportation data management and analysis.	3
The University of Arizona	Arizona	**Travel Demand Modeling**	Detailed investigation of methods to model travel demand, covering data collection and analysis, model development, and forecasting applications.	3
The University of Arizona	Arizona	**Urban Transportation Planning**	Transportation planning in relation to urban development; techniques and procedures for developing long-range regional plans. Usually offered every third semester beginning Fall 2002.	3

College/University	State	Course Name	Description	Credits Earned
The University of Iowa	Iowa	**Design of Transportation Systems**	Overview of different modes within transportation systems; concepts of sustainability and livability in transportation system design; derivation of standards for geometric design of highways; roundabout design; cross-sectional and longitudinal geometric design of highways.	3
The University of Iowa	Iowa	**Principles of Transportation Engineering**	History of transportation modes, new transport technologies, traffic operations and control, economic evaluation of transport alternatives, transportation planning, roadway design and construction, route location, preventive maintenance strategies.	3
The University of Iowa	Iowa	**Traffic Engineering**	Design of traffic control devices; evaluation and analysis of intersections and transportation networks using appropriate computer software.	3
The University of Iowa	Iowa	**Transportation Demand Analysis**	City planning procedures and traffic engineering techniques applied to transportation problems; trip generation, distribution, assignment, mode choice models; travel surveys, data collection techniques; arterial flow, intersection performance, parking; transit system analysis.	3
The University of Iowa	Iowa	**Transportation Infrastructure Construction and Management**	Analytical methods for developing transportation infrastructure construction and management systems; e-construction, transportation infrastructure condition evaluation, performance modeling, maintenance and rehabilitation optimization, asset management, development of transportation infrastructure construction and management system; application of information technology and mobile computing to solving transportation infrastructure construction and management problems.	3
The University of Kansas	Kansas	**Introduction to Transportation Engineering**	Students are provided with a solid introduction to the principles of highway engineering and traffic analysis. This course will present a large number of practical problems, and in sufficient depth, such that the student will be capable of solving real highway-related problems.	3
The University of Memphis	Tennessee	**Airport Planning and Design**	Aeronautical demand and air traffic control; airport and runway configuration; capacity and delay analysis, geometric design of runways and taxiways; airport access and parking; ground movements and baggage movements.	3
The University of Memphis	Tennessee	**Traffic Engineering**	Traits and behavior patterns of road users and their vehicles. Includes traffic signs and signals, pavement markings, hazard delineation, capacity, accidents and parking analysis.	3
The University of Memphis	Tennessee	**Intro to TSMO**	Introduction to operations and management concepts exploring multidisciplinary contexts in traffic, transit and freight, emerging technologies, policy issues and communication strategies, performance-based planning, and systems thinking.	3
The University of Memphis	Tennessee	**Transportation Systems Engineering**	Development and function of transportation systems; operational control and characteristics; system coordination, traffic flow and patterns. Three lecture hours per week.	3
The University of New Orleans	Louisiana	**Principles of Transportation and Highway Engineering**	Design concepts, loadings, codes for steel bridges. Steel bridge design and construction in compliance with AISC current year competition rules. (	3
The University of Texas at San Antonio	Texas	**Highway Engineering**	General characteristics of highway design; horizontal and vertical alignment, cross-sections, earthwork, drainage, and pavement; and economic analysis.	3
The University of Texas at San Antonio	Texas	**Transportation Engineering**	Technical elective course. Study of the Highway Capacity Manual, traffic stream parameters and relationships, analytical techniques in traffic engineering such as capacity analysis, queuing theory, and traffic simulation. Design and operation of advanced traffic management systems including signalization, real-time motorist information, urban incident management, and ITS concepts.	3
The University of Texas Rio Grande Valley	Texas	**Highway Engineering**		3

College/University	State	Course Name	Description	Credits Earned
The University of Texas Rio Grande Valley	Texas	**Transportation Engineering**		3
The University of Toledo	Ohio	**Transportation Engineering**		
The University of Toledo	Ohio	**Transportation Engineering II**		
Trine University	Indiana	**Highway Geometric Design**	Basic principles and techniques of geometric design of highways and streets. Safety and comfort for road users with due regard to social, economic and environmental constraints. Dimensions and layout of visible highway features such as alignment, sight distance and intersection. Applications of national design standards and controls criteria.	3
Trine University	Indiana	**Transportation Engineering**	An introduction to the basic design, operation, control, and planning of highway transportation. Topics include an overview of project phases and the history of transportation as well as the fundamentals of traffic operations, user characteristics, capacity, and level of service, geometrics, traffic signal timing, and transportation planning. An introduction to basic concepts and terminology for air, rail, and freight engineering will be covered.	3
Trinity University	Texas	**Signals and Systems**	The analysis of signals and linear systems in the time and frequency domains using transform methods. Topics include: methods of modeling signals and systems, convolution, frequency response, impulse response, the Fourier and Laplace transforms, and transfer functions as applied to circuits and general linear systems.	
Trinity University	Texas	**Signals and Systems Laboratory**	Laboratory to accompany ENGR 3321. A mix of experiments and short design projects intended to motivate, illustrate, and apply concepts from ENGR 3321. Modern methods of simulation and computer-aided design of linear systems are introduced.	
United States Coast Guard Academy	Connecticut	**Transportation Engineering**		
University of Alaska Anchorage	Alaska	**Advanced Traffic Flow Theory**	The course presents the different theories of traffic flow, statistical distributions of traffic flow parameters, traffic stream models, various car-following models, and traffic flow models for intersections. The class also presents the methods to analyze traffic performance using shock waves and queuing analysis.	3
University of Alaska Anchorage	Alaska	**Design of Highways**	Discusses fundamental aspects of transportation engineering in the design of highway systems. Addresses the design of geometric elements of streets and highways with the focus on safety, efficiency and pavement design. Topical areas include roadway functional classification, traffic controls, vertical and horizontal alignments, cross-section, interchanges, and intersections.	3
University of Alaska Anchorage	Alaska	**Fundamentals of Transportation Engineering**	Introduces multi-modal transportation systems, including highways, airports, railroads and water transportation. Discusses factors that influence planning, design and operation of these systems. Emphasizes highway systems.	3
University of Alaska Anchorage	Alaska	**Highway Capacity Manual II**	Highway capacity analysis for preliminary planning, geometrical design and current operational capacity of roadway transportation facilities.	3
University of Alaska Anchorage	Alaska	**Highway Capacity Manual l**	Highway capacity analysis for preliminary planning, geometrical design and current operational capacity of roadway transportation facilities.	3
University of Alaska Anchorage	Alaska	**Highway Engineering II**	Geometrical and structural design, construction, and maintenance of highway facilities and associated economic, social, and environmental consequences.	3
University of Alaska Anchorage	Alaska	**Highway Engineering l**	Geometrical and structural design, construction, and maintenance of highway facilities and associated economic, social, and environmental consequences.	3
University of Alaska Anchorage	Alaska	**Traffic Engineering II**	Traffic engineering studies and analyses, traffic flow theory, traffic control systems design, signalization, and capacity analyses.	3

College/University	State	Course Name	Description	Credits Earned
University of Alaska Anchorage	Alaska	**Traffic Engineering I**	Traffic engineering studies and analyses, traffic flow theory, traffic control systems design, signalization, and capacity analyses.	3
University of Alaska Anchorage	Alaska	**Traffic Modeling and Simulation II**	Introduces concepts of traffic flow simulation, modeling of driver behavior, and application of traffic simulation in Intelligent Transportation Systems (ITS).	3
University of Alaska Anchorage	Alaska	**Traffic Modeling and Simulation I**	Introduces concepts of traffic flow simulation, modeling of driver behavior and application of traffic simulation in Intelligent Transportation Systems (ITS).	3
University of Alaska Anchorage	Alaska	**Transportation Engineering**	Introduction to planning and engineering of transportation systems and their functions, components, and operation. Those systems include highways, airports, railroads, and water transportation with emphasis for highways on planning, geometrical design, traffic operations, and design of pavement structures.	3
University of Alaska Fairbanks	Alaska	**Fundamentals of Transportation Engineering**	Offered Spring. Introduces multi-modal transportation systems including highways, airports railroads and water transportation. Factors that influence planning, design and operation of these systems is discussed. Highway systems are emphasized in the course.	3
University of Alaska Fairbanks	Alaska	**Highway Engineering**	Offered Fall. Design of geometric elements of streets and highways with emphasis on safety and efficiency. Roadway functional classification, design controls, vertical and horizontal alignments, cross sections, interchanges and intersections.	3
University of Alaska Fairbanks	Alaska	**Traffic Engineering II**	Operation and control of transportation systems with emphasis on traffic on highways and streets. Traffic control devices, data collection, capacity and level of service analysis, intersection signalization, traffic impact analysis, accident analysis and other safety considerations.	3
University of Alaska Fairbanks	Alaska	**Traffic Engineering I**	Operation and control of transportation systems with emphasis on traffic on highways and streets. Traffic control devices, data collection, capacity and level of service analysis, intersection signalization, traffic impact analysis, accident analysis and other safety considerations.	3
University of Arkansas	Arkansas	**Honors Studies in Transportation Engineering**	The study of advanced topics in the transportation engineering field. May include participation in transportation engineering courses normally available only to graduate students.	Varies
University of Arkansas	Arkansas	**Transportation Design Project**	Comprehensive engineering design project primarily related to transportation issues.	2
University of Arkansas	Arkansas	**Transportation Infrastructure**	Transportation infrastructure includes discussion on the geometric design of roadways, roadway drainage, roadway materials, roadway structural design, and an economic analysis of roadways. This includes the design of horizontal and vertical alignment, cross section, intersections, pavement materials, and structural capacity. Corequisite: Lab component.	3
University of Arkansas	Arkansas	**Transportation Systems Engineering**	Introduction to transportation systems engineering and planning. Includes the following topics: transportation governance, financing, and the effect on the environment; traffic flow theory; safety; traffic operations and control; capacity; and travel demand modeling.	3
University of Arkansas at Little Rock	Arkansas	**Highway Engineering**	An introduction to highway engineering and traffic analysis. Topics include geometric design of highways, pavement design, traffic flow, highway capacity, level-of-service analysis, traffic control devices and safety, travel demand and traffic forecasting. Fall only.	3
University of California, Berkeley	California	**Advanced Topics in Transportation Theory**	Selected topics in the mathematical analysis of transportation systems. Topics will vary from year to year.	1
University of California, Berkeley	California	**Air Transportation**	Nature of civil aviation; structure of the airline industry; aircraft characteristics and performance; aircraft noise; navigation and air traffic control; airport planning and design; airline operations; aviation system planning.	3

College/University	State	Course Name	Description	Credits Earned
University of California, Berkeley	California	**Analysis of Transportation Data**	Probabilistic models in transportation. The use of field data. Data gathering techniques, sources of errors, considerations of sample size. Experiment design for demand forecasting and transportation operations analysis. Analysis techniques.	3
University of California, Berkeley	California	**Highway Traffic Operations**	Operational planning and management of the highway transportation system. The highway system is presented as a set of operating environments with each having its unique analytical framework. Major topics to be covered include policy and institutional issues, selection of strategies and tactics, evaluation of objectives and measures of effectiveness.	3
University of California, Berkeley	California	**Infrastructure Systems Management**	Integrated treatment of quantitative and analytical methods for the management of infrastructure facilities over their life. The focus of the course is on statistical modeling and numerical optimization methods and their application to managing systems of civil infrastructure, with an emphasis on transportation facilities.	3
University of California, Berkeley	California	**Intelligent Information Systems**	The use of advanced surveillance, navigation, communication, and computer technology to monitor, analyze, and improve the performance of transportation systems. Enabling technologies. Application to monitoring, analysis, evaluation, and prediction of transportation system performance and behavior. Intervention strategies. Feasibility studies. Human factors and institutional issues. Case studies. In the laboratory, students carry out a term project under the supervision of an ITS researcher.	3
University of California, Berkeley	California	**Logistics**	Vehicle routing. Transportation-inventory-production interrelationships, physical distribution networks, many-to-many networks (airlines, postal, etc.), the role of transshipments and terminals in logistic systems for the transportation of goods and passengers, public and private transportation system design. Relevant methodologies.	3
University of California, Berkeley	California	**Operations of Transportation Facilities**	The management of vehicle flows and fleets. Traffic stream properties and their measurement. Theories of traffic flow. Capacity analysis and queueing. Flow control and fleet scheduling.	3
University of California, Berkeley	California	**Operations of Transportation Terminals**	Characteristics of terminals on a mode by mode basis (sea ports, railyards, airports, parking lots, etc.). Methodologies used to study terminal operations and the management of congestion. (Chronographs, input-output diagrams, pricing, simulation). Studies illustrating the use of the methodologies for different modes.	3
University of California, Berkeley	California	**Public Transportation Systems**	Analysis of mass transit systems, their operation, and management. Technology of transit vehicles and structures. Public policy and financing.	3
University of California, Berkeley	California	**Supply Chain and Logistics Management**	Supply chain analysis is the study of quantitative models that characterize various economic trade-offs in the supply chain. The field has made significant strides on both theoretical and practical fronts. On the theoretical front, supply chain analysis inspires new research ventures that blend operations research, game theory, and microeconomics. These ventures result in an unprecedented amalgamation of prescriptive, descriptive, and predictive models characteristic of each subfield. On the practical front, supply chain analysis offers solid foundations for strategic positioning, policy setting, and decision making.	3
University of California, Berkeley	California	**Systems Analysis in Transportation**	The systems approach and its application to transportation planning and engineering. Prediction of flows and level of service. Production functions and cost minimization. Utility theory and demand modeling. Transportation network analysis and equilibrium assignment. Decision analysis and evaluation of transportation projects.	3

College/University	State	Course Name	Description	Credits Earned
University of California, Berkeley	California	**Traffic Safety and Injury Control**	This course applies principles of engineering, behavioral science, and vision science to preventing traffic collisions and subsequent injury. A systematic approach to traffic safety will be presented in the course, and will include (1) human behavior, vehicle design, and roadway design as interacting approaches to preventing traffic crashes and (2) vehicle and roadway designs as approaches to preventing injury once a collision has occurred. Implications of intelligent transportation system concepts for traffic safety will be discussed throughout the course.	3
University of California, Berkeley	California	**Transportation Economics**	Application of micro- and macro-economic concepts to transportation systems. Urban and interregional travel demand analysis. Freight demand. Project and program evaluation. Social welfare theory. Analysis of social cost. Investment analysis and pricing theory. Economic impact analysis. Role of economic analysis in decision making.	3
University of California, Berkeley	California	**Transportation Sustainability**	This multi-disciplinary course is intended to introduce students to the fundamentals of sustainable transportation, with an emphasis on: 1) current trends, climate and energy science, and the policy context; 2) methodological and analysis techniques; 3) vehicle technology, fuels, and intelligent transportation systems (ITS) solutions (supply side); and 4) land use, public transportation, and demand management.	3
University of California, Berkeley	California	**Transportation Systems Engineering**	A capstone class with the objective to design transportation facilities based on operational capacity, site constraints, and environmental design considerations. Emphasis on airports, including landside and airside elements, and environmental assessment and mitigation techniques.	3
University of California, Davis	California	**Transportation Policy**		3
University of California, Davis	California	**Transportation System Operations**		4
University of California, Irvine	California	**Traffic Flow Theory II**	Advanced mathematical analysis of vehicular flow. Detailed treatise on car-following models. Fourier and Laplace analysis of stability problems. Perturbation analysis. Derivation of macroscopic traffic flow relationships from microscopic considerations. Advanced hydrodynamic theory. Prerequisite: CEE226A. Graduate students only. (Design units: 0)	4
University of California, Irvine	California	**Traffic Flow Theory l**	Traffic measurement and fundamental speed-density-flow relationships. Kinematic models. Shock waves. Statistical-kinetic theory of traffic. Introductory car-following principles and stability. Gap acceptance. Platoon dispersion. Two-fluid model. Queueing process. Multi-regime and catastrophe models. Higher-order continuum models. Microscopic and macroscopic simulation. Grad students only. (Design units: 0)	4
University of California, Irvine	California	**Traffic Systems Operations and Control II**	Advanced topics related to operation, control, and analysis of arterial and freeway traffic systems. Control concepts, traffic stream principles, detectors, local controllers, system masters, traffic signal and ramp metering timing principles. Prerequisite: CEE229A. Graduate students only. (Design units: 0)	4
University of California, Irvine	California	**Traffic Systems Operations and Control l**	Introduction to operation, control and analysis of arterial and freeway traffic systems. Control concepts, traffic stream principles, detectors, local controllers, system masters, traffic signal and ramp metering timing principles, traffic measurement technologies, traffic delay principles. (Design units: 0)	4
University of California, Irvine	California	**Transit Systems Planning**	Planning methods for public transportation in urban areas. Technological and operating characteristics of vehicles, facilities, and systems. Short-range planning techniques: data collection and analysis, demand analysis, mode choice, operational strategies, financial analysis. Design of systems to improve performance. (Design units: 0)	4

College/University	State	Course Name	Description	Credits Earned
University of California, Irvine	California	**Transportation and the Environment**	Analysis of the impacts of motor vehicle transportation on the environment. Introduction to life cycle analysis applied to transportation. Basic economic tools for transportation externalities. Transportation planning, urban form, health, and the environment. Transportation sustainability. Civil Engineering majors have first consideration for enrollment. (Design units: 0)	4
University of California, Irvine	California	**Transportation Data Analysis I**	Statistical analysis of transportation data sources. Analysis of categorical and ordinal data. Regression and advanced multivariate analysis methods such as discriminant analysis, canonical correlation, and factor analysis. Sampling techniques, sample error and bias, survey instrument design. Graduate students only. . (Design units: 0)	4
University of California, Irvine	California	**Transportation Planning Models II**	Design and application of comprehensive transportation models. Network development, demand modeling, and equilibrium assignment. Model calibration, validation, prediction, and evaluation. Regional modeling, site impact analysis, and circulation studies. Design of transportation alternatives. (Design units: 0)	4
University of California, Irvine	California	**Transportation Planning Models I**	Analytical techniques for the study of interactions between transportation systems design and the spatial distribution of urban activities. Development of models of demographic and economic activity, land use, and facility location. Forecasting exogenous inputs to existing transportation models. (Design units: 0)	4
University of California, Irvine	California	**Transportation System II: Operations & Control**	Introduction to fundamentals of urban traffic engineering, including data collection, analysis, and design. Traffic engineering studies, traffic flow theory, traffic control devices, traffic signals, capacity and level of service analysis of freeways and urban streets. Laboratory sessions. Prerequisite: CEE11, CEE121. Civil Engineering majors have first consideration for enrollment. (Design units: 2)	4
University of California, Irvine	California	**Transportation System III: Planning & Forecasting**	Theoretical foundations of transportation planning, design and analysis methods. Theory and application of aggregate and disaggregate models for land use development, trip generation, and destination, mode, and route choice. Transportation network analysis. Planning, design, and evaluation of system alternatives. Laboratory sessions. Corequisite: CEE110. Prerequisite: CEE121. Civil Engineering majors have first consideration for enrollment. Concurrent with ENGRCEE 223. (Design units: 2)	4
University of California, Irvine	California	**Transportation System IV: Freeway Operations and Control**	Fundamentals of traffic on urban freeways, including data collection, analysis, and design. Traffic engineering studies, traffic flow theory, freeway traffic control devices, capacity and level of service analysis of freeways and highways. Laboratory sessions. Prerequisite: CEE121. Civil Engineering majors have first consideration for enrollment. (Design units: 2)	4
University of California, Irvine	California	**Transportation System I: Analysis and Design**	Introduction to analysis and design of fundamental transportation system components, basic elements of geometric and pavement design, vehicle flow and elementary traffic, basic foundations of transportation planning and forecasting. Laboratory sessions. Prerequisite: CEE11 and CEE81A. Civil Engineering majors have first consideration for enrollment. (Design units: 2)	4
University of California, Irvine	California	**Transportation Systems Analysis II**	Advanced mathematical methods and models to address logistics and urban transportation problems. Topics include network flows, advanced optimization techniques, network models, and heuristic algorithms. Prerequisite: CEE221A; graduate standing or consent of instructor. Graduate students only. (Design units: 0)	4
University of California, Irvine	California	**Transportation Systems Analysis I**	Introduction to mathematical methods and models to address logistics and urban transportation problems. Techniques include stochastic models, queueing theory, linear programming, and introductory non-linear optimization. Graduate students only. (Design units: 0)	4

College/University	State	Course Name	Description	Credits Earned
University of California, Irvine	California	**Travel Demand Analysis II**	Methods of discrete choice analysis and their applications in the modeling of transportation systems. Emphasis on the development of a sound understanding of theoretical aspects of discrete choice modeling that are useful in many applications in travel demand analysis. Prerequisite: CEE220A. Graduate students only. (Design units: 0)	4
University of California, Irvine	California	**Travel Demand Analysis III: Activity-based Approaches**	The methodological underpinnings of activity-based travel demand modeling. Presents methodologies within the context of a generalization of discrete choice modeling approaches, emphasizing the distinctions that separate these two approaches and presenting appropriate mathematical and statistical tools to address these distinctions. Prerequisite: ENGRCEE 220A. Graduate students only. (Design units: 0)	4
University of California, Irvine	California	**Travel Demand Analysis l**	Fundamentals of transportation systems analysis. Theoretical aspects of travel demand. Travel behavior. Modeling of performance characteristics and costs of transportation modes. In-depth presentation of travel demand modeling techniques. Development of travel choice models including mode, route, and destination choice. Equilibration. Graduate students only. (Design units: 0)	4
University of California, Irvine	California	**Urban Transportation Networks II**	Analytical approaches and algorithms to the formulation and solution of the equilibrium assignment problem for transportation networks. Emphasis on user equilibrium (UE) comparison with system optimal, mathematical programming formulation, supply functions, estimation. Estimating origin-destination matrices, network design problems. Prerequisite: ENGRCEE 221A and ENGRCEE 228A. Graduate students only. (Design units: 0)	4
University of California, Irvine	California	**Urban Transportation Networks l**	Analytical approaches and algorithms to the formulation and solution of the equilibrium assignment problem for transportation networks. Emphasis on user equilibrium (UE) comparison with system optimal, mathematical programming formulation, supply functions, estimation. Estimating origin-destination matrices, network design problems. Prerequisite: CEE220A. Graduate students only. (Design units: 0)	4
University of California, Los Angeles	California	**Introduction to Transportation Engineering**	Lecture, four hours; discussion, two hours; outside study, six hours. Designed for juniors/senior Civil Engineering students and Public Affairs graduate students. General characteristics of transportation systems, including streets and highways, rail, transit, air, and water. Capacity considerations, including planning, design, and operations. Components of roadway design, including horizontal and vertical alignment, cross sections, and pavements. Letter grading.	4
University of California, Los Angeles	California	**Traffic Engineering Systems: Operations and Control**	Lecture, four hours; fieldwork/laboratory, two hours; outside study, six hours. Designed for juniors/seniors and public affairs graduate students. Applications of traffic safety improvements, highway capacity analyses, signal design and timing, Intelligent Transportation Systems concepts, and traffic interface with railroads, urban transit, bicyclists, and pedestrians. Students analyze local roadway and present recommended improvements to public agency officials. Letter grading.	4
University of Central Florida	Florida	**Highway Engineering**	Three functional classifications are covered: planning, design and operation of transportation facilities. Emphasis is on the highway transportation mode. Fall, Spring	3
University of Central Florida	Florida	**Transportation Analytics**	Qualitative and quantitative approaches to contemporary transportation challenges, including economic theory, optimization algorithms, statistical methods, and sustainable transportation alternatives. Spring	3
University of Central Florida	Florida	**Transportation Engineering Systems**	Topics such as safety, Intelligent Transportation Systems, and airport transportation will be covered. Fall, Spring	3

College/University	State	Course Name	Description	Credits Earned
University of Cincinnati	Ohio	**Transportation Infrastructure Engineering**		
University of Colorado at Boulder	Colorado	**Transportation Systems**	Introduces technology, operating characteristics, and relative merits of highway, airway, waterway, railroad, pipeline, and convey or transportation systems. Focuses on evaluation of urban transportation systems and recent transportation innovations. Requisites: Restricted to College of Engineering majors only.	3
University of Colorado Denver	Colorado	**Highway Capacity Analysis**	Covers the principles and applications of highway capacity analysis for freeways and arterials, ramps and interchanges, weave and merge sections, signalized and unsignalized intersections, roundabouts, pedestrian areas and transit. Emphasis is on level-of-service analysis procedures in the Highway Capacity Manual, although other approaches are also discussed. Additional topics include roadway characteristics, vehicle dynamics, human factors, speed and volume studies, travel time surveys and traffic flow characteristics. Prereq: CVEN 3602. Max hours: 3 Credits.	3
University of Colorado Denver	Colorado	**Highway Engineering**	Evaluates alternate highway routes. Discusses highway drainage, finance, maintenance, pavement design, traffic operations and principles of economic analysis. Analyses of the impact of the highway on the environment. Prereq: CVEN 3602 and CVEN 3708/3718. Max hours: 3	3
University of Colorado Denver	Colorado	**Traffic Impact Assessment**	Covers (1) procedures to satisfy state and local requirements for transportation impact studies, (2) methods to perform trip generation, distribution, and traffic assignment for impact analyses, and (3) analysis of transportation impacts on residential communities, mode choice, regional business (downtown or suburban), peak and off-peak travel times, noise, safety, parking and pedestrians. A course project requires students to develop an application of analysis software to a case study area. Prereq: CVEN 3602. Max hours: 3 Credits.	3
University of Colorado Denver	Colorado	**Transportation Engineering**	This course will introduce you to the concepts and methods of transportation engineering, planning and management. This course will emphasize traffic engineering. Topics will include vehicle dynamics, traffic flow fundamentals, accident analysis, signal timing, highway capacity analysis, level of service analysis, freeway operations, and evaluation procedures for alternative transportation projects. Prereq: Junior standing or permission of instructor. Max hours: 3 Credits	3
University of Connecticut	Connecticut	**Case Studies in Transportation Engineering**	Analysis of case studies in transportation and urban planning and design. Application of transportation engineering and planning skills. Oral and written group reports, group discussions, individual written papers.	3
University of Connecticut	Connecticut	**Street and Highway Design**	History of street and highway design; land-use context, street design data collection and analysis, speed, safety and street network characterization; pedestrian and bikers in design, cross-section and alignment design.	3
University of Connecticut	Connecticut	**Traffic Engineering Characteristics**	Relationships among traffic flow characteristics; microscopic and macroscopic representations of traffic flow; capacity and level of service of highways; traffic stream models; shock wave analysis.	3
University of Connecticut	Connecticut	**Transportation Engineering and Planning**	Design of transportation facilities. Traffic flow and capacity analysis. Travel demand analysis and planning methods.	3
University of Connecticut	Connecticut	**Transportation Planning**	Transportation economics, urban transportation planning process, evaluation of transportation improvements, transportation systems management.	3
University of Dayton	Ohio	**Highway Geometrics**	Study of circular and spiral curves, vertical curves, grade lines, earthwork and mass diagram, slope and grade stakes, and contour grading. Second term, each year.	

College/University	State	Course Name	Description	Credits Earned
University of Dayton	Ohio	**Transportation Engineering**	Fundamentals of transportation engineering, including design, construction, maintenance, and economics of transportation facilities. Design of pavement structures and drainage systems. Prerequisite(s): Junior or senior status.	
University of Delaware	Delaware	**Roadway Geometric Design**	Physical dimensions of roadways such as vertical and horizontal curvatures, superelevation rates, lane widths, cross sections, and grades. Topics include roadway functions, design controls and criteria, elements of design, local roads and streets, collector roads and streets, rural and urban arterials, freeways, intersections, and grade separations.	3
University of Delaware	Delaware	**Transportation Facilities Design**	Theoretical concepts of general transportation demand, supply and flow analysis. Planning and design of multi-modal transportation facilities including streets and highways, railways and guideways, airports, and harbors and ports. Engineering, social and economic evaluation of alternative design schemes for simple case studies and existing transportation facilities.	3
University of Delaware	Delaware	**Urban Transportation Planning**	Characteristics of urban travel demand, travel demand forecasting models, urban transportation modes and their characteristics, urban transportation planning processes and issues, evaluation of plans, economic analysis, transportation financing, transportation policy and regulations, and urban transportation systems management.	3
University of Detroit Mercy	Michigan	**Transportation Engineering**	Historical development of road transportation, design of roadways related engineering studies, level of service, economic evaluation and safety.	3
University of Evansville	Indiana	**Transportation Engineering**	Covers road vehicle performance, geometric design of highways, empirical pavement design, fundamentals of Superpave, traffic flow, traffic surveys, highway capacity and level of service analysis and fundamental concepts in railway engineering. Emphasis on land transportation.	3
University of Georgia	Georgia	**Principles of Surveying and Transportation**	Accuracy and error in measurements; distance measurement and corrections; leveling; angles and directions; traffic flow and control; geometric and pavement design of highways.	3
University of Hartford	Connecticut	**Transportation Engineering l**	Planning of urban and rural transportation systems, analysis of highway capacity and alignments, design of the horizontal and vertical alignments of roads and highways. Design and analysis of traffic control systems. Airport design. Issues in transportation safety and freight transportation. Laboratory applications of specialized computer software; design and analysis projects.	4
University of Hawaii Manoa	Hawaii	**Fundamentals of Transportation**	Transportation modes: land, air, water, pipelines. Tourist, urban transportation. Geometric design, human factors, vehicular flow models, capacity analysis. Overview: traffic impact, air quality, parking studies.	3
University of Hawaii Manoa	Hawaii	**Traffic Engineering**	Design/analysis of signalized, unsignalized intersections, urban networks. Traffic impact studies; analysis steps and applications. Design/redesign options. Parking studies: demand, alternative designs (lot layouts).	3
University of Hawaii Manoa	Hawaii	**Urban and Regional Transportation Planning**	Application of travel demand forecasting models to transportation planning. Evaluation and decision-making. Term projects. Pre: 361.	3
University of Houston	Texas	**Transportation Engineering**	Introduction to transportation engineering, emphasizing highway engineering, including geometric design, traffic engineering, transportation planning, and safety.	3
University of Idaho	Idaho	**Fundamentals of Transportation Engineering**	Intro to planning, design, and operation of highway and traffic, public transportation, and airport systems. Three lectures and one 3-hour lab a week; periodic field data collection and one or two field trips.	3
University of Idaho	Idaho	**Highway Design**	Theory and practice in highway design, highway functional classification concepts, design controls and criteria, geometric design of highways and streets, cross section and roadside design, and highway safety manual applications.	3

College/University	State	Course Name	Description	Credits Earned
University of Idaho	Idaho	**Traffic Systems Design**	Analysis and design of network traffic systems; system evaluation using computer optimization and simulation; development and testing of alternative system design. Two lec and one 3-hr lab a wk.; field data collection and field site visits. Cooperative: open to WSU degree-seeking students.	3
University of Illinois at Chicago	Illinois	**Railroad Track Engineering**	Railroad track engineering concepts including track components, response of track to wheel loads, design and analysis of railroad tracks, construction, evaluation, and maintenance of railroad tracks, load distribution, and track substructures. Course Information: Prerequisite(s): CME 315; or consent of the instructor. Recommended Background: Basic knowledge of strength of materials, soil mechanics, and structures.	3
University of Illinois at Chicago	Illinois	**Traffic Engineering and Design**	Highway Traffic control with an emphasis on highway capacity analysis and Traffic Signal Design. Queuing theory, traffic flow theory, corridor management, and Traffic Safety. Course Information: 3 undergraduate hours. 4 graduate hours. Extensive computer use required. Field work required. Prerequisite(s): CME 302 or consent of the instructor.	3
University of Illinois at Chicago	Illinois	**Transportation Engineering**	Fundamentals of transportation engineering. Design, operations and planning of transportation systems of various technologies, emphasizing road and public transit. Course Information: Extensive computer use required. Field trips and computer laboratory required. Prerequisite(s): CS 107 or CS 109. Class Schedule Information: Students outside the stated restrictions may be admitted with the consent of the instructor. To be properly registered, students must enroll in one Laboratory and one Lecture-Discussion.	3
University of Illinois at Urbana-Champaign	Illinois	**Railroad Track Engineering**	Railroad track engineering concepts including track component and system design, construction, evaluation, maintenance, load distribution, and wheel-rail interaction. Design and analysis tools for railroad track engineering and maintenance. Field trip to observe railroad track system and components.	3
University of Illinois at Urbana-Champaign	Illinois	**Railroad Transportation Engineering**	Railroad track engineering concepts including track component and system design, construction, evaluation, maintenance, load distribution, and wheel-rail interaction. Design and analysis tools for railroad track engineering and maintenance. Field trip to observe railroad track system and components.	3
University of Illinois at Urbana-Champaign	Illinois	**Traffic Capacity Analysis**	Fundamentals of traffic engineering; analysis of traffic stream characteristics; capacity of urban and rural highways; design and analysis of traffic signals and intersections; traffic control; traffic impact studies; traffic accidents.	3
University of Illinois at Urbana-Champaign	Illinois	**Transportation Engineering**	Design, planning, operation, management, and maintenance of transportation systems; integrated multi-modal transportation systems (highways, air, rail, etc.); layout of highways, airports, and railroads with traffic flow models, capacity analysis, and safety. Design of facilities and systems with life cycle costing procedures and criteria for optimization.	3
University of Kentucky	Kentucky	**Railway Freight and Passenger Operations and Intermodal Transportation**	Study of the transportation engineering aspects of efficient management of railway operations including freight, passenger, and intermodal transportation.	3
University of Kentucky	Kentucky	**Transportation Engineering**	An introduction to transportation engineering. Development of transportation systems in the United States. Route geometrics and design. Traffic flow characteristics and control. Planning financing and economic analysis of transport facilities. Prereq: CE 211 and engineering standing.	3
University of Louisiana at Lafayette	Louisiana	**Highway Engineering**	Analysis and design of transportation systems, geometric and pavement design, human factors, environmental impact assessment, and economic analyses of transportation alternatives. Applications to large-scale problems. Testing of materials.	3

College/University	***State***	***Course Name***	***Description***	***Credits Earned***
University of Louisiana at Lafayette	Louisiana	**Highway Safety Engineering**	Highway safety, fundamentals of safety analysis, highway systems, safe highway systems, safe highway design and operation, and highway safety modeling.	3
University of Louisiana at Lafayette	Louisiana	**Transportation Engineering I**	Traffic flow models, highway capacity and level of service analysis, transportation planning models, and highway safety.	3
University of Louisiana at Lafayette	Louisiana	**Transportation Engineering II**	Traffic flow models, highway capacity and level of service analysis, transportation planning models, and highway safety.	3
University of Louisville	Kentucky	**Transportation Systems Engineering**	A study of the planning, design, implementation, and evaluation of transportation systems across the modes. Issues of legislation, regulation, and funding are also examined.	3
University of Maine	Maine	**Transportation Engineering**	An introduction to the broad field of transportation with emphasis on the motor vehicle mode. Principles of roadway and urban transportation planning, economic analysis methods, and route design elements are discussed and related to the planning and design of highway transportation routes. Students design a section of roadway and prepare a technical paper on a current transportation engineering problem.	3
University of Maine	Maine	**Transportation Safety**	Fundamental theory on transportation safety processes and evaluation methodology. Topics: vehicle/road/driver interaction, countermeasure effectiveness, enforcement, education and engineering measures.	3
University of Maine	Maine	**Urban Transportation Planning**	Basic concepts and practices in the field of transportation planning, including the process and policy surrounding urban transportation planning, characteristics of urban travel, air quality - noise, energy - land use, the elements of decision making, data management and diagnosis, demand and supply analysis, project evaluation and implementation. A transportation demand management study constitutes a major part of the course.	3
University of Maryland College Park	Maryland	**Highway Engineering**	Highway location and design, highway engineering economics, traffic engineering, traffic measurement devices and technologies. Includes discussion of technological advances in traffic flow and capacity, such as signal systems, corridor control, automatic driver information, incident detection and autonomous vehicle operation.	3
University of Maryland College Park	Maryland	**Introduction to Transportation Engineering and Planning**	Engineering problems of transportation by highways, airways, pipelines, waterways, and railways. Transportation modes and technologies, vehicle dynamics, basic facility design, traffic stream models, capacity analysis, transportation planning, evaluation and choice, and network analysis.	3
University of Massachusetts Amherst	Massachusetts	**Highway Location and Geometric Design**	Highway location and geometric design principles for streets and highways with emphasis on roadway safety. Includes state-of-the-art design policies and current research findings. AutoCAD and transportation design computer software used for class assignments and the class project.	3
University of Massachusetts Amherst	Massachusetts	**Intelligent Transport Systems**	A critical review and analysis of intelligent transportation systems (ITS) in the management and operation of surface transportation facilities; selected ITS technologies reviewed include wireless and wire communication systems, sensors, information processing techniques, automated location systems, and innovative computational methods; emphasis is placed on several ITS user services including traffic control, en-route and pre-trip information, electronic payment, and fleet management as they pertain to surface transportation facilities in large metropolitan areas as well as small urban and rural communities.	3

College/University	State	Course Name	Description	Credits Earned
University of Massachusetts Amherst	Massachusetts	**Public Transportation Systems**	A historical overview of public transportation and a summary of existing and future transit and paratransit systems and technologies; application of intelligent transportation system (ITS) technologies (including advanced communication, sensor, and information processing technologies) in the implementation of transit and paratransit operations; public transit systems costs, demand, pricing, and performance evaluation; project planning including routing, scheduling, preliminary design and ownership and organizational options; and systems planning.	3
University of Massachusetts Amherst	Massachusetts	**Spatial Analysis in Transportation**	Spatial analysis using geographic information systems and other technologies for planning, design, management, operation, and analysis of civil engineering infrastructure systems and facilities.	3
University of Massachusetts Amherst	Massachusetts	**Traffic Engineering**	Fundamental principles of traffic flow and intersection traffic operations including traffic data collection methods, traffic control devices, traffic signal design, and analysis techniques. Emphasizes quantitative and computerized techniques for designing and optimizing intersection signalization. Several traffic engineering software packages used.	3
University of Massachusetts Amherst	Massachusetts	**Transportation Systems**	Transportation operations, planning, and design; emphasis on the highway mode. Topics include: vehicle, operator, and roadway characteristics; traffic control; capacity; geometric design objectives and plan formulation; demand forecasting; and economic, social, and environmental evaluation.	3
University of Massachusetts Dartmouth	Massachusetts	**Advanced Traffic Engineering**	Applied technology and scientific principles to the planning, functional design, operations, and management of surface transportation facilities. A course project is required and includes topic areas in capacity analysis, simulation software applications, modeling traffic flow, environmental impact studies and other studies including volume, speed, travel-time, and delay studies.	3
University of Massachusetts Dartmouth	Massachusetts	**Introduction to Transportation Engineering Systems**	A comprehensive overview of the characteristics of transportation systems. Concepts in major areas such as geometric design, human factors, traffic engineering simulation, and transportation planning and evaluation, including travel behavior and socioeconomic effects, will be introduced. Principles of highway construction and design will be included.	3
University of Massachusetts Dartmouth	Massachusetts	**Traffic Engineering**	Introduction to the concepts of movement control. Discussion and quantitative appraisal of the characteristics of the transport user, the vehicle, the road, the navigation and control systems. Written and oral reports are assigned on field data collections and evaluations of typical control problems, traffic studies, road user reactions, and potential future transport systems.	3
University of Massachusetts Lowell	Massachusetts	**Transportation Engineering**	Development of the basic principles pertaining to the movement of people and goods by modern transportation systems. Techno-economic characteristics of the various transportation modes. Aspects of planning, design and operation of land, air and water transportation facilities. Development, structure and function of the U.S. transportation system.	3
University of Massachusetts Lowell	Massachusetts	**Transportation Engineering Laboratory**	Practice techniques of data collection, analysis and presentation that are commonly used in the planning, design and operation of transportation facilities with primary emphasis on highway systems.	3
University of Miami	Florida	**Transportation Engineering II**	Transportation system planning and design. Advanced geometric design for highway and railway/transit. Human, vehicle, and environmental factors affecting the design, operation, and safety of transportation systems. Planning and design of both landside/airside aspects of airport facilities. Water port and multi-modal facilities design.	3

College/University	State	Course Name	Description	Credits Earned
University of Miami	Florida	**Transportation Engineering I**	Thermodynamic properties of materials; the first and second laws of thermodynamics; application to thermodynamic processes; introduction to heat transfer.	3
University of Michigan	Michigan	**Introduction to Transportation Engineering**	Fundamentals of planning, design and operation of highway transportation facilities. Topics covered include driver and vehicle performance characteristics, highway geometric design principles, basics of traffic analysis, traffic signal operations, transportation planning, connected and automated vehicle technologies and their impacts to the transportation infrastructure.	4
University of Minnesota - Twin Cities	Minnesota	**Principles of Geographic Information Science**	Introduction to study of geographic information systems (GIS) for geography and non-geography students. Topics include GIS application domains, data models and sources, analysis methods and output techniques. Lectures, readings and hands-on experience with GIS software.	3
University of Minnesota - Twin Cities	Minnesota	**Principles of Highway Design**	Vertical and horizontal alignment, cross-sections and earthwork computations, roadside design, highway capacity, impact of vehicle type on geometric design, intersection design, safety impacts of highway design.	3
University of Minnesota - Twin Cities	Minnesota	**Traffic Engineering**	Principles of vehicle/driver performance as they apply to safe/efficient operation of highways. Design/use of traffic control devices. Capacity/level of service. Trip generation, traffic impact analysis. Safety/traffic studies.	3
University of Minnesota - Twin Cities	Minnesota	**Traffic Engineering**	Principles of vehicle and driver performance as they apply to the safe and efficient operation of highways. Design and use of traffic control devices. Capacity and level of service. Trip generation and traffic impact analysis. Safety and traffic studies.	3
University of Minnesota - Twin Cities	Minnesota	**Transit Planning and Management**	Principles/techniques related to implementing transit systems. Historical perspective, characteristics of travel demand, demand management. Evaluating/benchmarking system performance. Transit-oriented development. Analyzing alternative transit modes. System design/finance. Case studies, field projects.	3
University of Minnesota - Twin Cities	Minnesota	**Transportation Engineering**	Applying laws of motion to vehicle performance, determining constraints for highway designs. Traffic flow principles, their relation to capacity and level of service. Geometric design, traffic control, pavement design, transportation planning.	3
University of Minnesota - Twin Cities	Minnesota	**Transportation Policy, Planning, and Development**	Techniques of analysis and planning for transportation services. Demand-supply interactions. Evaluating transportation alternatives. Travel demand forecasting. Integrated model systems. Citizen participation in decision-making.	3
University of Minnesota Duluth	Minnesota	**Design of Traffic Systems II**	This course aims to provide an in-dept. knowledge of design principles and methodologies for traffic control systems to optimize operational efficiency and safety of traffic flows. The theories of traffic flow modeling, simulation and control will be introduced as the basis for designing traffic systems. The process to analyze traffic systems performance will be studied with computer-based tools. The design methodologies for traffic control systems for arterials and freeways will be discussed and applied to real roadways in a simulated environment. A process to assess the effectiveness of design strategies on different types of highways will be studies and applied to sample corridors.	3
University of Minnesota Duluth	Minnesota	**Design of Traffic Systems II**	This course provides an in-depth knowledge of design principles and methodologies for traffic control systems to optimize operational efficiency and safety of traffic flows. The theories of traffic flow modeling, simulation and control are introduced as the basis for designing traffic systems. The process to analyze traffic systems performance is applied with computer-based tools. The design methodologies for traffic control systems for arterials and freeways are discussed and applied to real roadways in a simulated environment. A process to assess the effectiveness of design strategies on different types of highways is evaluated and applied to sample corridors.	3

College/University	State	Course Name	Description	Credits Earned
University of Minnesota Duluth	Minnesota	**Highway Planning and Design II**	This course aims to provide an in-depth knowledge on highway network planning and design methodologies. Current planning and design methods for roadways will be introduced and used for class projects. The potential interrelationship between design parameters and traffic operation/safety will also be introduced for each design element.	3
University of Minnesota Duluth	Minnesota	**Highway Planning and Design II**	This course aims to provide an in-depth knowledge on highway network planning and design methodologies. Current planning and design methods for roadways will be introduced and used for class projects. The potential interrelationship between design parameters and traffic operation/safety will also be introduced for each design element.	3
University of Minnesota Duluth	Minnesota	**Transportation Engineering**	Introduction to transportation systems, driver behavior, vehicle characteristics, and principles of highway network planning. Introduction to roadway and intersection design methods, traffic signal operation and timing optimization methods. Fundamental of traffic flow theory.	3
University of Mississippi	Mississippi	**Airport Planning and Design**	Impacts of national transportation policies with emphasis on ground, aviation, and intermodal facilities; financing resources; collection and use of traffic and passenger data for airport planning and design; travel demand forecasting; capacity analysis; visual aids and air traffic control; runway orientation and geometric design; design of terminal areas and ground access; basic pavement structural design and maintenance management; environmental impacts and economic assessment; airport applications of remote sensing and spatial technologies, GIS, and Intelligent Transportation System (ITS) technologies.	3
University of Mississippi	Mississippi	**Transportation Engineering II**	Advanced topics in transportation engineering and management with emphasis on intermodal facilities; physical design and traffic management; measures of system effectiveness and performance; environmental and social impacts; Intelligent Transportation System (ITS) technologies; applications of remote sensing and spatial technologies and GIS; economic evaluation of alternatives; computer modeling and simulation.	3
University of Mississippi	Mississippi	**Transportation Engineering l**	Major transportation modes and their characteristics; mechanics of motion; geometric and intersection design; traffic flow theory; probabilistic methods; capacity analysis; planning models; environmental impact analysis; economic evaluation; Intelligent Transportation System (ITS) and computer applications.	3
University of Missouri - Columbia	Missouri	**Fundamentals of Transportation Engineering**	Covers fundamentals of transportation engineering including geometric design, traffic engineering, pavements, and planning.	4
University of Missouri - Kansas City	Missouri	**GIS for Engineers**	This course covers the fundamental concepts and methods for use of GIS software used to solve engineering applications and problems. The course uses module based practical learning to apply and integrate foundational knowledge, develop the skills required to model various types of imagery data, incorporate this data into projects for management and design, and provide the skills necessary for students to depict ideas and design graphically. A personal computer capable of running the software is required for the course. Non-engineering majors by instructor permission only.	3
University of Missouri - Kansas City	Missouri	**Highway and Traffic Engineering**	Principles of highway engineering and traffic analysis, road/vehicle performance, geometric alignment of highways, traffic analysis and queuing theory, signal design, statistical analysis of traffic data and highway drainage.	3
University of Missouri - St. Louis	Missouri	**Highway and Traffic Engineering**		3

College/University	State	Course Name	Description	Credits Earned
University of Missouri - St. Louis	Missouri	**Transportation Engineering**		3
University of Mount Union	Ohio	**Transportation Engineering and Traffic Analysis**		2
University of Nebraska - Lincoln	Nebraska	**Airport Planning and Design**	Planning and design of general aviation and air carrier airports. Land-side components include vehicle ground-access systems, vehicle circulation parking, and terminal buildings. Air-side components include aircraft apron-gate area, taxi-way system, runway system, and air traffic control facilities and airspace. Emphasis on design projects.	3
University of Nebraska - Lincoln	Nebraska	**Highway Design**	Design of roadways, intersections, interchanges, parking facilities, and land development site access and circulation. Emphasis on design projects.	3
University of Nebraska - Lincoln	Nebraska	**Highway Design and Construction**		3
University of Nebraska - Lincoln	Nebraska	**Highway Engineering**	Introduction to the principles of highway engineering and traffic operations and control.	3
University of Nebraska - Lincoln	Nebraska	**Traffic Engineering**	Design of signalized intersections, arterial street and network signal systems, and freeway control systems.	3
University of Nebraska - Lincoln	Nebraska	**Urban Transportation Planning**	Development of urban transportation planning objectives and goals. Data collection procedures, land use and travel forecasting techniques, trip generation, trip distribution, modal choice analyses, and traffic assignment. Site development and traffic impact analysis.	3
University of Nevada - Las Vegas	Nevada	**Airport Design**	Fundamental engineering principles in planning, location, design, and operation of airport facilities (terminals, apron areas, taxiways, and runways); ground access, drainage, aircraft characteristics and performance as they relate to airport design, aircraft noise and environmental considerations; elements of air traffic control.	3
University of Nevada - Las Vegas	Nevada	**Computer Applications in Transportation Engineering**	Application of computer software models and programs for solving planning, design, and operations problems in transportation engineering. Includes traffic network analysis models, transportation planning, and impact models.	3
University of Nevada - Las Vegas	Nevada	**Geometric Design of Highways**	Design of visible elements of highways such as horizontal and vertical alignment and cross-section in accordance with design controls derived from characteristics of vehicles, drivers, traffic, and pedestrians interacting with geometry, terrain, and environment to yield a safe roadway at design capacity.	3
University of Nevada - Las Vegas	Nevada	**GIS Applications in Transportation Engineering**	Introduction to the basics of Geographic Information Systems software and hardware and their use in civil engineering. Emphasis on the application of GIS for the planning, design, operations, and maintenance of civil engineering systems. Laboratory sessions provide hands-on experience with GIS software and hardware using specific examples/case studies of GIS applications in various areas of civil engineering.	3
University of Nevada - Las Vegas	Nevada	**High Speed Rail**	High speed rail station, track, traction and power, rolling stock, signal and communication, traffic organization, passenger service, and maintenance.	3
University of Nevada - Las Vegas	Nevada	**Introduction to Railroad Transportation**	Railway track, vehicle motion, signals and communications, railway track maintenance, railway operations, freight operation, passenger train operations.	3
University of Nevada - Las Vegas	Nevada	**Public Transportation Systems**	Analysis and evaluation of mass transit systems, and their operation and management: demand and cost analysis, route design, schedules, and fare policy. Technology of transit systems, including vehicles and structures. Transit financing. Impact on land use and environment.	3

College/University	State	Course Name	Description	Credits Earned
University of Nevada - Las Vegas	Nevada	**Railroad Engineering**	Design of major elements of railroad track, including track, subgrade materials, design and construction, construction costs and stability problems, drainage, ballast, cross ties, concrete and other artificial ties, rail, fastenings and other track material, track geometry, turnouts and crossings, track-train dynamics, conduct of work, and railroad right of way.	3
University of Nevada - Las Vegas	Nevada	**Traffic Engineering**	Studies in highway and traffic planning and principles of traffic operations.	3
University of Nevada - Reno	Nevada	**Traffic Operations**	Studies in traffic operations, intersection control, and traffic impact analysis.	3
University of Nevada - Reno	Nevada	**Transportation Engineering**	Fundamentals of transportation engineering; traffic facility design and operations; highway geometric design; transportation planning; pavement design.	3
University of New Hampshire	New Hampshire	**Transportation Engineering and Planning**	Fundamental relationships of traffic speed, density, and flow applied to public and private modes of transport. Principles of demand forecasting and urban systems planning.	3
University of New Haven	Connecticut	**Transportation Engineering**	A study of planning, design, and construction of transportation systems including highways, airports, railroads, rapid transit systems, and waterways. 3 credits	3
University of New Mexico	New Mexico	**Highway and Traffic Engineering**	Principles of the geometric design and operation of streets and highways, including planning aspects, traffic design and control and highway safety. Application of these principles to actual situations.	3
University of New Mexico	New Mexico	**Transportation Engineering**	Multimodal examination of the planning, design and operation of transportation facilities; social aspects and economic evaluation of transportation system improvements; transportation design project.	3
University of New Mexico	New Mexico	**Urban Transportation Planning**	Planning aspects of highway transportation including transportation goals, transportation forecasting techniques and models, selection between alternate solutions, financing improvements.	3
University of North Dakota	North Dakota	**Transportation Engineering**	Transportation systems; transportation planning and future developments; computer aided design; design and analysis of transportation facilities including traffic operations, highway geometry, and pavement.	3
University of North Florida	Florida	**Advanced Transportation Engineering**	This course provides comprehensive coverage of the principles of traffic engineering with an emphasis on road and intersection analysis and design, including the following topics: volume and speed studies, traffic control devices, signal design and timing, and traffic simulation tools.	3
University of North Florida	Florida	**Highway Geometric Design**	This course encompasses the use of the American Association of State Highway and Transportation Officials (AASHTO) policy on Geometric Design of Highways and Streets. This course provides a detailed coverage of the principles and techniques necessary for the design of the highway geometric elements.	3
University of North Florida	Florida	**Traffic Operations**	This course entails the use of the Highway Capacity Manual in evaluating the Level of Service for various transportation facilities.	3
University of North Florida	Florida	**Transportation Engineering**	This course offers an introduction to transportation engineering, including the characteristics of transportation modes, interaction between modes, facility design consideration, planning of transportation systems, economics, public policy, implementation and management.	3
University of Notre Dame	Indiana	**Transportation Engineering**	The planning, design, operation, safety, and economics of transportation systems. Spring.	3
University of Oklahoma	Oklahoma	**Transportation Engineering**		3

College/University	State	Course Name	Description	Credits Earned
University of Pittsburgh	Pennsylvania	**Public Transportation Systems**	This course is designed to give seniors and graduate students a basic background in the planning, operations and development of public transportation systems within the context of the overall transportation system.	3
University of Pittsburgh	Pennsylvania	**Traffic Management and Operations**	Introduction to traffic flow theory and characteristics. Highway capacity analysis. Basic traffic management and control.	3
University of Pittsburgh	Pennsylvania	**Transportation Design Project**	Consists of comprehensive projects with emphasis on the nature of engineering problem solving and the creative aspects of design.	3
University of Pittsburgh	Pennsylvania	**Transportation Engineering**	Introduction to the design, planning, operation, management, and maintenance of transportation systems. Transportation planning inter-modal transportation systems (highway, air, rails, etc.). Transportation planning of highways, airports, and railroads with traffic flow models, capacity analysis, and safety. Concepts for designing facilities and systems area study with life cycle costing procedures and criteria for optimization.	3
University of Pittsburgh	Pennsylvania	**Urban Transportation Planning**	All aspects of the transportation planning process including transportation planning and decision making, transportation modeling, demand and supply analysis, transportation studies, environmental issues and project implementation.	3
University of Pittsburgh at Johnstown	Pennsylvania	**Highway Engineering**	Highway administration, classification, planning and programming. Geometric design of highways. Traffic characteristics and capacity analyses. Traffic operations and control. Highway design project.	3
University of Pittsburgh at Johnstown	Pennsylvania	**Highway Surveying and Design**	Highway location surveys, geometric design, and construction stakeout. Emphasis is placed upon the design of horizontal and vertical alignments from field surveys and topographic maps. Elements of design include horizontal circular and spiral curves, superelevation, vertical profiles, vertical parabolic curves, cross-sections, earthwork quantities, and drainage. The Land Development Desktop (LDD) is utilized in the planning and design process including preparation of design plans for a semester long highway project.	3
University of Pittsburgh at Johnstown	Pennsylvania	**Transportation**	Study of transportation systems including planning, analysis, design and management. Emphasis is placed on traffic volumes, speed-flow-density relationships, highway safety, capacity analysis and level of service, intersection control, forecasting travel demand, evaluating alternatives, environmental and social considerations, and transportation systems management. The lab focuses on spot speed, traffic volume, travel delay, parking, and accident studies. The Highway Capacity Software is utilized in the design of signals and in the traffic analysis of highway segments and intersections.	4
University of Portland	Oregon	**Traffic Engineering**	Introduction to traffic engineering; traffic stream components and characteristics; fundamental principles of traffic flow; studies of traffic speed, volume, travel time, delay, and pedestrian; capacity analysis of freeways, highways, signalized and unsignalized intersections; traffic control devices; traffic signals; traffic accidents and safety; and traffic management.	3
University of Portland	Oregon	**Transportation Engineering**	Introduction to transportation systems and modes; transportation planning; driver, pedestrian, and vehicle characteristics; fundamental principles of traffic flow; highway capacity analysis; geometric design of highways; traffic operations; design of the intersection and interchange; parking design; transportation safety and environmental impacts; introduction to pavement design.	3
University of Puerto Rico at Bayamon	Puerto Rico	**Road Design and Construction**		3

College/University	State	Course Name	Description	Credits Earned
University of Rhode Island	Rhode Island	**Geometric Design of Highways**	Evaluation of alternative designs. Criteria and practices of geometric design; at grade intersections, interchanges, channelization, weaving parking facilities, and road appurtenances; safety considerations, lane balancing, ramps, and terminals.	3
University of Rhode Island	Rhode Island	**Highway Engineering**	Design of modern highways and streets including planning, location, geometric layout, drainage structures, bituminous materials, pavement structure, construction, operation, maintenance and rehabilitation.	3
University of Rhode Island	Rhode Island	**Highway Engineering Laboratory**	Highway capacity analysis, computer applications of geometric design, soil resilient modulus test, L. A. abrasion test, asphalt viscosity test, Marshall and Superpave mix-design, pavement management lab, and field trip.	1
University of Rhode Island	Rhode Island	**Intelligent Transportation Systems**	Traffic systems operations/planning strategies; Advanced Transportation Management Systems; Detection Devices; Benefits and Evaluation; In-Vehicle Navigation Theory; Real-Time Dynamic Routing Issues.	3
University of Rhode Island	Rhode Island	**Public Transportation Systems**	Bus and rail modes; technological characteristics on capacity, service quality, costs; analysis, evaluation; performance monitoring, route and network design; frequency determination; vehicle scheduling; advanced operations strategies.	3
University of Rhode Island	Rhode Island	**Traffic Engineering**	Highway traffic characteristics and methods of providing for an effective, free, and rapid flow of traffic. Types of studies, regulations, control devices and aids, planning and administration.	3
University of Rhode Island	Rhode Island	**Traffic Systems Operations**	Signalized and unsignalized intersection treatments; coordination concepts; arterial and freeway management, operating strategies, and design issues; simulation and optimization; performance evaluation.	3
University of Rhode Island	Rhode Island	**Transportation Engineering**	Concepts of transportation planning and design as well as traffic analysis techniques are covered with respect to Multi-Mode travel within transportation systems.	3
University of Rhode Island	Rhode Island	**Urban and Rural Transportation**	Cross-listed as (CPL), CVE 546. Issues confronting planning for urban and rural transportation systems; the variety of policies that governments pursue in addressing issues and problems; technical and political constraints, transportation studies, and demand analysis techniques.	3
University of South Alabama	Alabama	**Introduction to Transportation Engineering**	Principles of transportation engineering with emphasis on highways and traffic.	3
University of South Alabama	Alabama	**Traffic Engineering**	This course will focus on traffic flow parameters and their influence on roadway traffic conditions, with emphasis on traffic data collection, traffic safety analysis, roadway markings, traffic signs, traffic signal timing and signal capacity analysis, and traffic management systems.	3
University of South Alabama	Alabama	**Transportation Geometric Design II**	This course will provide students with an understanding of the basic principles and techniques of highway design. This will include laying out potential routes, design of the alignment and intersections, and evaluation of earthwork requirements. The student should be able to understand and apply these principles to highway design problems. The student should also be able to use existing computer tools to generate and analyze designs. Upon completion, students should be prepared to work in the field of highway design.	3
University of South Alabama	Alabama	**Transportation Geometric Design III**	This course will provide students with an understanding of the basic principles and techniques of highway design. This will include laying out potential routes, design of the alignment and intersections, and evaluation of earthwork requirements. The student should be able to understand and apply these principles to highway design problems. The student should also be able to use existing computer tools to generate and analyze designs. Upon completion, students should be prepared to work in the field of highway design.	3

College/University	State	Course Name	Description	Credits Earned
University of South Alabama	Alabama	**Transportation Geometric Design I**	Basic principles and techniques of highway design, including route layout, alignment, intersection design, and materials/earthwork estimation. Use of computer tools to generate and analyze highway designs.	3
University of South Alabama	Alabama	**Transportation Systems Evaluation**	This course will focus on concepts and principles of transportation economic analysis, transportation costs and benefits, user and nonuser consequences, methods of evaluation of plans and projects, environmental impact assessments, and transportation programming and management.	3
University of South Carolina	South Carolina	**Highway Design**	Design of transportation facilities using relevant tools and guidelines with emphasis on physical and operational aspects of arterials, freeways, intersections, and interchanges, including geometry, capacity, control, and safety.	3
University of South Carolina	South Carolina	**Introduction to Transportation Engineering**	Transportation design, planning, and operational analysis, including roadway, airway, and railway systems; transportation elements, including traveled way, vehicle, control, terminals, and advanced technology; traffic data collection, interpretation, and analysis.	3
University of South Carolina	South Carolina	**Operation and Logistics of Railway Systems**	Principles of rail operations; Network management; Best practices for train planning, performance management and delivery of service; technical elements of a railway from an operations perspective (train controls, signaling, communications, yards, tractive power etc.).	3
University of South Carolina	South Carolina	**Railway Engineering I**	Introduction to the analysis and design of the railway infrastructure for freight and passenger systems to include track and track support systems, grade crossings, special track work, construction, inspection, assessment and compliance.	3
University of South Carolina	South Carolina	**Traffic Engineering**	Capacity analysis of freeways and arterials. Traffic flow characteristics and basic relationships among traffic flow parameters. Signalized and unsignalized intersection control and signal timing design.	3
University of South Carolina	South Carolina	**Transportation Engineering Laboratory**	This course covers the principles of distances, elevations and angles that pertain to roadways, basic theories in engineering measurements and surveying calculations, and an introduction to mapping, for transportation engineering applications.	1
University of South Carolina	South Carolina	**Transportation Systems Planning**	Fundamental interactions between supply and demand in transportation systems. Modeling transportation demand and trip-making behavior. Evaluation of alternatives for decision making.	3
University of South Florida	Florida	**Capstone Geotechnical/ Transportation Design**	A capstone geotechnical/transportation design experience for seniors in Civil and Environmental Engineering. Design of embankment and pavement bases. Comprehensive surface streets, open highway intersection and site design, plan preparation.	3
University of South Florida	Florida	**Transportation Engineering II**	Techniques for the geometric route design of surface transportation systems; horizontal and vertical alignments. Spiral curves, superelevations and earthwork analysis; drainage, soils, and a rigid and flexible pavement design; right-of-way acquisition and Environmental Impacts; site layout & design, and operation of alternate models including bus, air, rail, water, and pipeline facilities and terminals.	3
University of South Florida	Florida	**Transportation Engineering I**	Principles of surface transportation system development, design, and operations; administration, modal characteristics, capacities, and functional classifications; vehicle kinematics, human factors and minimum design standards; traffic flow theory and queuing, capacity and signalization; transportation planning and economics.	3
University of Southern California	California	**Principles of Transportation Engineering**	Planning, design, construction, maintenance, and operation of facilities for air, water, rail, and highway transit systems. Junior or senior standing.	3
University of Tennessee at Knoxville	Tennessee	**Honors: Transportation Engineering II**	Same as 455 with additional honors project.	3

College/University	State	Course Name	Description	Credits Earned
University of Tennessee at Knoxville	Tennessee	**Transportation Engineering II**	Integrating transportation engineering principles into design of multimodal transportation systems, including overview of transportation design tools often utilized in the industry. Analysis of geometric design and operations management strategies to improve safety and performance; including design for non-motorized and public transport, intelligent transportation systems, signal systems, and simulation.	3
University of Tennessee at Knoxville	Tennessee	**Transportation Engineering l**	Introduction to traffic demand, transportation planning, traffic flow relationships, geometric design, transportation safety, traffic control devices, queuing analysis, and multimodal transportation.	3
University of Tennessee at Knoxville	Tennessee	**Transportation Engineering Lab**	Applying transportation principles to transportation operations and planning problems. Includes data collection techniques and analysis and application of transportation analysis software to model transportation systems.	3
University of Texas at Arlington	Texas	**Introduction to Railroad Engineering**	Overview of the railroad industry in the United States; structure of track, base, and foundation; drainage, railroad structures (bridges and retaining walls); geometric design; communications and signaling; maintenance.	3
University of Texas at Arlington	Texas	**Street and Highway Design**	The geometric design concepts for urban and rural roadways. Consideration of vehicle and road user characteristics in roadway design, including horizontal and vertical alignments, intersections, interchanges, and roadway cross-section and right-of-way considerations.	3
University of Texas at Arlington	Texas	**Traffic Engineering**	Design and control of fixed-time, actuated, and computer-controlled traffic signals; optimization of traffic flow at intersections; capacity analysis of intersections, legal requirements and traffic studies for installation of traffic control devices; characteristics of signs, signals, and markings; traffic laws.	3
University of Texas at Arlington	Texas	**Transportation Engineering**	Planning, design, and operation of transportation facilities. Characteristics of vehicle movement; basic geometric design of highways; traffic flow relations in traffic streams; highway capacity; traffic engineering; and procedures for transportation planning.	3
University of Texas at Arlington	Texas	**Urban Transportation Infrastructure Planning**	Urban transportation system design, planning, transportation modeling, economic theory, travel demand and travel estimation techniques.	3
University of Texas at Austin	Texas	**Transportation Systems**		
University of Texas at Austin	Texas	**Traffic Engineering**		3
University of Texas at Austin	Texas	**Design and Eval of Ground Based Transportation Systems**		3
University of Texas at Austin	Texas	**Optimization Techniques in Transportation Engineering**		3
University of Texas at El Paso	Texas	**Advanced Travel & Infrastructure Demand Analysis**	This course addresses new developments in the econometric and behavioral aspects of demand analysis and forecasting, through a number of model-estimation methods that are used in transportation data analysis, economic analysis, and other subject areas that deal with data analysis. Applications include passenger travel, urban activity decisions, user responses to information, freight transportation as well as the demand for other types of infrastructure facilities and services. It is important to note that the methods presented can be used in wide variety of data-analysis applications and go well beyond the techniques typically covered in statistics courses.	3

College/University	State	Course Name	Description	Credits Earned
University of Texas at El Paso	Texas	**Highway Geometric Design**	This course will provide students with an understanding of the basic principles and techniques of highway design. This will include laying out potential routes, detailed design of the alignment, and evaluation of drainage, earthwork, and intersection requirements. The student should be able to understand and apply these principles to highway design problems. The student will use existing computer tools to generate and analyze designs. Upon completion, students should be prepared to work in the field of highway design and to study advanced topics in roadway design.	3
University of Texas at El Paso	Texas	**Infrastructure Network Flow Analysis and Optimization**	The primary focus of this course is on the use of quantitative techniques of operations research to model system performance, design transportation services, and analyze transportation network problems through the design, analysis and implementation of algorithms. Topics include introductions to data structures, memory management and complexity analysis; application of graph theory and network analysis to transportation problems (including shortest path, vehicle routing and other problems arising in connection with scheduled and unscheduled systems); analytical approaches to the formulation of network equilibrium assignment problems and solution algorithms.	3
University of Texas at El Paso	Texas	**Traffic Engineering**	Traffic Engineering Human, vehicular, and traffic characteristics as they relate to driver-vehicle roadway operational systems, traffic studies, and methods of analysis and evaluation. Traffic flow theory and application of traffic control, signalization, and freeway operations. Intelligent transportation systems.	3
University of Texas at El Paso	Texas	**Traffic Flow/ Simulation Modeling**	This is a comprehensive introductory course to traffic flow and simulation modeling. Topics include: basic microscopic; mesoscopic and macroscopic traffic flow theories; advanced traffic flow theories such as high-order traffic flow theories; analytical and simulation based traffic flow modeling; traffic simulation models and their applications.	3
University of Texas at El Paso	Texas	**Urban Transportation Planning**	This course introduces the student to transportation planning and provides the student with an understanding of transportation planning models, including travel demand models of trip generation, trip distribution, mode choice, and traffic assignment. Practical problems are assigned to provide familiarity with models used and experience in data handling and estimation.	3
University of Texas at Tyler	Texas	**Traffic Engineering: Operations and Control**	Introduction to traffic systems, flow characteristics, data collection, control of urban streets and freeways, operations of arterial streets, freeway, and networks, optimal signal timing design, capacity analysis using computer simulation. Additionally, the course will cover a detailed Evaluation of stresses in flexible pavements, materials characterization, and design of flexible pavements for highways and airports.	3
University of Texas at Tyler	Texas	**Transportation Engineering Systems**	The first course of your transportation engineering classes under the civil engineering curriculum. During the upcoming semester, I believe you will find our study of transportation engineering systems as well as pavement design and analysis to be interesting, challenging, and rewarding.	3
University of Texas at Tyler	Texas	**Transportation Systems Management and Operations**	Foundations of the transportation system management and operations, including arterial street systems and freeway systems. Principles of simulation of urban streets operations and traffic signal control and optimization, and freeway operations analysis and simulation using commercially available packages.	3

College/University	State	Course Name	Description	Credits Earned
University of Texas at Tyler	Texas	**Urban Transportation Planning**	Overview of the four step urban transportation planning process, estimation of the travel demand models of trip generation, trip distribution, mode choice, and traffic assignment, and the forecasting of travel patterns using the travel demand models, state-of-the-art approaches and transportation network analysis for evaluation of system alternatives.	3
University of the District of Columbia	Washington, D.C.	**Transportation Engineering Lecture**		3
University of the Pacific	California	**Transportation Engineering**	Students study the considerations and procedures in the planning, design, and operation of various transportation systems with primary emphasis on highways. Prerequisites: Completion of all Fundamental Skills. Junior or Senior standing.	4
University of Turabo	Puerto Rico	**Highway Engineering**	Three hours of lecture per week. Geometric design of highways. Analysis, behavior, performance, and structural design of pavements for highways.	3
University of Turabo	Puerto Rico	**Transportation and Traffic Engineering**	Three hours of lecture per week. Fundamental principles of traffic flow, operations, and controls. Capacity analysis and level of service evaluation of highways.	3
University of Utah	Utah	**Transportation Engineering**		
University of Vermont	Vermont	**Design/Planning for Bikes/Pedestrian**	Interdisciplinary introduction to design/planning concepts for bikes/pedestrians from a systems view. Examines current best practices on how effectively they address social, environmental, economic, and health related transportation issues.	3
University of Vermont	Vermont	**Intelligent Transportation Systems**	Introduction to Intelligent Transportation Systems (ITS), ITS user services, ITS applications, the National ITS architecture, ITS evaluation, and ITS standards.	3
University of Vermont	Vermont	**Traffic Operations & Design**	Advanced concepts of traffic engineering and safety; human, vehicle and environment factors; simulation and statistical analysis software; transportation design manuals.	3
University of Vermont	Vermont	**Transportation**	Analysis of transportation systems; technological characteristics; the transportation planning process and techniques of travel modeling and forecasting for both urban and rural areas.	3
University of Vermont	Vermont	**Transportation Systems**	Transportation systems planning, analysis, and design with foci on safety, modeling, decision support, and environmental impacts.	3
University of Virginia	Virginia	**Introduction to Geographic Information Systems**		
University of Virginia	Virginia	**Introduction to Transportation Planning**		
University of Virginia	Virginia	**Traffic Operations**		
University of Virginia	Virginia	**Transportation Facilities Design**		
University of Virginia	Virginia	**Transportation Infrastructure Design**		
University of Washington	Washington	**GIS for Civil Engineers**	GIS in civil engineering applications. Geographic and spatial data types and acquiring considerations. Data models and structures. Projections and transformations. Attribute-based operation, spatial operations. Surfaces and near neighbors. Training on Arc GIS software.	3
University of Washington	Washington	**Traffic Engineering Fundamentals**	General review of the fundamentals of traffic engineering, including their relationship to transportation operations management and planning, with emphasis on calculations and procedures in the Highway Capacity Manual; field surveys and data analysis.	3
University of Washington	Washington	**Traffic Simulation**	In-depth discussion of microscopic traffic simulation models. Will provide engineering and planning students the information on how to develop and operate traffic simulation models and evaluate and present results from simulation models. Hands-on course projects and labs will be used for this course.	3

College/University	State	Course Name	Description	Credits Earned
University of Washington	Washington	**Transportation and Construction Capstone Design Project**	Comprehensive design project focusing on planning, design, and construction of a transportation project such as highways, transit, and airports.	5
University of Washington	Washington	**Transportation Data Management**	Introduction to modern concepts, theories, and tools for transportation data management and analysis. Applications of software tools for transportation data storage, information retrieval, knowledge discovery, data exchange, online information sharing, statistical analysis, system optimization, and decision support.	3
University of Washington	Washington	**Transportation Engineering**	Studies vehicular transportation fundamentals including vehicle dynamics, geometric design, pavement design, traffic flow concepts, level of service analysis, intelligent transportation systems, travel demand prediction methods, freight logistics, and management of transportation systems. Includes a review of relevant vehicle operating characteristics.	5
University of Washington	Washington	**Urban Transportation Planning and Design**	Brief review of major issues in urban transportation planning. Planning process discussed and transportation models introduced. Uses a systems framework, including goals and objectives, evaluation, implementation, and monitoring. A design term project, individual or small groups, utilizes material presented on a contemporary problem.	3
University of Wisconsin - Madison	Wisconsin	**An Introduction to Geographic Information Systems**	Design, implementation and use of automated procedures for storage, analysis and display of spatial information. Covers data bases, information manipulation and display techniques, software systems and management issues. Case studies. Meets with Civil Environmental Engineering 357.	3
University of Wisconsin - Madison	Wisconsin	**Geometric Design of Transport Facilities**	Problems in ground transportation facility design; generation, capacity, location and design; rural and urban at-grade intersection design; grade separations; interchanges; parking lots and terminals.	3
University of Wisconsin - Madison	Wisconsin	**Seminar-Transportation Engineering**	Current problems and research developments in transportation, highways, traffic engineering, and transportation planning and systems analysis.	1
University of Wisconsin - Madison	Wisconsin	**Traffic Control**	Traffic data collection studies; measures of effectiveness and evaluation of traffic system performance; design and application of traffic control devices; design of traffic signal systems; operational controls and traffic management strategies.	3
University of Wisconsin - Madison	Wisconsin	**Transportation Engineering**	Characteristics of transportation supply and demand; measuring and estimating demand; social and environmental impacts; planning of transportation systems; characteristics of transportation modes; interaction between modes; mode interfaces; transportation technology; economics; public policy, implementation and management.	3
University of Wisconsin - Madison	Wisconsin	**Urban Transportation Planning**	Principles of planning, evaluation, selection, adoption, financing, and implementation of alternative urban transportation systems; formulation of community goals and objectives, inventory of existing conditions; transportation modeling--trip generation, distribution, modal choice, assignment, technological characteristics and operation of modern transit and other movement systems.	3
University of Wisconsin - Milwaukee	Wisconsin	**Traffic Control**	Control of transportation systems with emphasis on traffic engineering principles. Data collection, capacity analysis, traffic improvements, signalization, signs and markings, channelization, intersection, speeds and safety considerations.	3
University of Wisconsin - Milwaukee	Wisconsin	**Transportation Engineering**	Technological and common elements of all modes of transportation; their effect on performance, demand, and outputs of a transportation system. Development of new transportation systems.	3
University of Wisconsin - Milwaukee	Wisconsin	**Transportation Facilities Design**	Physical design of transportation facilities including geometric design and terminals for highway, rail, air and water transportation. Student project work will be required.	3

College/University	***State***	***Course Name***	***Description***	***Credits Earned***
University of Wisconsin - Milwaukee	Wisconsin	**Urban Transportation Planning**	Techniques used to plan urban transportation systems; data collection, trip generation, trip distribution, factors underlying the choice of mode, traffic assignment, modeling and evaluation techniques.	3
University of Wisconsin - Platteville	Wisconsin	**Geographic Information Systems**	Basic GIS concepts in cartography and digital mapping, geodetic datums and control, map projections and coordinates, databases, topology, spatial queries/analysis, digital orthophotography, digital elevation models, and applications. Use of state-of-the-art software and World Wide Web components for GIS.	3
University of Wisconsin - Platteville	Wisconsin	**Highway Engineering**	Comprehensive design of contemporary highway projects. Emphasis on improving utilization of existing facilities and creating efficient new facilities through transportation system management techniques. Consideration of geometric and intersection design and standards; earthwork computations; design of parking facilities; design of highway surface and subsurface drainage systems; environmental, mobility and community impacts as measures of effectiveness.	3
University of Wisconsin - Platteville	Wisconsin	**Traffic Engineering**	Elements of traffic engineering including road user, vehicle and roadway system; traffic flow theory; traffic studies and data collection; traffic control devices; principles of intersection signalization; capacity and level of service analysis for freeways, rural highways and intersections using state-of-the-art software for traffic operations and management.	3
University of Wisconsin - Platteville	Wisconsin	**Transportation Engineering**	Introductory overview of transportation systems with emphasis on the highway mode of transportation. Topics include fundamentals of transportation economics, land-use and transportation interaction, elements of transportation planning, traffic operations, concepts of highway locations and geometric design, and introduction to flexible and rigid pavement systems.	3
University of Wyoming	Wyoming	**Geometric Design of Highways**	Criteria controlling geometric design of highways including design speed, design volume, vehicle requirements and capacity design standards for different highway types; design of sight distance, alignment, grade; cross-section design; access control, frontage roads; intersection design elements, and design of intersections and interchanges.	3
University of Wyoming	Wyoming	**Traffic Engineering: Operations**	Basic characteristics of traffic, such as drivers, vehicles, volumes, speeds, delay, origins and destinations, intersection performance, capacity, termination and accidents; techniques for making traffic engineering investigations; traffic laws and ordinances, regulations, design and application of signal systems; curb parking control; enforcement and traffic administration; and public relations.	3
University of Wyoming	Wyoming	**Transportation Engineering**	Introduction to the major topics in Transportation Engineering. Focus areas include roadway and non-motorized facility design, traffic operations, transportation planning, and pavement materials and design.	3
University of Wyoming	Wyoming	**Wyoming D.O.T. Design Squad Cooperative Experience**	Experience with Wyoming Department of Transportation design procedures and fundamentals. Participation in development of design documents used to construct actual projects.	3
Utah State University	Utah	**Geometric Design of Highways**	Principles of highway location and planning, with full consideration of economic, environmental, and other impacts. Capacity analysis of intersections and highways, passing-lane design, and risk-cost based horizontal and vertical alignment design. Introduction to design software through coursework and term projects.	3
Utah State University	Utah	**Traffic Engineering**	Topics covered include characteristics, measurements, and analysis of volume, speed, density, and travel time; capacity and level of service analysis; signalization and traffic control devices.	3

College/University	State	Course Name	Description	Credits Earned
Utah State University	Utah	**Urban and Regional Transportation Planning**	Examination of travel demand forecasting, data collection, and survey data analysis techniques. Focuses on transportation-land use interactions and impact of market-based policies on travel demand. Theories and applications of traditional and advanced trip distribution, mode choice, and route assignment models.	3
Valparaiso University	Indiana	**Design Of Transportation Facilities**	Infrastructure and associated needs for transportation facilities. Highway geometric design and the necessary design aids will be a major focus of the class, but other facilities will also be addressed, particularly rail and airport design. Other topics will include pavement design and the explicit incorporation of safety into the design process.	3
Valparaiso University	Indiana	**Introduction to Transportation Engineering**	Topics include transportation system characteristics, transportation demand, transportation planning, transportation engineering studies, human and vehicle design factors, traffic flow and operations, signing and marking, and safety. While highway modes occupy a majority of the time due to their relative importance, other modes such as rail, air, and water will also be discussed.	3
Vanderbilt University	Tennessee	**Geographic Information Systems**	Principles of computerized geographic information systems (GIS) and analytical use of spatial information. Integration with global positioning systems (GPS) and internet delivery. Includes GIS software utilization and individual projects.	3
Vanderbilt University	Tennessee	**Intelligent Transportation Systems**	Elements of intelligent transportation system (ITS) architecture. Survey of component systems. Analysis of potential impacts. Field operational tests, analysis methods, deployment initiatives and results.	3
Vanderbilt University	Tennessee	**Traffic Engineering**	Analysis of the characteristics of traffic, including the driver, vehicle, volumes, capacities, congestion, roadway conditions, complete streets and accidents. Traffic regulations, markings, signing, signalization, and safety programs are also discussed. Prerequisite: CE 3501 or CE 3601.	3
Vanderbilt University	Tennessee	**Transportation Systems Design**	Geometric analysis of transportation ways with particular emphasis on horizontal and vertical curve alignment and superelevation. Design of highways, interchanges, intersections, and facilities for pedestrians, and air, rail, and public transportation. Prerequisite: CE 3501 or 3601.	3
Vanderbilt University	Tennessee	**Transportation Systems Engineering**	Planning, design, and operations of transportation systems. Particular emphasis on the design process, traffic engineering, urban transportation planning, the analysis of current transportation issues, and the ethics of transportation safety.	3
Vanderbilt University	Tennessee	**Urban Transportation Planning**	Analytical methods and the decision-making process. Transportation studies, travel characteristic analysis, and land-use implications are applied to surface transportation systems. Emphasis is on trip generation, trip distribution, modal split, and traffic assignment. Planning processes in non-urban settings are also presented.	3
Villanova University	Pennsylvania	**Transportation Engineering**	Introduction to transportation planning, intermodal transportation systems, roles of government agencies, alternatives analysis, environmental justice and right-of-way process, facility design (alignment, geometrics), operations (capacity, level of service, traffic control, queuing), and air/public/freight/port and future modes of transportation.	3
Virginia Military Institute	Virginia	**Transportation Engineering**	An overview of highway transportation systems and their relationship to the growth of urban metropolitan areas. The course explores the basic characteristics of highway design and operation and the engineering analysis of highway projects.	3

College/University	***State***	***Course Name***	***Description***	***Credits Earned***
Virginia Military Institute	Virginia	**Transportation Planning and Design**	An overview of the highway transportation modeling process and the relationship of accessibility and urban development highway designs. A special emphasis is placed on intersection planning and design. Field data collecting methods are performed and microscopic transportation modeling packages are utilized to evaluate and analyze intersections.	3
Virginia Polytechnic Institute and State University	Virginia	**Airport Planning and Design**	Airport planning and economic justification, site selection, configuration, development and design of terminal areas, demand forecasting, access, traffic control.	3
Virginia Polytechnic Institute and State University	Virginia	**Geometric Design of Highways**	Functional design of highways; curves, intersections, interchanges, drainage, and other features involved in highway safety and traffic efficiency.	3
Virginia Polytechnic Institute and State University	Virginia	**Introduction to Transportation Engineering**	Planning, design and operation of transportation systems with emphasis in multimodal transportation techniques and unified system engineering theories to analyze large scale transportation problems. Discussion of Intelligent Vehicle Highway Systems (IVHS) and hands on experience in computer models in transportation operations and planning. Interactions between transportation infrastructure and environmental engineering planning.	3
Virginia Polytechnic Institute and State University	Virginia	**Planning Transportation Facilities**	Transportation planning process; urban and regional studies, surveys, data analysis, model development and testing; transportation management, administration, finance, system evaluation, implementation, and integration.	3
Virginia Polytechnic Institute and State University	Virginia	**Traffic Engineering**	Study of traffic and parking characteristics; application of traffic control devices; principles and techniques used to improve the efficiency and safety of traffic flow systems.	3
Virginia Polytechnic Institute and State University	Virginia	**Traffic Signal System Operation and Control**	Traffic signal system control, with emphasis in arterial operation. Signal system design and operations, traffic simulation techniques, advanced traffic control strategies, and incorporation of surface street systems into Intelligent Transportation Systems (ITS). Hands-on experience in signal system software and hardware.	3
Virginia Polytechnic Institute and State University	Virginia	**Transportation Safety**	Basic principles associated with transportation safety related to humans, vehicles and infrastructure as well as principles of design for safety and practices of empirical evaluation of safety. Principles and practices of accident investigation and injury epidemiology as well as safeguards and control practices. A grade of C- or better required in prerequisite.	3
Washington State University	Washington	**Advanced Topics in Transportation Engineering**	May be repeated for credit; cumulative maximum 9 hours. Special topics course in transportation engineering. Cooperative: Open to UI degree-seeking students.	Varies
Washington State University	Washington	**Transportation Engineering**	Road-vehicle interaction, geometric design, traffic flow and queuing theory, highway capacity and level of service, and introduction to pavement design and materials. Typically offered Fall and Spring. Cooperative: Open to UI degree-seeking students.	3
Wayne State University	Michigan	**Highway Design**	Application of standards, theory and practice in design of streets and highways. Design of streets and highways including cross section elements, shoulder and roadside features. Pavement design and rehabilitation work.	3
Wayne State University	Michigan	**Transportation Design**	Open only to students enrolled in professional Engineering programs. A description of design elements of various system components of transportation; including the driver, vehicle and roadway. Traffic flow design elements including volume, density and speed; intersection design elements including delay, capacity and accident countermeasures and terminal design elements including inflow, outflow and circulation.	3

College/University	State	Course Name	Description	Credits Earned
Wayne State University	Michigan	**Transportation Engineering**	Open only to students enrolled in professional Engineering programs. Transportation functions; transportation systems including highways, railways and airways. Techniques of transportation systems analysis including optimization, network flows and queueing theory. Material fee as indicated in the Schedule of Classes	3
Wayne State University	Michigan	**Transportation Policy and Planning**	Introduction to the role of transportation in the planning process involving both regional and urban considerations.	3
Wentworth Institute of Technology	Massachusetts	**Highway Engineering**	Introduction to principles of highway engineering, including the history of transportation engineering, fundamentals of traffic flow and driver characteristics, intersection design and control, capacity and level of service of highways and intersections, geometric design of highways, highway drainage, principles of pavements, design of flexible and rigid pavements, and pavement management.	4
Wentworth Institute of Technology	Massachusetts	**Traffic Systems Analysis**	Subjects include traffic signals and controls, traffic system analysis, microscopic level simulations, VBA coding, level of service analysis.	3
West Texas A&M University	Texas	**Transportation Engineering**	Introduction to planning and operations of transportation facilities, vehicle/operation/infrastructure characteristics, technological, economic and environmental factors. Introduction to traffic engineering and road/highway planning. Emphasis on design, construction and maintenance, earthwork, drainage structures, pavements, safety features, and sustainability.	3
West Virginia University	Virginia	**Highway Engineering**	Highway administration, economics and finance; planning and design; subgrade soils and drainage; construction and maintenance. Design of a highway. Center line and grade line projections, earthwork and cost estimates.	3
West Virginia University	Virginia	**Introduction to Transportation Engineering**	Integrated transportation systems from the standpoint of assembly, haul, and distribution means. Analysis of transport equipment and traveled way. Power requirements, speed, stopping, capacity, economics, and route location. Future technological developments and innovations.	4
West Virginia University	Virginia	**Pedestrian/Bike Transportation**	Planning, design, operation and maintenance of pedestrian and bicycle facilities, including multi-use trails; policies to encourage non-motorized travel; traffic calming; accessibility and ADA requirements; connections to transit. (3 hr. lec.).	3
West Virginia University	Virginia	**Railway Engineering**	Development and importance of the railroad industry. Location, construction, operation, and maintenance. (3 hr. lec.).	3
West Virginia University	Virginia	**Traffic Engineering and Operations**	Driver and vehicular characteristics, horizontal and vertical curve design, traffic flow theory, analysis of traffic engineering data, traffic engineering studies, traffic signal analysis and design.	3
West Virginia University	Virginia	**Urban Transportation Planning and Design**	Principles of planning and physical design of transportation systems for different parts of the urban area. Land use, social, economic, and environmental compatibilities emphasized. Evaluation and impact assessment. (3 hr. lec.).	3
West Virginia University Institute of Technology	Virginia	**Highway Engineering**	Highway administration, economics and finance; planning and design; subgrade soils and drainage; construction and maintenance. Design of a highway. Center line and grade line projections, earthwork and cost estimates.	3
West Virginia University Institute of Technology	Virginia	**Traffic Engineering**	Traffic engineering concepts and parameters, traffic data collection and analysis methods, theory and design of traffic control systems, traffic safety and operations analysis.	3
West Virginia University Institute of Technology	Virginia	**Transportation Engineering**	Introduction to integrated transportation systems, vehicle, roadway and human characteristics, traffic engineering studies, intersections and interchanges, highway geometric design, highway pavement design, transportation planning, highway capacity analysis and evaluation of alternatives.	3

College/University	State	Course Name	Description	Credits Earned
Western Kentucky University	Kentucky	**Transportation Engineering**	An introduction to transportation engineering. Development of transportation systems in the United States. Route geometrics and design. Traffic flow characteristics and control. Planning, financing, and economic analysis of transport facilities.	3
Western Michigan University	Michigan	**Traffic Design**	Elements of traffic engineering including traffic flow theory, highway capacity analysis and traffic control systems. Traffic engineering tools and implements including traffic sensor and data systems, parking and traffic accident analysis, freeway traffic management systems and uniform traffic control devices. Application of control measures such as ramp metering systems, actuated signal control systems and traffic impact analysis. Concepts in transportation system management, cost-effectiveness, and public policies.	3
Widener University	Pennsylvania	**Transportation Engineering**	Study of the general concepts in planning and design of airports, highways, railroads, water transportation, and mass transit systems. Methodology of determining transportation systems requirements and feasibility.	
Worcester Polytechnic Institute	Massachusetts	**Transportation: Traffic Engineering**	This course provides an introduction to the field of transportation engineering with particular emphasis on traffic engineering. Topics covered include a description of the transportation industry and transportation modes; characteristics of drivers, pedestrians, vehicles and the roadway; traffic engineering studies, highway safety, principles of traffic flow, intersection design and control, capacity analysis, and level of service analysis.	3
Youngstown State University	Ohio	**Highway Design**	Methods of highway route location; design methods and standards for highways, intersections, freeways, and interchanges. Includes extensive use of computer-aided design.	3
Youngstown State University	Ohio	**Transportation Engineering**	Introductory survey of transportation topics including transportation systems, vehicular operation and control, and transportation planning techniques; introduction to design of highways, airports, and railroads; and traffic engineering.	3
Youngstown State University	Ohio	**Transportation Technology**	Transportation planning and highway system design. Familiarization with AASHTO design manuals; geometric design and signalization of highway segments; capacity analysis and route selection. Cost-benefit analysis for transportation projects.	3

Appendix B: Catalog of TSMO-related Graduate Courses

College/University	State	Course Name	Description	Credits Earned
Auburn University	Alabama	**Intelligent Transportation Systems**	Introduction to intelligent transportation systems, covering applications of information and communications technologies to transportation, with emphasis on operations of traffic management and traveler information systems	3
Auburn University	Alabama	**Public Transportation**	Technology and characteristics of public transportation; transportation demand analysis; transit users; innovative technologies.	3
Auburn University	Alabama	**Roadside Design**	Concepts of roadside design that can prevent or reduce crash severity. Topics include design, selection, placement and construction of longitudinal barriers, crash cushions, bridge rails, transitions, end terminals, sign posts, and other roadside features.	3
Auburn University	Alabama	**Traffic Control Systems**	Fundamental design concepts for highway traffic control systems. Control requirements and warrants: hardware operation and equipment selection; development and implementation of timing plans for isolated intersections and intersection networks.	3
Auburn University	Alabama	**Traffic Engineering Analysis**	Capacity analysis of rural and suburban highways, 2-lane highways, freeways, weaving sections, ramps and intersections.	3
Auburn University	Alabama	**Traffic Flow Theory**	Basic phenomena underlying traffic stream movement and individual vehicle behavior. Topics include flow parameters and relationships; microscopic and macroscopic flow models; equations of motion and state; single and multi-regime flow models.	3
Auburn University	Alabama	**Transportation Safety**	Transportation safety problems and the engineer's role in developing and administering safety programs. Topics include hazardous location identification; analysis of accident data; development and evaluation of accident countermeasures and safety programs.	3
Boise State University	Idaho	**Highway and Traffic Systems Design**	Planning, design, and operations of urban and rural highway system	
Boise State University	Idaho	**Traffic Engineering**	Covers the theory and practice of traffic operations, control, and management. Topics include traffic signal systems, isolated and area-wide signal system operations, and traffic simulation. Use of software and completion of a project will be required	

College/University	State	Course Name	Description	Credits Earned
Bradley University	Illinois	**Traffic Signal Design**	Analysis and design of traffic signals for isolated intersections and coordinated systems. Hardware, communication, and detection systems associated with signal systems. Fundamental concepts of simulation of traffic operations. Application of optimization/simulation computer software programs	3
Bucknell University	Pennsylvania	**Introduction to Roadside Safety**	Fundamentals of roadside safety design and analysis: topics include traffic barrier warranting and selection, crash data analysis, hardware performance evaluation, and benefit/cost analysis.	4
California State Angeles	California	**Urban Transportation Planning**	Travel forecasting, data requirements, collection methods, trip generation and distribution models; modal split analysis, trip assignment, plan alternatives, and evaluation methodology.	3
California State University, Fresno	California	**Traffic Operations and Control**	Transportation studies. Highway traffic characteristics. Highway system traffic analysis. Highway system capacity design. Traffic regulations and control.	3
California State University, Fresno	California	**Transportation Geographic Information Systems (GIS)**	This course covers basic and advanced concepts of Transportation GIS, introduces basic applications of two ArcGIS extensions (spatial and network analysts), and enables advanced applications of user-defined functions through the usage of the Model Builder and Python scripting.	3
California State University, Fresno	California	**Transportation Planning and Design**	Geometric design of land transportation facilities, primarily road/street systems. Traffic theory and analysis, including statistical analysis of traffic parameters. Freeway and intersection capacity. Simple transportation demand forecast.	3
California State University, Long Beach	California	**Advanced Traffic Engineering**	analysis of arterial streets traffic operations. Queuing Analysis; Signal timing coordination and optimization; Use of traffic optimization and simulation computer models to solve problems.	3
California State University, Long Beach	California	**Traffic Operations**	Principles of traffic flow. Highway traffic operations. Evaluation of quality of traffic operations including long-range impact on efficient use of the systems and on safety. Identification and evaluation of measures of effectiveness. Travel demand management strategies and intelligent transportation system applications.	3

College/University	State	Course Name	Description	Credits Earned
California State University, Los Angeles	California	**Traffic Flow Analysis**	Measurements and analysis of traffic flow characteristics: speed, density, flow, headway; statistical data analysis, time-space diagrams, traffic flow models, queuing theory, shock wave analysis, traffic models applications.	3
California State University, Sacramento	California	**Advanced Transportation Facility**	Advanced study of current topics in highway and mass transportation facility design including safety, curve design, pavement design and drainage facility design. Focuses on current design practice and recent or impending changes in design practice	3
California State University, Sacramento	California	**Analysis and Control of Traffic Systems**	Traffic data collection and analysis, practical application of theoretical methods of analysis such as capacity, level of service, and queuing theory. Investigation of traffic control techniques such as actuated signals and signal systems, and study of management techniques for traffic congestion.	3
California State University, Sacramento	California	**Traffic Flow Theory.**	Study of traffic flow characteristics including flow rate, speed, and density, at both the microscopic and macroscopic levels. Traffic flow analysis using the theoretical methods including capacity analysis, traffic stream models, shockwave analysis, and queuing analysis. Emphasis is on theory with demonstration of practical applications.	3
California State University, Sacramento	California	**Transportation Planning**	Introduction to the complexities of comprehensive intermodal transportation planning. Study of transportation problems, system operating characteristics, alternative modes, and the planning process. Analyzes factors affecting travel behavior and methods of forecasting demand for travel by various modes	3
Clarkson University	New York	**Transportation Systems Design**	A properly designed transportation system improves transportation mobility and accessibility while minimizing harm to our physical, natural, and social environments. The overall goal is to bring together engineers and scientists, social scientists, biologists, ecologists and economists to create the knowledge and technology that will lead to better investments and to smarter policies in transportation energy systems.	

College/University	*State*	*Course Name*	*Description*	*Credits Earned*
Clemson University	South Carolina	**Applications in Traffic Engineering**	Highway capacity analysis; design of unsignalized intersections; intelligent transportation systems; parking; traffic signal coordination; microscopic and macroscopic traffic simulation.	3
Clemson University	South Carolina	**Intelligent Transportation Systems**	Students learn concepts of Intelligent Transportation Systems (ITS), including traffic flow principles, advanced traffic sensor and communications technologies and real-time management strategies, to increase the safety and efficiency of the surface transportation system. Covers the process of planning, design and operations of ITS.	3
Clemson University	South Carolina	**Roadway Geometric Design**	Geometric design of roadways, at-grade intersections, and interchanges in accordance with conditions imposed by driver ability, vehicle performance, safety, and economics.	3
Clemson University	South Carolina	**Traffic Engineering Operations**	Basic characteristics of motor-vehicle traffic, highway capacity, applications of traffic control devices, traffic design of parking facilities, engineering studies, traffic safety, traffic laws and ordinances, public relations.	3
Clemson University	South Carolina	**Transportation Safety Engineering**	Methodology for conducting transportation accident studies; accident characteristics as related to operator, facility, and mode; statistical applications to accident data; current trends and problems in transportation safety.	3
Clemson University	South Carolina	**Travel Demand Forecasting**	In-depth coverage of travel-demand forecasting theory and the four-step process; site impact analysis; disaggregate demand models. Students work in groups to develop a computer-based travel forecasting model for a small city.	3
Clemson University	South Carolina	**Urban Transportation Planning**	Urban travel characteristics, characteristics of transportation systems, transportation and land-use studies, trip distribution and trip assignment models, city patterns, and subdivision layout.	3
Cleveland State University	Ohio	**Highway Engineering**	Properties of materials used in highway construction. Effects of loading and the environment on pavement life. Design of flexible and rigid pavement systems. Construction methods and management.	3

College/University	State	Course Name	Description	Credits Earned
Cleveland State University	Ohio	**Highway Safety**	This course covers: Crashes, contributing factors, crash analysis and estimation methods, and the roadway safety management process including: network screening; diagnosis; selection of countermeasures; economic analysis; project prioritization; and safety effectiveness evaluation.	3
Cleveland State University	Ohio	**Traffic Flow Theory**	he Traffic Flow Theory course provides the basic concepts and theories of traffic flow characteristics and the associated analytical techniques. This course reviews the foundations of traffic science and presents the major classes of models derived for traffic flow. Recent developments and topics of current research are introduced. The course also addresses the implications of the models and the traffic system properties for traffic operations and control.	3
Cleveland State University	Ohio	**Transportation Engineering**	Survey of transportation development, characteristics, and planning; traffic characteristics capacity of various systems, including basic procedures, controls, and criteria in highway design; environmental considerations.	3
Cleveland State University	Ohio	**Urban Transportation Planning**	Focus on factors involved in the process of urban planning and regional transportation systems, encompassing all modes. Provides students with theory and applications of urban transportation planning studies, traffic models, investment models, programming and scheduling.	3
Florida A&M University	Florida	**Advanced Traffic Flow Analysis**	Traffic Flow Characteristics, Demand And Supply Analysis, Capacity Analysis, Traffic Stream Models, Queuing Analysis, Computer Simulation Models, Network Analysis, And Intelligent Transportation Systems (its).	8
Florida A&M University	Florida	**Highway Geometric Design**	Principles And Procedures For The Geometric Design Of Highways And Streets; Consideration Of Traffic, Land Use, And Aesthetic Factors.	6

College/University	State	Course Name	Description	Credits Earned
Florida A&M University	Florida	**Intelligent Transportation Systems**	Course Covers Advanced Traffic Management Systems (atms), Advanced Traveler Information Systems (atis), Advanced Vehicle Control Systems, Commercial Vehicle Operations, Rural Its, Human Factors, Institutional Issues, Architecture And Standards, Simulation And Modeling.	5
Florida A&M University	Florida	**Traffic Engineering**	Nature, Characteristics, And Theories Of Traffic Flow; Street And Highway Traffic Problems. Traffic Survey Procedures And Origin-destination Studies. Theory And Design Of Automatic Control Of Traffic Systems And Transit Systems.	7
Florida A&M University	Florida	**Traffic Engineering**	Nature, Characteristics, And Theories Of Traffic Problems. Traffic Survey Procedures, Origin-destination Studies. Introduction To Theory And Design Of Automatic Control Of Traffic Systems	3
Florida A&M University	Florida	**Traffic Operations**	Operation Of Transportation Systems, Monitoring, Regulation, And Control Traffic.	4
Florida Atlantic University	Florida	**Highway Engineering**	Route selection including environmental impacts, vertical and horizontal alignment, intersection design, evaluation of subgrade soil strengths, and pavement design, drainage, and overlay design	3
Florida Atlantic University	Florida	**Highway Traffic Characteristics and Measurements**	This course instructs students on the concept of advanced traffic operations including the characteristics of functional relationships between traffic modeling and travel demand forecasting. Students evaluate transportation scenarios and design solutions to improve traffic operations.	3
Florida Atlantic University	Florida	**Intelligent Transportation Systems**	Provides instruction on topics related to intelligent transportation systems, including theoretical fundamentals of systems engineering, traffic flow theory, architecture of telecommunications networks, freeway and arterial management and other topics related to ITS.	3
Florida Atlantic University	Florida	**Maritime Freight Operations**	Addresses important transportation modeling techniques for maritime freight transport. Mathematical models are used to represent transportation problems, and commercial computer software packages are used to evaluate and investigate modern freight transportation systems.	3

College/University	*State*	*Course Name*	*Description*	*Credits Earned*
Florida Atlantic University	Florida	**Sustainable Public Transportation**	Designed to outline the principles of transit systems in the urban transportation arena, functional relationships that govern bus and rail transit, and issues associated with unbalanced flow and lane control, transportation system management and railroad economics and policies.	3
Florida Atlantic University	Florida	**Traffic Signal Systems**	This course teaches students about advanced concepts of traffic signal systems that are currently used in the U.S. Students design, evaluate and optimize various components of traffic signal operations both for individual intersections and coordinated traffic signal systems.	3
Florida Institute of Technology	Florida	**Deterministic Operations Research Models**	An applied treatment of modeling, analysis and solution of deterministic operations research problems. Includes model formulation, linear programming, network flow and transportation problems and algorithms, integer programming and dynamic programming.	3
Florida Institute of Technology	Florida	**Statistical and Econometric Methods for Transportation Data Analysis**	Teaches model estimation and application for transportation data analysis (least squares regression; simultaneous equations; count-data; discrete outcome; multinomial, nested and mixed logit; ordered data; duration (hazard-based); and random parameters models). Uses NLOGIT.	3
Florida International University	Florida	**Advanced Highway Capacity Analysis**	Parameters involved in calculating highway capacity and level of service on different highway and transportation facilities. Computer application will be also discussed	3
Florida International University	Florida	**Applied Statistics in Traffic and Transportation**	Civil and Environmental Engineering statistics methods as applied to traffic and transportation are covered. Topics include: significance tests, standard distributions, analysis of variance, and regression analysis	3
Florida International University	Florida	**Fundamentals of Traffic Engineering**	Speed and volume studies, stream characteristics, traffic flow theory, accident characteristics	3
Florida International University	Florida	**Mass Transit Planning**	Theories and principles of mass transit planning, include highway transit, rail transit and new transit modes. Design projects required.	3
Florida International University	Florida	**Transportation Demand Analysis**	Travel demand analysis and forecasting. Modeling techniques including trip generation and distribution, mode split, and trip assignment. Practical applications	3

College/University	State	Course Name	Description	Credits Earned
George Mason University	Virginia	**Traffic Engineering Modeling and Analysis**	Covers fundamentals of traffic flow theory; shock-wave analysis; queuing theory; macroscopic traffic flow models on freeway and arterials; fundamentals of traffic simulation; car following models; network analysis based on traffic simulation models; and developing skills to select most appropriate model for given scenarios.	3
George Mason University	Virginia	**Transportation Engineering and the Environment**	Introduction to transportation and air quality; Clean Air Act; greenhouse gases, climate change, and modeling for greenhouse gases; travel activity; The NEPA process for transportation projects; road transportation and noise; noise abatement.	3
George Mason University	Virginia	**Travel Demand Modeling**	Covers elements of Travel Demand Modeling at considerable detail. Design and execution of travel surveys; analysis of survey data; economic and demographic data and analysis; development of classification, regression and discrete choice models for four-step and activity based travel demand models; spatial analysis of data; matrix methods; validation and calibration of models; traffic and transit assignment methods and their application; select-link anal sis. Hands-on modeling assignments	3
George Washington University	Washington, D.C.	**Intelligent Transportation Systems**	Commands, controls, and communications in modern multimodal transportation; infrastructure/highway and vehicle automation, advanced traffic management, vehicle control and safety systems; information, data, and sensory requirements; practical applications and projects.	3
George Washington University	Washington, D.C.	**Traffic Engineering and Highway Safety**	Roadway traffic capacity and network performance measures; steady and unsteady traffic flow phenomena; traffic control signalization theory and practical implementation; monitoring techniques, instruments, and data processing for highway safety. Traffic related highway safety design concepts	3
Georgia Institute of Technology	Georgia	**Advanced Traffic Detection and Control**	Latest developments in traffic control equipment and software, including incident management. Communications- technology alternatives. Video, other above-road detector technologies. Hands-on practice with equipment.	3

College/University	State	Course Name	Description	Credits Earned
Georgia Institute of Technology	Georgia	**Signalized Intersections and Networks**	Traffic-responsive signalization. Detector placement and signal timing at individual intersections. Hands-on practice with equipment. Timing of coordinated systems. Signal plans and specifications.	3
Georgia Institute of Technology	Georgia	**Traffic Engineering**	Characteristics of traffic demand, traffic flow, vehicles, drivers, roadways, and pedestrians. Studies and data analysis. Capacity analysis. Traffic control and intelligent systems. Operations and management.	3
Georgia Institute of Technology	Georgia	**Traffic Flow Theory**	Advanced study of underlying principles and analytical procedures used in performing capacity analyses of transportation facilities. Highway Capacity Manual procedures and other analytical techniques presented.	3
Georgia Institute of Technology	Georgia	**Transit Systems Planning and Design**	Introduction to transit system planning and design concepts. Course will discuss the planning, design, and operations of transit systems, and the operations of intermodal terminals	3
Georgia Institute of Technology	Georgia	**Transportation Infrastructure Management and Traffic Control**	Transportation infrastructure traffic control and safety- related issues are addressed for initial implementation of transportation facilities as well as daily operational aspects.	3
Georgia Institute of Technology	Georgia	**Transportation Safety Analysis**	Understanding the human factors elements of transportation safety, and how to appropriately model the highly complex and stochastic occurrence of accidents on a transportation network.	3
Georgia Institute of Technology	Georgia	**Urban Transportation Planning**	An overview course on the history, finance, operations, modeling, politics, environmental impacts, and planning of urban transportation systems in the United States.	4
Idaho State University	Idaho	**Transportation Engineering**	Fundamentals of earthwork, route location, drainage, and pavement materials with application to geometric and pavement design of highways, streets and rural roads.	3
Illinois Institute of Technology	Illinois	**Advanced Traffic Engineering**	Data collection, statistical analysis, and interpretation of traffic information. Advanced traffic engineering topics such as signaling, street-and-highway capacity analysis, and highway safety research.	3

College/University	State	Course Name	Description	Credits Earned
Illinois Institute of Technology	Illinois	**Algorithms in Transportation**	Modeling and analysis of transportation network problems through the design, analysis, and implementation of algorithms. Emphasis on the use of quantitative and qualitative methods of operations research to model system performance. Covers fundamental data structures, complexity analysis, memory management, recursive programs, application of graph theory, and network analysis to transportation problems, analytical formulations, and solution algorithms for origin-destination estimation, static and dynamic traffic assignments, and transportation resource allocation.	3
Illinois Institute of Technology	Illinois	**Traffic Operations & Flow Theory**	Studies of space and time distribution of speed and other traffic characteristics in the transportation network. Macro, micro, and mesoscopic traffic flow theories. Simulation in traffic networks. Application of flow theories to traffic control and operations.	3
Illinois Institute of Technology	Illinois	**Transportation Economics, Development and Policy**	Application of managerial, micro- and macroeconomic concepts to transportation systems. Investment and impact analysis. Transport policy as it relates to social, economic and environmental issues. Legislative actions affecting transport issues.	3
Iowa State University	Iowa	**Advanced Traffic Operations**	Solve real-world traffic engineering problems; explore interactions between traffic systems components; advanced skills related to signal timing, coordination, and optimization; practical applications of common traffic engineering tools.	3
Iowa State University	Iowa	**International Transportation and Logistics**	Logistics systems and legal framework for the international movement of goods. Operational characteristics of providers of exporting and importing services. The effects of government trade policies on global logistics.	3
Iowa State University	Iowa	**Principles of Transportation**	Economic, operating, and service characteristics of the various modes of transportation, with a special emphasis on freight transportation. Factors that influence transport demand, costs, market structures, carrier pricing, and carrier operating and service characteristics and their influence on other supply chain costs and supply chain performance. Nonmajor graduate credit.	3

College/University	State	Course Name	Description	Credits Earned
Iowa State University	Iowa	**Traffic Engineering**	Driver, pedestrian, and vehicular characteristics. Traffic characteristics; highway capacity; traffic studies and analyses. Principles of traffic control for improved highway traffic service. Application of intersection, corridor or network analysis computer evaluation and optimization tools.	3
Iowa State University	Iowa	**Traffic Safety, Operations, and Maintenance**	Engineering aspects of highway traffic safety. Reduction of accident incidence and severity through highway design and traffic control. Accident analysis. Legal implications. Safety in highway design, maintenance, and operation.	3
Iowa State University	Iowa	**Transportation Data Analysis**	Analysis of transportation data, identification of data sources and limitations. Static and dynamic data elements such as infrastructure characteristics, flow and operations-related data elements. Spatial and temporal extents data for planning, design, operations and management of transportation systems. Summarizing, analyzing, modeling and interpreting data. Use of information technologies for highways, transit, and aviation systems.	3
Iowa State University	Iowa	**Transportation Systems Development and Management Laboratory**	Study of designated problems in traffic engineering, urban transportation planning, and urban development. Forecasting and evaluation of social, economic, and environmental impact of proposed solutions; considerations of alternatives. Formulation of recommendations and publication of a report. Presentation of recommendations in the host community.	3
Iowa State University	Iowa	**Urban Transportation Planning Models**	Urban transportation planning context and process. Project planning and programming. Congestion, mitigation, and air quality issues. Transportation data sources. Travel demand and network modeling. Use of popular travel demand software and applications of geographic information systems. Term project required for graduate credit.	3

College/University	State	Course Name	Description	Credits Earned
Jackson State University	Mississippi	**Highway Engineering**	Analysis of factors in developing a highway transportation facilities; traffic estimates and assignment; problems of highway geometrics and design standards; planning and location principles; intersection design factors; street systems and terminal facilities; programming improvements; drainage design; structural design of surface; concepts of highway management and finance; and highway maintenance planning.	3
Jackson State University	Mississippi	**Traffic Engineering**	Study of fundamentals of traffic engineering; analysis of traffic stream characteristics; capacity of urban and rural highways; design and analysis of traffic signals and intersection; traffic control; traffic impact studies; and traffic accidents	3
Kansas State University	Kansas	**Traffic Engineering**	Traffic operations of roads, streets, and highways; traffic engineering studies; use of signs, signals, and pavement markings as traffic control devices; highway and intersection capacity, design and operations of traffic signals; current microcomputer models and applications	3
Kansas State University	Kansas	**Traffic Flow Theory**	Theory of traffic flow, traffic stream characteristics, car following models, shock wave analysis, queuing analysis, application of statistical methods to traffic engineering problems, traffic simulation.	3
Kansas State University	Kansas	**Transportation Safety**	Importance of transportation safety, crash data collection, common crash databases, traffic safety studies, accident data analysis, identification of high crash locations, traffic control devices as related to safety, special population group safety, traffic conflict studies, accident reconstruction, statistical methods in crash data analysis and traffic calming	3

College/University	*State*	*Course Name*	*Description*	*Credits Earned*
Kennesaw State University	Georgia	**Advanced Highway Design and Traffic Safety**	Providing a safe and efficient transportation system for all users is the primary objective of federal, state, and local transportation agencies throughout the nation. Better highway design practices have been proven to be the most efficient approach to “safer roads”. This advanced highway design and traffic safety class is intended to provide the fundamentals of highway design and operation, human factors and vehicle characteristic and how they interact with the roadway, and highway safety analysis and different statistical techniques employed in the analysis.	3
Kennesaw State University	Georgia	**Transportation Engineering**	Significance of highway transportation to the economy and society, road vehicle performance, geometric design of highways, pavement design, traffic flow and queuing theory capacity and level of service analysis.	3
Lamar University	Texas	**Transportation Engineering and Traffic Analysis**	Introduce students to the principles of transportation engineering with a focus on highway engineering and traffic analysis. The course covers fundamental concepts and principles that guide road design, as well as the movement and control of vehicular traffic. Specifically, these include geometric design, traffic flow theory, highway capacity analysis, traffic signal operations and travel demand and forecasting.	3
Lawrence Technological University	Michigan	**Highway Safety Engineering**	This course addresses concepts of highway safety engineering. Major topics include crash data analysis, statistical methods, site investigation methods, and principles and evaluation of effectiveness of highway safety improvements.	3
Lawrence Technological University	Michigan	**Traffic Engineering**	This course addresses concepts of traffic engineering, traffic studies and traffic control. Major topics include introduction to traffic flow theory, traffic control devices, traffic data analysis, freeway and multilane highway traffic management, signalized intersection analysis and emerging technologies in traffic management.	3

College/University	State	Course Name	Description	Credits Earned
Louisiana State University and A&M College	Louisiana	**Advanced Highway Design and Traffic Safety**	Theoretical development and application of highway design principles, particularly as they relate to safety; analysis of accident statistics, diagnosis of high-hazard locations, risk management, tort liability and design treatments to address high accident locations; design principles of traffic calming, highway-railroad grade crossings, highway work zones and roadway cross-sections.	3
Louisiana State University and A&M College	Louisiana	**Mass Transit Systems**	Historical development, role in society, federal participation and institutional and legislative development of transit; description of conventional and innovative forms, and characteristics of users; planning, vehicle scheduling, environmental impact and energy consumption; system costs, pricing and financing; future systems and policies.	3
Louisiana State University and A&M College	Louisiana	**Traffic Engineering Operations and Control**	Traffic regulations, operational problems and engineering organization; theory and practice of application, design, operation and maintenance of traffic control devices; methods and devices studied include signing, markings, delineation and illumination, signals and signal systems, one-way street and unbalanced-flow street operations, speed zoning and freeway monitoring and control.	3
Merrimack College	Massachusetts	**Traffic Engineering**	Engineering principles for safe and efficient movement of goods and people on streets and highways, including characteristics of users, vehicles and traffic facilities; data collection; traffic control; operational analysis; design; management; safety; parking and related aspect of transportation planning and geometric design.	3
Merrimack College	Massachusetts	**Transportation Planning & Systems Analysis**	Review and critique of techniques used to plan transportation facilities and services in urban areas; application of selected techniques to forecast demand and evaluate transportation alternatives.	3
Michigan State University	Michigan	**Principles of Traffic Engineering**	Driver and vehicle characteristics affecting traffic flow and safety. Speed, density, capacity relationships. Signal control in street networks. Freeway management systems. Risk management and liability	3

College/University	State	Course Name	Description	Credits Earned
Michigan State University	Michigan	**Transportation Engineering**	Overview of transportation system issues and problems. Fundamentals of highway design and operations. Planning and evaluation of transportation system alternatives.	3
Michigan State University	Michigan	**Transportation Planning**	Transportation planning process and procedures. Estimation of travel demand using traditional models of trip generation, trip distribution, modal split, and traffic assignment. Use of "quick-response" procedures. Traffic impact of new facilities.	3
Mississippi State University	Mississippi	**Freight Transportation System Analysis**	Definition, taxonomy and emerging issues for multi-modal transportation systems with focus on freight transportation and mathematical models for complex logistics and supply chain systems	3
Mississippi State University	Mississippi	**Public Transportation**	principles of efficient management, and planning of public transportation systems: capabilities and limitations, optimal scale and layout, design and operation of transit systems	3
Mississippi State University	Mississippi	**Traffic Engineering**	Human and vehicular characteristics as they affect highway traffic flow; traffic regulation, accident cause/prevention; improving flow on existing facilities; planning traffic systems	3
Mississippi State University	Mississippi	**Traffic Flow Theory**	An analysis of the engineering and mathematical principles of traffic flow	3
Mississippi State University	Mississippi	**Traffic Simulation and Advanced Traffic Management**	Understanding of existing traffic control systems. In-depth knowledge of traffic simulation	3
Mississippi State University	Mississippi	**Urban Transportation Planning**	Navigation vessels and their characteristics. Planning and design of Marine Transportation System facilities including navigation ports, channels and locks	3
Mississippi State University	Mississippi	**Waterborne Transportation Engineering**	Navigation vessels and their characteristics. Planning and design of Marine Transportation System facilities including navigation ports, channels and locks	3
Morgan State University	Maryland	**Advanced Intelligent Transportation Systems**	This course exposes students to high-level simulation and communications tools for modeling connected vehicles, including vehicle-infrastructure interface (VII), vehicle-vehicle interface (VVI), adaptive traffic signal systems, driver response to traveler information systems, and multimodal transportation systems safety and security.	3

College/University	State	Course Name	Description	Credits Earned
Morgan State University	Maryland	**Advanced Intelligent Transportation Systems**	This course exposes students to high-level simulation and communications tools for modeling connected vehicles, including vehicle-infrastructure interface (VII), vehicle-vehicle interface (VVI), adaptive traffic signal systems, driver response to traveler information systems, and multimodal transportation systems safety and security.	3
Morgan State University	Maryland	**Advanced Topics in Traffic Engineering**	Theory, analysis and design of coordinated traffic signal systems, traffic information systems and traffic management emphasizing area wide optimization, intermodal coordination and incident management.	3
Morgan State University	Maryland	**Advanced Topics in Traffic Engineering**	Theory, analysis and design of coordinated traffic signal systems, traffic information systems and traffic management emphasizing area wide optimization, intermodal coordination and incident management.	3
Morgan State University	Maryland	**Advanced Urban Transportation Planning**	This course discusses the traditional four -step planning process and the respective mathematical models and algorithms. Hands-on experience with state -of-the-art travel demand simulation, noise, and air quality analysis software will be emphasized. Students will be given a case problem and are expected to follow MPO accepted procedures to document and present their proposed transportation plan.	3
Morgan State University	Maryland	**Air and Sea Port Management**	This course provides students with an understanding of the planning, management and operations of transportation hubs. Master planning and its impacts on management of facilities are covered from beginning to end. The course focuses on the relationship between the planning process and the needs of management in the operation of the facility.	3
Morgan State University	Maryland	**Contemporary Global Issues in Transportation and Urban Infrastructure**	This course exposes students to timely global issues and emerging paradigms in transportation and infrastructure planning, design, and management. Topics covered include adaptive and sustainable urban infrastructure systems, emergency-response transportation planning and management, transportation-energy infrastructure nexus, and innovative infrastructure financing methods.	3

College/University	State	Course Name	Description	Credits Earned
Morgan State University	Maryland	**Economics of Transportation**	This course focuses on the microeconomic tools necessary for understanding, analyzing, and managing transportation firms and industries. The course is a mix of theoretical tools and applied industry studies. The major subjects covered in this course include costs, pricing behavior, regulation, inter modal competition, technological advances, and strategic decision making	3
Morgan State University	Maryland	**Freight Transportation Systems and Logistics**	This course focuses on management of the distribution of goods and freight within and between urban areas. The course covers management of raw materials and finished products transported from sources to marketplace.	3
Morgan State University	Maryland	**General Systems Theory**	This course introduces students to the concept and types of systems, and application of systems-based solution approach in transportation and urban infrastructure planning and management.	3
Morgan State University	Maryland	**Geographic Information Systems**	This course is designed to expose students to the concepts of spatial analysis using GIS tools. Students learn how to develop and use a GIS-based decision support system. In addition, students will learn how to undertake GIS need assessment studies and learn how to determine the appropriate software and hardware requirements. State of the art software is used to expose students to current tools available to produce quality GIS output.	3
Morgan State University	Maryland	**Intelligent Transportation**	This introductory course examines the cross-cutting issues in intelligent transportation system (ITS) deployment in the United States. Discussions will include the overview of ITS evolutionary process, the original six program category areas, the new seven services, and intelligent transportation infrastructure and system architecture.	3
Morgan State University	Maryland	**Introduction to Urban Transportation**	This course is designed to familiarize the student with the problems associated with urban transportation systems. Common transportation problems in urban areas will be diagnosed, and potential solutions will be discussed in the context of policy, planning, engineering and design.	3

College/University	State	Course Name	Description	Credits Earned
Morgan State University	Maryland	**Land Use and Transportation Planning**	This course deals with the basic concepts, principles, strategies, and tools of local-level urban transportation and land use planning. The focus is on the real-world planning process and implementation and its relationship with transportation planning. We will consider information requirements for planning, policy considerations, environmental analysis, residential and non-residential land use needs, and a range of planning tools and put them into practice through a series of real-world exercises.	3
Morgan State University	Maryland	**Management of Transportation Systems**	This course is designed to familiarize the student with some of the basic tools and skills required for mid-level and senior managers in transportation. It will focus on managerial issues and problems including economic, marketing, operational, financial, technological labor related, political and institutional concerns.	3
Morgan State University	Maryland	**Operations Research Applications in Transportation**	This course reviews operations research techniques most relevant to physical distributions and transportation systems management. Discussions include linear programming (integer programming), transportation and transshipment problem, dynamic programming and inventory control, and graphs. Problem formulation skill is emphasized.	3
Morgan State University	Maryland	**Quantitative Methods in Transportation**	This course reviews statistical analysis and probability models relevant to transportation systems analysis and modeling. Discussions include descriptive statistics, regression and correlation analysis, hypothesis testing using parametric and non parametric statistics, probability distribution models, vehicular flow theory, and gap and queue analysis.	3
Morgan State University	Maryland	**Special Problems in Transportation**	This course provides the opportunity for students to examine special topics of inters in transportation. They may include; Air & Water Ports Management Transportation, Geographic Information Systems, Transportation Safety, Transportation & Environmental Issues, Transportation Policy, Transportation & Energy Conservation, Transportation & Spatial Integration, and other emerging transportation issues.	3

College/University	State	Course Name	Description	Credits Earned
Morgan State University	Maryland	**Traffic & Highway Systems Design and Analysis**	This course discusses the basic concept of traffic and highway systems performance analysis and design. Topics covered include traffic flow theory, traffic data collection and analysis, levels of service concept and analysis, traffic safety, highway geometric and drainage design.	3
Morgan State University	Maryland	**Traffic Engineering I**	The principals of traffic engineering involving the analysis, planning and design of loads, streets and highways, and their related networks. Coverage includes the dynamics of traffic flows, traffic studies, and data collection; capacity analysis of free ways and arteries; the analysis and design of traffic control systems, including signalized and unsignalized intersections.	3
Morgan State University	Maryland	**Transportation in Developing Countries**	This course provides an opportunity for in depth examination of transportation issues as they relate to developing countries. The course deals with problems, issues, policies, and solutions of transportation systems and the development process.	3
Morgan State University	Maryland	**Transportation Models and Simulation Analysis I**	The theory, development and application of modelling systems commonly used in planning, engineering and operational analysis of transportation systems. The application and calibration of an existing transportation modeling system.	3
Morgan State University	Maryland	**Transportation Policy**	This course will introduce the student to the development, analysis and implementation of U.S. transportation policy. It will focus on how potential ideas for government action about transportation are translated from concepts into reality. It will cover principal issues, programs, concepts, decision-making processes, and institutional relationships. A broad conceptual framework to understand how policy is formed at the Federal, State, and local level will be analyzed in both governmental and modal basis.	3

College/University	State	Course Name	Description	Credits Earned
Morgan State University	Maryland	**Transportation System Evaluation**	The course focuses on analytical methods commonly used in transportation planning. Discussions include transit, highway, and intersection capacity analysis, pavement performance evaluation, traffic accident analysis, benefit-cost analysis, and environmental impact assessment process. Hands-on experience with planning module of the 1990 Highway Capacity Software is emphasized.	3
Morgan State University	Maryland	**Urban Public Transportation Systems**	The basic aim of the course is to acquaint the student with the major problems and issues in the planning and management of public transportation systems. The role of the various types of public transportation systems including buses, rapid transit systems, and other new models will be examined.	3
New Jersey Institute of Technology	New Jersey	**Public Transportation Operations and Technology**	Presentation of the technological and engineering aspects of public transportation systems. Historical development of public transportation technologies. Vehicle and right-of-way characteristics, capacity and operating strategies. Public transportation system performance.	3
New Jersey Institute of Technology	New Jersey	**Traffic Control**	Traffic laws and ordinances; regulatory measures; traffic control devices; markings, signs and signals; timing of isolated signals; timing and coordination of arterial signal systems; operational controls; flow, speed, parking; principles of transportation system management/ administration; highway lighting; and state-of-the-art surveillance and detection devices and techniques.	3
New Jersey Institute of Technology	New Jersey	**Traffic Safety**	System behavioral principles are applied to safety aspects of highway operation and design, and improvements of existing facilities. Solutions are evaluated on the basis of cost effectiveness	3
New Jersey Institute of Technology	New Jersey	**Transportation Engineering**	A study of the principal modes of transportation, with emphasis on the planning, design and construction of facilities for modern transportation systems.	3

College/University	State	Course Name	Description	Credits Earned
North Carolina State University	North Carolina	**Advanced Traffic Control**	Advanced signalized traffic control methods at intersections, arterials and networks. Applications of mathematical optimization techniques to signal timing and coordination. Use of traffic simulation and optimization models for signal evaluation and design. Roundabout analysis and design.	
North Carolina State University	North Carolina	**Highway Design**	Corridor selection; highway alignment; design of roadsides, intersections, and interchanges. Completion of research paper for students taking course for graduate credit.	3
North Carolina State University	North Carolina	**Highway Safety**	Methods to reduce collisions and injuries on highways. Identifying promising locations, choosing appropriate countermeasures, and evaluating past projects. Understanding the institutional context and establishing appropriate highway design standards.	3
North Carolina State University	North Carolina	**Intelligent Transportation Systems**	Intelligent Transportation Systems (ITS) planning and human factor elements; application of monitoring, communications and information dissemination technologies to transportation systems; advanced traffic management for freeway and arterial systems; traveler information and public transportation systems; automated vehicle and highway systems. ITS evaluation methods and models.	
North Carolina State University	North Carolina	**Special Topics in Transportation Engineering**	New or special course on recent developments in some phase of civil engineering. Specific topics and prerequisites identified for each section and varied from term to term.	
North Carolina State University	North Carolina	**Traffic Flow Theory**	Stream flow, shock wave, queuing, and other macroscopic theories; car following, gap acceptance, and other microscopic theories; distributions of traffic stream parameters; building traffic simulation models.	
North Carolina State University	North Carolina	**Traffic Operations**	Highway capacity; traffic control systems; intelligent vehicle/highway systems; and other advanced topics.	3
North Carolina State University	North Carolina	**Transportation Engineering Data Collection and Analysis**	Broad range of transportation engineering data collection and analysis applications encompassing the modes of highway, transit and pedestrian travel and the contexts of system planning, design and operation. Proposal preparation with primary focus on methodology and work plan development for addressing important research and practice questions.	3

College/University	State	Course Name	Description	Credits Earned
North Carolina State University	North Carolina	**Transportation Systems Engineering**	Multi-modal transportation systems; railroads, airports, highways, and other modes. Planning, analysis, and design. Fundamental concepts; supply, demand, flows, impacts, and network optimization.	3
North Dakota State University	North Dakota	**Traffic Engineering**	Traffic characteristics, studies, and control devices; operations analysis and design; aspects of signing, signalization, markings, and lighting; accident analysis; traffic laws and ordinances; work zone safety practices; arterial and freeway management. 1 three-hour lecture plus two-hour laboratory work.	
Northeastern University	Illinois	**Performance Models and Simulation of Transportation Networks**	Reviews concepts and methods for the analysis of the performance of complex transportation systems, and approaches for planning, design, monitoring and management and control of traffic flows over complex transportation networks. Topics include deterministic and probabilistic models, elements of queuing theory, network optimization algorithms, and simulation. Applications in traffic flow modeling, capacity analysis of diverse transportation facilities, level of service and estimation of delays, optimal design of transportation network services, and traffic assignment on congested networks are included.	4
Northeastern University	Illinois	**Public Transportation**	Studies the analysis, planning, and operational design of urban public transportation systems. Topics include service planning and scheduling, service reliability and operational control, automated systems for location, fare collection, and passenger counting, service performance measurement, rail system operations and design, data collection, ridership estimation, demand forecasting, pricing, and coordinated transit and land use planning. Introduces supporting mathematical methods in optimization, random processes, and statistical sampling	4

College/University	State	Course Name	Description	Credits Earned
Northeastern University	Illinois	**Sustainable Urban Transportation: Netherlands**	Examines how Dutch communities and their transportation systems are planned and designed to promote ABC (all-but-car) transportation, traffic safety, and livability. Topics include design of urban bicycling infrastructure for the mainstream population; planning and service design for high-quality public transportation; urban planning in support of transit, bicycle, and foot transportation, including both suburban development and urban redevelopment; and Vision Zero/Systematic Safety policy and design for traffic safety and its application to urban areas. Taught in study-abroad format in the Netherlands.	4
Northeastern University	Illinois	**Traffic Engineering and Sustainable Urban Street Design**	Explores street and intersection design for meeting societal needs related to traffic capacity, level of service, safety, walkability, bikeability, and the quality of public space. Intersection analysis and design topics include traffic flow theory and measurement, capacity, queuing and delay for both vehicles and pedestrians, and signal timing plan design including design for pedestrian crossings. Street design topics include street functions, speed control, street and intersection layout, bicycling facilities including bike lanes and separated bike paths, and pedestrian facilities including sidewalks and crossings. Offers students an opportunity to practice with standard design manuals and intersection analysis software.	4

College/University	*State*	*Course Name*	*Description*	*Credits Earned*
Northeastern University	Illinois	**Transportation Demand Forecasting and Model Estimation**	Provides in-depth study of methods used for model estimation, model building, and interpretation of results. Emphasizes travel demand forecasting, including trip generation, distribution, model choice and route choice. Topics include aggregate and disaggregate models including discrete choice (binary and multinomial logit and extensions); model building and statistical testing; aggregation, sampling and sample design. Demonstrates the applicability and underlying principles of the various models through case studies with focus on practical aspects and interpretation. Bases main methodological approaches on econometric methods, mainly on regression modeling and maximum likelihood estimation. Uses general and specialized software tools for data analysis and model estimation. While the focus is on estimating transportation demand models, the methods are applicable to a broad class of applications in engineering, marketing, etc.	4
Northeastern University	Illinois	**Transportation Systems: Analysis and Planning**	Discusses urban transportation planning and engineering for modes other than highway. Covers travel demand forecasting for both the short and long term including impact analysis methods, simple elasticity models, and the four-step model system of trip generation, trip distribution, modal split, and network assignment. Introduces transit service analysis and design. Other topics include capacity, service, and engineering design basics for different travel modes, such as bus, airport, rail, and bicycle. Considers the environmental impact, economic evaluation, and financial impact of different modes of transportation.	4

College/University	State	Course Name	Description	Credits Earned
NYU	New York	**Intelligent Transportation Systems and Their Applications**	This course introduces the concepts and applications of Intelligent Transportation Systems (ITS) and its growing role in the management of transportation systems. The course stresses the role of ITS as national policy, as specified in major transportation funding legislation – ISTEA, TEA21 and SAFETY-LU. A systems engineering approach to overall development of ITS technologies is stressed. Major components of ITS are discussed, and examples of their application treated. Coordination and integration of ITS components are treated.	3
NYU	New York	**Management of Urban Traffic Congestion**	The purpose of this course is to (1) understand the causes of traffic congestion and to measure how congestion impacts transportation users and communities, (2) set forth a vision for managing congestion and (3) develop and evaluate strategies and policies that achieve the vision.	3
NYU	New York	**Multimodal Transportation Safety**	Technology, legislation and market forces have contributed to improved transportation safety for decades. But one must consider which metrics are most relevant for which modes, the role of demographics and traffic levels and other factors when analyzing and predicting safety trends. The course pays attention to a systems view, to metrics by mode and to both standard field and statistical analyses. Consistent with current priorities, the course addresses security as well as safety issues.	3
Ohio University	Ohio	**Highway Safety and Risk Assessment**	Introduction to highway safety improvement program and three plus standards. Specific topics include data collection, identification of hazardous locations, crash reconstruction, countermeasures, and risk management.	3
Ohio University	Ohio	**Introduction to Highway Safety**	Aspects of highway safety; identification of highway safety problems; design/implementation/evaluation of highway safety improvement projects and programs.	3

College/University	State	Course Name	Description	Credits Earned
Ohio University	Ohio	**Traffic Impact Studies**	Trip generation, distribution, and assignment; transport behavior of individuals and households; traffic impact studies; parking studies; on-site planning; site access and off-site improvements	3
Ohio University	Ohio	**Traffic Parameters**	Microscopic and macroscopic traffic flow fundamentals and characteristics.	3
Ohio University	Ohio	**Traffic Signal Systems**	Traffic parameters, traffic data collection, capacity analysis of freeways, signalized intersection design, hardware. communication and detection systems, coordinated signal system analysis and design.	3
Oklahoma State University	Oklahoma	**Highway Traffic Operations**	Operational characteristics of uninterrupted-flow and interrupted-flow traffic facilities. The 1985 HCM procedures for analyzing the capacity of freeways, multilane and two-lane rural highways, urban arterials, signalized and unsignalized street intersections, and transit and pedestrian facilities. Administrative and planning actions for congestion management. Design alternatives and improvement strategies for effective use of urban arterial street width.	3
Old Dominion University	Virginia	**Transportation Fundamentals**	This course surveys the current practice of transportation engineering in the United States. It focuses on various ground transportation modes and covers policy, institutional planning and operational issues. Students are introduced to planning models, capacity analysis, traffic impact analysis, and parking studies.	3
Old Dominion University	Virginia	**Transportation Operations I**	This is the first course in transportation operations and traffic flow theory. Topics include traffic engineering studies, capacity analysis, intersection control, traffic flow models, shockwave analysis, signal warrant analysis, and safety analysis. Course includes applications of modeling and simulation to isolated intersections.	3
Old Dominion University	Virginia	**Transportation Operations II**	This is the second course in transportation operations and traffic flow theory. Topics covered include design of progressive signal systems, queuing theory, car following models, and applications of microscopic traffic simulation to corridor studies.	3

College/University	***State***	***Course Name***	***Description***	***Credits Earned***
Old Dominion University	Virginia	**Transportation Safety**	This course focuses on major transportation safety issues including transportation safety goals, safety of various transportation modes, identification of problematic locations, selection of safety countermeasures and their evaluation, safety data and modeling issues	3
Oregon Institute of Technology	Oregon	**Advanced Traffic Engineering**	Traffic studies including volume, speed, travel time and delay. Freeway and rural highway facility design, signing and marking. Urban un-signalized and signalized intersection design. Arterial planning and design.	3
Oregon Institute of Technology	Oregon	**Transportation Safety**	Safety concepts in highway engineering including highway design, operation, and maintenance, as well as human factors, statistical analysis, traffic control and public policy. Design concepts of intersections, interchanges, signals, signs and pavement markings.	4
Oregon State University	Oregon	**Isolated Signalized Intersections**	No Course Descriptions Available	
Oregon State University	Oregon	**Public Transportation**	No Course Descriptions Available	
Oregon State University	Oregon	**Traffic Operations and Design**	No Course Descriptions Available	
Oregon State University	Oregon	**Transportation Systems Analysis, Planning, and Policy**	No Course Descriptions Available	
Penn State	Pennsylvania	**Traffic Operations**	The highway capacity manual, concepts and analyses, freeway operations, signalized and unsignalized intersections, signal coordination, traffic impact studies.	3
Penn State	Pennsylvania	**Traffic Simulation and Control**	Simulation theory, traffic modeling using GPSS, traffic signal optimization using TEXAS, EVIPAS, PASSERII, TRANSYT-7F, TRAF-NETSIM, FRESIM and CORFLO	3
Penn State	Pennsylvania	**Transportation Design**	Design of streets and highway facilities; emphasis on geometric elements, intersections and interchanges, roadway drainage, and pavement design.	3
Penn State	Pennsylvania	**Transportation Networks and Systems Analysis**	Techniques of transportation network, user, stochastic user, and variable demand equilibrium; transportation activity system; computer simulation techniques and forecasting methods.	3
Penn State	Pennsylvania	**Transportation Operations**	Tools for analyzing transportation operations, including: properties of traffic streams, queuing, traffic dynamics, networks, probability and estimation of traffic properties.	3

College/University	*State*	*Course Name*	*Description*	*Credits Earned*
Penn State	Pennsylvania	**Transportation Safety Analysis**	Issues and methods in transportation safety analysis; factors contributing to crashes; crash causation; modeling accident occurrence; identifying sites for treatment.	3
Portland State University	Oregon	**Transportation Network Analysis**	Basics of network modeling and optimization, minimum cost flows, shortest path algorithms, principles of traffic assignment (user equilibrium, system optimal, elastic demand user equilibrium, stochastic user equilibrium-), efficient algorithms for different variants of traffic assignment.	4
Portland State University	Oregon	**Transportation Seminar**	This weekly seminar features a different speaker each week covering various topics in transportation research and practice. The topics cover all modes of transportation, with a focus on current practice. Course is cross- listed course with USP	1
Rensselaer Polytechnic Institute	New York	**Highway Engineering**	Principles of geometric design of highways, intersections, interchanges, and terminals. Practical issues of vertical and horizontal curvature, highway evaluation, driver and vehicle dynamics, and traffic safety are also addressed. Computer-aided design and modeling.	3
Rensselaer Polytechnic Institute	New York	**Traffic Control and Simulation**	Topics on traffic control systems such as signals and ramp metering; sensor-aided and data-oriented traffic modeling; fundamentals and applications of microscopic traffic simulation. State of the art signal design and traffic simulation tools will be used throughout the class.	3
Rensselaer Polytechnic Institute	New York	**Traffic Engineering**	Basic characteristics of traffic flow, including driver, vehicle, volume, speed, delay, capacity, and accidents; traffic regulation and control, signs, markings, signals, and signal systems; basic traffic flow theory; study methods and analysis procedures to solve traffic engineering and control problems.	3
Rowan University	New Jersey	**Advanced Design of Elements of Transportation Engineering**	The fundamental theme of the course is the study of advanced topics in highway design and analysis, signalized and un-signalized intersection design, forecast travel demand modeling and transportation planning. Topics covered vary from year to year based upon instructor and student interests. This course also includes field measurements and computer applications.	

College/University	*State*	*Course Name*	*Description*	*Credits Earned*
Rowan University	New Jersey	**Advanced Transportation Engineering**	The fundamental theme of the course is the study of advanced topics in transportation engineering including advanced highway engineering and advanced mass transit systems. These advanced topics include the impact and interaction of sociological, economic, geographic and environmental factors on transportation systems. The course includes appropriate field measurements and computer applications	
Rutgers University	New Jersey	**Maritime Transportation**	Supply-demand; liner shipping industry; management and operation of the port sector, environmental aspects, including dredged material management and ship-generated marine pollution; security problems and initiatives in maritime transportation.	3
Rutgers University	New Jersey	**Railway Track Engineering and Safety**	Course topics include rails, ties, track layout and geometry; ballast and subgrade; ties; fastenings; track analysis and design; special track work; grade crossings; track standards; and inspection, condition assessment, and life cycle asset management. There may be field trip(s) to observe railroad track and components.	3
Rutgers University	New Jersey	**Security and Safety in Maritime Transportation and Port Operations**	Overview of the principles of vulnerability assessment of critical transportation infrastructure. Overview of international maritime transportation and port security and safety codes. Federal and industry maritime transportation, port and container security initiatives. Overview of principles of onboard vessel and marine terminal operations relating to safety and security. Technologies to assist maritime and port security and potential for implementation. Modeling and simulation techniques to assist maritime and port security planning. Port Facility Security Plans and marine terminal operations safety. Coordination of Authorities involved in port security.	3

College/University	State	Course Name	Description	Credits Earned
Rutgers University	New Jersey	**Traffic Engineering**	Techniques and hardware used for real-time traffic-data collection, sources of errors and sample-size determination; design parameters, including economic and human factors, as well as environmental constraints; experiment design for model-development and transportation-operations analyses; deterministic and stochastic models of traffic processes, including queuing theory, headway distributions, and gap acceptance; stream-flow characteristics, including car-following and multilane models, bottleneck, fuel consumption, and noise models; models for automatic vehicle control; network operations; models for modes of traffic; traffic control, short-term planning, and system evaluation.	3
Rutgers University	New Jersey	**Traffic Operations**	Real-time transportation operations; transportation-system evaluation; demand modeling; time-sensitive transportation problems, including real-time traffic control and network wide feedback control; linear and nonlinear network optimization; deterministic and stochastic queuing models of the control of rush hour traffic, traffic-signal timing, and ramp metering; incident management; operations; strategic versus tactical transportation infrastructure planning; operation of parking facilities; congestion management strategies; automatic vehicle control.	3
Saint Louis University	Missouri	**Traffic Engineering**	Design, analysis and use of traffic control devices. Traffic administration, traffic flow theory, and highway capacity. An introduction to computer and traffic engineering. Acquisition, evaluation, statistical analysis and reporting of traffic engineering date used to design, evaluate and operate transportation systems	3
Saint Martin's University	Washington	**Advanced Transportation Engineering**	Selected topics in advanced transportation planning techniques, signalization design, airport planning and design and transportation economics. Course is designed to equip students with practical design-oriented knowledge of land-use impacts on transportation, travel demand forecasting, models of trip distribution and traffic assignment on the road network. Independent research report or design project required for graduate credit	3

College/University	State	Course Name	Description	Credits Earned
Saint Martin's University	Washington	**Traffic Capacity Analysis**	Analyzes and evaluates capacity and level of service of highway facilities using methodology of the 124 Highway Capacity Manual (HCM). Covers operational, design and planning applications. Specific focus on the application of the HCM methodology to two-lane rural highways, freeways and multilane highways, ramps and weaving segments, urban streets and signalized intersections. Use of HCS software emphasized	3
San Diego State University	California	**Mass Transit Engineering**	Transit system characteristics, analysis of demand for transit services, transit system planning, scheduling, analysis and design.	3
San Diego State University	California	**Seminar in Transportation Engineering**	An intensive study in transportation engineering	3
San Diego State University	California	**Traffic Flow and Control**	Advanced treatment of traffic flow and control issues. Highway capacity and traffic flow characteristics, traffic flow modeling, intersection control, freeway control systems, intelligent transportation systems.	3
San Jose State University	California	**Public Transportation Systems**	Performance characteristics of public transportation systems. Planning, design and operational issues related to public transportation systems. Emerging technologies.	3
San Jose State University	California	**Topics in Transportation Engineering**	presentation and discussion of special topics in transportation engineering. Topics may vary each semester. Course may be repeated with instructor consent.	3
San Jose State University	California	**Traffic Operations**	Flow, density and speed characteristics. Capacity and level of service analysis of transportation facilities with emphasis on highways and streets. Analysis of strategies and tactics, including traffic control, related to optimal use of facilities.	3
Southern Illinois University Edwardsville	Illinois	**Computer Simulation in Traffic Engineering**	Highway capacity software (HCS), signal timing software (SYNCHRO), and micro-simulation software (TSIS).	3
Southern Illinois University Edwardsville	Illinois	**Traffic Studies**	Acquisition, evaluation, statistical analysis and reporting of traffic engineering data used to design, evaluate and operate transportation systems.	3
Southern Illinois University Edwardsville	Illinois	**Transportation Infrastructure Security using Intelligent Transportation Systems**	Protection and recovery from security incidents using the integration outlined in the security areas of the National ITS Architecture and the capabilities of new technologies.	3

College/University	State	Course Name	Description	Credits Earned
Southern Illinois University Edwardsville	Illinois	**Transportation Safety Systems**	Implementation, operation and evaluation of transportation safety systems for highway and non-highway modes analysis, remediation strategies, and case studies.	3
Southern Illinois University Edwardsville	Illinois	**Travel Demand Forecasting**	Transportation engineering principles for estimating the impact of new development on specific facilities and on a region using travel demand forecasting tools.	3
Syracuse University	New York	**Transportation Engineering**	Transportation systems, modes and significance. Traffic engineering fundamental relationships and field studies. Intersection design and control. Geometric design of road alignments. Introduction to transportation planning. Additional work required of graduate students.	3
Temple University	Pennsylvania	**Intelligent Transportation Systems**	Coverage embraces the multidimensional upgrades needed for highway and vehicles for developing intelligent transportation systems. Contributions from important related fields such as telecommunications, safety, management, urban and regional planning, and economics where they interface with transport are included. Several case studies constitute an integral part of the course.	3
Temple University	Pennsylvania	**Transportation Engineering**	This course focuses on the principal modes of transportation, including highway, rail, and air; analysis of elements of transport technology; and transportation system development, planning, design, construction, and maintenance.	3
Temple University	Pennsylvania	**Transportation Engineering Materials**	Topics include physical properties of asphalt, aggregates, Portland cement, Portland cement concrete, and their combinations; advanced techniques in material characterization in the lab and the field; material variability, sampling, and statistical techniques; and the impact of these properties on their characterization of the design, construction, rehabilitation, and management of transportation facilities, including Portland cement concrete pavements with steel reinforcement; construction methodologies, recycling, and energy consideration; and application of the state-of-the-art computer software packages.	3

College/University	State	Course Name	Description	Credits Earned
Temple University	Pennsylvania	**Transportation Systems Management**	This course covers cost-effective techniques for the rebuilding of deteriorated transportation systems; pavement management and traffic systems management; extensive use of advanced computer software packages.	3
Tennessee State University	Tennessee	**Traffic Engineering**		3
Tennessee Technological University	Tennessee	**Public Transportation**	Public transportation modes and characteristics, planning of public transportation networks, mathematical modeling of the demand for public transportation, and measurement of system performance.	3
Tennessee Technological University	Tennessee	**Traffic Control Systems**	Theory and practical applications of traffic regulatory measures and traffic control systems, including adaptive, responsive, preemption, and Intelligent Transportation Systems.	3
Tennessee Technological University	Tennessee	**Transportation Demand Analysis**	Theory and development of models of trip generation, trip distribution, mode choice, and traffic assignment. Transportation supply. Travel survey. Intercity-passenger travel-demand. Demand for air transportation.	3
Tennessee Technological University	Tennessee	**Transportation Safety Engineering**	Basic structure of transportation safety, traffic safety analysis and issues to identify, address, and implement countermeasures in crash areas, community oriented safety programs.	3
Texas A&M University	Texas	**Engineering and Urban Transportation Systems**	Characteristics of transportation engineering systems; transportation engineering data collection; modeling effects of engineering project planning, trip generation, trip distribution, mode choice and traffic assignment; use and interpretation of engineering modeling results; engineering project analysis.	3
Texas A&M University	Texas	**Traffic Engineering: Characteristics**	Human, vehicular and traffic characteristics as they relate to driver-vehicle-roadway operational systems; traffic studies and methods of analysis and evaluation	2 Lecture Hours; 3 Lab Hours
Texas A&M University	Texas	**Traffic Engineering: Design**	Design of traffic control device installations with special emphasis on traffic signal design and installation, including the design features of detector placement and operation; national and state design standards and guidelines for traffic control device installation.	2 Lecture Hours; 3 Lab Hours

College/University	State	Course Name	Description	Credits Earned
Texas A&M University	Texas	**Traffic Engineering: Operations**	Advanced theory and application of traffic control; signalization and freeway operations.	2 Lecture Hours; 3 Lab Hours
Texas Tech University	Texas	**Advanced Traffic Engineering I: Highway Capacity Analysis**	Study of the concepts and methodologies for assessing the capacity and level of service of various surface transportation facilities.	3
Texas Tech University	Texas	**Advanced Traffic Engineering II: Traffic Flow Theory and Control**	Fundamentals of macro and microscopic traffic flow characteristics, continuum flow models, control of signalized intersections, and traffic simulation.	3
The Citadel	South Carolina	**Traffic Engineering Operations**	Basic characteristics of motor-vehicle traffic, highway capacity, applications of traffic control devices, traffic design of parking CGC/EUGS Academic Catalog 155 facilities, engineering studies, traffic safety, traffic laws and ordinances, basic statistical analysis, components of traffic systems, measurement of traffic data, characterizing traffic system performance, analysis of existing traffic facilities, and design of traffic facilities for achieving desired system performance.	3

College/University	State	Course Name	Description	Credits Earned
The Citadel	South Carolina	**Transportation Safety Engineering**	Methodology for conducting transportation accident studies, accident characteristics as related to operator, facility, and mode, statistical applications to accident data, current trends and problems in transportation safety	3
The Citadel	South Carolina	**Travel Demand Forecasting**	In-depth coverage of travel-demand forecasting theory and the four step process, site traffic impact analysis, and disaggregate travel demand models. Theory and method of forecasting travelers' choices of route, mode, destination, departure time, trip frequency and origin location in congested transportation networks.	3

College/University	State	Course Name	Description	Credits Earned
The Citadel	South Carolina	**Urban Transportation Planning**	A systems approach to the transportation planning process focusing on policy issues and the decision making process. Topics include: 1.) Trip generation modeling –variables influencing trip generation, regression analysis and category analysis; 2.) Trip distribution – modeling factors governing trip distribution, growth factor methods and gravity models, calibration of gravity models; 3.) Mode split modeling – factors influencing mode choice, discrete choice models; 4.) Route selection – traffic assignment; and 5.) Transportation surveys; transport related land use models, urban structure, urban goods transport. Use of popular transportation planning software will also be covered	3
The City College of New York	New York	**Geometric Design**	Functional design of traffic facilities including plans and profiles, intersection and other interchange areas, parking, etc. Computer aided design methods and procedures using Eagle Point and PDS interfacing AUTOCAD	3
The City College of New York	New York	**Highway Engineering**	The design of highway alignment and route location. Basic elements of highway design, including pavement type, earthwork and drainage. Importance and consequences of maintenance and engineering economics; life-cycle cost analysis.	3
The City College of New York	New York	**Multimodal Transportation Technologies**		

College/University	State	Course Name	Description	Credits Earned
The City College of New York	New York	**Rail System Design**	Design of light and heavy rail facilities for passenger and freight operations. Track structure. Alternative technologies for construction, guidance and communications. Maintenance of way.	3
The City College of New York	New York	**Sustainable Transportation**		
The City College of New York	New York	**Traffic Control**		
The City College of New York	New York	**Traffic Engineering**	Traffic flow theory, including fundamental diagram, microscopic models, and macroscopic models. Analysis of traffic data, including capacity and performance assessment. Network models and simulation. Advanced technology applications for data collection, traffic control, and real-time system management.	3
The City College of New York	New York	**Transit Systems: Planning and Operations**	Basic techniques of service area analysis, route development, scheduling, revenue estimation, and service improvements for fixed route bus and rail transit. Integration of fixed route transit with paratransit, matching mode with service area, relationship of transportation department with other departments, budgeting, and policy setting also will be discussed.	
The City College of New York	New York	**Transportation Asset Management**		
The City College of New York	New York	**Transportation Economics**	The main objective of this course is to introduce the students to major theories, methods and policy issues in the field of urban transportation economics. These include demand analysis and forecasting, cost structure of transport firms, pricing and regulation, competition and market structure, public transit analysis, network economics, externalities and congestion pricing, transportation investment analysis and joint transportation and land-use modeling. Emphasis is on the use of analytical techniques for the analysis of real-world urban transportation problems and policy-making.	3
The City College of New York	New York	**Transportation Network Analysis**		
The City College of New York	New York	**Transportation Policy**		

College/University	*State*	*Course Name*	*Description*	*Credits Earned*
The City College of New York	New York	**Transportation Safety**		
The City College of New York	New York	**Urban Freight and City Logistics**	Core concepts, challenges and methods of urban freight and city logistics. Fundamentals of urban spatial structure, drivers of urban changes. Freight distribution methods and stakeholders. Externalities of freight operations. Urban freight data sources and data collection strategies. Policies and mitigation strategies, and analytical methodologies supporting decision-making. Illustrative case studies.	3
The City College of New York	New York	**Urban Transportation**	Historical development of urban surface transportation systems. Stakeholders, user and operating characteristics, and infrastructure elements for passenger motor vehicle, transit, bicycle, pedestrian, and freight modes. Safety, environmental, and financial considerations. Regulations and technology applications	3
The University of Akron	Ohio	**Advanced Transportation Engineering I**	Highway and parking facility design, transportation planning, highway capacity estimates, signal systems and optimization, incident detection and management, freeway ramp metering, and highway traffic safety.	3
The University of Akron	Ohio	**Advanced Transportation Engineering II**	Highway and parking facility design, transportation planning, highway capacity estimates, signal systems and optimization, incident detection and management, freeway ramp metering, and highway traffic safety.	3
The University of Akron	Ohio	**Traffic Detection and Data Analysis**	Theory and application of pressure tubes, loop detectors, and imaging sensing, microwave, infrared, ultrasonic, laser detectors. Parameter estimation, reliability, and data mining and fusion.	3
The University of Akron	Ohio	**Traffic Engineering**	Vehicle and urban travel characteristics, traffic flow theory, traffic studies, accidents and safety, traffic signs and marking, traffic signal planning, traffic control and transportation administration.	3
The University of Kansas	Kansas	**Geometric Design of Traffic Facilities**	A study of basic principles in the design of freeways, urban street systems, parking terminal and other traffic facilities with emphasis on capacity, safety, level of service, and dynamic design concept.	3

College/University	State	Course Name	Description	Credits Earned
The University of Kansas	Kansas	**Highway Safety**	Several topics dealing with highway safety are presented and discussed. Typical topics are railroad/highway crossings, accident reconstruction, distractions to the drivers, speed and crashes, elderly drivers, traffic control devices, roadside design, access management, traffic calming devices, and crash rates	3
The University of Kansas	Kansas	**Railroad Engineering**	A comprehensive study of the railroad industry, including the development of the railway system, an overview of the railroad industry, basic track work, right-of-way and roadway concerns, drainage, track design, railroad structures, electrification, and rail passenger service. A final design project is required.	3
The University of Kansas	Kansas	**Traffic Engineering Characteristics**	A study of fundamental traits and behavior patterns of the road user and his or her vehicle in traffic. The major content involves techniques for obtaining data, analyzing data and interpreting data on traffic speed, volume, streamflow, parking and accidents. Capacity analyses using the most up to date procedures for major traffic facilities such as undivided highways, city streets, freeways, interchanges and intersections are also discussed at length.	3
The University of Kansas	Kansas	**Traffic Engineering Operations.**	A study of theory and practical applications of a number of traffic operational and management tools to achieve the convenient, safe and efficient movement of people and goods in urban street networks. The major content involves signalized intersection capacity, design and operation; signalized intersection coordination; and modern roundabout design.	3
The University of Kansas	Kansas	**Traffic Simulation Modeling and Analysis**	This course introduces popular tools for modeling, analyzing and optimizing various transportation elements. Students will learn to formulate and apply basic principles of simulation modeling; use simulation and optimization techniques for improving traffic operations of a signalized intersection, an urban street network, and a freeway facility; and apply processes for developing simulation applications.	3

College/University	State	Course Name	Description	Credits Earned
The University of Kansas	Kansas	**Urban Transportation Planning**	A detailed study of the comprehensive transportation planning process which involves the determination of urban travel characteristics and needs from studies of traffic, social-economical, and environmental factors, as well as the applications of land use, trip generation, trip distribution, model split, and traffic assignment models.	3
The University of Memphis	Tennessee	**Geometric Design Transportation Systems**	Design of streets and highways with emphasis on the factors and features controlling safe and efficient vehicle operation; applications of design concepts to urban and rural systems, intersections, interchanges, safety appurtenances, and parking facilities.	3
The University of Memphis	Tennessee	**Mass Transit Systems**	Operational analysis of equipment and facility design and service characteristics of urban mass transit systems; analysis of capacity, speed, accessibility, terminal operations; study of financing, decision-making, administration and marketing policies and practices, trends in future transit technology.	3
The University of Memphis	Tennessee	**Traffic Engineering**	Traits and behavior patterns of road users and their vehicles, including traffic signs and signals, pavement markings, hazard delineation, capacity, accidents, and parking analysis.	3
The University of Memphis	Tennessee	**Traffic Engineering Operations**	Theory of traffic control: traffic laws and ordinances; application of traffic control devices; analysis and design of traffic signal systems, parking control and design pedestrian control; one-way and unbalanced lane operation, roadway illumination; selected operational problems.	3
The University of Memphis	Tennessee	**Traffic Flow Theory**	This course will introduce to student the theories that seek to describe in a precise mathematical way the interactions between the vehicles, their operators, and the infrastructure. Different models and theories that characterize the flow of highway traffic, signalized or unsignalized intersections will be presented. A number of software will be introduced that are currently used in practice and in research to perform traffic impact studies using macroscopic, mesoscopic and microscopic traffic simulation.	3

College/University	*State*	*Course Name*	*Description*	*Credits Earned*
The University of Memphis	Tennessee	**Transportation System Analysis**	Transportation problems, goals, and objectives; evaluation and decision-making techniques; measurement of variables and intangibles in transportation decisions, cost allocation and benefit transfer, risk and uncertainty; financing and implementation; differential impacts of transportation improvements.	3
The University of Memphis	Tennessee	**Intro to Transportation Systems Mgmt and Operations**	Introduction to operations and management concepts exploring multidisciplinary contexts in traffic, transit and freight, emerging technologies, policy issues and communication strategies, performance-based planning, and systems thinking.	3
The University of Memphis	Tennessee	**Urban Transportation Engineering**	A review of the transportation problem as it relates to development patterns in American cities. The theory and application to engineering and socioeconomic factors directed toward the formulation of models for conducting transportation studies.	3
The University of Texas at San Antonio	Texas	**Transportation Engineering**	Study of the Highway Capacity Manual, traffic stream parameters and relationships, analytical techniques in traffic engineering such as capacity analysis, queuing theory, and traffic simulation. Design and operation of advanced traffic management systems including signalization, real-time motorist information, urban incident management, and ITS concepts.	3
University of Alabama	Alabama	**Transportation System Evaluation**	This course integrates the basic concepts and tools of systems analysis, including those from microeconomics, optimization, project evaluation and decision making into the context of transportation planning and management.	3
University of Alabama - Birmingham	Alabama	**Intelligent Transportation Systems**	Legal, institutional and planning issues. System architecture, telecommunication techniques, Advanced User Services, intermodal systems, deployment programs, cost and benefit evaluation.	3
University of Alabama - Birmingham	Alabama	**Non-Motorized Transportation Design and Planning**	Urban planning principles that support non-motorized transportation, local bicycle or pedestrian plans, non-motorized transportation safety related considerations, non-motorized transportation design including traffic calming techniques, procedures for capacity analysis of pedestrian facilities.	3

College/University	State	Course Name	Description	Credits Earned
University of Alabama - Birmingham	Alabama	**Simulation Models for Transportation Applications**	Basic concepts of simulation models for analysis and optimization of transportation systems. Experimentation with planning simulation models and traffic models for signal timing and capacity analysis	3
University of Alabama - Birmingham	Alabama	**Traffic Engineering Operations**	Highway and Intersection capacity analysis, traffic signal timing and phasing, coordination, freeway operations, non-signalized traffic control techniques	3
University of Alabama - Birmingham	Alabama	**Traffic Flow Theory**	Microscopic and macroscopic traffic flow characteristics. Traffic flow analytical techniques including car-following models, traffic stream models, shock wave analysis. Queuing analysis and gap acceptance. Simulation models for network analysis.	3
University of Alabama - Birmingham	Alabama	**Transportation Engineering Seminar**	Seminar focusing on student research and guest presentations of various topics of interest to graduate transportation engineering students.	1
University of Alabama - Birmingham	Alabama	**Urban and Transportation Planning**	Land use planning for transportation systems; trip generation, trip distribution, and traffic assignment. CE 345 (Transportation Engineering) or an equivalent is a prerequisite for this course.	3
University of Alabama - Huntsville	Alabama	**Traffic Engineering Design**	Driver, pedestrian, and vehicle characteristics. Principles of traffic flow for improved highway traffic service and safety. Designs freeways, rural roads, urban streets, traffic signals, signs, channelization, and other traffic control measures	3
University of Alabama - Huntsville	Alabama	**Urban Transportation Planning**	Planning of highway systems and terminals as part of a complete planning approach; public transportation system planning; transportation planning studies, projection analysis, plan formulation, and programming.	3
University of Alaska Anchorage	Alaska	**Advanced Traffic Flow Theory**	The course presents the different theories of traffic flow, statistical distributions of traffic flow parameters, traffic stream models, various car-following models, and traffic flow models for intersections. The class also presents the methods to analyze traffic performance using shock waves and queuing analysis. - See more at: https://catalog.uaa.alaska.edu/graduateprograms/coeng/civilengineering/ms-civilengineering/#sthash.s7BvAjIz.dpuf	3

College/University	State	Course Name	Description	Credits Earned
University of Alaska Anchorage	Alaska	**Highway Engineering**	Geometrical and structural design, construction, and maintenance of highway facilities and associated economic, social, and environmental consequences. - See more at: https://catalog.uaa.alaska.edu/graduateprograms/coeng/civilengineering/ms-civilengineering/#sthash.s7BvAjIz.dpuf	3
University of Alaska Anchorage	Alaska	**Traffic Engineering**	Traffic engineering studies and analyses, traffic flow theory, traffic control systems design, signalization, and capacity analyses. - See more at: https://catalog.uaa.alaska.edu/graduateprograms/coeng/civilengineering/ms-civilengineering/#sthash.s7BvAjIz.dpuf	3
University of Alaska Anchorage	Alaska	**Traffic Modeling and Simulation**	Introduces concepts of traffic flow simulation, modeling of driver behavior, and application of traffic simulation in Intelligent Transportation Systems (ITS). - See more at: https://catalog.uaa.alaska.edu/graduateprograms/coeng/civilengineering/ms-civilengineering/#sthash.s7BvAjIz.dpuf	3
University of Arkansas	Arkansas	**Traffic Engineering**	A study of both the underlying theory and the use of traffic control devices (signs, traffic signals, pavement markings), and relationships to improved traffic flow and safety, driver and vehicle characteristics, geometric design, and societal concerns. Also includes methods to collect, analyze, and use traffic data. Prerequisite: CVEG 3413 with a grade of C or better or graduate standing.	3
University of Arkansas	Arkansas	**Transportation and Land Development**	Study of interaction between land development and the transportation network. Application of planning, design, and operational techniques to manage land development impacts upon the transportation system, and to integrate land layout with transportation network layout.	3
University of Arkansas	Arkansas	**Transportation Design Project**	Comprehensive engineering design project primarily related to transportation issues.	3

College/University	***State***	***Course Name***	***Description***	***Credits Earned***
University of Arkansas	Arkansas	**Transportation Infrastructure**	Transportation infrastructure includes discussion on the geometric design of roadways, roadway drainage, roadway materials, roadway structural design, and an economic analysis of roadways. This includes the design of horizontal and vertical alignment, cross section, intersections, pavement materials, and structural capacity.	3
University of Arkansas	Arkansas	**Transportation Management Systems**	Six transportation management systems are explored: pavement, bridge, intermodal, public transportation, safety, and congestion. System approaches are presented. Techniques are introduced on how to optimally allocate resources. Pavement and bridge structure basics are discussed and their performance parameters are presented. Case studies are used to illustrate the interfaces among various modes of transportation. Safety and congestion problems in transportation are addressed	3
University of Arkansas	Arkansas	**Transportation Pavements and Materials**	Study of the engineering properties and behavior of materials commonly used in transportation facilities as they relate to the design and performance of flexible and rigid pavement systems.	3 Lecture Hours; 3 Lab Hours
University of Arkansas	Arkansas	**Transportation System Characteristics**	Introduction to traffic flow theory, including traffic stream interactions and capacity. Applications for planning, design, operations.	3
University of Arkansas	Arkansas	**Transportation Systems Engineering**	Transportation Systems Engineering: Introduction to transportation systems engineering and planning. Includes the following topics: transportation governance, financing, and the effect on the environment; traffic flow theory; safety; traffic operations and control; capacity; and travel demand modeling.	3

College/University	*State*	*Course Name*	*Description*	*Credits Earned*
University of Buffalo, The state University of New York	New York	**Geometric Design of Highways**	The purpose of this course is to provide students with the principles of geo-metric design of highways with a focus on highway design objectives and design guidelines and methods. More specific topics include: development and applications of concepts of geometric de-sign of rural and urban highways; design controls and criteria; elements of design, including sight distance, horizontal and vertical alignment; cross section elements; interchange types and design el-ements; grade separations and clearance; development of visual elements. AutoCAD and CARL-SON software will be used in this course, but no prior knowledge of either is necessary.	3
University of Buffalo, The state University of New York	New York	**Traffic Operations and Design**	This course addresses the design, operation, control and management of transportation facilities. Topics covered in the course include geometric design of roadways, capacity analysis for freeway segments, signal timing and design, and intersection design and layout. Students are introduced to a number of traffic analysis and traffic simulation software, including SYNCHRO and SimTraffic. Students are required to undertake a comprehensive term project that involves detailed analysis and/or simulation of a transportation facility and write a survey-type paper on a topic of recent interest that is related to traffic operations and design.	3
University of Buffalo, The state University of New York	New York	**Traffic Safety**		3

College/University	State	Course Name	Description	Credits Earned
University of Buffalo, The state University of New York	New York	**Transportation Analytics**	This course aims to provide students with a general background of various statistical analysis techniques and data mining methods that are used in transportation systems. It covers various practical analytical topics in transportation and logistics, including model estimation, data analysis, traffic forecasting, and incident prediction. A broad range of transportation related techniques are covered in statistics, data mining and optimization skills, such as Logistic Regression, Poisson Regression, Time Series Modeling, Survival Analysis, Classification, and Clustering. Popular statistical modeling software will be used to solve various practical problems.	3
University of Buffalo, The state University of New York	New York	**Transportation Network Analysis**	The focus of this class is modeling flow patterns through urban transportation networks. An analytical approach to modeling the resulting flow pattern is adopted, based on the formulation and solution of the traffic assignment problem as a non-linear optimization problem. Among the topics covered in the course are transportation networks and optimality, cost functions, deterministic and stochastic user equilibrium assignment, origin-destination matrix estimation, and network reliability and design.	3
University of Buffalo, The state University of New York	New York	**Travel Demand Forecasting**	The focus of this class is on the state-of-the-art methods for forecasting travel demand. The ability to forecast travel demand is fundamental to any transportation planning effort. The first part of the class will focus on the four-step travel demand forecasting process that consists of the trip generation, trip distribution, mode split, and traffic assignment steps. This approach, though aggregate and conventional, has been widely used for planning purposes in the US and other countries in the world. Recent refinements to the process will also be discussed, along with a brief introduction to activity-based analysis, an alternative paradigm of travel demand forecasting that is behavior oriented and tends to increase the sensitivity of transportation planning models to policy making.	3

College/University	State	Course Name	Description	Credits Earned
University of California - Berkeley	California	**Advanced Topics in Transportation Theory**	Selected topics in the mathematical analysis of transportation systems. Topics will vary from year to year.	3
University of California - Berkeley	California	**Air Transportation**	Nature of civil aviation; structure of the airline industry; aircraft characteristics and performance; aircraft noise; navigation and air traffic control; airport planning and design; airline operations; aviation system planning.	3
University of California - Berkeley	California	**Analysis of Transportation**	Probabilistic models in transportation. The use of field data. Data gathering techniques, sources of errors, considerations of sample size. Experiment design for demand forecasting and transportation operations analysis. Analysis techniques.	3
University of California - Berkeley	California	**Highway Traffic Operations**	operational planning and management of the highway transportation system. The highway system is presented as a set of operating environments with each having its unique analytical framework. Major topics to be covered include policy and institutional issues, selection of strategies and tactics, evaluation of objectives and measures of effectiveness.	3
University of California - Berkeley	California	**Operation of Transportation Facilities**	The management of vehicle flows and fleets. Traffic stream properties and their measurement. Theories of traffic flow. Capacity analysis and queueing. Flow control and fleet scheduling.	3
University of California - Berkeley	California	**Operations of Transportation Terminals**	Characteristics of terminals on a mode by mode basis (sea ports, railyards, airports, parking lots, etc.). Methodologies used to study terminal operations and the management of congestion. (Chronographs, input-output diagrams, pricing, simulation). Studies illustrating the use of the methodologies for different modes.	3
University of California - Berkeley	California	**Public Transportation Systems**	analysis of mass transit systems, their operation, and management. Technology of transit vehicles and structures. Public policy and financing.	3
University of California - Berkeley	California	**System Analysis in Transportation**	he systems approach and its application to transportation planning and engineering. Prediction of flows and level of service. Production functions and cost minimization. Utility theory and demand modeling. Transportation network analysis and equilibrium assignment. Decision analysis and evaluation of transportation projects.	3

College/University	*State*	*Course Name*	*Description*	*Credits Earned*
University of California - Berkeley	California	**Traffic Safety and Injury Control**	This course applies principles of engineering, behavioral science, and vision science to preventing traffic collisions and subsequent injury. A systematic approach to traffic safety will be presented in the course, and will include (1) human behavior, vehicle design, and roadway design as interacting approaches to preventing traffic crashes and (2) vehicle and roadway designs as approaches to preventing injury once a collision has occurred.	3
University of California - Berkeley	California	**Transportation and Land Use Planning**	Examination of the interactions between transportation and land use systems; historical perspectives on transportation; characteristics of travel and demand estimation; evaluation of system performance; location theory; models of transportation and urban structure; empirical evidence of transportation-land use impacts; case study examinations.	3
University of California - Berkeley	California	**Transportation Policy and Planning**	Policy issues in urban transportation planning; measuring the performance of transportation systems; the transportation policy formulation process; transportation finance, pricing, and subsidy issues; energy and air quality in transportation; specialized transportation for elderly and disabled people; innovations in transportation policy.	3
University of California - Berkeley	California	**Transportation Sustainability**	This multi-disciplinary course is intended to introduce students to the fundamentals of sustainable transportation, with an emphasis on: 1) current trends, climate and energy science, and the policy context; 2) methodological and analysis techniques; 3) vehicle technology, fuels, and intelligent transportation systems (ITS) solutions (supply side); and 4) land use, public transportation, and demand management.	3
University of California - Davis	California	**Flow in Transportation Networks**	Elements of graph theory, a survey of pertinent optimization techniques, extremal principles in network flow problems, deterministic equilibrium assignment, stochastic equilibrium assignment, extensions of equilibrium assignments and dynamic transportation network assignment.	4

College/University	State	Course Name	Description	Credits Earned
University of California - Davis	California	**Sustainable Transportation Technology and Policy**	Role of technical fixes and demand management in creating a sustainable transportation system. Emphasis on technology options, including alternative fuels, electric propulsion, and IVHS. Analysis of market demand and travel behavior, environmental impacts, economics and politics.	3
University of California - Davis	California	**Transportation Demand Analysis**	procedures used in urban travel demand forecasting. Principles and assumptions of model components (trip generation, trip distribution, model split). New methods of estimating travel demand. Computer exercises using empirical data to calibrate models and forecast travel demand.	4
University of California - Davis	California	**Transportation System Operations**	Principles of transportation system operations; traffic characteristics and methods of measurement; models of transportation operations and congestion applied to urban streets and freeways. GE credit: QL, SE. Effective: 2016 Fall Quarter.	4
University of California - Davis	California	**Urban Traffic Management and Control**	Basic concepts, models, and methods related to the branch of traffic science that deals with the movement of vehicles on a road network, including travel speed, travel time, congestion concepts, car-following and hydrodynamic traffic models.	4
University of California - Irvine	California	**Traffic Flow Theory**	Traffic measurement and fundamental speed-density-flow relationships. Kinematic models. Shock waves. Statistical-kinetic theory of traffic. Introductory car-following principles and stability. Gap acceptance. Platoon dispersion. Two-fluid model. Queueing process. Multi-regime and catastrophe models. Higher-order continuum models. Microscopic and macroscopic simulation.	4
University of California - Irvine	California	**Traffic Flow Theory II.**	Advanced mathematical analysis of vehicular flow. Detailed treatise on car-following models. Fourier and Laplace analysis of stability problems. Perturbation analysis. Derivation of macroscopic traffic flow relationships from microscopic considerations. Advanced hydrodynamic theory.	4

College/University	State	Course Name	Description	Credits Earned
University of California - Irvine	California	**Traffic Systems Operations and Control I.**	Introduction to operation, control and analysis of arterial and freeway traffic systems. Control concepts, traffic stream principles, detectors, local controllers, system masters, traffic signal and ramp metering timing principles, traffic measurement technologies, traffic delay principles.	4
University of California - Irvine	California	**Traffic Systems Operations and Control II.**	Advanced topics related to operation, control, and analysis of arterial and freeway traffic systems. Control concepts, traffic stream principles, detectors, local controllers, system masters, traffic signal and ramp metering timing principles.	4
University of California - Irvine	California	**Transit Systems Planning**	Planning methods for public transportation in urban areas. Technological and operating characteristics of vehicles, facilities, and systems. Short-range planning techniques: data collection and analysis, demand analysis, mode choice, operational strategies, financial analysis. Design of systems to improve performance.	4
University of California - Irvine	California	**Transportation Data Analysis**	Statistical analysis of transportation data sources. Analysis of categorical and ordinal data. Regression and advanced multivariate analysis methods such as discriminant analysis, canonical correlation, and factor analysis. Sampling techniques, sample error and bias, survey instrument design.	4
University of California - Irvine	California	**Transportation Planning Models**	Design and application of comprehensive transportation models. Network development, demand modeling, and equilibrium assignment. Model calibration, validation, prediction, and evaluation. Regional modeling, site impact analysis, and circulation studies. Design of transportation alternatives.	4
University of California - Irvine	California	**Travel Demand Analysis I**	Fundamentals of transportation systems analysis. Theoretical aspects of travel demand. Travel behavior. Modeling of performance characteristics and costs of transportation modes. In-depth presentation of travel demand modeling techniques. Development of travel choice models including mode, route, and destination choice.	4

College/University	State	Course Name	Description	Credits Earned
University of California - Irvine	California	**Travel Demand Analysis II**	Methods of discrete choice analysis and their applications in the modeling of transportation systems. Emphasis on the development of a sound understanding of theoretical aspects of discrete choice modeling that are useful in many applications in travel demand analysis	4
University of California - Irvine	California	**Travel Demand Analysis III: Activity-based Approaches**	The methodological underpinnings of activity-based travel demand modeling. Presents methodologies within the context of a generalization of discrete choice modeling approaches, emphasizing the distinctions that separate these two approaches and presenting appropriate mathematical and statistical tools to address these distinctions.	4
University of California - Irvine	California	**Urban Transportation Networks I**	Analytical approaches and algorithms to the formulation and solution of the equilibrium assignment problem for transportation networks. Emphasis on user equilibrium (UE) comparison with system optimal, mathematical programming formulation, supply functions, estimation. Estimating origin-destination matrices, network design problems.	4
University of California - Irvine	California	**Urban Transportation Networks II**	Advanced analysis, optimization, and modeling of transportation networks. Topics include advanced static and dynamic traffic assignment algorithms, linear and nonlinear multi-commodity network flow optimization, network simplex, and network control problems.	4
University of Central Florida	Florida	**Geometric Design of Transportation Systems**	Study of highway geometric design in the engineering of transportation systems.	3
University of Central Florida	Florida	**Highway Capacity**	Highway capacity for all functional classes of highway. Traffic signalization including traffic studies, warrants, cycle length, timing, phasing and coordination.	3
University of Central Florida	Florida	**Traffic Engineering**	Study of operator and vehicle characteristics, and design for street capacity, signals, signs, and markings.	3
University of Central Florida	Florida	**Traffic Operations**	Fundamentals of traffic flow theory and applications to traffic operations on highways and streets. Work on real life traffic operations project and report results.	3
University of Central Florida	Florida	**Traffic Safety Analysis**	Understanding crash research concepts, and identifying factors contributing to traffic crash occurrence.	3

College/University	State	Course Name	Description	Credits Earned
University of Colorado Denver	Colorado	**Advanced Street & Highway Design**	This course delves into the art and science of designing sustainable and context sensitive street and highway facilities. Topics include road classification, transportation planning, road alignments, cross-section design, bicycle and pedestrian facilities, intersections, and street network design.	3
University of Colorado Denver	Colorado	**Highway Capacity Analysis**	Covers the principles and applications of highway capacity analysis for freeways and arterials, ramps and interchanges, weave and merge sections, signalized and unsignalized intersections, roundabouts, pedestrian areas and transit. Emphasis is on level-of-service analysis procedures in the Highway Capacity Manual, although other approaches are also discussed. Additional topics include roadway characteristics, vehicle dynamics, human factors, speed and volume studies, travel time surveys and traffic flow characteristics.	3
University of Colorado Denver	Colorado	**Traffic Impact Assessment**	Covers (1) procedures to satisfy state and local requirements for transportation impact studies, (2) methods to perform trip generation, distribution, and traffic assignment for impact analyses, and (3) analysis of transportation impacts on residential communities, mode choice, regional business (downtown or suburban), peak and off-peak travel times, noise, safety, parking and pedestrians. A course project requires students to develop an application of analysis software to a case study area. Prereq: Graduate standing or permission of instructor.	3
University of Colorado Denver	Colorado	**Traffic Operations and Control**	Covers principles of traffic flow and analysis methods for surface street traffic systems. Emphasis is on network modeling and simulation of coordinated signal systems, together with unsignalized intersections and freeway junctions using modern software tools. Additional topics include alternative signal timing plans, signal controllers, vehicle detection systems for volume, speed, occupancy and ramp metering. A course project requires students to develop and apply modeling software to a case study area.	3

College/University	*State*	*Course Name*	*Description*	*Credits Earned*
University of Colorado Denver	Colorado	**Traffic Simulation Modeling**	This graduate-level course introduces students to the principles, methods, and software needed to perform traffic simulations of alternative transportation modes in urban areas. Students will develop a case study simulation of their choosing.	3
University of Colorado Denver	Colorado	**Transit Construction**	This course introduces students to the fundamentals of transit construction necessary for successful project completion. It also covers how many different types of transit projects are managed and sustained. The instructors of this course have hands-on experience in transit construction, scheduling, and project control.	3
University of Colorado Denver	Colorado	**Transit System Design**	This course introduces students to the components of transit system planning and design including station design and accessibility. The course focuses primarily on light rail design, but provides an overview of different transit modes. The instructors of this course have hands-on experience in transit planning, design, and construction.	3
University of Colorado Denver	Colorado	**Transportation Engineering Statistics**	Covers statistical analysis methods for engineering studies in general, and for highway accident and traffic flow data in particular. Topics include data needs, sampling designs, survey methods, hypothesis testing, tests of proportions, non-parametric tests, analysis of variance, multivariate regression, and other tests of fit. Introductory overview of state and federal accident databases. Comparisons of accident rates by highway type, vehicle speeds, vehicle types, weather conditions and other factors also presented.	3
University of Colorado Denver	Colorado	**Transportation System Safety**	This is a graduate-level course on road safety that will: investigate contemporary safety analysis techniques; highlight the disconnect between the current safety paradigm and actual safety outcomes; cover drive, bicyclist and pedestrian safety concerns; and discuss notable efforts such as Vision Zero.	3

College/University	State	Course Name	Description	Credits Earned
University of Colorado Denver	Colorado	**Travel Demand Forecasting**	This course introduces students to the principles and methods of travel demand forecasting as developed over the last 50 years. It covers data needs, statistical estimation techniques, and multi-modal modeling as applied to forecast future travel demands. The emphasis is on basic models rather than elaborate mathematics or software.	3
University of Colorado Denver	Colorado	**Urban Transportation Modeling**	An advanced coverage of urban and regional transportation planning models, procedures and software. Mathematical formulations, properties, and solution algorithms are presented. Additional topics include methods of data acquisition from public domain databases for use in modeling software. A course project requires students to develop an application of modeling software to a case study area	3
University of Connecticut	Connecticut	**Public Transportation Systems**	Characteristics of public transportation systems, public transport network planning, station spacing and design, public transportation and land use development, public transportation network design problems, and introduction to transit assignment.	3
University of Connecticut	Connecticut	**Seminar in Transportation and Urban Engineering**	Extended discussions on presentations contributed by staff, students and outside speakers. Required every semester for all full-time students in the Transportation and Urban Engineering Area of Concentration in the Civil Engineering Field of Study.	3
University of Connecticut	Connecticut	**Street and Highway Design**	Urban street and highway design: vertical and horizontal alignment, cross-section elements, traffic barriers, interchanges and intersections, pedestrian and bike facilities, traffic calming, community and roadside elements	3
University of Connecticut	Connecticut	**Traffic Engineering Characteristics**	Relationships among traffic flow characteristics; microscopic and macroscopic representations of traffic flow; capacity of highways; traffic stream models; shock wave analysis; queueing analysis; traffic simulation.	3
University of Connecticut	Connecticut	**Traffic Engineering Operations**	Driver, pedestrian and vehicle operating characteristics. Traffic data collection. Accident and safety analysis. Highway capacity analysis. Traffic signs and markings. Traffic signal timing and operation. Traffic management.	3

College/University	State	Course Name	Description	Credits Earned
University of Connecticut	Connecticut	**Transportation Network Analysis**	Network modeling and graph theoretical applications to transportation systems. Algorithmic approaches to common network problems. System optimal and user equilibrium traffic assignment modeling and solution techniques.	3
University of Connecticut	Connecticut	**Transportation Safety**	Human factors in traffic safety, economic costs of crashes, crash data collection and database management, elements of statistics and crash count distributions, exploratory analysis of crash count data, regression analysis of crash count data, before-after studies, network screening and diagnosis, roadway and roadside design, crash modification factors.	3
University of Connecticut	Connecticut	**Travel Demand Forecasting**	Alternative formulations and calibration of trip generation, trip distribution and travel mode choice prediction models. Traffic network equilibrium and assignment.	3
University of Dayton	Ohio	**Highway Geometric Design**	Advanced topics in horizontal and vertical alignment design controls and criteria, sight distance, intersection and interchange design	3
University of Dayton	Ohio	**Highway Traffic Safety**	Issues involved in transportation safety, strategic highway safety planning at state and local levels. Extent of the highway safety problem, elements of traffic accidents, common accident countermeasures, collection and analysis of accident data, evaluation of safety-related projects and programs, and litigation issues.	3
University of Dayton	Ohio	**Traffic Engineering**	Characteristics of traffic, including the road user, vehicle, traffic control devices, accident analysis, signal operations and design and the fundamentals of signal system progression.	3
University of Dayton	Ohio	**Travel Demand Modeling**	Introduction to the theory, concepts and methods underlying the practice of urban travel demand modeling. The course involves model data inputs, model development, forecasting applications, and model evaluation techniques.	3

College/University	*State*	*Course Name*	*Description*	*Credits Earned*
University of Dayton	Ohio	**Urban Public Transportation**	Planning and analysis of urban public transportation service and operations with a focus on bus and rail modes. Provides fundamental knowledge and methods for route and network planning, service planning and analysis, performance monitoring, operations control, and frequency and headway determination.	3
University of Delaware	Delaware	**Roadway Geometric Design**	Physical dimensions of roadways such as vertical and horizontal curvatures, superelevation rates, lane widths, cross sections, and grades. Topics include roadway functions, design controls and criteria, elements of design, local roads and streets, collector roads and streets, rural and urban arterials, freeways, intersections, and grade separations	3
University of Delaware	Delaware	**Traffic Engineering and Modeling**	Introduction to technical aspects of traffic engineering as applied in everyday projects. Students will explore traffic engineering concepts through practical applications, including the use of software packages such as HCS, Synchro, and VISSIM. Software "black box" will be opened to provide each student the ability to diagnose transportation issues and think critically about analysis results. Students will obtain working knowledge of traffic engineering concepts, theories, and methods needed to execute real-word traffic engineering tasks.	3
University of Delaware	Delaware	**Transportation Facilities Design**	Theoretical concepts of general transportation demand, supply and flow analysis. Planning and design of multi-modal transportation facilities including streets and highways, railways and guideways, airports, and harbors and ports. Engineering, social and economic evaluation of alternative design schemes for case studies and existing transportation facilities.	3
University of Delaware	Delaware	**Urban Transportation Planning**	Characteristics of urban travel demand, travel demand forecasting models, urban transportation modes and their characteristics, urban transportation planning processes and issues, evaluation of plans, economic analysis, transportation financing, transportation policy and regulations, and urban transportation systems management.	3

College/University	State	Course Name	Description	Credits Earned
University of Delaware	Delaware	**Urban Transportation Systems**	Design and operation of urban transportation systems, characteristics of public transportation modes, vehicle design, right-of-way types and terminal facilities. Application of operations research techniques to analysis of scheduling, network optimization, capacity and evaluation of alternatives.	3
University of Detroit Mercy	Michigan	**Advanced Traffic Engineering**	An advanced course in vehicular traffic.	3
University of Detroit Mercy	Michigan	**Transportation Engineering**	Historical development of road transportation, design of roadways related engineering studies, level of service, economic evaluation and safety.	3
University of Florida	Florida	**Advanced Transportation Systems Analysis**	Systems analysis in transportation planning and engineering, including supply, demand, equilibrium, evaluation, and decision analysis.	3
University of Florida	Florida	**Advanced Urban Transportation Planning**	Analytical techniques for estimating future travel demands; and for planning transportation facilities and locations. Review of transportation technology and future systems.	3
University of Florida	Florida	**Computational Methods in Transportation Engineering**	Applying numeric methods to traffic engineering/analysis. Key issues in implementing a computational methodology into a software format. Fundamentals of developing simulation software.	3
University of Florida	Florida	**Freeway Operations and Simulation**	Uninterrupted traffic flow theory. Highway capacity analysis. Microscopic simulation. Freeway management and control methods.	3
University of Florida	Florida	**Traffic Engineering**	Traffic characteristics, studies and analyses, street operations, level of service analysis, congestion and access management, signs and markings, pedestrians, bicycles, parking, roadway lighting.	3
University of Florida	Florida	**Traffic Flow Theory**	Vehicle-roadway-infrastructure interactions, equations of motion, and car-following; microscopic and macroscopic traffic characteristics and traffic stream models; simulation, queueing theory, and shockwave analysis.	3
University of Florida	Florida	**Transportation Policy and Planning**	Introduction to transportation policy planning in urban context. Transportation policy instruments and policy-making processes, critical issues in transportation policy, history of policy in U.S. at federal, state, and local levels.	3

College/University	*State*	*Course Name*	*Description*	*Credits Earned*
University of Florida	Florida	**Urban Streets Simulation and Control**	Principles of simulation modeling and applications. Simulating urban street operations using commercially available packages; traffic signal control and optimization for urban streets; signal control hardware	3
University of Florida	Florida	**Urban Transportation Models**	Mathematical models for decision making in planning and operations of urban highway and transit systems.	3
University of Hartford	Connecticut	**Highway Engineering**	Highway and intersection capacity and level of service, geometric design, traffic signal design, signal systems and coordination, traffic calming, intelligent transportation systems, accident analysis.	3
University of Hartford	Connecticut	**Public Transportation Systems**	Theory and principles of public transportation including relationship to land use, economics, and demographics; role of government in planning and implementation of fixed guideway transit systems; policy issues; demand forecasting; cost estimation and measures of cost effectiveness. Emphasis on case studies to critically assess the effectiveness of public transportation systems.	3
University of Hartford	Connecticut	**Simulation and Modeling of Transportation Systems**	Principles of simulation. Use of traffic simulation models for the planning, design, and operations of transportation systems. Simulation model development, calibration and validation. Traffic signal control and optimization strategies. Statistical design and analysis of simulation experiments. Performance measures analysis. Group project, written and oral presentation of the project.	3
University of Hartford	Connecticut	**Traffic Flow Theory and Analysis**	Fundamentals of traffic flow theory are developed. Topics are the characteristics of macroscopic and microscopic traffic flow, the statistical distribution of traffic flow parameters, traffic stream models, car-following and continuum- flow models, shock wave analysis, queuing analysis, and traffic signal control and optimization. May be taken as a professional elective for senior civil engineering undergraduates.	3
University of Hartford	Connecticut	**Urban Transportation Planning**	Methodologies for planning multimodal transportation systems, trip generation, trip distribution, mode choice, traffic assignment, travel-demand and network modeling, interrelationship of transportation and urban environment, data sources and collection, transport legislation and financing.	3

College/University	State	Course Name	Description	Credits Earned
University of Hawaii at Manoa	Hawaii	**Advanced Transportation Modeling and Statistics**	Demand modeling, discrete choice and activity-based modeling. Demand forecasting by simulation. Transportation surveys and sampling methods. Application of cluster, factor, regression, logistic and ARIMA analyses to transportation.	3
University of Idaho	Idaho	**Highway Design and Traffic Safety**	Geometric design of highways as related to operation and safety. Analysis of highway design alternatives and control strategies with respect to accident probabilities. Statistical models for safety analysis. Accident countermeasure selection and evaluation methodology. Risk management.	3
University of Idaho	Idaho	**Highway Traffic Operations**	Theory of two-lane highway and freeway operations, application of traffic simulation models for the design and operations of highway, development and assessment of freeway management and control strategies including Intelligent Transportation Systems applications, field data collection and analysis.	3
University of Idaho	Idaho	**Intersection Traffic Operations**	Application of traffic simulation models to the design and operations of traffic facilities, including intersection, arterials; assessment and design of traffic signal timing strategies.	3
University of Idaho	Idaho	**Public Transportation**	Concepts and principles of planning and operations of public transportation systems, including bus transit, rail transit, and paratransit modes.	3
University of Idaho	Idaho	**Simulation of Transportation Systems**	This course introduces students to the simulation of transportation systems, including the algorithms that constitute most traffic simulation models and how the models are applied to the study of real transportation problems. The course considers the fundamental issues that the transportation engineer must consider when developing and applying simulation models, the core algorithms that constitute transportation simulation models, how to build and test a simulation network, the process for validating and calibrating a simulation model, how model results should be analyzed and presented, and the process for using and the value of hardware-in-the-loop simulation.	3

College/University	State	Course Name	Description	Credits Earned
University of Idaho	Idaho	**Traffic Flow Theory**	Introduction to elements of traffic flow theory including principles of traffic stream characteristics, capacity, queuing theory, and shock waves; application of traffic flow theory to freeway and arterial traffic flow problems. Cooperative: open to WSU degree-seeking students.	3
University of Illinois - Chicago	Illinois	**Sustainable Transportation Systems**	Transportation network analysis, mobile source emission modeling and life-cycle based transportation energy modeling.	4
University of Illinois - Chicago	Illinois	**Traffic Engineering and Design**	Highway Traffic control with an emphasis on highway capacity analysis and Traffic Signal Design. Queuing theory, traffic flow theory, corridor management, and Traffic Safety.	4
University of Illinois - Chicago	Illinois	**Transportation Networks**	Application of constrained optimization methods to the analysis, planning and design of urban transportation networks.	4
University of Illinois - Chicago	Illinois	**Urban Travel Forecasting**	Theory and method of forecasting travelers' choices of route, mode, destination, departure time, trip frequency and origin location in congested urban transportation networks.	4
University of Illinois-Urbana/Champaign	Illinois	**Traffic Flow Theory**	Fundamentals of traffic flow, traffic flow characteristics, statistical distributions of traffic flow parameter, traffic stream models, car following models, continuum follow models, shock wave analysis, queuing analysis, traffic flow models for intersections, network flow models and control, traffic simulation.	4
University of Illinois-Urbana/Champaign	Illinois	**Traffic Signal Systems**	Theory and application of concepts in traffic signal systems control, signal timing design, signal cabinet components, signal controllers, traffic signal theory and control, vehicle detection technologies, communication methods, interconnected rail-highway crossing signals, signal coordination, and signal systems network.	4
University of Iowa	Iowa	**Application Simulation to Transportation**	Transportation system management and traffic engineering; application of real-time simulation and visualization.	3

College/University	State	Course Name	Description	Credits Earned
University of Iowa	Iowa	**Design of Transportation Systems**	Overview of different modes within transportation systems; concepts of sustainability and livability in transportation system design; derivation of standards for geometric design of highways; roundabout design; cross-sectional and longitudinal geometric design of highways	3
University of Iowa	Iowa	**Traffic Engineering**	Design of traffic control devices; evaluation and analysis of intersections and transportation networks using appropriate computer software.	3
University of Iowa	Iowa	**Winter Highway Maintenance**	Aspects of winter highway maintenance; current and innovative practices and the theory that underpins them.	3
University of Louisville	Kentucky	**Advanced Traffic Operations**	A continuation of CEE 560, with an emphasis on mathematical and computer techniques to solve traffic problems.	
University of Louisville	Kentucky	**Airport Planning and Design**	Addresses the planning, design and development of 21st century airports. When you complete this course, you will have a better understanding of the complex issues facing today's airports. This will be accomplished through the following learning objectives: Identify the key milestones comprising the historical evolution of air transportation Recognize the significant aviation laws and regulations for US airports and explain their importance on the industry Interpret air transport demand forecasting and its impact on airport infrastructure Classify airport terminal space and analyze airport planning components Evaluate airport system planning and layout to address system capacity; at the national and local levels Assess the role of air traffic control and the FAA with the planning and design of US airports Calculate engineering factors for airport pavement Analyze specialty functions associated with air cargo and its impact on the airport environment Critique environmental analysis components	3

College/University	State	Course Name	Description	Credits Earned
University of Louisville	Kentucky	**Applied Hydrology**	Introduction to hydrologic systems; modeling runoff from watersheds using lumped and distributed methods; storm water management and design; hydrologic and hydraulic routing including kinematic wave routing; computer rainfall-runoff simulation models. A hydrologic design project will be assigned to all students; special assignments dealing with hydrologic processes will be assigned to M.S. students.	3
University of Louisville	Kentucky	**Applied Logistics in Transportation**	Special Topic in Civil and Environmental Engineering	3
University of Louisville	Kentucky	**Bridge Design**	Special Topic in Civil and Environmental Engineering	3
University of Louisville	Kentucky	**Construction Materials**	Properties of construction materials such as cement, concrete, asphalt, and structural elastomers. Design of Portland cement concrete and asphaltic concrete mixes.	3
University of Louisville	Kentucky	**Geometric Design of Highways**	The concepts of geometric design for rural and urban highways, utilizing proprietary design software are introduced and applied.	
University of Louisville	Kentucky	**Geometric Highway Design**	The concepts of geometric design for rural and urban highways, utilizing proprietary design software are introduced and applied.	3
University of Louisville	Kentucky	**Intelligent Transportation Systems**	Examines the elements of traffic flow theory, incident/emergency management, dynamic route guidance, in-vehicle systems, and traffic signal systems.	3
University of Louisville	Kentucky	**Traffic Engineering**	Examines characteristics of the vehicle, the driver, and the traffic stream. Highway and intersection capacity, theory of traffic flow, parking, traffic safety	3
University of Louisville	Kentucky	**Traffic Engineering**	Examines characteristics of the vehicle, the driver, and the traffic stream. Highway and intersection capacity, theory of traffic flow, parking, traffic safety.	
University of Louisville	Kentucky	**Transportation Planning & Urban Development**	Focuses on the principles of transportation planning in the urban environment, including land use planning, with emphasis on the orderly development of the transportation system.	3

College/University	*State*	*Course Name*	*Description*	*Credits Earned*
University of Massachusetts Amherst	Massachusetts	**Advanced Concepts in Traffic Safety**	Advanced topics in traffic safety including both motorized and nonmotorized modes with an emphasis on the science of safety. Includes safety management systems, human factors, data needs and limitations, identification of hazardous locations, diagnosis of problems, development of countermeasures, road safety audits/reviews, and crash reconstruction. Safety modeling using the Interactive Highway Safety Design Modules and other modeling platforms incorporated as applicable. Several traffic engineering software packages also used to demonstrate relationships between traffic safety and operational efficiency.	3
University of Massachusetts Amherst	Massachusetts	**Public Transportation Systems**	Relationship of public transportation to technological innovation; financing and regulation; supply, demand, and price considerations; performance evaluation; routing and scheduling; application of microcomputers; and project planning and design.	3
University of Massachusetts Amherst	Massachusetts	**Traffic Engineering**	Characteristics of traffic system components including drivers, vehicles, and roadways. Fundamental principles of traffic flow, operations, and controls. Traffic demand analysis and highway capacity analysis. Traffic engineering studies involving volume, speed, travel time, and delay. Techniques of field data collection and methodology of office analysis. Intersection design and analysis. Signalized intersection control involving signal phases and timing. Emphasizes both methodology and practice.	3
University of Massachusetts Amherst	Massachusetts	**Traffic Flow Theory and Simulation I**	Fundamentals of traffic flow including its characteristics and their relationships; mathematical models that describe traffic flow dynamics at multiple levels of detail; solutions and applications of these models that capture traffic flow phenomena such as congestion and queue dissipation.	3
University of Massachusetts Amherst	Massachusetts	**Traffic Flow Theory and Simulation II**	Applications of traffic flow theory involving traffic flow modeling at varying levels of details using manually-generated and commercially-available transportation simulation tools. Fundamentals involved in transportation simulation such as random number generation, input/output analysis, and macroscopic and microscopic traffic flow models.	3

College/University	State	Course Name	Description	Credits Earned
University of Massachusetts Amherst	Massachusetts	**Transportation Design**	Highway location and geometric design principles for streets and highways with emphasis on roadway safety. Includes state-of-the-art design policies and current research findings. AutoCAD and transportation design computer software used for class assignments and the class project. Students work in design teams on transportation design projects with an emphasis on creative design and problem solving through transportation systems management techniques.	3
University of Massachusetts Amherst	Massachusetts	**Transportation Systems Analysis**	Introduction to transportation systems analysis and modeling as applied to the urban transportation planning process, multiple transportation modes, and the larger metropolitan environment.	3
University of Massachusetts Dartmouth	Massachusetts	**Advanced Traffic Engineering**	Applied technology and scientific principles to the planning, functional design, operations, and management of surface transportation facilities. A course project is required and includes topic areas in capacity analysis, simulation software applications, modeling traffic flow, environmental impact studies and other studies including volume, speed, travel-time, and delay studies.	3
University of Massachusetts Lowell	Massachusetts	**Advanced Highway Geometric Design**	Development of the principals of modern roadway design while addressing context specific design requirements and constraints. Topics will include guidelines for highway design, design and review of complex geometry, geometric design to address safety and operational concerns, multi-modal design for signalized and un-signalized intersections, complete streets design concepts, and superelevation. Course-work will also include principals to present transportation designs to the public, transportation advocates, and private clients.	3

College/University	State	Course Name	Description	Credits Earned
University of Massachusetts Lowell	Massachusetts	**Public Transit Plan and Design**	Planning and design of public transportation systems and their technical, operational and cost characteristics. Discussion of the impact of public transportation on urban development; the different transit modes, including regional and rapid rail transit (RRT), light rail transit (LRT), buses, and paratransit, and their relative role in urban transportation; planning, design, operation and performance of transit systems (service frequency and headways, speed, capacity, productivity, utilization); routes and networks; scheduling; terminal layout; innovative transit technologies and their feasibility.	3
University of Massachusetts Lowell	Massachusetts	**Traffic Engineering**	Engineering principles for safe and efficient movement of goods and people on streets and highways, including aspects of (a) transportation planning; (b) geometric design; (c) traffic operations and control; (d) traffic safety, and; (e) management of transportation facilities. Topics include: traffic stream characteristics; traffic engineering studies; capacity and level-of-service analysis; traffic control; simulation of traffic operations; accident studies; parking studies; environmental impacts.	3
University of Massachusetts Lowell	Massachusetts	**Traffic Flow Theory**	Traffic flow theory seeks to describe through precise mathematical models (a) the interactions between the vehicle and the roadway system and (b) the interactions among vehicles. Such theories forms the basis of all the models and procedures used in design and operational analysis of streets and highways. The course examines the fundamental traffic flow characteristics: time headway, flow, time-space trajectories, speed, distance headway and density. In depth treatment of related analytical techniques including traffic stream modeling at both microscopic and macroscopic levels, supply and demand analysis, shock wave analysis, queuing analysis and simulation modeling of traffic systems.	3

College/University	State	Course Name	Description	Credits Earned
University of Massachusetts Lowell	Massachusetts	**Traffic Management and Control**	The course presents modern methods of traffic management, traffic control strategies and traffic control systems technology. Main topics covered, include: transportation systems management (TSM); traffic control systems technology; control concepts - urban and suburban streets; control and management concepts - freeways; control and management concepts - integrated systems; traveler information systems; system selection, design and implementation; systems management; ITS plans and programs. The course will also include exercises in the use and application of traffic simulation and optimization models such as: CORSIM, TRANSYT and MAXBAND/ MULTIBAND.	3
University of Massachusetts Lowell	Massachusetts	**Traffic Principles for Intelligent Transportation Systems**	The objective of this course is to introduce the student to the traffic principles that are pertinent for the planning, design and analysis of Intelligent Transportation Systems (ITS). The course is oriented toward students that come from different disciplines and who do not have previous background in traffic or transportation principles. It is designed as an introductory course that will enable the student to pursue more advanced courses in transportation systems subsequently.	3
University of Massachusetts Lowell	Massachusetts	**Transportation Network Analysis**	This course is to introduce engineering students to basic transportation network analysis skills. Topics covered include fundamentals of linear and nonlinear programming, mathematical representations of transportation networks, various shortest path algorithms, deterministic user equilibrium traffic assignment, stochastic user equilibrium traffic assignment, dynamic traffic assignment, heuristic algorithms for solving traffic assignment problems, and transportation network design.	3

College/University	State	Course Name	Description	Credits Earned
University of Massachusetts Lowell	Massachusetts	**Urban Transportation Planning**	Objectives and procedures of the urban transportation planning process. Characteristics and current issues of urban transportation in the United States (both supply and demand). Techniques of analysis, prediction and evaluation of transportation system alternatives. Consideration of economic, environmental, ethical, social and safety impacts in the design and analysis of transportation systems.	3
University of Michigan	Michigan	**Introduction to Transportation Engineering**	Fundamentals of planning, design and operation of highway transportation facilities. Topics covered include driver and vehicle performance characteristics, highway geometric design principles, basics of traffic analysis, traffic signal operations, transportation planning, connected and automated vehicle technologies and their impacts to the transportation infrastructure.	4
University of Michigan	Michigan	**Traffic Science**	This course provides fundamentals of traffic science, including data collection, analysis, design, and operations. Main components include traffic flow theory, traffic simulation, and traffic operations. An introduction to connected and automated vehicle technology and its applications in traffic flow and signal control will be introduced	3
University of Michigan	Michigan	**Travel Behavior Analysis and Forecasting**	This course provides and introduction to analysis and forecasting of passenger travel demand. The objective is for students to understand the fundamentals of discrete choice models. Using case studies and participating in a group project, students will also understand how these models are applied in practice.	3
University of Missouri - Columbia	Missouri	**Advanced Research Methods in Transportation Engineering**	This course will cover advanced research methods used in transportation. A special focus will be on the state-of-art approaches in traffic engineering. Mathematical and analytical models will be reviewed in detail. This is a reading intensive course where students are expected to review research articles on various topics. The methods used in the articles and a critical review of the article findings will be discussed in an interactive manner in the class.	3
University of Missouri - Columbia	Missouri	**Highway Transportation**	Economics of transportation on highways. Comparison of vehicle operation costs. Project studies of highway problems in general.	3

College/University	State	Course Name	Description	Credits Earned
University of Missouri - Columbia	Missouri	**Theory of Traffic Flow**	Scientific approach to study of traffic phenomena with emphasis on applications. Deterministic and stochastic models of traffic flow; optimization of intersection controls; computer simulation of traffic problems.	3
University of Missouri - Columbia	Missouri	**Transportation Networks**	This course presents techniques used in equilibrium analysis of transportation networks. The details of traffic assignment algorithms will be discussed along with theory and practical algorithms.	3
University of Missouri - Kansas City	Missouri	**Advanced Traffic Engineering**	This course covers the review of traffic flow characteristics, the field survey practices and studies, traffic signal designs, freeway operation, and the introduction to Intelligent Traffic Systems (ITS).	3
University of Missouri - Kansas City	Missouri	**Principles of Railroad Engineering**	The engineering analysis and design of railroad systems including the study of the dynamics of track/trains; wheel/rail interaction related to acceleration and braking; horizontal and vertical geometric design of railroads and rail-bed design, rail structures; freight and passenger operations; and, rail-highway interaction and safety.	3
University of Missouri - Kansas City	Missouri	**Traffic Flow Theory**	This course covers the review of macroscopic and microscopic traffic flow characteristics, the traffic flow models, and the traffic simulation applications.	3
University of Missouri - Kansas City	Missouri	**Transportation Network Modeling**	This course is about modeling, solving, and understanding network flow problems, especially in the transportation discipline. This course covers equilibrium traffic assignment, network design, fleet assignment, fleet routing, and crew scheduling.	3
University of Nebraska - Lincoln	Nebraska	**Analysis and Estimation of Transportation Demand**	Introduction to conceptual, methodological, and mathematical foundations of analysis and design of transportation services. Review of probabilistic modeling. Application of discrete choice models to demand analysis.	3
University of Nebraska - Lincoln	Nebraska	**Highway Design**	Design of roadways, intersections, interchanges, parking facilities, and land development site access and circulation. Emphasis on design projects.	3
University of Nebraska - Lincoln	Nebraska	**Traffic Engineering**	Design of signalized intersections, arterial street and network signal systems, and freeway control systems	3

College/University	State	Course Name	Description	Credits Earned
University of Nebraska - Lincoln	Nebraska	**Transportation Characteristics**	Use of the concepts of volume, speed, density, and capacity to describe the characteristics and performance of surface, air, and water transportation systems.	3
University of Nebraska - Lincoln	Nebraska	**Transportation Safety Engineering**	Safety criteria in the planning, design, and operation phases of highway, rail, airport, mass transit, pipeline, and waterway transportation systems. Background of safety legislation and funding requirements. Identification of high accident locations and methods to determine cost/effectiveness of improvements.	3
University of Nebraska - Lincoln	Nebraska	**Urban Transportation Planning**	Development of urban transportation planning objectives and goals. Data collection procedures, land use and travel forecasting techniques, trip generation, trip distribution, modal choice analyses, and traffic assignment. Site development and traffic impact analysis.	3
University of Nevada - Reno	Nevada	**Traffic Operations**	Studies in traffic operations, intersection control, and traffic impact analysis.	3
University of Nevada - Reno	Nevada	**Traffic Safety**	Advanced statistical methods for traffic safety analyses.	3
University of Nevada - Reno	Nevada	**Traffic Simulation**	Advanced techniques for developing and application of simulation models in transportation.	3
University of Nevada - Reno	Nevada	**Transportation Systems Management and Operations**	Advanced techniques for transportation systems management and operations.	3
University of New Hampshire	New Hampshire	**Transportation Engineering and Planning**	Fundamental relationships of traffic speed, density, and flow applied to public and private modes of transport. Principles of demand forecasting and urban systems planning.	3
University of New Mexico	New Mexico	**Highway and Traffic Engineering**	Principles of the geometric design and operation of streets and highways, including planning aspects, traffic design and control and highway safety. Application of these principles to actual situations.	3
University of North Carolina at Charlotte	North Carolina	**Traffic Control and Operation**	Traffic control theory and application; traffic regulation, laws and ordinances; speed control, intersection control, flow control and parking control; design and application of control devices, investigation, evaluation techniques; statistical analysis; administration.	3

College/University	State	Course Name	Description	Credits Earned
University of North Carolina at Charlotte	North Carolina	**Traffic Flow Theory**	Logical foundations and mathematical representation of traffic flow; interrelation between microscopic and macroscopic equations of motion for highway traffic; stochastic properties of traffic at low and moderate densities. Car-following theories of traffic flow at high densities. Applications of queuing theory.	3
University of North Carolina at Charlotte	North Carolina	**Traffic Safety**	Crash data elements and source of data; Crash site reconstruction; Quantifying risk; Safety evaluation process: Problem definition, high crash locations, ranking and prioritization, understanding causal factors, countermeasure selection, before-after evaluation; Crash prediction Modeling; Economic appraisal; Safety conscious planning.	3
University of North Carolina at Charlotte	North Carolina	**Traffic Signal Control Systems**	Study of control systems for isolated intersections, arterial streets, closed networks, and freeways. Emphasis on computer models; state-of-the-art detection, control, and communications equipment and software; and intelligent vehicle/highway systems.	3
University of North Carolina at Charlotte	North Carolina	**Transportation Systems Analysis**	Issues, concepts and methods of transportation systems engineering and planning. Decision making in transportation management. The application of analytical methods to the development and evaluation of transport systems.	3
University of North Carolina at Charlotte	North Carolina	**Urban Transportation Networks: Operations and Optimization**	Introduction to planning and optimization techniques for the analysis of transportation networks. Principles of precise algorithms for finding transport network equilibrium flows and applications that relate to these flows. Topics include: basic optimization skills, shortest path algorithms, user equilibrium, system optimal, elastic demand, OD matrix estimation, network design, congestion pricing, and stochastic user equilibrium.	3
University of North Florida	Florida	**Advanced Highway Geometric Design**	This course provides a detailed coverage of the principles and techniques necessary for the design of the highway geometric elements. Emphasis will be on the design criteria and methods necessary to prepare a set of highway plans.	3

College/University	State	Course Name	Description	Credits Earned
University of North Florida	Florida	**Highway Safety Analysis**	This course provides a detailed coverage of safety analysis using methodologies of the Highway Safety Manual developed by the American Association of State Highway and Transportation Officials (AASHTO). Topics covers include; crash modification factors, safety performance functions, principles and techniques used in identification and evaluation of high crash locations, and corrective measures to enhance highway safety.	3
University of North Florida	Florida	**Operational Analysis of Transportation Facilities**	This course provides a detailed coverage of capacity and level of service analysis of freeways, surface streets, signalized and unsignalized intersections using methodologies of the Highway Capacity Manual.	3
University of North Florida	Florida	**Traffic Signal Systems**	This course provides comprehensive coverage of the timing of coordinated traffic signal systems with an emphasis on computer analysis and simulation, including a treatment of the following topics: data collection, timing analysis via Synchro, time-space diagrams, controller functions for coordination, field implementation, traffic responsive operation, project evaluation, and system maintenance.	3
University of Pittsburgh	Pennsylvania	**Public Transportation Systems**	This course is designed to give seniors and graduate students a basic background in the planning, operations and development of public transportation systems within the context of the overall transportation system.	3
University of Pittsburgh	Pennsylvania	**Traffic Management and Operations**	Introduction to traffic flow theory and characteristics. Highway capacity analysis. Basic traffic management and control.	3
University of Pittsburgh	Pennsylvania	**Urban Transportation Planning**	All aspects of the transportation planning process including transportation planning and decision making, transportation modeling, demand and supply analysis, transportation studies, environmental issues and project implementation.	3
University of Puerto Rico, Mayaguez Campus	Puerto Rico	**Advanced Transportation Systems Analysis**	Advanced topics in transportation and demand analysis; transportation economy; resource models; techniques for the design and generation of alternatives in transportation systems.	3

College/University	State	Course Name	Description	Credits Earned
University of Puerto Rico, Mayaguez Campus	Puerto Rico	**Mass Transportation**	Study of concepts related to the planning and operation of mass transportation systems in urban areas. Discussion and comparison of diverse modes of mass transport. Detailed study of urban rail systems.	3
University of Puerto Rico, Mayaguez Campus	Puerto Rico	**Traffic Engineering**	City and highway traffic surveys and designs; accidents, congestion, delay, speed, volume density, parking, channelization, lighting, traffic control and routing, signs, signals and markings, urban traffic consideration in city planning; driver reactions and habit patterns	3
University of Puerto Rico, Mayaguez Campus	Puerto Rico	**Transportation Systems Analysis II**	Principles and techniques of systems analysis and mathematical programming are presented and applied to economic, physical planning, and the evaluation and operation of transportation facilities. Mathematical models are used to examine problems related to optimum efficiency of transportation systems and modes. Operations research methods of COLLEGE OF ENGINEERING Graduate Catalogue 2014-2015 171 linear programming, non-linear programming, network analysis, queueing theory, and simulation are studied	3
University of Rhode Island	Rhode Island	**Highway Engineering**	Design of modern highways and streets including planning, location, geometric layout, drainage structures, bituminous materials, pavement structure, construction, operation, maintenance and rehabilitation.	3
University of Rhode Island	Rhode Island	**Public Transportation Systems**	Bus and rail modes; technological characteristics on capacity, service quality, costs; analysis, evaluation; performance monitoring, route and network design; frequency determination; vehicle scheduling; advanced operations strategies.	3
University of Rhode Island	Rhode Island	**Traffic Engineering**	Highway traffic characteristics and methods of providing for an effective, free, and rapid flow of traffic. Types of studies, regulations, control devices and aids, planning and administration.	3

College/University	State	Course Name	Description	Credits Earned
University of Rhode Island	Rhode Island	**Traffic Systems Operations**	Signalized and unsignalized intersection treatments; coordination concepts; arterial and freeway management, operating strategies, and design issues; simulation and optimization; performance evaluation. (Lec. 3) Pre: CVE 442 or permission of instructor.	3
University of Rhode Island	Rhode Island	**Transportation Engineering**	Concepts of transportation planning and design as well as traffic analysis techniques are covered with respect to Multi-Mode travel within transportation systems. (Lec. 3) Pre: At least a 2.00 (C) average in MTH 141, MTH 142, PHY 203, PHY 204, and CHM 101.	3
University of Rhode Island	Rhode Island	**Urban and Rural Transportation**	Issues confronting planning for urban and rural transportation systems; the variety of policies that governments pursue in addressing issues and problems; technical and political constraints, transportation studies, and demand analysis techniques. (Lec. 3) Pre: CPL 410 or 501 or permission of instructor. In alternate years.	3
University of South Alabama	Alabama	**Traffic Engineering**	This course will focus on traffic flow parameters and their influence on roadway traffic conditions, with emphasis on traffic data collection, traffic safety analysis, roadway markings, traffic signs, traffic signal timing and signal capacity analysis, and traffic management systems.	3
University of South Alabama	Alabama	**Transportation Geometric Design**	This course will provide students with an understanding of the basic principles and techniques of highway design. This will include laying out potential routes, design of the alignment and intersections, and evaluation of earthwork requirements. The student should be able to understand and apply these principles to highway design problems. The student should also be able to use existing computer tools to generate and analyze designs. Upon completion, students should be prepared to work in the field of highway design.	3
University of Southern California	California	**Design of Transportation Facilities**	Planning, design, staging, construction, test, and maintenance of the public works and facilities for land, water, and air transportation.	3
University of Southern California	California	**Traffic Engineering and Control**	Conceptual engineering geometric design, installation, and calibration of vehicular storage and traffic controls; safe flow optimization of vehicles on various thoroughfares.	3

College/University	State	Course Name	Description	Credits Earned
University of Tennessee - Knoxville	Tennessee	**Design of Railway Transportation Systems**	Basic principles of rail way transportation, track behavior and design, geometric design of railway lines and terminals, train performance, railway signaling and communications, capacity and operations analysis.	3
University of Tennessee - Knoxville	Tennessee	**Public Transit Planning and Operations**	Characteristics of transit modes – conventional, informal, and paratransit; operational design of transit services: route planning and scheduling; cost analysis; traveler behavior; performance evaluation; data collection methods; organization and financing.	3
University of Tennessee - Knoxville	Tennessee	**Traffic Engineering: Operations**	Operation and management of the surface transportation system including freeways and arterials; traffic control systems including traffic signal design and operation; traffic control devices including signing and markings.	3
University of Tennessee - Knoxville	Tennessee	**Transportation Safety**	Transportation safety defined from a multi-disciplinary perspective and characterized by crashes, injuries and deaths. Significant challenges to transportation safety are identified. Environmental, roadway, vehicle, and human factors involved in crashes are explored using descriptive analysis and advanced modeling/simulation techniques. Discussion of current state-of-the-practice in Highway Safety Manual.	3
University of Texas - El Paso	Texas	**Advanced Traffic Engineering.**	Advanced Traffic Engineering (3-0) Human, vehicular, and traffic characteristics as they relate to driver-vehicle-roadway operational systems; traffic studies and methods of analysis and evaluation. Advanced theory and application of traffic control; signalization; and freeway operations.	

College/University	State	Course Name	Description	Credits Earned
University of Texas - El Paso	Texas	**Advanced Travel & Infra Demand Analysis**	Advanced Travel and Infrastructure Demand Analysis (3-0) This course addresses new developments in the econometric and behavioral aspects of demand analysis and forecasting, through a number of model-estimation methods that are used in transportation data analysis, economic analysis, and other subject areas that deal with data analysis. Applications include passenger travel, urban activity decisions, user responses to information, freight transportation as well as the demand for other types of infrastructure facilities and services. It is important to note that the methods presented can be used in wide variety of data-analysis applications and go well beyond the techniques typically covered in statistics courses.	
University of Texas - El Paso	Texas	**Intermodal Transportation Systems**	Intermodal Transportation Systems (3-0) The primary focus of this course is on the design and strategic planning of intermodal transportation systems (infrastructure and rolling stock); that is, how strategic planning pertains to freight transportation. Freight logistics, intermodal technology, and intermodal terminal operations. Intermodal freight transportation policy, planning, and operations systems and programs. Applications include inland and bi-national (border region) planning and design	
University of Texas - El Paso	Texas	**Traffic Engineering**	Traffic Engineering Human, vehicular, and traffic characteristics as they relate to driver-vehicle roadway operational systems, traffic studies, and methods of analysis and evaluation. Traffic flow theory and application of traffic control, signalization, and freeway operations. Intelligent transportation systems.	3
University of Texas - El Paso	Texas	**Traffic Flow/Simulation Modeling.**	Traffic Flow and Simulation Modeling (3-0) This is a comprehensive introductory course to traffic flow and simulation modeling. Topics include: basic microscopic; meso-scopic and macroscopic traffic flow theories; advanced traffic flow theories such as high-order traffic flow theories; analytical and simulation based traffic flow modeling; traffic simulation models and their applications.	

College/University	State	Course Name	Description	Credits Earned
University of Texas at Arlington	Texas	**ANALYTICAL MODELS IN TRANSPORTATION**	Development and analysis of mathematical models in transportation. Topics include travel demand, trip generation, distribution, mode choice, assignment, plan evaluation, spatial distribution, traffic control and flow models; principles of behavioral, econometric, deterministic, probabilistic, and chaotic simulation models, and their applications.	3
University of Texas at Arlington	Texas	**Public Transit Planning and Operations**	Theory and application of technologies used for transit demand analysis, routing, scheduling, evaluation, crew assignment, maintenance strategies, and management. Land-use impact on public transit policy and operation is also introduced.	3
University of Texas at Arlington	Texas	**Traffic Flow Theory**	Speed, density relationships of vehicular traffic flow; statistical aspects of traffic events and queuing processes; deterministic models and simulation models of traffic flow behavior; applications of flow theory to traffic problem solutions.	3
University of Texas at Austin	Texas	**Acquisition and Analysis of Transportation Data**		3
University of Texas at Austin	Texas	**Advanced Theory of Traffic Flow**		3
University of Texas at Austin	Texas	**Advanced Traffic Engineering**		3
University of Texas at Austin	Texas	**Advances in Transportation Demand Analysis**		3
University of Texas at Austin	Texas	**Airport Design and Operation**		3
University of Texas at Austin	Texas	**Analysis and Design of Transportation Systems I**		3
University of Texas at Austin	Texas	**Analysis and Design of Transportation Systems II**		3
University of Texas at Austin	Texas	**Contemporary Transportation Issues**		3
University of Texas at Austin	Texas	**Freight Transportation**		3
University of Texas at Austin	Texas	**Intermodal Transportation Systems**		3
University of Texas at Austin	Texas	**Public Transportation Engineering**		3

College/University	State	Course Name	Description	Credits Earned
University of Texas at Austin	Texas	**Traffic Science Seminar**		3
University of Texas at Austin	Texas	**Transportation Network Analysis**		3
University of Texas at Austin	Texas	**Transportation Planning: Methodology and Techniques**		3
University of Texas at Austin	Texas	**Transportation Systems Management**		3
University of Texas at Austin	Texas	**Transportation Systems Operations and Control**		3
University of Texas Tyler	Texas	**Public Transportation Engineering**	In this Public Transportation Engineering course you will learn the state-of-the-art and state-of-the practice of the public transportation systems engineering design and analysis. You will be studying on the introduction to public transportation systems, including planning, design, management, and operations of mass transit systems in urban and rural areas; principles of transit demand forecasting; optimal transit route network design; and driver and vehicle scheduling. In addition, you will be given the opportunity to applying the principles learned throughout this course and we will work to maximize the use of your computer in support of our work.	3
University of Texas Tyler	Texas	**Traffic Flow Theory**	In-depth traffic flow theory at micro-, meso-, and macro-scopic levels. Fundamentals of traffic flow, traffic flow characteristics, statistical distributions of traffic flow parameter, traffic stream models, car following models, continuum flow models, shock wave analysis, queuing analysis, traffic flow models for intersections, network flow models and control, traffic simulation.	3

College/University	*State*	*Course Name*	*Description*	*Credits Earned*
University of Texas Tyler	Texas	**Transportation Network Analysis**	Introduction to planning and optimization techniques for the analysis of transportation networks. Principles of precise algorithms for finding transport network equilibrium flows and applications that relate to these flows. Topics include routing algorithms, user equilibrium traffic assignments, system optimal, stochastic user equilibrium, traffic paradox, origin-destination matrix estimation, and transportation network design.	3
University of Texas Tyler	Texas	**Transportation Systems Management and Operations**	Foundations of transportation system management and operations, including arterial street systems and freeway systems. Principles of simulation of urban streets operations and traffic signal control and optimization, and freeway operations analysis and simulation using commercially available packages such as HCS+, Corsim, Synchro, Transyt-7F and Passer-V. Co-listed with CENG 4355. The graduate student will complete an additional project.	3
University of Utah	Utah	**Highway and Traffic Engineering**	Advanced topics in highway and traffic engineering: roadway safety management, practices for design and safety considerations in resurfacing, restoration, and rehabilitation projects, performance-based roadway design, roadside design, work zone management and design, project development and delivery.	3
University of Utah	Utah	**Public Transportation Systems**	This course provides a systematic coverage of public transportation characteristics, technology, and operations. The course presents a history of transit development in the U.S., and overview of trends in transit ridership, a review of transit systems and their usage worldwide, the fundamentals of transit vehicle motion, bus supply, operating and performance characteristics, and rail transit supply characteristics.	3
University of Utah	Utah	**Transportation Modeling**	Transportation model study and development, definition, construction, calibration, validation, taxonomy of models, the modeling process.	3
University of Utah	Utah	**Transportation Safety**	Fundamental concepts of road safety analysis: data sources, exposure, contributing factors to crash occurrence and severity, driver behavior, statistical road safety modeling, before-after studies, economic analysis.	3

College/University	*State*	*Course Name*	*Description*	*Credits Earned*
University of Vermont	Vermont	**Traffic Operations & Design**	Advanced concepts of traffic engineering and safety; human, vehicle and environment factors; simulation and statistical analysis software; transportation design manuals.	3
University of Virginia	Virginia	**Advanced Integrated Transportation Systems Models**	Introduces the current & advanced optimization and simulation computer models used in traffic operations. Covers the advantages and disadvantages of models considered and is project-oriented, with students spending a significant amount of time in selecting & using these models to solve “real world” problems.	3
University of Virginia	Virginia	**Intermodal Transportation**	Studies the structure of domestic freight and passenger transportation in the United States. Focuses on the integration of modes, economic impacts, national transportation policy and advanced technology. Case studies of contemporary examples of intermodal integration are explored.	3
University of Virginia	Virginia	**Public Transportation**	Study of the application of transportation systems and technologies in an urban context. Focuses on the management and operation of public transit systems, and comparative costs and capabilities of transit modes.	3
University of Virginia	Virginia	**Traffic Flow Theory**	Analyzes theoretical and mathematical models of traffic flow; deterministic and stochastic traffic flow models, queueing theory and its application including cases where arrival rates exceed service rates; acceleration noise and traffic simulation. Prerequisite: CE 6400.	3
University of Virginia	Virginia	**Transportation Data Analysis and Modeling**	This course explores the unique modeling and analysis challenges faced by transportation engineers. Students will be introduced to these challenges in a wide range of transportation areas - ranging from traffic flow theory, to safety, to aviation. Data characteristics from these areas will be investigated, along with well-suited modeling and analysis techniques.	3
University of Virginia	Virginia	**Transportation Impact Analysis**	Introduces the non-travel impacts of transportation systems and the methodologies used to capture them for project evaluation; to develop and illustrate methodologies used for evaluating the effectiveness of transportation system/projects including benefit-cost analysis and multi-objective decision models, and to illustrate the analysis of different alternatives.	3

College/University	***State***	***Course Name***	***Description***	***Credits Earned***
University of Virginia	Virginia	**Transportation Logistics**	This course covers logistics systems, with emphasis on the design and analysis of transportation and supply chain systems. Topics include transportation network design, scheduling, routing, contracting and pricing; interactions and trade-offs of these activities; and models and techniques for the analysis of logistics systems.	3
University of Virginia	Virginia	**Transportation Safety Engineering**	A study of different transportation systems management strategies with specific emphasis on their impact on safety, including methods of obtaining and analyzing crash data. Emphasis is also placed on the interaction of human and vehicle characteristics and the road environment on safety.	3
University of Washington	Washington	**Traffic Engineering Fundamentals**	General review of the fundamentals of traffic engineering, including their relationship to transportation operations management and planning, with emphasis on calculations and procedures in the Highway Capacity Manual; field surveys and data analysis.	3
University of Washington	Washington	**Traffic Simulation**	In-depth discussion of microscopic traffic simulation models. Will provide engineering and planning students the information on how to develop and operate traffic simulation models and evaluate and present results from simulation models. Hands-on course projects and labs will be used for this course.	3
University of Washington	Washington	**Transportation Engineering**	Studies vehicular transportation fundamentals including vehicle dynamics, geometric design, pavement design, traffic flow concepts, level of service analysis, intelligent transportation systems, travel demand prediction methods, freight logistics, and management of transportation systems. Includes a review of relevant vehicle operating characteristics.	3
University of Wisconsin - Madison	Wisconsin	**Traffic Control**	Traffic data collection studies; measures of effectiveness and evaluation of traffic system performance; design and application of traffic control devices; design of traffic signal systems; operational controls and traffic management strategies	3

College/University	*State*	*Course Name*	*Description*	*Credits Earned*
University of Wisconsin - Madison	Wisconsin	**Transportation Engineering**	Characteristics of transportation supply and demand; measuring and estimating demand; social and environmental impacts; planning of transportation systems; characteristics of transportation modes; interaction between modes; mode interfaces; transportation technology; economics; public policy, implementation and management.	3
University of Wisconsin - Milwaukee	Wisconsin	**Methods of Transportation Analysis**	Mathematical tools useful in analysis of transportation systems. Process of modeling and simulation, matrix techniques, network analysis, statistical analysis, etc. As related to transportation. Use of standard packaged computer programs. Class project may be utilized to develop these skills.	3
University of Wisconsin - Milwaukee	Wisconsin	**Traffic Control**	Control of transportation systems with emphasis on traffic engineering principles. Data collection, capacity analysis, traffic improvements, signalization, signs and markings, channelization, intersection, speeds and safety considerations.	3
University of Wisconsin - Milwaukee	Wisconsin	**Traffic Planning and Operations**	Planning and design of traffic systems, delay and capacity of signalized intersections, freeway controls, traffic system management and optimization, queues, traffic assignment and simulation.	3
University of Wisconsin - Milwaukee	Wisconsin	**Transportation Engineering**	Technological and common elements of all modes of transportation; their effect on performance, demand, and outputs of a transportation system. Development of new transportation systems.	3
University of Wyoming	Wyoming	**Traffic Control**	Planning, designing, and operating transportation facilities to optimum efficiency using traffic control devices. Topics included are traffic flow theory; pavement markings, signing, and signal design; computer design of signal systems using linear and network models; traffic control in construction areas.	3
University of Wyoming	Wyoming	**Traffic Engineering: Operations**	Basic characteristics of traffic, such as drivers, vehicles, volumes, speeds, delay, origins and destinations, intersection performance, capacity, termination and accidents; techniques for making traffic engineering investigations; traffic laws and ordinances, regulations, design and application of signal systems; curb parking control; enforcement and traffic administration; and public relations.	3

College/University	*State*	*Course Name*	*Description*	*Credits Earned*
University of Wyoming	Wyoming	**Traffic Safety**	Safety design and operational practices for streets and highways including safety improvement programs, design of barrier systems, bicycle and pedestrian consideration; access control; safety evaluation; and measures of effectiveness.	3
Utah State University	Utah	**Geometric Design of Highways**	Principles of highway location and planning, with full consideration of economic, environmental, and other impacts. Capacity analysis of intersections and highways, passing-lane design, and risk-cost based horizontal and vertical alignment design. Introduction to design software through coursework and term projects.	3
Utah State University	Utah	**Public Transportation**	Principles of planning, design, and operation of transit systems in urban and rural areas. Determination of optimal route alignments, schedules, and station/stop spacings. Exploration of innovations in financing and pricing, including cost-cutting techniques.	3
Utah State University	Utah	**Traffic Engineering**	Topics covered include characteristics, measurements, and analysis of volume, speed, density, and travel time; capacity and level of service analysis; signalization and traffic control devices.	3
Utah State University	Utah	**Traffic Operations Analysis**	Traffic flow fundamentals, macroscopic and microscopic models of traffic flow, shock wave analysis, car following principles, queuing systems, and simulation.	3
Utah State University	Utah	**Transportation Network Analysis**	Analytical approaches and algorithms to the formulation and solution of the equilibrium assignment problem for transportation networks. Emphasis on user equilibrium, comparison with system optimal stochastic user equilibrium, origin-destination matrix estimation, and network design problems.	3
Utah State University	Utah	**Transportation Safety**	This course includes statistical analysis of transportation data, including safety and risk assessment; regression and multivariate analysis, such as discriminant analysis, canonical correlation, and factor analysis; and in-depth study of selected methodologies for analyzing transportation safety and designing countermeasures. Additional coursework is required for those enrolled in the graduate level course.	3

College/University	State	Course Name	Description	Credits Earned
Utah State University	Utah	**Transportation Systems Analysis**	Introduces systems approach to analysis of transportation services and infrastructure. Focuses on basic and advanced concepts, including operations research techniques, simulation, and artificial intelligence. Topics include facility sizing and location, financial and economic analysis of investment projects, and privatization.	3
Vanderbilt University	Tennessee	**Advanced Transportation Design**	In-depth view of the transportation design process. Complex transportation design problems and solutions, with the use of computer-based analytical design tools. Comprehensive design projects.	3
Vanderbilt University	Tennessee	**Public Transportation Systems**	Comprehensive study of public transportation, with emphasis on planning, management, and operations; paratransit, ridesharing, and rural public transportation systems.	3
Vanderbilt University	Tennessee	**Theory of Traffic Flow**	A study of traffic flow from the perspective of probability as applied to highway, intersection and weaving capacities. Discrete and continuous flow, vehicle distributions, queuing, and simulation.	3
Vanderbilt University	Tennessee	**Traffic Engineering**	Analysis of the characteristics of traffic, including the driver, vehicle, volumes, speeds, capacities, roadway conditions, and accidents. Traffic regulation, control, signing, signalization, and safety programs are also discussed.	3
Villanova University	Pennsylvania	**Highway Safety**	Overview of highway safety including factors that contribute to highway crashes, techniques to improve the safety of the roads, geometric design elements, and accident reconstruction techniques	3
Villanova University	Pennsylvania	**Railway Engineering**	Introduction to passenger and freight railroad service, railway infrastructure, track geometry. Alignment design, power and energy, railroad capacity issues, intermodal operations, signaling and control.	3
Villanova University	Pennsylvania	**Traffic Engineering**	Road user and vehicle characteristics, stream flow characteristics, freeway operations, speed studies, traffic control and management, and its technologies and applications.	3
Villanova University	Pennsylvania	**Urban Transportation Engineering**	Transportation problems as related to urban areas; transit and other mode characteristics and planning; transportation network analyses through generation; distribution and assignment.	3

College/University	State	Course Name	Description	Credits Earned
Virginia Polytechnic Institute and State University	Virginia	**Analysis and Planning of Mass Transit Systems**	An overview of mass transit systems; transit system planning including demand and cost analysis and evaluation; transit system design including route design, scheduling, and fare policy; transit networks and marketing; para transit systems; future trends in mass transit.	3
Virginia Polytechnic Institute and State University	Virginia	**Analysis of Air Transportation Systems**	Planning, design and operation of aviation systems with computer aided design tools and computer simulation models. Airline airport operations and practices and their effect in airport planning and design. Air cargo facilities planning and modeling. State-of-the-art computer simulation models used in aviation environmental planning and airspace modeling.	3
Virginia Polytechnic Institute and State University	Virginia	**Highway Transportation Safety**	Identification of highway safety problems and development of solutions. User characteristics and expectations, road audits, roadside hardware systems, safety enhancing treatments, standard traffic control devices, real-time information and control systems, work zone and railroad crossing treatments, older driver design concepts, traffic calming, designs for pedestrians and bikes, delineation and lighting principles, and advanced 3D/4D design concepts. Group and individual analyses of problems.	3
Virginia Polytechnic Institute and State University	Virginia	**Traffic Characteristics and Flow**	Driver, vehicle, and roadway characteristics; stochastic modeling of traffic processes including queueing theory, headway distributions, and gap acceptance; stream flow characteristics including car-following and multilane traffic models, roadway capacity and bottleneck analysis, network operations, and fuel consumption models. Pre: Graduate standing.	3
Virginia Polytechnic Institute and State University	Virginia	**Traffic Signal System Operation and Control**	Traffic signal system control, with emphasis in arterial operation. Signal system design and operations, traffic simulation techniques, advanced traffic control strategies, and incorporation of surface street systems into Intelligent Transportation Systems (ITS). Hands on experience in signal system software and hardware.	3
Virginia Polytechnic Institute and State University	Virginia	**Transportation Network Analysis**	Optimal paths in transportation networks, transportation network design, vehicle routing and scheduling, facility location problems, traffic flows on networks, traffic assignment problems.	3

College/University	State	Course Name	Description	Credits Earned
Wayne State University	Michigan	**Advanced Traffic Signal Systems**	Analysis and design of traffic signal systems. Hardware, communication and detection systems associated with microcomputer-based signal systems. Coordinated signal systems	4
Wayne State University	Michigan	**Traffic Engineering Control and Operation**	Traffic flow theories, macroscopic and microscopic models of traffic control, statistical analysis; design and application of intelligent transportation systems on traffic flow characteristics; evaluation.	4
Western Michigan University	Michigan	**Public Transportation**	Design and analysis of public transportation systems; their operation and management: demand and cost analysis. Technological characteristics along with their impacts on capacity, quality of service, and cost. Impact of transit systems on land use and environment.	3
Western Michigan University	Michigan	**Traffic Model and Simulation**	Understanding macroscopic and microscopic traffic flow models and applying simulation techniques to modeling traffic phenomena; application of traffic flow models to traffic operation studies; issues in data needs and model validation; incorporating advanced traffic operation and ITS technologies into traffic simulation models; advanced transportation simulation models.	3
Western Michigan University	Michigan	**Traffic Operations and Management**	This course deals with the application of traffic engineering and control concepts, including data collection, analysis, and traffic control systems design to traffic operations and management. Traffic engineering studies, traffic flow theory, traffic control devices, traffic signal control and ramp metering systems, and intelligent transportation systems will also be addressed.	3
Western Michigan University	Michigan	**Traffic Safety Engineering**	Reasons causing traffic accidents, factors affecting traffic safety, countermeasures representing traffic crashes, applications of statistical modeling techniques to accident pattern and traffic conflict analysis, assessment of safety effectiveness, traffic safety policies and advanced technologies.	3
Western Michigan University	Michigan	**Travel Demand Analysis**	Study of theoretical aspects of travel demand concepts and analytical methods; urban and regional travel demand analysis; forecasting methods and behavioral demand models.	3

Appendix C: Catalog of TSMO-related Professional Development Courses and Training Programs

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
A & SW Consultants Inc.	**Advanced Maintenance of Traffic**	Advanced	20 hours	Advanced course is required for personnel with responsibility or authority to decide on the specific Maintenance of Traffic requirements to be implemented.	Certificate of Completion	http://www.floridamot.com/mot-course-descriptions-1.html	Florida-area; particularly FDOT	$ 450.00	Classroom
A & SW Consultants Inc.	**Advanced Refresher Maintenance of Traffic**	Advanced	8 hours	This Refresher class will review changes to Index 600 and MUTCD, which affect traffic control operations, as well as reiterate work zone practices.	Certificate of Completion	http://www.floridamot.com/mot-course-descriptions-1.html	Florida-area; particularly FDOT	$ 250.00	Classroom
AASHTO - American Association of State Highway and Transportation Officials	**TSMO Guidance: Business Processes - Level 3 to Level 4**	Advanced		A complete range of guidance for Transportation Systems Management and Operations from which user-specific selections are made via the One-Minute Guidance Evaluation or the Customized Guidance Evaluation. The guidance is divided into six dimensions that represent features of transportation agencies and their activities critical to effective TSM&O. Each dimension is further divided into three or four sub-dimensions and through the evaluation processes, can be specified to the user agency's current level of maturity—organized to provide only that guidance appropriate to reaching the next level.		www.aashtotsmoguidance.org/browse/	State DOT/TSMO professionals	No Cost	Web Based
AASHTO - American Association of State Highway and Transportation Officials	**TSMO Guidance: Collaboration - Level 3 to Level 4**	Advanced		A complete range of guidance for Transportation Systems Management and Operations from which user-specific selections are made via the One-Minute Guidance Evaluation or the Customized Guidance Evaluation. The guidance is divided into six dimensions that represent features of transportation agencies and their activities critical to effective TSM&O. Each dimension is further divided into three or four sub-dimensions and through the evaluation processes, can be specified to the user agency's current level of maturity—organized to provide only that guidance appropriate to reaching the next level.		www.aashtotsmoguidance.org/browse/	State DOT/TSMO professionals	No Cost	Web Based
AASHTO - American Association of State Highway and Transportation Officials	**TSMO Guidance: Culture - Level 3 to Level 4**	Advanced		A complete range of guidance for Transportation Systems Management and Operations from which user-specific selections are made via the One-Minute Guidance Evaluation or the Customized Guidance Evaluation. The guidance is divided into six dimensions that represent features of transportation agencies and their activities critical to effective TSM&O. Each dimension is further divided into three or four sub-dimensions and through the evaluation processes, can be specified to the user agency's current level of maturity—organized to provide only that guidance appropriate to reaching the next level.		www.aashtotsmoguidance.org/browse/	State DOT/TSMO professionals	No Cost	Web Based
AASHTO - American Association of State Highway and Transportation Officials	**TSMO Guidance: Organization/Workforce - Level 3 to Level 4**	Advanced		A complete range of guidance for Transportation Systems Management and Operations from which user-specific selections are made via the One-Minute Guidance Evaluation or the Customized Guidance Evaluation. The guidance is divided into six dimensions that represent features of transportation agencies and their activities critical to effective TSM&O. Each dimension is further divided into three or four sub-dimensions and through the evaluation processes, can be specified to the user agency's current level of maturity—organized to provide only that guidance appropriate to reaching the next level.		www.aashtotsmoguidance.org/browse/	State DOT/TSMO professionals	No Cost	Web Based
AASHTO - American Association of State Highway and Transportation Officials	**TSMO Guidance: Performance Measurement - Level 3 to Level 4**	Advanced		A complete range of guidance for Transportation Systems Management and Operations from which user-specific selections are made via the One-Minute Guidance Evaluation or the Customized Guidance Evaluation. The guidance is divided into six dimensions that represent features of transportation agencies and their activities critical to effective TSM&O. Each dimension is further divided into three or four sub-dimensions and through the evaluation processes, can be specified to the user agency's current level of maturity—organized to provide only that guidance appropriate to reaching the next level.		www.aashtotsmoguidance.org/browse/	State DOT/TSMO professionals	No Cost	Web Based
AASHTO - American Association of State Highway and Transportation Officials	**TSMO Guidance: Systems and Technology - Level 3 to Level 4**	Advanced		A complete range of guidance for Transportation Systems Management and Operations from which user-specific selections are made via the One-Minute Guidance Evaluation or the Customized Guidance Evaluation. The guidance is divided into six dimensions that represent features of transportation agencies and their activities critical to effective TSM&O. Each dimension is further divided into three or four sub-dimensions and through the evaluation processes, can be specified to the user agency's current level of maturity—organized to provide only that guidance appropriate to reaching the next level.		www.aashtotsmoguidance.org/browse/	State DOT/TSMO professionals	No Cost	Web Based

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
AASHTO - American Association of State Highway and Transportation Officials	**TSMO Guidance: Business Processes - Level 2 to Level 3**	Basic		A complete range of guidance for Transportation Systems Management and Operations from which user-specific selections are made via the One-Minute Guidance Evaluation or the Customized Guidance Evaluation. The guidance is divided into six dimensions that represent features of transportation agencies and their activities critical to effective TSM&O. Each dimension is further divided into three or four sub-dimensions and through the evaluation processes, can be specified to the user agency's current level of maturity—organized to provide only that guidance appropriate to reaching the next level.		www.aashtotsmoguidance.org/browse/	State DOT/TSMO professionals	No Cost	Web Based
AASHTO - American Association of State Highway and Transportation Officials	**TSMO Guidance: Collaboration - Level 2 to Level 3**	Basic		A complete range of guidance for Transportation Systems Management and Operations from which user-specific selections are made via the One-Minute Guidance Evaluation or the Customized Guidance Evaluation. The guidance is divided into six dimensions that represent features of transportation agencies and their activities critical to effective TSM&O. Each dimension is further divided into three or four sub-dimensions and through the evaluation processes, can be specified to the user agency's current level of maturity—organized to provide only that guidance appropriate to reaching the next level.		www.aashtotsmoguidance.org/browse/	State DOT/TSMO professionals	No Cost	Web Based
AASHTO - American Association of State Highway and Transportation Officials	**TSMO Guidance: Culture - Level 2 to Level 3**	Basic		A complete range of guidance for Transportation Systems Management and Operations from which user-specific selections are made via the One-Minute Guidance Evaluation or the Customized Guidance Evaluation. The guidance is divided into six dimensions that represent features of transportation agencies and their activities critical to effective TSM&O. Each dimension is further divided into three or four sub-dimensions and through the evaluation processes, can be specified to the user agency's current level of maturity—organized to provide only that guidance appropriate to reaching the next level.		www.aashtotsmoguidance.org/browse/	State DOT/TSMO professionals	No Cost	Web Based
AASHTO - American Association of State Highway and Transportation Officials	**TSMO Guidance: Organization/Workforce - Level 2 to Level 3**	Basic		A complete range of guidance for Transportation Systems Management and Operations from which user-specific selections are made via the One-Minute Guidance Evaluation or the Customized Guidance Evaluation. The guidance is divided into six dimensions that represent features of transportation agencies and their activities critical to effective TSM&O. Each dimension is further divided into three or four sub-dimensions and through the evaluation processes, can be specified to the user agency's current level of maturity—organized to provide only that guidance appropriate to reaching the next level.		www.aashtotsmoguidance.org/browse/	State DOT/TSMO professionals	No Cost	Web Based
AASHTO - American Association of State Highway and Transportation Officials	**TSMO Guidance: Performance Measurement - Level 2 to Level 3**	Basic		A complete range of guidance for Transportation Systems Management and Operations from which user-specific selections are made via the One-Minute Guidance Evaluation or the Customized Guidance Evaluation. The guidance is divided into six dimensions that represent features of transportation agencies and their activities critical to effective TSM&O. Each dimension is further divided into three or four sub-dimensions and through the evaluation processes, can be specified to the user agency's current level of maturity—organized to provide only that guidance appropriate to reaching the next level.		www.aashtotsmoguidance.org/browse/	State DOT/TSMO professionals	No Cost	Web Based
AASHTO - American Association of State Highway and Transportation Officials	**TSMO Guidance: Systems and Technology - Level 2 to Level 3**	Basic		A complete range of guidance for Transportation Systems Management and Operations from which user-specific selections are made via the One-Minute Guidance Evaluation or the Customized Guidance Evaluation. The guidance is divided into six dimensions that represent features of transportation agencies and their activities critical to effective TSM&O. Each dimension is further divided into three or four sub-dimensions and through the evaluation processes, can be specified to the user agency's current level of maturity—organized to provide only that guidance appropriate to reaching the next level.		www.aashtotsmoguidance.org/browse/	State DOT/TSMO professionals	No Cost	Web Based
AASHTO - American Association of State Highway and Transportation Officials	**TSMO Guidance: Business Processes - Level 1 to Level 2**	Introductory		A complete range of guidance for Transportation Systems Management and Operations from which user-specific selections are made via the One-Minute Guidance Evaluation or the Customized Guidance Evaluation. The guidance is divided into six dimensions that represent features of transportation agencies and their activities critical to effective TSM&O. Each dimension is further divided into three or four sub-dimensions and through the evaluation processes, can be specified to the user agency's current level of maturity—organized to provide only that guidance appropriate to reaching the next level.		www.aashtotsmoguidance.org/browse/	State DOT/TSMO professionals	No Cost	Web Based

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
AASHTO - American Association of State Highway and Transportation Officials	**TSMO Guidance: Collaboration - Level 1 to Level 2**	Introductory		A complete range of guidance for Transportation Systems Management and Operations from which user-specific selections are made via the One-Minute Guidance Evaluation or the Customized Guidance Evaluation. The guidance is divided into six dimensions that represent features of transportation agencies and their activities critical to effective TSM&O. Each dimension is further divided into three or four sub-dimensions and through the evaluation processes, can be specified to the user agency's current level of maturity—organized to provide only that guidance appropriate to reaching the next level.		www.aashtotsmoguidance.org/browse/	State DOT/TSMO professionals	No Cost	Web Based
AASHTO - American Association of State Highway and Transportation Officials	**TSMO Guidance: Culture - Level 1 to Level 2**	Introductory		A complete range of guidance for Transportation Systems Management and Operations from which user-specific selections are made via the One-Minute Guidance Evaluation or the Customized Guidance Evaluation. The guidance is divided into six dimensions that represent features of transportation agencies and their activities critical to effective TSM&O. Each dimension is further divided into three or four sub-dimensions and through the evaluation processes, can be specified to the user agency's current level of maturity—organized to provide only that guidance appropriate to reaching the next level.		www.aashtotsmoguidance.org/browse/	State DOT/TSMO professionals	No Cost	Web Based
AASHTO - American Association of State Highway and Transportation Officials	**TSMO Guidance: Organization/Workforce - Level 1 to Level 2**	Introductory		A complete range of guidance for Transportation Systems Management and Operations from which user-specific selections are made via the One-Minute Guidance Evaluation or the Customized Guidance Evaluation. The guidance is divided into six dimensions that represent features of transportation agencies and their activities critical to effective TSM&O. Each dimension is further divided into three or four sub-dimensions and through the evaluation processes, can be specified to the user agency's current level of maturity—organized to provide only that guidance appropriate to reaching the next level.		www.aashtotsmoguidance.org/browse/	State DOT/TSMO professionals	No Cost	Web Based
AASHTO - American Association of State Highway and Transportation Officials	**TSMO Guidance: Performance Measurement - Level 1 to Level 2**	Introductory		A complete range of guidance for Transportation Systems Management and Operations from which user-specific selections are made via the One-Minute Guidance Evaluation or the Customized Guidance Evaluation. The guidance is divided into six dimensions that represent features of transportation agencies and their activities critical to effective TSM&O. Each dimension is further divided into three or four sub-dimensions and through the evaluation processes, can be specified to the user agency's current level of maturity—organized to provide only that guidance appropriate to reaching the next level.		www.aashtotsmoguidance.org/browse/	State DOT/TSMO professionals	No Cost	Web Based
AASHTO - American Association of State Highway and Transportation Officials	**TSMO Guidance: Systems and Technology - Level 1 to Level 2**	Introductory		A complete range of guidance for Transportation Systems Management and Operations from which user-specific selections are made via the One-Minute Guidance Evaluation or the Customized Guidance Evaluation. The guidance is divided into six dimensions that represent features of transportation agencies and their activities critical to effective TSM&O. Each dimension is further divided into three or four sub-dimensions and through the evaluation processes, can be specified to the user agency's current level of maturity—organized to provide only that guidance appropriate to reaching the next level.		www.aashtotsmoguidance.org/browse/	State DOT/TSMO professionals	No Cost	Web Based
APTA - American Public Transportation Association	**APTA Bus & Paratransit Conference Sessions**	Advanced	4 days	This technical, educational program covers operations and maintenance, accessibility and paratransit, integrated mobility and transformative technology, first- and last-mile transportation, safety and security, planning and sustainability, funding and finance, capital programs, procurement, and workforce development.	PDH	www.apta.com/mc/bus/Pages/default.aspx	bus and paratransit system employees and managers, board members, contractors, suppliers, manufacturers, and consultants		Workshop/ Event
APTA - American Public Transportation Association	**APTA Rail Conference Sessions**	Advanced	4 days	For all rail modes – urban, commuter, high-speed, and intercity – this technical conference features sessions on technology, operations, maintenance, safety & security, planning, finance, capital projects, workforce development, and more.	PDH	www.apta.com/mc/rail/Pages/default.aspx	Rail agency staff, mid-level and executive management, board members, government agency staff, suppliers, consultants, and contractors.		Workshop/ Event

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
APTA - American Public Transportation Association	**APTA Transit CEO Seminar**	Advanced	3 days	CEO Program; This executive leadership forum on emerging trends and best practices focuses on public transportation policy, new business models, security, labor relations, funding, finance, and other issues.	PDH	www.apta.com/mc/transitceos/Pages/default.aspx	chief executive officers and their deputies (with many different job titles) of APTA-member operating public transportation systems.		Workshop/ Event
APTA - American Public Transportation Association	**Leadership APTA**	Advanced	1 year	Leadership APTA is the American Public Transportation Association's premier professional development program designed to develop and support those experienced managers and leaders aspiring to hold senior and executive leadership positions in APTA, their organizations, and the public transportation industry.	Leadership APTA Class of XXXX designation	www.apta.com/members/memberprogramsandservices/leadershipapta/Pages/default.aspx	public transit industry leaders - only organizations with APTA membership are eligible	$ 5,000.00	Workshop/ Event
APTA - American Public Transportation Association	**APTA's Emerging Leaders Program**	Basic	12 Months	Participate in a national professional development program specifically designed to meet your needs as you move forward in your career. Deepen your knowledge of the public transportation industry outside your area of specialization. Develop a strong network of transit professionals.	Designation as APTA Emerging Leader graduate	www.apta.com/members/memberprogramsandservices/Emerging-Leaders-Program/Pages/default.aspx	Individuals with 3-5 years experience and 1-3 years management in transit industry	$ 3,500.00	Workshop/ Event
ASCE	**Application of Clear Zones for Roadway Departures**	Basic	1.5 hours	his webinar will provide information on how roadside clear zones are to be provided in area with and without curbs. Clarification of the terminology used in various FHWA publications will be provided including the understanding of clear zones and their importance. The first half of the presentation will focus on how to minimize roadway departures. The second half of the presentation will focus on what should be done to mitigate crashes resulting from drivers drifting out of the travel lanes.	1.5 PDH	mylearning.asce.org/diweb/catalog/item/id/2000059/q/t=2125&t=2118&q=application&c=79	Transportation professionals Engineers Technicians Field maintenance staff who work for cities, counties, and state agencies involved in designing and maintaining roadways where there is a need to provide clear zone and roadside safety systems Participants on AASHTO/TRB current research and guidance on clear zones and various aspects of roadside safety as it relates to run off the road crashes	Individual: $159.00 Group: $349.03	Webinar
ASCE	**Avoiding Roundabout Design Failures: An Interactive Approach to Identifying Errors and Finding Solutions**	Basic	1.5 hours	This webinar is interactive: the instructor presents 25 poorly designed roundabouts and asks the attendees what went wrong to encourage a lively dialogue about what the fixes might be. The resulting discussions are intended to promote understanding of key aspects of roundabout design and the need to conform to the best practices presented in NCHRP Report 672 and other authoritative texts. This webinar presents case studies of three roundabouts with known problems and what was done to correct them.	1.5 PDH	mylearning.asce.org/diweb/catalog/item/id/2031683/q/t=2125&t=2118&q=avoiding&c=79	Transportation engineers/planners Community leaders Government officials	Individual: $159.00 Group: $349.03	Webinar

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
ASCE	**Innovative and Smart Construction: Use of Infrared Thermal Profiling and GPR Pavement Density Scanner**	Basic	1 hour	This webinar presents two innovative SHRP2 solutions: use of infrared thermal profiling, and GPR pavement density scanner for archiving uniform layers of Hot Mix Asphalt (HMA) from a DOT perspective. The benefits of these quality control technologies are many. using the real time, fast and nondestructive testing produce continuous data that could be used reliably for achieving consistency of job, uniformity of finished product and avoiding costly time sensitive spot testing. The significant benefits will ultimately help the DOTs to do more with their budgets and reduce user costs.	1.0 PDH	mylearning.asce.org/diweb/catalog/item/id/1687117/q/t=2125&t=2118&c=79&o=t	Consultants Research and quality control personnel from contactors State DOT Researchers	Individual: $129.00 Group: $299.00	Web Based
ASCE	**Pedestrian and Bicycle Safety Assessment Studies**	Basic	1.5 hours	This webinar describes the pedestrian and bicycle safety assessment study process and provides guidelines for transportation professionals conducting such studies. While this webinar uses the experience gained in specific communities, the methods described are applicable to communities throughout the United States. Webinar participants should use both national and locally adopted standards, practices, or references as needed as well as those resources identified in this webinar.	1.5 PDH	mylearning.asce.org/diweb/catalog/item/id/2000871/q/t=2125&t=2118&q=Pedestrian*20&c=79	Transportation engineers/planners Community leaders Government officials	Individual: $159.00 Group: $349.00	Webinar
ASCE	**Roadway Geometric Design for Improved Safety and Operations**	Basic	1.5 hours	This webinar explores the National Cooperative Highway Research Program (NCHRP) Synthesis 432: Recent Roadway Geometric Design Research for Improved Safety and Operations as well as other recent publications such as NCHRP Report 707 on Auxiliary Lanes, NCHRP Report 730 on Ramp Terminals and NCHRP Report 422 on Trade-Off Considerations in Highway Geometric Design. Given the abundance of literature on roadway geometric design issues, practitioners have faced challenges identifying the information that they need to do their job effectively.	1.5 PDH	mylearning.asce.org/diweb/catalog/item/id/1687387/q/t=2125&t=2118&q=roadway&c=79	This webinar benefits transportation professionals (engineers and planners) who work for consultants, cities, counties, and state agencies involved in designing highway projects. This course is designed for individuals with some background or training in designing highways including intersections and interchanges.	Individual: $159.00 Group: $349.04	Webinar

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
ASCE	**School Zones: A Comprehensive Look at Signs, Markings and Safety Programs**	Basic	1.5 hours	This webinar will benefit you if you are a professional who manages, provides consulting for, or is considering a school zone safety program in your community. The presentation begins with an explanation of the current guidelines in the Manual on Uniform Traffic Control Devices, or MUTCD, to help you identify whether the current practices in your city, town, or jurisdiction are in compliance. Case studies and specific examples will be provided to help you understand why different treatments apply to different conditions. Updates from the new 2009 MUTCD will then be highlighted. The presentation concludes with a discussion on the Safe Routes to School Program and the important guidance that you can provide to your community to foster an environment that promotes safety for both the motoring and non-motoring public near your neighborhood schools.	1.5 PDH	mylearning.asce.org/diweb/catalog/item/id/1687396/q/t=2125&t=2118&q=school*20zone&c=79	This webinar will benefit transportation professionals (including engineers and planners) who work for cities, towns, counties, state agencies, consultants, and others who are responsible for managing school zone safety in their community. This webinar is designed for individuals with some background or training in traffic operations and with some familiarity of the Manual on Uniform Traffic Control Devices, (MUTCD).	Individual: $159.00 Group: $349.02	Webinar
ASCE	**Engineering For a Sustainable Future**	Basic	16 hours	This course redefines sustainable engineering for the built environment. From now on, making a project "sustainable" is no longer a matter of adding "green" features to a conventional design. Today's civil engineer needs to know how to meet project owner needs and contribute to sustainable performance, while taking into account significantly changing operating conditions.	1.6 CEUs	mylearning.asce.org/diweb/catalog/item/id/551237/q/t=2118&t=2134&c=79		Member $749.00 | Non-Member $899.00	Online
ATSSA - American Traffic Safety Services Association	**TRAFFIC CONTROL SUPERVISOR (TCS)**	Advanced	2 days	The TCS course is designed to train those who will be actively involved in designing or setting up and maintaining temporary traffic control in a work zone. It moves from the concepts and techniques taught in the TCT course to the implementation of traffic control plans and techniques for installation and removal. Students are taught how to read and interpret plans and specifications and implement them in the field. Workshops included in the course are designed to provide real world examples in designing temporary traffic control setups and also recognizing, analyzing and correcting deficiencies. An additional, vital objective of this course is teaching students the skills necessary to become an effective supervisor, capable of leading a team in the field.	1.5 CEUs	www.atssa.com/TrainingCertification/CourseInformation/TrafficControlSupervisorTCS.aspx	supervisory personnel that are responsible for the installation, maintenance, or removal of traffic control devices	$355 ATSSA Members; $405 Non-members	Classroom
ATSSA - American Traffic Safety Services Association	**TRAFFIC CONTROL DESIGN SPECIALIST (TCDS)**	Basic	2 days	This course addresses the entire process for designing, installing, maintaining, and evaluating temporary traffic control in work zones. This course will teach students to understand the engineering concepts necessary to properly design effective traffic control plans, as well as the fundamental principles of temporary traffic control, the sources of standards and guidelines, the proper processes and procedures for adjustments, and legal implications. It is recommended for traffic engineers, engineering technicians, consultants, and other individuals responsible for temporary traffic control design and plan approval.	1.5 CEUs	www.atssa.com/TrainingCertification/CourseInformation/TrafficControlDesignSpecialistTCDS.aspx	traffic engineers, engineering technicians, consultants, and other individuals responsible for temporary traffic control design and plan approval	$495 ATSSA Members $595 Non-members	Classroom

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
ATSSA - American Traffic Safety Services Association	**Traffic Control Technician (TCT)**	Introductory	2 days	Everyone involved in a construction work zone project should have a basic knowledge of temporary traffic control that allows them to assist in installing traffic control devices, monitoring their performance, and recognizing deficiencies during the course of a project. The TCT course is an introduction to temporary traffic control in work zones for individuals who work in the field installing and removing traffic control devices. The course provides concepts, techniques, and practice exercises in the installation and maintenance of traffic control devices.	0.75 CEUs	www.atssa.com/TrainingCertification/CourseInformation/TrafficControlTechnicianTCT.aspx	Individuals who perform duties in or around temporary traffic control work zones	$180 ATSSA Members; $205 Non-members	Classroom
CITE Consortium	**Nuts and Bolts of Operations Performance Measurement**	Advanced	8 hours	This course will emphasize the measurement side of performance measurement, looking specifically at the data, tools and analysis methodologies available to the practitioner. It also will serve as a primer for those who have forgotten transportation engineering fundamentals.	0.8 CEU	www.citeconsortium.org/course/nuts-and-bolts-of-operations-performance-measurement-blended/	This course is intended for the senior analyst, as well as first and second-level management	$ 175.00	Web Based
CITE Consortium	**Archived Data for Planning, Operations, and Safety**	Basic	6 hours	This course is designed to help you understand the benefits of creating an open and accessible data archive of your agency's data.	0.6 CEU	www.citeconsortium.org/course/archived-data-planning-operations-safety-2/		$ 250.00	Web Based
CITE Consortium	**Connected Vehicles and the Future of Transportation**	Basic	1 hour	his one hour presentation is part of the Regional Operations Forums (ROFs) that were developed under the second Strategic Highway Research Program (SHRP2) project L36: Regional Operations Forums for Advancing Systems Operations, Management, and Reliability.		www.citeconsortium.org/course/connected-vehicles-future-transportation/		No Cost	Web Based
CITE Consortium	**ITS Applications in Transit Management Operations**	Basic	4 hours	This course presents an overview of ITS applications in public transit management and operations with emphasis on three specific areas. Applications and technologies employed in the Public Transit Operations domain include advanced communications systems, AVL, automated passenger counter systems, and electronic payment systems, to name a few.	0.4 CEU	www.citeconsortium.org/course/its-applications-in-transit-management-operations/		$ 150.00	Web Based
CITE Consortium	**ITS Project Management Certificate**	Basic	4.4 hours	The courses for this program focus on defining the requirements and specifications, conceptualization, basic design and engineering involved with implementation phases and installation of ITS into transportation technology.	4.4 CEU; Certification	www.citeconsortium.org/cite-courses/certificate-programs/its-project-management/		$ 625.00	Web Based
CITE Consortium	**Operations Performance Management: Real-time Operations to Long-term Planning**	Basic	8 hours	This course takes a broader management view of performance management — harnessing the power of performance measurement to improve management practice, closing the loop between strategic objectives and measured performance. It provides the use with understanding of how performance management is used to make cost-effective investment decisions that are geared to meeting agency goals.	0.8 CEU	www.citeconsortium.org/course/operations-performance-management-real-time-operations-long-term-planning-blended/		$ 250.00	Web Based
CITE Consortium	**Overview of Operations**	Basic	5 hours	This course provides an overview of the field of transportation systems management and operations (TSM&O), with a focus on the optimal operation of freeways and arterials as an integrated corridor system to achieve greater user mobility.	0.4 CEU	www.citeconsortium.org/course/overview-of-operations-course/		$ 175.00	Web Based
CITE Consortium	**Road Weather Information Systems (RWIS) Equipment and Operations**	Basic	6 hours	Adverse weather is our common enemy in road maintenance, traffic, and emergency operations. Transportation agencies are well aware of the operational and logistical challenges of such weather.	0.6 CEU	www.citeconsortium.org/course/road-weather-information-systems-rwis-equipment-and-operations-blended/		$ 250.00	Web Based
CITE Consortium	**Traffic Engineering and Operations**	Basic		The courses for this program focus on the proper design, construction and maintenance of traffic control signs, signals, roadway pavement markings, etc. to enhance motoring and pedestrian traffic safety.	4.2-4.8 CEU; Certification	www.citeconsortium.org/cite-courses/certificate-programs/traffic-engineering-and-operations/		$ 625.00	Web Based
CITE Consortium	**Transportation Management**	Basic	6 hours	Many ITS professionals get involved in the design and/or operation of transportation management systems. It is important, however, to step back and consider the essential functions that these systems perform. This course will prepare students to define functional requirements for the procurement or design of a transportation management system.	0.6 CEU	www.citeconsortium.org/course/transportation-management/		$ 175.00	Web Based

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
CITE Consortium	**Connected Vehicles 101**	Introductory	6 hours	The connected vehicle research being sponsored by U.S. DOT is moving from research to reality. The connected vehicle concept leverages the potentially transformative capabilities of wireless technology to make surface transportation safer, smarter and greener	0.6 CEU	www.citeconsortium.org/course/connected-vehicles-101-blended/	This introductory course targets transportation planners, managers, and engineers at state and local agency levels, who are interested in learning more about the Connected Vehicle Program and its benefits and implications for public agencies.	No Cost	Web Based
CITE Consortium	**Improving Highway Safety with ITS**	Introductory	8 hours	This course is an introduction to ITS-based strategies and tools available for improving highway safety.	0.8 CEU	www.citeconsortium.org/course/improving-highway-safety-with-its-blended/	This course is intended for ITS, transportation operations, and safety professionals, including, but not limited to, planners, operators, designers, emergency management, and maintenance personnel.	$ 175.00	Web Based
CITE Consortium	**Introduction to Operations Performance Measures and Management**	Introductory	6 hours	This course will define performance measurement and management, how they are used in an organization, how they are set up, and what the expected outcomes are for performance management. We will describe both the reasons performance measurement and management enhances a transportation agency's operations and the elements of a successful Operations Performance Measures & Management (OPMM) program.	0.6 CEU	www.citeconsortium.org/course/introduction-to-operations-performance-measures-and-management-blended/		$ 250.00	Web Based
CITE Consortium / Professional Capacity Building Partnership	**Advanced Systems Engineering**	Advanced	10 hours	This course is intended to cover a broad set of topics in system engineering and system integration. It will provide participants with an appreciation of the principles of systems engineering and its application to ITS projects.	CEU	www.citeconsortium.org/cite-courses/usdot-pcb-partnership/	Professionals and Students	No Cost	Web Based
CITE Consortium / Professional Capacity Building Partnership	**Improving Highway Safety with ITS**	Basic	Independent Study	This course aims to increase awareness of the benefits to be gained through the deployment of ITS for highway safety applications.	CEU	www.citeconsortium.org/cite-courses/usdot-pcb-partnership/	Professionals and Students	No Cost	Classroom/Web
CITE Consortium / Professional Capacity Building Partnership	**Managing High Technology Projects in Transportation**	Basic	Independent Study	This course is designed to improve project management skills of both public and private sector personnel who are responsible for managing the implementation of technology-intensive transportation projects.	CEU	www.citeconsortium.org/cite-courses/usdot-pcb-partnership/	Professionals and Students	No Cost	Web Based
CITE Consortium / Professional Capacity Building Partnership	**Principles and Tools for Road Weather Management**	Basic	Varies	This course provides transportation professionals in highway maintenance and/or highway operations with training to develop tools and strategies for addressing road weather problems. The course begins with an overview of the types of road weather problems and their associated costs, as well as basic meteorology for non-meteorologists. Through this course, participants are exposed to various strategies for addressing road weather problems, including Road Weather Information Systems (RWIS) and the development of crosscutting decision support systems to respond effectively to weather situations. In addition, road weather solutions unique to maintenance management, traffic management, traveler information, and emergency management are discussed.	CEU	www.citeconsortium.org/cite-courses/usdot-pcb-partnership/	Professionals and Students	No Cost	Web Based

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
CITE Consortium / Professional Capacity Building Partnership	**Telecommunications and Networking Fundamentals (formerly Introduction to Telecommunications Technology)**	Introductory	6 hours	Telecommunications is the backbone of all ITS applications. It provides the means for sending data, voice, and video information between devices. This course is a primer on telecommunications for the ITS professional with little or no formal training in telecommunications. With so many ITS projects now requiring a telecommunications aspect, this course is a must for project managers.	Certificate of Completion	www.citeconsortium.org/course/telecommunications-and-networking-fundamentals-formerly-introduction-to-telecommunication-technology-blended/	ITS professional with little or no formal training in telecommunications.		Web Based
CITE Consortium / Professional Capacity Building Partnership	**Introduction to Systems Engineering**	Introductory	Independent Study	This course is an introduction to systems engineering for ITS project managers and project staff. It provides a high-level view of a broad and rich topic area, introducing basic concepts to individuals who are working on ITS projects. The goal is to allow these individuals to understand the benefits of applying systems engineering approaches as a means of developing quality systems. The course covers technical practices such as modeling, prototyping, trade-off analysis and testing, and management practices such as risk assessment and mitigation, which make up "best practices" in the systems engineering arena.	CEU	www.citeconsortium.org/cite-courses/usdot-pcb-partnership/	Professionals and Students	No Cost	Web Based
CITE Consortium / Professional Capacity Building Partnership	**Introduction to the National ITS Architecture**	Introductory	Independent Study	The course is intended to provide students with a broad overview of the National ITS Architecture and the role it plays in ITS planning, designing and implementation processes. It provides some background (what the National ITS Architecture consists of, how it is defined, why it was established, and what its aims and objectives are), and introduces the notion of User Service. The physical architecture is explained using examples of local implementations of the National ITS Architecture. Specific elements of the physical architecture, such as subsystems and terminators, are presented in some detail.	CEU	www.citeconsortium.org/cite-courses/usdot-pcb-partnership/	Professionals and Students	No Cost	Web Based
Community Transportation Association of America	**Certified Community Transit Supervisors (CCTS)**	Advanced	2 days	To meet the unique challenge facing these important personnel, CTAA has developed the "all new" Certified Community Transit Supervisor "5.3" program. This two-day classroom workshop has been updated to include a wide variety of skills necessary to successfully manage front-line employees and a web-based prerequisite course. The workshop will provide comprehensive training in leadership, working effectively within a team, advanced communication skills, the supervisor's role in safety, and the supervisor's role in customer driven service.	Certified Community Transit Supervisor and Recertification	web1.ctaa.org/webmodules/webarticles/anmviewer.asp?a=34&z=116	Front Line Transit Managers and Supervisors	Open Enrollment- $500, All inclusive CTAA member- $7,000	Workshop/ Event
Community Transportation Association of America	**PASS Online**	Basic	Independent Study	The PASS basic program consists of 6 modules and includes comprehensive training on the assistance that drivers should be providing to passengers with special needs. It is based on CTAA's Passenger Service and Safety (PASS) driver and trainer certification program that has successfully trained and certified over 45,000 drivers and instructors. It is regarded as an industry standard and we are proud to offer PASS training in an online format.	PASS Certification and Recertification	training.ctaa.org	Drivers and Instructors	Basic Program CTAA Members- $25.00 Nonmembers- $50.00 BASIC Recertification- $25.00 Full Driver Recertification- $35.00	Web Based
Community Transportation Association of America	**The Keys to NEMT Success**	Basic	8 hours	The world of non-emergency medical transportation (NEMT) is rapidly changing - so fast, in fact, that any organization providing NEMT services today needs some help. Wouldn't it be great to have a recognized NEMT expert - someone who's been an NEMT operator and has experience working directly with insurance companies, brokerages and state Medicaid agencies - at your disposal to help you understand exactly how the changing environment will impact your operation, and how to take advantage of new opportunities?	NEMT Certification	web1.ctaa.org/webmodules/webarticles/anmviewer.asp?a=4505&z=118	Transportation Professionals	CTAA Members- $175, Nonmembers- $250	Web Based
Community Transportation Association of America	**Traffic and Driver Certification (PASS)**	Basic	3 days	The PASS program is designed as a three-day Train-the-Trainer workshop to certify trainers who can then train drivers or as a two-day Driver training in which our instructors train your drivers. Some of the advantages of offering the PASS certification program is the ability to reduce organizational liability; comprehensive, up-to-date training on the assistance drivers should be providing to passengers with special needs; intensive emergency situation training; certification oversight provided by national leaders in the community transportation field; and updates for all participants on relevant regulatory changes.	Passenger Assistance Safety and Sensitivity (PASS) Trainer and Driver Certification and Recertification	web1.ctaa.org/webmodules/webarticles/anmviewer.asp?a=35&z=116	Public	Open Enrollment- $500, Closed Enrollment- $7,500 (all inclusive CTAA member)	Workshop/ Event

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
Community Transportation Association of America	**Vehicle Maintenance Professionals (VMMI)**	Basic	3 days	The Community Transportation Association of America (CTAA) offers a unique training and certification program for maintenance managers and staff. The Vehicle Maintenance Management and Inspection (VMMI) training program promotes the community transportation industry's commitment to safe, reliable transportation through building up the professional skills of maintenance personnel and managers. This three-day program is designed to improve the maintenance oversight of fleets of smaller transit vehicles (i.e., less than 25-foot length).	Vehicle Maintenance Management and Inspection Certification and Recertification	web1.ctaa.org/webmodules/webarticles/anmviewer.asp?a=37&z=116	Maintenance Personnel and Managers	Open Enrollment-$500, All inclusive CTAA member-$7,500	Workshop/ Event
Community Transportation Association of America	**Dispatchers (PDS)**	Basic	2 days	The Professional Dispatching and Scheduling (PDS) training program focuses on operational efficiency as well as customer service techniques. Persons who successfully complete this course will have developed and demonstrated their expertise in maximizing the efficient delivery of demand-responsive transportation, conveying riders' requests into affordable and appropriate trips, and in making effective use of their system's transportation resources.	Professional Dispatching and Scheduling Certification and Recertification	web1.ctaa.org/webmodules/webarticles/anmviewer.asp?a=36&z=116	Public	Open Enrollment-$500, All inclusive CTAA member-$7,000	Workshop/ Event
Community Transportation Association of America	**Safety and Security Accreditation (CTSSA)**	Basic	2 days	This is a program designed to promote the safety and security of the customers of community and public transportation systems and also to promote the safety and security of the women and men who deliver these services and provide mobility for the riding public every day. CTAA is accomplishing this goal by working with member agencies, our board of directors, and experts in the field to determine standards for safety and security and by developing a program to assess an organization's achievement in meeting those standards.	Accreditation for organization	web1.ctaa.org/webmodules/webarticles/anmviewer.asp?a=3052&z=117	Public transit systems	$ 6,000.00	Other
Community Transportation Association of America	**Safety and Security Officer (CSSO)**	Basic	2 days	A commitment to safety has long been a hallmark of community transportation programs. This commitment extends both to the riding public and to the women and men who work in the nation's community transportation systems. To demonstrate this commitment to safety, the Community Transportation Association of America has developed the Certified Safety and Security Officer program.	Certified Safety and Security Officer and Recertification	web1.ctaa.org/webmodules/webarticles/anmviewer.asp?a=41&z=116	Public	Open Enrollment-$500, All inclusive CTAA member-$8,376	Workshop/ Event
Community Transportation Association of America	**State Transit Program Administrator (CTPA)**	Basic	20 hours	Our newest certification program is designed exclusively for state agency personnel responsible for public and community transportation programs. The Certified Transit Programs Administrator program, or CTPA, was developed by our staff under the guidance of a select group of state transit agency employees, and is a cooperative venture of CTAA and the American Association of State Highway and Transportation Officials (AASHTO).	Certified Community Transit Administrator, CTPA Recertification, 20 hours of Training or Professional Development and Recertification	web1.ctaa.org/webmodules/webarticles/anmviewer.asp?a=38&z=116	Public		Workshop/ Event
Connected Vehicle Trade Association/Mobile Comply /Society of Automotive Engineers (SAE)	**Connected Vehicle Professional III - Data, Markets, Policy and Regulations**	Advanced		Connected Vehicle Professional III – Data, Markets, Policy and Regulations focuses on data generated by connected vehicle and data security with an introduction to the development, implementation and regulation of connected vehicles	Certificate of Competency from SAE International (Upon Completion of all 3 courses)	mobilecomply.com/product/cvp203-cvp-iii-data-markets-policy-regulations/	IT Professionals, Software Engineers, Automotive Engineers, Information and Vehicle Technicians, Insurance and Telecommunications Professionals, Transportation Providers , Business Leaders	$ 2,500.00	Blended Course

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
Connected Vehicle Trade Association/Mobile Comply /Society of Automotive Engineers (SAE)	**Connected Vehicle Professional III - Data, Markets, Policy, and Regulations**	Advanced	25 hours	Connected Vehicle Professional III – Data, Markets, Policy and Regulations focuses on data generated by connected vehicle and data security with an introduction to the development, implementation and regulation of connected vehicles. Learners are provided review of material from CVPI and CVPII as well as an introduction to overviews on policies and regulations being introduced into the space. Learners are presented with wide-ranging course materials, suggested reading resources, and are tested on various key areas of instruction.	A series of three courses provides Connected Vehicle credentialing	mobilecomply.com/product/cvp203-cvp-iii-data-markets-policy-regulations/	Professionals	$ 2,500.00	Classroom/Web
Connected Vehicle Trade Association/Mobile Comply /Society of Automotive Engineers (SAE)	**Autonomous Vehicle Focus Track**	Basic	24 hours	This program series offers participants the ability to learn more about specific areas of study in either connected or autonomous vehicle focused tracks. Culled from cutting-edge research by subject matter experts, these four-hour concentrated courses offer attendees with the most up-to-date knowledge and technology in the specific course focus. Although a basic understanding of the respective course topic is recommended, there are no prerequisites. Courses include: (AVF601) Autonomy Basics (AVF602) In-Vehicle Systems (AVF603) Infrastructure & V2I (AVF604) Data, Updates & OTA (AVF605) Testing (AVF606) Policy & Regulations	PDH	mobilecomply.com/programs/connected-autonomous-vehicle-concentrated-series/	Professionals	$ 600.00	Classroom/Web
Connected Vehicle Trade Association/Mobile Comply /Society of Automotive Engineers (SAE)	**Connected Vehicle Focus Track**	Basic	36 hours	This program series offers participants the ability to learn more about specific areas of study in either connected or autonomous vehicle focused tracks. Culled from cutting-edge research by subject matter experts, these four-hour concentrated courses offer attendees with the most up-to-date knowledge and technology in the specific course focus. Although a basic understanding of the respective course topic is recommended, there are no prerequisites. Courses include: (CVF501) Connected Vehicle Basics – 4 Hours (AVF601) (CVF502) In-Vehicle Systems – 4 Hours (CVF503) Infrastructure & V2I – 4 Hours (CVF504) Communications – 4 Hours (CVF505) Data, Updates & OTA – 4 Hours (CVF506) Organizational Impact / Smart Cities – 4 Hours (CVF507) Security Basics – 4 Hours (CVF508) Testing – 4 Hours (CVF509) Policy & Regulations – 4 Hours	PDH	mobilecomply.com/programs/connected-autonomous-vehicle-concentrated-series/	Professionals	$ 600.00	Classroom/Web
Connected Vehicle Trade Association/Mobile Comply /Society of Automotive Engineers (SAE)	**Connected Vehicle Professional II – Standards and V2X**	Basic		Connected Vehicle Professional II – V2X, Standards (CVP II) focuses on connected vehicle standards from various organizations including SAE International and the Institute of Electrical and Electronics Engineers (IEEE), and provides an overview of major consortia and training in Vehicle-to-Vehicle (V2V), Vehicle-to-Infrastructure (V2I), and Vehicle-to-Anything (V2X) technologies.	Certificate of Competency from SAE International (Upon Completion of all 3 courses)	mobilecomply.com/wp-content/uploads/2015/09/CVP-II-Course-Description.pdf	IT Professionals, Software Engineers, Automotive Engineers, Information and Vehicle Technicians, Insurance and Telecommunications Professionals, Transportation Providers , Business Leaders	$ 2,500.00	Blended Course
Connected Vehicle Trade Association/Mobile Comply /Society of Automotive Engineers (SAE)	**Connected Vehicle Professional II- V2X and Standards**	Basic	25 hours	CVP II focuses on connected vehicle standards from various organizations including SAE International and the Institute of Electrical and Electronics Engineers (IEEE), and provides an overview of major consortia and education in Vehicle-to-Vehicle (V2V), Vehicle-to-Infrastructure (V2I), and Vehicle-to-X (V2X) technologies. Although CVP I is not a prerequisite for this course it is strongly encouraged. This course can be attended online or in-person.	A series of three courses provides Connected Vehicle credentialing	mobilecomply.com/product/cvp-202-cvpii-v2x-standards/	Professionals	$ 2,500.00	Classroom/Web

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Connected Vehicle Trade Association/Mobile Comply /Society of Automotive Engineers (SAE)	**Connected Vehicle Short Course**	Basic	4 hours	This course is geared towards those professionals looking to participate in the full Connected Vehicle Profession-al (CVP) Credentialing Program but are either limited in understanding or time. The four-hour Connected Vehicle Short Course lays the ground work for concepts that will be explored in further depth during the full CVP program. Examples of topics introduced during the course include: a high-level view of the industry, its stakeholders, basic technology driving the industry and fundamental standards and regulations that professionals in this space will need to be familiar with.	PDH	mobilecomply.com/product/cvs302-connected-vehicle-short-course/	Professionals	$ 500.00	Classroom
Connected Vehicle Trade Association/Mobile Comply /Society of Automotive Engineers (SAE)	**FastTrack to Automotive Cyber Security**	Basic	8 hours	The final course in the series requires successfully completion of (FCV102) Fast- Track to Connected Vehicles and (FCV102) FastTrack to Autonomous Vehicles. This course provides a foundation in cybersecurity and data privacy issues surrounding connected vehicles, intelligent transportation infrastructure and cloud-based services. Specific threats and consequences are explored, together with creating and maintaining secure automotive systems and emerging best practices for data privacy.	PDH	mobilecomply.com/programs/fast-track-automotive-cyber-security/	Professionals	$ 950.00	Classroom/Web
Connected Vehicle Trade Association/Mobile Comply /Society of Automotive Engineers (SAE)	**FastTrack to Autonomous Vehicles**	Basic	8 hours	This course explains how increasingly autonomous vehicles are turning one hundred years of conventional wisdom on its head. No part of the industry will be left unchanged by this transition from vehicle design and production volumes, to ownership and insurance models, to urban planning and legal liability models. The course builds on concepts covered in (FCV101) FastTrack to Connected Vehicles which participants must have successfully completed.	PDH	mobilecomply.com/product/fcv102-fasttrack-autonomous-vehicles/	Professionals	$ 950.00	Classroom/Web
Connected Vehicle Trade Association/Mobile Comply /Society of Automotive Engineers (SAE)	**FastTrack to Connected Vehicles**	Basic	8 hours	This course walks participants through the evolution and possible future of connected vehicles. It analyses the profound changes being driven across the automotive industry by rapid advances in on-board processing power, wireless communications, and cloud analytics. The course examines these changes from automotive engineering, software and communications, and market perspectives.	PDH	mobilecomply.com/programs/fast-track-connected-vehicles/	Professionals	$ 950.00	Classroom/Web
Connected Vehicle Trade Association/Mobile Comply /Society of Automotive Engineers (SAE)	**V2I and Infrastructure Basics**	Basic		The V2I & Infrastructure (CVF510)course provides comprehensive technician level training. It is offered as a half-day class enabling participants to gain an understanding of V2I concepts, on-board units, antenna functions and architecture.	PDH	mobilecomply.com/product/cvf510-v2i-infrastructure-basics/	Technician-level professionals	$ 900.00	Classroom/Web
Connected Vehicle Trade Association/Mobile Comply /Society of Automotive Engineers (SAE)	**Connected Vehicle Professional I- Function, Protocols, and Architecture**	Introductory	25 hours	Connected vehicle application concepts and vision, performance functions, communication protocols, hardware architecture components and software architecture methodologies within the connected vehicle ecosystems. To ensure a globally informed awareness, learners will be presented with in-depth wide-ranging course materials, suggested domestic and internationally source reading resources, and tested on various key areas of instruction.	A series of three courses provides Connected Vehicle credentialing	mobilecomply.com/product/cvp201-cvpi-functions-protocols-architectures/	Professionals	$ 2,500.00	Classroom/Web

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
Connected Vehicle Trade Association/Mobile Comply /Society of Automotive Engineers (SAE)	**Connected Vehicle Professional I- Function, Protocols, and Architecture**	Introductory		Connected Vehicle Professional I – Ecosystem, Functions, Mobility, Communication Protocols, Software and Hardware Architectures will focus on Connected Vehicle foundations, and application components. This is followed by transportation and market trends with defined impacts of current and projected connected vehicle applications. Ensuring is connected vehicle communication protocols, purpose and areas of use and highlighting global concerns and impacts. Connectivity enabling technologies are presented in generational progression from past to current and projected future implementations.	Certificate of Competency from SAE International (Upon Completion of all 3 courses)	mobilecomply.com/our-courses/connected-vehicle-professional-i/	IT Professionals, Software Engineers, Automotive Engineers, Information and Vehicle Technicians, Insurance and Telecommunications Professionals, Transportation Providers , Business Leaders	$ 2,500.00	Blended Course
CSCMP - Council of Supply Chain Management Professionals	**Council of Supply Chain Management Professionals 2018 Edge Conference**	Basic		From leading-edge content to cutting-edge supply chain solutions, EDGE reflects the unparalleled resources CSCMP offers today and symbolizes our unwavering commitment to supply chain in the future.	15 CEU	www.eiseverywhere.com/ehome/cscmp2017/Home/			Workshop/ Event
CSCMP - Council of Supply Chain Management Professionals	**Physical Distribution Systems - Part One**	Basic		Physical Distribution is the tasks concerned with the planning, implementing and controlling the flow of material, final goods and associated information from the point of origin to the customer. Physical distribution takes place within numerous distribution channels. Physical Distribution I addresses transportation, warehousing and related functions.	CEU	cscmp.org/store/detail.aspx?id=QC-PDS-1		Members- $70, Nonmembers- $94.95	Webinar
CSCMP - Council of Supply Chain Management Professionals	**Physical Distribution Systems - Part Two**	Basic		Physical Distribution is the tasks concerned with the planning, implementing and controlling the flow of material, final goods and associated information from the point of origin to the customer. Physical Distribution II addresses issues related to reverse logistics, distribution resource planning, procurement, physical distribution interfaces and related functions.	CEU	cscmp.org/store/detail.aspx?id=QC-PDS-2		Members- $70, Nonmembers- $94.95	Webinar
CTAA EXPO: The Future of Mobility	**Addressing Transportation for Persons with Temporary Disabilities: How to Create a Win/Win Scenario for Riders and Providers**	Basic	Half day	Many individuals with temporary disabilities who apply for ADA transportation face long wait times for approval and therefore a severe lack of transportation assistance. In addition, often by the time the ADA application is approved, the individual has often regained his/her mobility and no longer needs ADA transportation. This results in a lose/lose scenario for both riders and the transit providers. This session will address these challenges and highlight providers from across the county who have found ways solutions to address this problem.	PDH	web1.ctaa.org/webmodules/webarticles/anmviewer.asp?a=5193&z=153	Public	Starting Members $450-1,250 Nonmembers $700-1,700	Workshop/ Event
CTAA EXPO: The Future of Mobility	**New Technologies in Transit Payments**	Basic	Half day	Current trends are away from fixed vehicle hardware and proprietary data formats. They have gravitated toward hand-held data phones and tablets running open-architecture dispatch and fare collection software. This session will address these developing trends in fare collection.	PDH	web1.ctaa.org/webmodules/webarticles/anmviewer.asp?a=5193&z=153	Public	Starting Members $450-1,250 Nonmembers $700-1,700	Workshop/ Event
CTAA EXPO: The Future of Mobility	**Re-envisioning your Operations and Revamping your Transit System**	Basic	Half day	Rising to the challenge of a yearlong exploration and examination of these challenges, agencies must look at opportunities as there community transit moves deeper into the digital era. Agencies now have to revamp their transit system to an innovative transit improvement plan to convey a better connection to community, employees and other modes of transit. This workshop will addresses key strategies for building strong transit system, offering a series of concepts for with a long-term commitment to the future of its transit system and community.	PDH	web1.ctaa.org/webmodules/webarticles/anmviewer.asp?a=5193&z=153	Public	Starting Members $450-1,250 Nonmembers $700-1,700	Workshop/ Event
CTAA EXPO: The Future of Mobility	**Succession Planning for your Transit System**	Basic	Half day	The appropriate planning is necessary for any company that hopes to survive in today's transportation industry. This workshop will in examine strategies protects you and your business in the transition of important customers, referral sources, shareholders as well as initiating and maintaining communication and accountability.	PDH	web1.ctaa.org/webmodules/webarticles/anmviewer.asp?a=5193&z=153	Public	Starting Members $450-1,250 Nonmembers $700-1,700	Workshop/ Event

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
CTAA EXPO: The Future of Mobility	**Transit's Role in Disasters**	Basic	Half day	As part of the response system of neighbors helping neighbors, transit services are on the front lines of providing emergency evacuation options, shuttling emergency crews, relief workers and repair teams, dispatching vehicles to offer safety, shelter and comfort, and supporting long-term efforts to rebuild. This session will offer experiences and strategies of transit professionals across the country in planning for, responding to and recovering from these tragedies so that you might be ready when disaster strikes your community	PDH	web1.ctaa.org/webmodules/webarticles/anmviewer.asp?a=5193&z=153	Public	Starting Members $450-1,250 Nonmembers $700-1,700	Workshop/ Event
CTAA EXPO: The Future of Mobility	**Tribal Transit Moving Forward**	Basic	Half day	This workshop will cover strategies to plan and establish sustainable tribal transit programs. This workshop will include creative ideas to fund tribal transit programs and required process in Federal agencies must work cooperatively together in with Tribes in order to carry out the requirements of the Tribal Transportation Program (TTP)	PDH	web1.ctaa.org/webmodules/webarticles/anmviewer.asp?a=5193&z=153	Public	Starting Members $450-1,250 Nonmembers $700-1,700	Workshop/ Event
EDI Traffic	**EDI Webinar Series**	Basic	1 hour	Several Webinars on Different Topics within Traffic and Transportation including Advanced Transportation Controller Cabinet Overview, Advanced Traffic Controller Cabinet Overview, How to make Inductive Loops Last the Lifetime of the Roadway, Creating Smart Traffic Cabinets & Intersections with Reliable Data, Access Control & Vehicle Detection Solutions, Bicycle Detection & Differentiation, Technical Advances in 33X Signal Monitors Using Flashing Yellow Arrow, Technical Advances in NEMA Signal Monitors Using Flashing Yellow Arrow, Best Practices for Inductive Loop Operation, Automatic Vehicle Identification, Obtaining Real-time Traffic Data from Remote Intersections	PDH	www.editraffic.com/webinars/			Webinar
Eno Center for Transportation	**Future Leaders Development Conference**	Basic	5 days	Each year, the Eno Future Leaders Development Conference (LDC) gives 20 of the nation's top graduate students in transportation a first-hand look at how national transportation policies are developed. Students apply to the program early in the year, and those selected as "Eno Fellows" come to Washington, DC for a week in the spring of meetings with federal officials and leaders of business and non-profit organizations.	Designation as Eno Fellow	www.enotrans.org/course/future-leaders-development-conference/	Students in transportation-related programs	$ 5,000.00	Seminar
Eno Center for Transportation	**Eno Transit Executive Seminar**	Basic	1 week intensive in DC; year long program	The Eno Transit Executive Seminar is an intensive week-long course held in Washington, DC. The course curriculum consists of individual coaching, leadership assessments, and classroom instruction from veteran transit leaders from across the industry. In addition, participants also focus on building individual interpersonal skills in small group settings. It is tailored specifically for senior-level managers who report to their General Manager or CEO in public transportation agencies and in companies that serve the transit industry.	Designation as Eno Transit Senior Executive Program graduate	www.enotrans.org/events/transit-senior-executive-program/	Top public and private transit executives	$ 4,250.00	Seminar
Eno Center for Transportation	**Transit Mid Manager Seminar**	Basic	5 days	Eno's Transit Mid-Manager Seminar, an integral element of Eno's leadership training program, is an intensive, weeklong course that provides mid-managers in the transit industry with the leadership and management skills needed to succeed. It is designed for mid-level managers at public and private transit operating companies, private sector partners, and federal and state transportation agencies. It provides the tools for mid-managers to act as a bridge between senior leadership and public facing employees as well as to advance to more senior positions	Designation as Eno Transit Mid-Manager graduate	www.enotrans.org/events/transit-mid-manager/	The program is tailored specifically for mid-level managers in public transportation agencies and companies that serve the transit industry – this includes public and private transportation agencies, private sector partners, union leadership, APTA, and the Federal Transit Administration (FTA).	$ 3,750.00	Seminar

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
FDOT - Florida Department of Transportation	**Curbing Transit Operator Distracted Driving Training**	Basic	45 Minutes	The goal of the "Curbing Transit Operator Distracted Driving Training Course" is to teach public transportation employees about the dangers and consequences of driving distracted. This course examines what distracted driving is, and how it has affected the public transportation industry. In addition, participants learn about their agency's policies and procedures for non-agency authorized wireless technologies, as well as relevant state laws and regulations.	Certificate of Completion	www.transitoperations.org/distracteddriving/florida.html			Classroom/Web
FDOT - Florida Department of Transportation	**Disability Etiquette for Transit Operators**	Basic	1-2 hours	This training will provide transit operators with basic tips, skills and techniques to improve their ability to interact with persons with disabilities in an understanding and effective manner. The learning objectives for transit operators include gaining general knowledge about the Americans with Disabilities Act (ADA), an understanding of the vital importance of mobility for persons with disabilities, and receiving guidelines for communicating effective with persons with disabilities.	Certificate of Completion	www.transitoperations.org/documents/training/DERegInformation.pdf			Web Based
FDOT - Florida Department of Transportation	**FPTA/FDOT/CUTR Professional Development Workshop and Transit Safety & Operations Summit**	Basic	2 days		Certificate of Completion	www.transitoperations.org/training.html			Classroom/Web
FDOT - Florida Department of Transportation	**Instructor's Course for Transit Trainers**	Basic	5 days	This instructor-led course provides a standardized training program that can be used by any transit service provider to train qualified, professional bus/paratransit operators. Instructors are trained in presentation and creative learning techniques, facilitation methods, and adult learning principles for teaching operators skills in vehicle operation, emergency management, and customer relations.	FDOT Florida Transit Operator Trainer Training Certificate.	www.floridatsn.org/wp-content/uploads/2018/01/ictt0226030218.pdf	Driver trainers, bus/paratransit operator trainers, safety managers, safety supervisors, training managers, operations managers, operations supervisors, HR managers to understand driver requirement		Classroom
FDOT - Florida Department of Transportation	**Transit Industrial Safety Management**	Basic	4.5 days	This course is designed to educate participants on how to develop, implement, and maintain an industrial safety management program following OSHA principles and guidelines for transit employees, equipment, and facilities. Participants learn about Safety Management Systems (SMS) principles, human behavior factors, proactive policies and procedures, identification of hazards and unsafe practices, hazard controls and resolution, documentation, employee training requirements, and management of a workplace safety program. A 30-hour (general industry) OSHA compliance certification is offered to all participants who successfully complete the course.	3.0 CEU	www.enotrans.org/events/categories/webinars/	Safety Program Administrators and Developers, Safety Inspectors and Auditors, Safety Managers and Supervisors, Risk Managers, Operations and Maintenance Supervisors/Managers, Safety Committee personnel, FTA-State Safety Oversight personnel (SSO).		Webinar

Organization	*Program/Course Name*	*Level*	*Time Period*	*Description*	*Credentials Earned*	*Website*	*Target Audience*	*Fees*	*Delivery Method*
FHWA	**Effective Target Setting for Transportation Performance Management**	Basic	2 days	This course will provide the information needed on how to establish and use performance targets. The course will answer these broad questions: What is a target?, Why should I set targets?, How do I set targets?, How do I use targets? The focus of this training will be at the State/MPO level. Federal employees will learn about their role in the context of States/MPOs going through the target setting steps.	1.2 CEUs	www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=138012&res=1&sf=0&course_no=138012	The target audience for this Instructor-led Training course includes the following: Technical roles responsible for setting targets + Planning/programming staff who develop the Statewide Transportation Improvement Plan (STIP) and Regional Transportation Improvement Plans (RTIPs) Staff dedicated to performance management + Individuals who will be involved in coordination/collaboration of target setting + Federal Highway	$ 525.00	Web Based
FHWA	**Effective Target Setting for Transportation Performance Management**	Basic	6.5 hours	The course supports the larger objective of helping State DOTs and MPOs understand how to implement performance management principles by teaching how to develop and set performance targets that will support progress toward an agency's strategic goals. This course answers the question, "How do I set targets?" by providing an in-depth review of the steps necessary. The course strikes a careful balance with providing information on setting targets that can be applied to a range of performance areas without getting into the details of specific c methodologies that are required by MAP-21. It contains short, focused lessons that reinforce content so that it can be directly applied by the learner.	0.7 CEUs	www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=138013&res=1&sf=0&course_no=138013	The target audience for this Web-based Training course includes the following: Technical roles responsible for setting targets + Planning/programming staff who develop the Statewide Transportation Improvement Program (STIP) and regional Transportation Improvement Programs (TIPs) Staff dedicated to performance management Individuals who will be involved in coordination/collaboration of target setting Federal	No Cost	Web Based

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
FHWA	**ITS Deployment Analysis Systems (IDAS)**	Basic	5 hours	This course is a Web-based training session on the newly developed ITS Deployment Analysis System (IDAS) software. IDAS provides ITS sketch planning capability to calculate the relative costs and benefits of ITS investments. IDAS incorporates a cost module, a benefit module and an internal travel demand model to generate cost/benefit comparisons for alternative ITS deployment scenarios. IDAS uses the output from an existing transportation planning model to establish a best-case scenario on which the user can deploy ITS services on special links in the regional transportation network model.	.5 CEUs	www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=137046&res=1&sf=0&course_no=137046	FHWA, State DOT, metropolitan planning organization, and local government transportation planning staff members who are involved in the day-to-day elements of transportation planning and modeling would bene t for this course. Operations Engineers, ITS Project Managers, and Transit Agency Personnel (this includes individuals who: 1. develop inputs for, set up, and carry out analyses of operations/ITS alternatives and/or	$ 50.00	Web Based
FHWA	**ITS Procurement**	Basic	3.5 hours	This course will provide an overview of strategies for successfully deploying ITS projects that build on systems engineering principles and practices. This course will present an approach to de fining ITS projects and desired outcomes. The focus of this course is on the procurement stage of the overall acquisition process. For this course, the procurement stage spans from identifying what you need to developing a procurement that helps you get what you need through contractor selection.   This course will provide you with tools to develop the key aspects of a request for quote (RFQ), request for proposal (RFP), invitation for bid (IFB), or goods contract advertisement to ensure a successful procurement	0.3 CEUs	www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=137049&res=1&sf=0&course_no=137049	Primary audience: Public agency ITS program and project managers, support staff, and consultants. Public agency procurement/contract managers and support staff. Federal field staff involved in ITS Secondary audience: Planners who will be assisting in interagency coordination/cooperation and ITS projects	No Cost	Web Based

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
FHWA	**Performance-based Planning and Programming**	Basic	2 days	As recent economic, political, and social trends have placed greater emphasis on public sector accountability and cost-effectiveness, many transportation agencies across the country have begun to shift towards a performance- based approach to plan, manage, and operate their systems. This course will familiarize transportation agencies with the key elements of a performance-based planning and programming (PBPP) framework, the relationship of these elements within existing planning and programming processes, and the connection of these elements to Transportation Performance Management (TPM) requirements initiated by legislation, including the Moving Ahead for Progress in the 21st Century (MAP-21) Act and continued under the Fixing America's Surface Transportation (FAST) Act and the Statewide and Nonmetropolitan Transportation Planning; Metropolitan Transportation Planning Final Rule, which was published in the Federal Register on May 27, 2016. This course begins by providing an overview of PBPP and then walks the participants through each element of the US Department of Transportation (USDOT) PBPP framework, providing examples of alternative approaches and real-world applications.	1.2 CEUs	www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=138007&res=1&sf=0&course_no=138007	The target audience for this Instructor-led Training course primarily includes transportation professionals responsible for developing and implementing performance-based plans and programs, and those responsible for integration and linkage of other requirements, under performance-based legislation initiated by MAP-21 and continued under FAST. This includes a broad audience of State DOTs, MPOs, regional planning organizations	$ 500.00	Web Based
FHWA	**The Role of Data in Transportation Performance Management**	Basic	2 days	The course begins with an overview of data management. It then details each part of the data supply chain, covering common needs, considerations, and challenges along the way. The course also covers issues related to data assessment and data improvement planning. The course material is synthesized at the end of the course through a group exercise in which participants create a data management and improvement plan.	1.2 CEUs	www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=138011&res=1&sf=0&course_no=138011	The target audience for this Instructor-led Training course primarily includes staff at FHWA, State DOTs, MPOs, and national organizations, such as Association of Metropolitan Planning Organizations (AMPO) and American Association of State Highway and Transportation Officials (AASHTO) who would bene t from an overview of data management in the context of TPM applications and an appreciation for some basic data management	$ 425.00	Web Based

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
FHWA	**TPM Overview for the MAP-21 and FAST Acts**	Basic	1.5 hours	This course presents an overview of the TPM provisions of MAP-21 and FAST, describes the responsibilities that agencies at various levels (Federal, State, and MPO) have in delivering these requirements, and captures best practices in use today that can help agencies get started on meeting the requirements. It begins by introducing participants to the TPM provisions of MAP-21 and FAST--including national goals and performance measures and how they relate, target setting, incorporation into the planning and programming process, and accountability and transparency requirements.	0.1 CEUs	www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=138005&res=1&sf=0&courseno=138005	The target audience for this Web-based course primarily consists of FHWA, State DOT, and MPO staff who have a role in meeting the MAP-21/FAST TPM requirements. Regional planning organization (RPO), transit agency, other local agency staff, along with executives and senior decision makers, make up a secondary audience.	No Cost	Web Based
FHWA	**Transportation Performance Management (TPM) for Safety**	Basic	2 days	This course explains the safety performance measures and noteworthy practices necessary for States to comply with the MAP-21 and FAST Act requirements. The course recommends an evidence-based and data-driven methodology for setting safety targets and provides participants with an understanding of the safety data needed to meet the safety TPM requirements. The course helps improve the ability of States' to coordinate target setting between the State Departments of Transportation (State DOTs) and the State Highway Safety Office (SHSO), as well as between the State DOT and the State's Metropolitan Planning Organizations (MPOs).	1.2 CEUs	www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=138006&res=1&sf=0&courseno=138006	The target audience for this Instructor-led Training course primarily includes State DOT safety specialists, planners, and others involved in the performance-based planning process; SHSO planners and decision makers; and MPO planners, safety experts, and decision makers. FHWA, the National Highway traffic Safety Administration (NHTSA), Strategic Highway Safety Plan (SHSP) stakeholders, transit agencies, Rural	$ 700.00	Web Based
FHWA	**Transportation Performance Management Awareness**	Basic	1 hour	Transportation Performance Management is a strategic approach that uses system information to make investment and policy decisions to achieve national performance goals. Performance Management helps inform decisions on the use of available resources, strengthens our accountability, and allows us to better understand and communicate what works and what does not work. This course provides an introduction to performance management. It covers the definition of performance management and basic performance management concepts, explains the critical role that the planning process plays in implementing a performance management program, and addresses what performance management means to the Federal Highway Administration.	0 CEU	www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=138001&res=1&sf=0&courseno=138001	The target audience for this Web-based Training course includes all FHWA employees.	$ 25.00	Web Based

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
FHWA	**Transportation Performance Management Overview for the MAP-21 and FAST Acts**	Basic	1 day	The aim of this course is to familiarize transportation professionals with the TPM provisions of MAP-21 and FAST and how it can impact existing products and processes. The course introduces key points of overlap between the transit and highway performance measurement provisions in MAP-21, but the primary focus is on the highway provisions. Course material is organized around the TPM elements of goals, measures, targets, plans, accountability and transparency and introduces the related MAP-21/FACT Act provisions for each element. The course also provides an introduction on how TPM provisions impact individual performance areas (i.e., safety, pavement/bridge, operations) and how these provisions come together under planning and programming.	0.6 CEUs	www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=138004&res=1&sf=0&course_no=138004	The target audience for this Instructor-led Training course primarily includes FHWA, State DOT, and MPO staff who have a role in meeting the MAP-21 TPM requirements. Executives and senior decision makers are a secondary audience. The course is highly recommended for participants interested in more detailed system-specific c MAP-21 implementation training.	$ 425.00	Web Based
FHWA	**Turbo Architecture Version 5.0**	Basic	6 hours	Turbo Architecture is an interactive software program that assists transportation planners and system integrators in the development of regional and project architectures. This Web-based training (WBT) provides ITS professionals with a hands-on experience using the Turbo Software Version 5.0. Participants will work with simulated examples and practice exercises to create, maintain, and use regional and project ITS architectures.	0 CEU	www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=137048&res=1&sf=0&course_no=137048	The Turbo Architecture WBT is designed for ITS professionals employed by MPOs, transit agencies, municipalities, State DOTs, FHWA Division Offices, or consultants and system integrators who use and/or maintain an ITS architecture and are involved with ITS planning, deployment, and operations.	No Cost	Web Based
FHWA	**Planning and Designing for Pedestrian Safety**	Basic	3 days	The Planning and Designing for Pedestrian Safety is a combination of the information from the 2-day "Developing a Pedestrian Safety Action Plan" (NHI-380089) and 2-day "Designing for Pedestrian Safety" (NHI-380090) course. This comprehensive course is designed to help state and local officials learn "HOW TO" address pedestrian safety issues in the development of a pedestrian safety action plan, and specific programs and activities tailored to their community. It is also intended to assist agencies in the further enhancement of their existing pedestrian safety plan, programs, and activities, including involving partners and stakeholders, collecting and analyzing data and information, prioritizing issues and concerns, selecting and implementing an optimal combination of education, enforcement, engineering strategies. This course goes into more detail on engineering strategies than the "Developing a Pedestrian Safety Action Plan" (NHI-380089) course. This course includes two field exercises in the application of the principles, concepts, and strategies covered in the course. Also the participants will share and prioritize potential policies, programs, and strategies.	1.8 CEUs	www.nhi.fhwa.dot.gov/course-search?tab=0&key=NHI+Course+380091+-+Planning+and+Designing+for+Pedestrian+Safety+&sf=0&course_no=380091	Engineers, planners, traffic safety and enforcement professionals, public health and injury prevention professionals, and decision-makers who have the responsibility of improving pedestrian safety at the state or local level.	$ 530.00	Classroom

Organization	*Program/Course Name*	*Level*	*Time Period*	*Description*	*Credentials Earned*	*Website*	*Target Audience*	*Fees*	*Delivery Method*
FHWA	**Introduction to Performance Measurement**	Introductory	2 hours	This course is one in a series of introductory courses that fall within the subject area of Transportation Performance Management. Transportation Performance Management is a strategic approach that uses system information to make investment and policy decisions to achieve national performance goals. Performance Management helps inform decisions on the use of available resources, strengthens our accountability, and allows us to better understand and communicate what works and what does not work.	0 CEU	www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=138003&res=1&sf=0&course no=138003	The target audience for this Web-based Training course includes all FHWA employees.	$ 25.00	Web Based
FHWA	**ITS Awareness WBT**	Introductory	6 hours	This course provides public and private sector practitioners with an introduction to current intelligent transportation systems (ITS). It presents an overview of the broader context in which individual ITS applications and service packages are developed, deployed, and operated. It also offers insights into the future directions in which ITS is expected to develop. This course will be of particular interest to Department of Transportation (DOT)staff seeking to introduce ITS to a wider number of staff, while also advancing the ITS expertise of select staff.	0.6 CEUs	www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=137050&res=1&sf=0&course no=137050	Public and private sector practitioners with interest in new transportation directions, including increased information on CV, AV and Smart City activities.	No Cost	Web Based
FHWA Business Process Frameworks for Transportation Operations	**Traffic Management Capability Maturity Framework Tool**	Basic		The framework looks at the agency's ability to monitor and control traffic and the road network including the centers that coordinate traffic information. Broadly, the framework assesses the capability to efficiently manage the movement of traffic on streets and highways and includes corridor management approaches. The capability levels and the actions are focused on defining the assessments from a traffic manager's perspective. The actions may require other agencies to be the responsible party, which is intended to foster multi-agency collaboration and dialogue about traffic management at the regional level.		ops.fhwa.dot.gov/tsmoframeworktool/available_frameworks/traffic.htm	City and state traffic managers in the region Selected group of traffic operators MPO representatives Law enforcement representatives Transit operators	No Cost	Web Based
FHWA Business Process Frameworks for Transportation Operations	**Traffic Signal Management Capability Maturity Framework Tool**	Basic		Traffic signal management involves the planning, design, integration, maintenance, and proactive operation of a traffic signal system in order to achieve policy based objectives to improve the efficiency, safety and reliability of signalized intersection operations. The framework assess the agency capability to support effective signal operations management by building on various existing resources available for this topic including the guidance provided in "Improving Traffic Signal Management and Operations: A Basic Service Model".		ops.fhwa.dot.gov/tsmoframeworktool/available_frameworks/traffic_signal.htm	Traffic engineers involved in signal design and operations Transit agencies and operators Emergency personnel Traffic and emergency operations staff	No Cost	Web Based
FHWA Business Process Frameworks for Transportation Operations	**Work Zone Management Capability Maturity Framework Tool**	Basic		Managing traffic during construction is necessary to minimize traffic delays, maintain motorist and worker safety, complete roadwork construction in a timely manner, and maintain access for businesses, institutions, and residents. This framework assesses the capability for effective work zone traffic management including assessing work zone impacts and implementing strategies for minimizing or mitigating the impacts.		ops.fhwa.dot.gov/tsmoframeworktool/available_frameworks/work_zone.htm	Work zone traffic managers Maintenance staff Traffic operations managers Construction staff Project planning and design staff	NO Cost	Web Based
FHWA Freight Management and Operations	**Freight Professional Development (FPD) Program**	Basic	Varies	Planning for Progress provides an overview of intermodal freight transportation and addresses why it is important for decision-makers, public transportation planners and other transportation professionals to integrate freight in their local, State, and multi-jurisdictional planning and investment decisions. Also includes FHWA workshops and Training for Leaders.		ops.fhwa.dot.gov/freight/fpd/			Web Based

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FHWA Organizing and Planning for Operations	**Analysis and Performance Measurement**	Basic		Analysis and performance measurement are integral to planning for operations. They are central to the success of an objectives-driven, performance-based approach and are often the most resource-intensive aspect to planning for operations in terms of data, staff expertise, and simulation tools and models. Analysis and performance measurement are the key activities in two major elements of the planning for operations approach: 1) the systematic process to develop and select M&O strategies to meet objectives and 2) system performance monitoring and evaluation. Performance measures and analysis also play an important role in the development of operations objectives. Operations data serves as the foundation for these activities. Key topics of analysis and performance measurement are: Analysis and Simulation Tools Benefit-Cost Analysis Performance Measures and System Monitoring Operations Data for Planning		ops.fhwa.dot.gov/plan4ops/focus_areas/analysis_p_measure/analysis_p_measure.htm	State DOT/MPOs/TSMO professionals	No Cost	Web Based
FHWA Organizing and Planning for Operations	**Congestion Management Process**	Basic		A congestion management process (CMP) is a systematic and regionally-accepted approach for managing congestion that provides accurate, up-to-date information on transportation system performance and assesses alternative strategies for congestion management that meet State and local needs. A CMP is required in metropolitan areas with population exceeding 200,000, known as Transportation Management Areas (TMAs). Federal requirements state that in all TMAs, the CMP shall be developed and implemented as an integrated part of the metropolitan transportation planning process; however, Federal regulations are not prescriptive regarding the methods and approaches that must be used to implement a CMP. The CMP and planning for operations are frequently combined in metropolitan regions. The strategies that come from a CMP are often M&O strategies. The CMP uses an objectives-driven, performance-based approach to planning for congestion management. Through the use of congestion management objectives and performance measures, the CMP provides a mechanism for ensuring that investment decisions are made with a clear focus on desired outcomes. This approach involves screening strategies using objective criteria and relying on system performance data, analysis, and evaluation.		ops.fhwa.dot.gov/plan4ops/focus_areas/cmp.htm	State DOT/MPOs/TSMO professionals	No Cost	Web Based
FHWA Organizing and Planning for Operations	**Integrating Operations into Planning and Programming**	Basic		FHWA and FTA promote the use of objectives-driven, performance-based approach to planning for operations. This resource includes focus on regional goals, setting operations objectives, management and operations strategies, programming and funding for operations, TSMO plans, and communicating with decision makers.		ops.fhwa.dot.gov/plan4ops/focus_areas/planning_prog.htm	State DOT/MPOs/TSMO professionals	No Cost	Web Based
FHWA Organizing and Planning for Operations	**Organizing for Operations**	Basic		Organizing for operations involves making transportation systems management and operations (TSMO) a central part of an agency's mission and institutional structure. This is accomplished by advancing TSMO programs and projects within the agency. A specific guidance framework has been developed to help transportation agencies improve the effectiveness of their TSMO activities. The framework, the "Operations Capability Improvement Process," is based on self-evaluation regarding the key process and institutional capabilities required from a transportation agency (or group of agencies) to achieve effective TSMO.		ops.fhwa.dot.gov/plan4ops/focus_areas/organizing_for_op.htm	State DOT/MPOs/TSMO professionals	No Cost	Web Based
FHWA Organizing and Planning for Operations	**Regional Collaboration and Coordination**	Basic		Regional collaboration and coordination is the foundation for effective planning for operations. Regional operations collaboration and coordination is an ongoing, iterative effort. Five major elements form a framework on which managers with day-to-day responsibilities for providing transportation and public safety services can build sustained relationships and create strategies to improve transportation system performance. The framework creates structures through which processes occur that result in products. It implies a commitment of resources and is motivated by a desire for measurable improvement in regional transportation system performance.		ops.fhwa.dot.gov/plan4ops/focus_areas/collab_and_coord.htm	State DOT/MPOs/TSMO professionals	No Cost	Web Based

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FHWA Organizing and Planning for Operations	**Regional Concept for Transportation Operations**	Basic		The U.S. Department of Transportations Organizing and Planning for Operations Program supports the integration of transportation systems management and operations strategies into the planning process for the purpose of improving transportation system efficiency, reliability, and options. This program is led by the Office of Operations and Office of Planning, Environment, & Realty of the Federal Highway Administration (FHWA) in coordination with the Federal Transit Administration (FTA), which work with metropolitan planning organizations, State and local departments of transportation, transit agencies, and other organizations to maximize the performance of existing infrastructure through multimodal and multi-agency programs and projects.		ops.fhwa.dot.gov/plan4ops/index.htm	State DOT/MPOs/TSMO professionals	No Cost	Web Based
FHWA Organizing and Planning for Operations	**Regional Concept for Transportation Operations**	Basic		A Regional Concept for Transportation Operations (RCTO) is a management tool that assists in planning and implementing management and operations (M&O) strategies in a collaborative and sustained manner. Developing an RCTO helps partnering agencies think through and reach consensus on what they want to achieve in the next 3 to 5 years and how they are going to accomplish it in the region. The ultimate benefit of an RCTO is the improvement in regional transportation system performance that is realized when jurisdictions and agencies work together toward commonly held operations objectives.		ops.fhwa.dot.gov/plan4ops/focus_areas/trans_ops.htm	State DOT/MPOs/TSMO professionals	No Cost	Web Based
Florida Association of Safety Councils the Safety Council of Palm Beach County	**F.D.O.T. Maintenance of Traffic Intermediate Level Training**	Basic	16 hours	The Safety Council of Palm Beach County is proud to present this training. Participants will gain knowledge and understanding of the equipment, techniques and procedures necessary to safely and correctly set up and maintain traffic. It will also upgrade their performance for legal aspects and safety practice for establishing work zones on state and federal highways. Visual and hands on techniques will be used to enhance employee performance.		safetycouncilpbc.org/mot-courses/	Municipal workers, contractors, and utility worker	$195.00 for Members $225.00 for Non-Members	Classroom
ITE	**Case Studies and Evolving Design Guidance for Bike/Bus Interaction**	Basic	1.5 hours	As jurisdictions implement new bicycle and transit infrastructure, the frequency of interactions between bus drivers and bicyclists is on the rise. This webinar will focus on guidance for designing facilities to best accommodate buses and bicycles in the public right-of-way. The webinar will describe the literature regarding best practices for multi-modal street designs and present case studies of various design solutions, including a before and after study of the effects of recent facility installations on the safety and comfort of cycling as well as the speed and reliability of transit service. Attendees will also learn from the presenters' recent bus/bike facility experiences in California and Maryland.	1.5 PDH/CM; Certificate of Completion	www.pathlms.com/ite/courses/5429		$149 Members $199 Non-Members	Webinar
ITE	**Implementation Success Stories: How SHRP2 is Helping Agencies Advance Operations**	Basic	1.5 hours	SHRP2 produced new tools and resources to help agencies advance transportation systems management and operations (TSMO). The products came along at a pivotal time as many agencies were placing more emphasis on effective operations to maximize the use of existing facilities to address public expectations, tight budgets, and less space for system expansion. Every State in the U.S. is deploying at least one of the SHRP2 Reliability products, and lead implementers are deploying as many as 10 products. During this webinar, some of these agencies will share their stories about how they have used the products to advance operations, build support for TSMO programs and investments, and improve travel in their regions.	1.5 PDH; Certificate of Completion	www.pathlms.com/ite/courses/4450			Webinar
ITE	**Implementing the New HCM6**	Basic	12 hours	The Transportation Research Board (TRB) and the Institute of Transportation Engineers (ITE) along with the SimCap Standing Committee of the ITE Traffic Engineering Council are collaborating on outreach activities associated with the recently released Highway Capacity Manual, 6th Edition (HCM 6): A Guide for Multimodal Mobility Analysis. This fundamental webinar course will present the new analysis procedures incorporated into HCM 6 and why these tools are vital to helping analyze today's transportation problems. This course will also discuss the implementation of the HCM 6 in various settings, such as reliability, multi-modal facilities, freeways, alternative intersections, interchanges, active traffic and demand Management, and interrupted flow facilities.	12 PDH credits and a certificate for each recording.	www.pathlms.com/ite/courses/5040		Individual Webinars- ITE member price: $49; non-member price: $99 , Entire 8-Part Webinar Course- ITE member price: $249; non-member price: $499	Webinar

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ITE	**Introducing the FHWA Speed Management ePrimer for Rural Transition Zones and Town Centers**	Basic	1.5 hours	This webinar will present the FHWA Speed Management ePrimer for Rural Transition Zones and Town Centers, developed by ITE. This resource, which complements the FHWA Traffic Calming ePrimer, focuses specifically on addressing speeding-related safety issues in rural communities. It includes guidance on the comprehensive rural speed management process, from identifying potential hot spots, to implementing and evaluating speeding countermeasures. The ePrimer places particular emphasis on low-cost treatments suitable for deployment in a rural environment, and includes several case studies from rural communities across the United States to illustrate the safety improvement process.	1.5 PDH; Certificate of Completion.	www.pathlms.com/ite/courses/6001		No Cost	Webinar
ITE	**Lagging Left-Turn Arrow Safety and Operation**	Basic	1.5 hours	This webinar will provide extensive collision analyses comparing lagging left-turn arrow and leading left-turn arrow operation. The webinar will also include commentary on the reasons lagging left-turn arrows have a substantially lower collision experience than leading left-turn arrows will be discussed. The webinar will include recent implementation of independent lagging left-turn arrow operation with flashing yellow left-turn arrows. Preliminary collision data for this operation will be provided.	certificate of completion and 1.5 PDH/CM credits	www.pathlms.com/ite/courses/5888		$149 Members $199 Non-Members	Webinar
ITE	**Managing Speed: Self-Enforcing Roadway Concepts**	Basic	1.5 hours	This webinar identifies methods that may produce self-enforcing or self-explaining roadways during the geometric design process. While safety performance associated with these methods is not well-understood yet, an implied outcome of effective speed management is that less severe crashes will result via the application of self-enforcing or self-explaining road design principles. Six different self-enforcing road concepts and the processes needed to implement the concepts when designing or evaluating existing two-lane rural highways are identified and described during the webinar.	1.5 PDH/CM; Certificate of Completion	www.pathlms.com/ite/courses/5426		$49 Members $99 Non-Members	Webinar
ITE	**Recommended Design Guidelines to Accommodate Pedestrians and Bicycles at Interchanges Webinar**	Basic	1.5 hours	This webinar recording features the guiding principles and case studies included in the recently-released Recommended Practice Recommended Design Guidelines to Accommodate Pedestrians and Bicycles at Interchanges. It will include a discussion of the preferred design guidelines for accommodating pedestrians and bicyclists at interchanges with respect to safety and accessibility. It will also discuss specific dimensions, safety features, signage, pavement markings, design geometries, and other treatments for accommodating non-motorized users at interchanges.	1.5 PDH; Certificate of Completion	www.pathlms.com/ite/courses/5038		$49 Members $99 Non-members	Webinar
ITE	**Safety Fundamentals: A 9-Part ITE Learning Hub Webinar Series**	Basic	1.5 hours/ 13.5 hours (entire course)	This 9-part webinar series highlights various aspects of road safety as part of ITE's continued focus on Vision Zero and the goal to reduce and eventually eliminate fatalities. Presented by experts in their field, this series will have a topic appropriate for all levels. There is a suite of introductory webinars for those not familiar with road user safety as well as modules discussing safety evaluations and safety for all road users.	Individual Webinar Registrants: 1.5 PDH credits per webinar, Entire Course Registrants: 13.5 PDH Credits for the entire series	www.pathlms.com/ite/courses/4180			Webinar
ITE	**Technology in Transportation — Happening Today and Preparing for Tomorrow**	Introductory	4.5 hours	This webinar series is designed to educate ITE members about key activities related to Connected Vehicles (CV). The first webinar will provide an introduction to the current status of CV deployment and ITE's activities in the CV/AV and Smart Communities areas and the Signal Phase and Timing (SPaT) Challenge. The second webinar will go into more depth on the SPaT Challenge, including current status, deployment challenges, and success stories. The third webinar will cover implementation guidance for vehicle-infrastructure (V2I) deployments.	4.5 PDH credits (1.5 per webinar) and 3 Certificates of Completion	www.pathlms.com/ite/courses/5296		No Cost	Webinar

Organization	*Program/Course Name*	*Level*	*Time Period*	*Description*	*Credentials Earned*	*Website*	*Target Audience*	*Fees*	*Delivery Method*
ITE	**PTOE Refresher Online Course**	Basic	1.5 hours/ 9 hours (entire course)	This on-demand webinar series provides an overview of topics, key references and independent study materials by topic for practicing engineers who intend to take the PTOE certification examination. The suite of webinars include six (6) 90-minute modules on traffic operations studies, traffic operations interrupted and uninterrupted flow, elements of geometric design, traffic safety and traffic control devices.	1.5 PDH per webinar; 9 PDH for entire series	www.pathlms.com/ite/courses/4699		Individual Modules ITE member price: $99; non-member price: $149 ;Entire 6-Part Refresher Course ITE member price: $200; non-member price: $450	Webinar
ITS America	**ITS AMERICA Webinar: A Proactive Approach To Road Safety Analysis**	Basic		n/a		drive.google.com/file/d/0BwMaQ13qg7EqRUNiZWNnTWhFS2s/view	Public	No Cost	Webinar
ITS America/USDOT	**2018 USDOT Webinar Series: What's New in Intelligent Transportation Systems (ITS) Deployment**	Basic	1 hour	To measure the deployment of ITS technology nationally, the USDOT's ITS Deployment Tracking Project surveys transportation agencies in the largest U.S. cities on a regular basis. The ITS Knowledge Resources Portal summarizes the benefits, costs, deployment levels, and lessons learned for ITS deployment and operations from over 20 years of ITS evaluation studies, research syntheses, handbooks, journal articles, and conference papers tracking the effectiveness of deployed ITS.		docs.google.com/forms/d/e/1FAIpQLSe5LbAYUQ1MU1ZHT5mkkkqWwU0hGHOxavgNMLSOQqZZzMAKrQ/viewform	Public	No Cost	Webinar
ITS America/USDOT	**Accessible Transportation Technologies Research Initiative (ATTRI) Update, Webinar 4 - Safe Intersection Crossing Project**	Basic	1 hour	Participants will hear directly from Carnegie Mellon University about the successes and challenges of their safe intersection crossing initiative. These are one of six projects awarded contracts by USDOT this year to develop technology prototypes to improve mobility options for all travelers, particularly those with disabilities. This project intends to connect pedestrian travelers with disabilities to the traffic signal systems, and use this connectivity to develop assistive services for safe intersection crossing and increased dependent mobility.		docs.google.com/forms/d/e/1FAIpQLScIIoPHUYQTqV6VDPyb-5HRuVrLFg5LrGIvrVDSyRpvYbzQMg/viewform	Public	No Cost	Webinar
ITS America/WYDOT	**Wyoming Department of Transportation Connected Vehicle Pilot Application Design Stage Update**	Basic	1 hour	This session will discuss the connected vehicle applications being developed as part of the WYDOT Connected Vehicle Pilot. Representatives from the WYDOT Pilot will: share their experiences of designing the safety and weather-related CV applications; identify technical and other barriers they are facing and how they are being overcome; and discuss how these apps will eventually be tested and their performance measured.		docs.google.com/forms/d/e/1FAIpQLSd7YPPN8CuPl2yzFqIulpc5vBjJ01t4g9X4ZYb_SrNhRiGEJA/viewform	Public	No Cost	Webinar
ITS PCB - ITS Professional Capacity Building Program	**Module 6: Freight, Intermodal, and Commercial Vehicle Operations (CVO)**	Basic		The purpose of this module is to illustrate and explain major intelligent transportation systems (ITS) applications related to commercial highway vehicle operations, including highway and intermodal interfaces of air, ocean, or rail intermodal freight. This module also shows how these applications deliver operating efficiencies, customer service quality improvements, better safety, improved enforcement, and greater security assurance, as well as how different ITS technologies and architectures relate to those benefits. Readers should gain an appreciation of what has been tried and proven and, in many cases, what the outcomes of those trials have been. This module should give both students and practitioners a better understanding of how such technologies can be used to improve freight transportation.		www.pcb.its.dot.gov/eprimer/module6.aspx		No Cost	Web Based

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ITS PCB - ITS Professional Capacity Building Program	**Supporting Freight Operations with ITS**	Basic	1.5 hours	This webinar will focus on ITS strategies that improve trucking operations for the benefit of improved mobility and public safety. There is a growing need for the public sector to include freight planning into the management of the transportation system—especially the highway system. Population growth, typically in urban areas, will result in increased demand for infrastructure to move large amounts of freight. Factors such as changing demographics, e-commerce, home deliveries versus store deliveries, automated vehicles and trucks, and the shift to regional warehouses to facilitate just-in-time deliveries, will add to today's increasing congestion challenge.	1.0 PDH	https://www.pcb.its.dot.gov/t3/s160803/s160803_Supporting_Freight_Operations_with_ITS_presentation_Fayez.ppt	Federal, State DOT, and Metropolitan Planning Organization ITS program managers, planners, and engineers Public safety personnel involved in freight compliance and regulations Freight logistic planners and those involved coordinating all aspects of the supply chain Consultants, academia, vendors, government officials, researchers, and students and those wanting to learn more about the	No Cost	Archived Webinar
ITS PCB - ITS Professional Capacity Building Program	**Adaptive Signal Control Case Study**	Basic		Results from the PCB Program's 2012 University Partners Workshop and webinar indicated that faculty supported U.S. DOT-sponsored case studies as a method for incorporating ITS content into existing Civil and Transportation Engineering courses. Case Studies expose students to ITS-related scenarios, from the perspective of different job roles, within transportation organizations. This exposure gives students an understanding of what it means to work as ITS professionals.		www.pcb.its.dot.gov/casestudies/default.aspx		No Cost	Online/PDF/Webinar
ITS PCB - ITS Professional Capacity Building Program	**Civil Design Considerations for ITS Implementations**	Basic		Results from the PCB Program's 2012 University Partners Workshop and webinar indicated that faculty supported U.S. DOT-sponsored case studies as a method for incorporating ITS content into existing Civil and Transportation Engineering courses. Case Studies expose students to ITS-related scenarios, from the perspective of different job roles, within transportation organizations. This exposure gives students an understanding of what it means to work as ITS professionals.		www.pcb.its.dot.gov/casestudies/default.aspx		No Cost	Online/PDF/Webinar
ITS PCB - ITS Professional Capacity Building Program	**Concept of Operations Development as Part of a Systems Engineering Process Case Study**	Basic		Results from the PCB Program's 2012 University Partners Workshop and webinar indicated that faculty supported U.S. DOT-sponsored case studies as a method for incorporating ITS content into existing Civil and Transportation Engineering courses. Case Studies expose students to ITS-related scenarios, from the perspective of different job roles, within transportation organizations. This exposure gives students an understanding of what it means to work as ITS professionals.		www.pcb.its.dot.gov/casestudies/default.aspx		No Cost	Online/PDF/Webinar
ITS PCB - ITS Professional Capacity Building Program	**National ITS Architecture Case Study**	Basic		Results from the PCB Program's 2012 University Partners Workshop and webinar indicated that faculty supported U.S. DOT-sponsored case studies as a method for incorporating ITS content into existing Civil and Transportation Engineering courses. Case Studies expose students to ITS-related scenarios, from the perspective of different job roles, within transportation organizations. This exposure gives students an understanding of what it means to work as ITS professionals.		www.pcb.its.dot.gov/casestudies/default.aspx		No Cost	Online/PDF/Webinar
ITS PCB - ITS Professional Capacity Building Program	**Travel Time Based Performance Measures Case Study**	Basic		Results from the PCB Program's 2012 University Partners Workshop and webinar indicated that faculty supported U.S. DOT-sponsored case studies as a method for incorporating ITS content into existing Civil and Transportation Engineering courses. Case Studies expose students to ITS-related scenarios, from the perspective of different job roles, within transportation organizations. This exposure gives students an understanding of what it means to work as ITS professionals.		www.pcb.its.dot.gov/casestudies/default.aspx		No Cost	Online/PDF/Webinar

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ITS PCB - ITS Professional Capacity Building Program	**Automated Vehicles and Policy**	Basic	1.5 hours	The U.S. DOT and the Intelligent Transportation Society of America (ITS America) are hosting a series of webinars on the key issues and opportunities facing the integration of automated vehicles into our transportation system. Automated Vehicles and Policy is the third in this AV Awareness series of webinars jointly produced by the ITS PCB Program and ITS America. This 90-minute webinar will explore the key policy topics and challenges for automated vehicles and discuss what transportation policy makers need to know to adequately consider automation in the future.	1.5 PDH	https://www.pcb.its.dot.gov/t3/s160301/s160301_Automated_Vehicles_and_Policy_presentation_Kim2.asp	Policy makers, state and local transportation agencies, metropolitan planning organizations, research organizations, legislative staff, and other transportation professionals interested in learning more about vehicle automation and policy	No Cost	Archived Webinar
ITS PCB - ITS Professional Capacity Building Program	**Connected Vehicle Basics**	Basic	1.5 hours	Connected vehicles use communications technology to allow cars, trucks, transit vehicles, traffic signals, work zones, and even pedestrians to "talk" to each other and exchange valuable information that could help avoid crashes and hazards. Connected vehicles have the potential to transform the way Americans travel through the creation of a safe, interoperable wireless communications network—a system that includes cars, buses, trucks, trains, traffic signals, cellphones, and other devices.	1.5 PDH	www.pcb.its.dot.gov/t3/s140424_cv_basics.asp	State DOT and MPO ITS program managers and engineers Consultants and vendors Government officials at local, State, and Federal levels University professors, students, administrators, and researchers Other individuals or entities involved in the design, deployment, operation, or evaluation of ITS programs Those interested in learning more about the Connected Vehicle Research	No Cost	Archived Webinar

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
ITS PCB - ITS Professional Capacity Building Program	**Connected Vehicle Reference Implementation Architecture Webinar #1: V2I Safety Applications**	Basic	2.5 hours	The objective of these webinars is to familiarize attendees with the CVRIA content so that they will be equipped to provide feedback on the architecture before the CVRIA team launches the analysis to identify candidate interfaces for standardization. The CVRIA team will be presenting two to three representative applications in the context of the architecture viewpoints per session. The session will also include a short discussion about the interface analysis and candidate standards identification process; and a brief discussion of the policy analysis process to date.	2.5 Hour	www.pcb.its.dot.gov/t3/s131106_cvria1.asp	Highway managers, including local, state, and federal, and any others interested in the development, deployment, or use of vehicle to infrastructure applications Suppliers of roadside equipment used in V2I communications	No Cost	Archived Webinar
ITS PCB - ITS Professional Capacity Building Program	**Innovative Approaches to Real-Time System Management Information**	Basic	1.5 hours	The purpose of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) Section 1201, Title 23 in the Code of Federal Regulations (CFR) Part 511 is to establish a Real-Time System Management Information Program (RTSMIP) to monitor in real time the traffic and travel conditions on the major highways across the U.S. In addition, the RTSMIP shares this data to address congestion problems through enhanced operations and facilitates traveler information.	1.5 PDH	www.pcb.its.dot.gov/t3/s140521_real_time.asp	State DOT and metropolitan planning organizations' ITS program managers and engineers Government officials at local, State, and Federal levels Consultants and vendors Researchers Other individuals or entities involved in the design, deployment, operation, or evaluation of ITS programs and real-time transportation systems Those interested in learning more about the RTSMIP	No Cost	Archived Webinar
ITS PCB - ITS Professional Capacity Building Program	**Leveraging Big Data for Transportation Improvement: Gaps and Opportunities**	Basic	1.5 hours	In the presence of this "big data," what is the future of modeling, traffic and performance management, trip generation and traveler information? User data can describe transportation system performance much more richly than the data collection infrastructure now used by traffic management centers, suggesting the possibility that user data could dramatically improve traffic management practices. Untapped potential may exist for user-derived data to guide agency decisions. This presentation will explore the trends, challenges, and opportunities in bringing the power of user data to the public agencies that manage highway operations.	1.5 PDH	www.pcb.its.dot.gov/t3/s120517_new_analytics.asp	Member of University Transportation Centers	No Cost	Archived Webinar
ITS PCB - ITS Professional Capacity Building Program	**Module 10: Rural and Regional ITS Applications**	Basic		The purpose of this module is to introduce the reader to the unique needs and challenges of deploying intelligent transportation systems (ITS) in rural and regional settings and to offer examples of how these deployments have been accomplished.		www.pcb.its.dot.gov/eprimer/module10.aspx		No Cost	Web Based

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ITS PCB - ITS Professional Capacity Building Program	**Module 11: Sustainable Transportation**	Basic		The concept of sustainability has been receiving increased attention over the past several years. This module addresses what is meant by sustainable transportation, identifies the various attributes that make up a sustainable transportation network, and discusses how transportation systems management and operations (TSM&O) and supporting intelligent transportation systems (ITS) technologies can contribute to a sustainable transportation network. Related concepts addressed include livability, climate change adaptation, and performance measures.		www.pcb.its.dot.gov/eprimer/module11.aspx		No Cost	Web Based
ITS PCB - ITS Professional Capacity Building Program	**Module 13: Connected Vehicles**	Basic		The purpose of this module is to describe the background, current activities, and future direction of the connected vehicle initiative. The module examines the anticipated roles and responsibilities of the principal participants; the major technologies and systems development efforts; the range of expected applications of the connected vehicle system; the potential institutional, policy, legal, and funding challenges facing the initiative; and the expected development and deployment timeline for a connected vehicle environment. This is not intended to be an exhaustive overview of the USDOT Connected Vehicle program, rather it is an overview of the current work being done.		www.pcb.its.dot.gov/eprimer/module13.aspx		No Cost	Web Based
ITS PCB - ITS Professional Capacity Building Program	**Module 4: Traffic Operations**	Basic		This module builds on the information provided in Module 3, "Application of ITS to Transportation Management Systems." Module 4 focuses specifically on the application of intelligent transportation systems (ITS) in traffic operations and how transportation facility owners, operators, and stakeholders use ITS technologies described in the previous module to manage and operate transportation systems.		www.pcb.its.dot.gov/eprimer/module4.aspx		No Cost	Web Based
ITS PCB - ITS Professional Capacity Building Program	**Module 5: Personal Transportation**	Basic		Personal transportation is concerned with the trips individuals make across all travel modes and the purpose of the trips. Intelligent transportation systems (ITS) technologies offer an array of applications and enhancements for personal transportation, from real-time information to safety systems and driver conveniences.		www.pcb.its.dot.gov/eprimer/module5.aspx		No Cost	Web Based
ITS PCB - ITS Professional Capacity Building Program	**National Connected Vehicle Field Infrastructure Footprint Analysis**	Basic	1.5 hours	The purpose of this analysis is to describe the fully deployed CV field infrastructure footprint, to identify the activities and project timelines needed to deploy that footprint, and to estimate costs associated with the deployment. These elements build upon the prior Applications Analysis, the Deployment Concepts, and the Deployment Scenarios developed as part of the Connected Vehicle Infrastructure Footprint Analysis.	1.5 PDH	www.pcb.its.dot.gov/t3/s140522_cv_footprint_analysis.asp	Highway managers, including local, State, and Federal, and others interested in the development, deployment, or use of vehicle-to-infrastructure (V2I) applications Suppliers of roadside equipment used in V2I communications State ITS coordinators Industry representatives (CVO, rail, telecom, transit, environment, weather, aftermarket devices, OEMs, security, privacy) Consultants/contrac	No Cost	Archived Webinar

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
ITS PCB - ITS Professional Capacity Building Program	**Network-Wide Impacts of Connected Vehicles on Mobility: An Agent-Based Modeling Approach**	Basic	1 hour	This webinar will feature two student presentations from Oregon State University. Alireza Mostafizi and Shangjia Dong are both working with Dr. Haizhong Wang within the School of Civil and Construction Engineering. Both students will be presenting from their current research in connected vehicle technology. Connected vehicle (CV) is an emerging and promising technology aiming to reduce highway fatalities, travel delay, and vehicle emissions. The CV system architecture is envisioned to comprise specially designed wireless communications devices specifically for use in the vehicular environment. These communications radios will become embedded in vehicles, infrastructure, and personal mobile devices to allow for a vast, interconnected, and data-rich network.	1.0 PDH	https://www.pcb.its.dot.gov/t3/s170426/s170426_CV_Technology_Improving_Transit_Operations_presentation_Lee2.ppt	The target audience of this webinar will include researchers and transportation planners who are interested in traffic flow modeling and the mobility impacts of connected vehicle technology in the transition phase.	No Cost	Archived Webinar
ITS PCB - ITS Professional Capacity Building Program	**Performance Measures and Benefit-Cost Analysis for Weather Responsive Traffic Management**	Basic	1.5 hours	This webinar will present current experiences in measuring and assessing the performance of traffic management strategies during adverse weather. It will highlight experiences from two State DOTs that are seeking to develop innovative performance measurement programs. A presentation on a benefit-cost approach of weather responsive traffic management will conclude the webinar.	1.5 PDH	www.pcb.its.dot.gov/t3/s140708_its_weather_responsive.asp	The target audience for this webinar includes State and city Department of Transportation staff who are involved in economic analysis, planning, traffic management, operations and maintenance of the transportation system, and others interested in these topics.	No Cost	Archived Webinar
ITS PCB - ITS Professional Capacity Building Program	**Module 1: Introduction to ITS**	Basic		ITS applies a variety of technologies to monitor, evaluate, operate, and manage transportation systems to enhance efficiency, reliability, and safety.		www.pcb.its.dot.gov/eprimer/module1.aspx		No Cost	Web Based
ITS PCB - ITS Professional Capacity Building Program	**Module 14: ITS Emerging Opportunities and Challenges**	Basic		Intelligent transportation systems (ITS), like other technology fields, is changing and evolving at an unprecedented pace, opening new fields and applications in transportation even as they challenge current assumptions and practices. Indeed, more than previous generations of ITS, this one is driven by data—lots and lots of it. And all that data is collected, mined, processed, analyzed, stored, and disseminated, which presents both opportunities and challenges to the field of transportation engineering. The purpose of this webinar is to gain an understanding of how ITS has evolved in the past 25 years, the significant changes in the roles played by the public and private sectors, the key technological and societal trends are responsible for those changes and a glimpse into the future of ITS.		www.pcb.its.dot.gov/eprimer/module14.aspx		No Cost	Web Based
ITS PCB - ITS Professional Capacity Building Program	**Module 3: Application of ITS to Transportation Management Systems**	Basic		The purpose of this module is (a) to review the application of intelligent transportation systems (ITS) in the management of transportation facilities during recurrent and nonrecurrent conditions, (b) to identify the benefits of those applications, and (c) to highlight associated challenges and lessons learned. Transportation management systems (TMS) have a lot in common with transportation system management and operations (TSM&O), which is discussed in Module 4, "Traffic Operations."		www.pcb.its.dot.gov/eprimer/module3.aspx		No Cost	Web Based

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ITS PCB - ITS Professional Capacity Building Program	**Module 9: Supporting ITS Technologies**	Basic		Data collection, weather and traffic monitoring, communication, information dissemination, and in-vehicle systems are all essential components of intelligent transportation systems (ITS). The technology behind these components is a primary driver of effective ITS. Advances in technology and integration provide significant opportunities for system enhancement, so it is important to have an understanding of these technologies when considering an ITS deployment. This module provides an overview of various support technologies and considers opportunities for deployment and integration.		www.pcb.its.dot.gov/eprimer/module9.aspx		No Cost	Web Based
ITS PCB - ITS Professional Capacity Building Program	**Module 2: Systems Engineering**	Basic		The purpose of this module is to provide an overview of the systems engineering process (SEP) that is central to the development of intelligent transportation systems (ITS) projects. The SEP is an interdisciplinary, structured process that meets the needs of the users, providers, and other stakeholders while maintaining the project schedule and budget. This module also provides an overview of related topics, including the National ITS Architecture and other architectures, the ITS Standards Program, and the use of the SEP for planning and deploying ITS projects.		www.pcb.its.dot.gov/eprimer/module2.aspx		no Cost	Web Based
ITS PCB - ITS Professional Capacity Building Program	**Module 7: Public Transportation**	Basic		Intelligent transportation systems (ITS) offer a broad range of technologies to improve operational efficiency, customer service and convenience, safety and security, and overall management in public transportation. Further, ITS provides opportunities to more easily analyze critical performance data as well as facilitate coordination and cooperation among multiple transit providers in a region, and enhance multimodal transportation. Finally, public transit ITS supports the transit Connected Vehicle Program bundle (Integrated Dynamic Transit Operations) by providing the related applications, specifically T-DISP (dynamic transit operations) and T-CONNECT (connection protection). Thus, the purpose of this module is to describe public transportation technologies; their application to and impact on transit operations, customer service and management; and their abilities to facilitate and encourage multimodal travel.		www.pcb.its.dot.gov/eprimer/module7.aspx		No Cost	Web Based
ITS PCB - ITS Professional Capacity Building Program	**Next Generation Traveler Information System**	Basic	1.5 hours	The purpose of the webinar is to present a recently completed project called "Next Generation Traveler Information System: A Five Year Outlook." The webinar will identify current and emerging technologies in traveler information systems for the next five years. It will also provide recommendations to transportation agencies for proactively addressing technology advancements, changes in traveler information business models and decisions, and public expectations as they occur, as well as provide recommendations for further research.	1.5 PDH	www.pcb.its.dot.gov/t3/s150923_nextgen_traveler_info_service.asp	Transit operations and customer information managers, developers of transit applications, consultants, vendors, academia, government officials, including those in local, state, and Federal Departments of Transportation (DOTs), and any other individuals or entities involved in the design, procurement, deployment, integration, management, or evaluation of ITS and traveler information technologies	No Cost	Archived Webinar

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ITS PCB - ITS Professional Capacity Building Program	**Module 12: Institutional Issues**	Basic		Agencies often overlook the institutional issues they may encounter in deploying and maintaining intelligent transportation systems (ITS) technologies, yet these issues can be as complex and challenging as the technological challenges. Agencies frequently encounter political and organizational challenges with funding, system ownership, and legal requirements, among others. Institutional arrangements need to be implemented during the planning stages of an ITS project to ensure success. This module looks at the various kinds of institutional issues that can arise, and provides guidance on addressing them		www.pcb.its.dot.gov/eprimer/module12.aspx		No Cost	Web Based
ITS PCB - ITS Professional Capacity Building Program	**Module 8: Electronic Tolling and Pricing**	Basic		This module has been designed to provide awareness and understanding of ETC, transportation payment systems applications, and pricing strategies. It also provides information on the benefits that can be delivered to customers as a result of the application of payment systems.		www.pcb.its.dot.gov/eprimer/module8.aspx#revgen		No Cost	Web Based
ITS PCB - ITS Professional Capacity Building Program	**ITS Standards Training Module: Vehicle-to-Vehicle (V2V) ITS Standards for Project Managers**	Introductory	1.32 hours	This module provides an introduction to the connected vehicle environment, a description of the vehicle-to-vehicle (V2V) environment, and its potential benefits to the operators of surface transportation systems. The module presents several V2V safety, mobility and environmental applications, and discusses how these applications impact surface transportation operations. It also reviews the types of information that may be exchanged between the connected devices that make up the V2V environment.		www.pcb.its.dot.gov/StandardsTraining/Modules.aspx?ModuleID=67	Private and Public Sector Users including Manufacturers Procurement Managers/Decision Makers Public Sector Project Managers		Webinar
ITS PCB - ITS Professional Capacity Building Program, Advancing ITS Education	**Adapting to Climate Change Using Intelligent Transportation Systems**	Basic	1.5 hours	Climate change has and will result in the increased frequency and severity of disrupting weather events. These events require a proactive response across the traffic, maintenance, and emergency management communities. New sensor technology and applications are being developed to help identify vulnerable regions and transportation routes that are subject to flooding, fog, smoke from wildfires or other harmful pollutants, high winds, ice, damaged pavement, and bridge weight restrictions. This approach will not only require new sensing capability from the field, but also a means of identifying alternate routes and/or alternate transportation modes. The following speakers will touch on all of these components in order to illustrate new approaches to building transportation resiliency and adapting to climate change.	1.5 PDH	https://www.pcb.its.dot.gov/t3/s160510/s160510_Adapting_to_Climate_Change_presentation_Barth.pdf	Anyone interested in climate change, Intelligent Transportation Systems, Transportation System Management and Operations (TSM&O); Bridge Engineers, City Planners, Emergency and Public Safety Managers, and academic and research staff.	No Cost	Web Based
ITS PCB - ITS Professional Capacity Building Program, Advancing ITS Education	**Connected Autonomous Vehicles on a Mixed Traffic Highway—Speed Harmonization, Capacity Analysis, and Lane Management**	Basic	1 hour	Connected autonomous vehicles (CAV) technologies will be in the market in the near future. This requires that transportation systems are ready to operate in a mixed traffic environment where a portion of vehicles are CAVs and the remaining are human-driven vehicles. This presentation includes two topics. First, a CAV-based microscopic trajectory-smoothing concept is proposed to harmonize traffic and improve mobility and environmental impacts. The proposed algorithm can be used to prevent or mitigate traffic speed drops near highway bottlenecks. The second topic investigates how different features of CAVs and corresponding lane management policies can improve throughput capacity of mixed traffic from a macroscopic perspective. An analytical model is proposed to quantify mixed traffic highway capacity. The proposed capacity analysis is then extended to a managed lane model to determine the optimal number of lanes to be allocated to CAVs. Financially, numerical examples are presented to investigate three different CAV technology scenarios: neutral, conservative, and aggressive CAV headway settings.	1.0 PDH	https://www.pcb.its.dot.gov/t3/s170208/s170208_Connected_Autonomous_Vehicles_on_Mixed_Traffic_Highway_presentation_Li.ppt	The target audiences includes transportation practitioners, transportation researchers, and college and graduate students.	No Cost	Web Based

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
ITS PCB - ITS Professional Capacity Building Program, Advancing ITS Education	**Solar-powered Automated Transit Networks: The Future of Sustainable Urban Transportation**	Basic	1 hour	The webinar will present the concept of solar-powered automated transit networks (ATNs). It will discuss why solar-powered ATNs makes sense as the preferable alternative mode of transit for dense, urban areas; what unique advantages they have; and how they can integrate into existing urban environments. Also to be discussed are: the challenges facing implementation; how universities and students can make a difference in their development and implementation; and what actions interested viewers can take to make them a reality.	1.0 PDH	https://www.pcb.its.dot.gov/t3/s161117/s161117_Solar_Powered_Automated_Transit_Networks_presentation_Furman.pdf	Urban planners Transit planners Transit policy planners Transportation planners Architects Land developers City staff City government leaders Engineers Business and land developers Students	No Cost	Web Based
ITS PCB - ITS Professional Capacity Building Program, Advancing ITS Education	**The Role of Connected & Automated Vehicles: How Can Urban Areas Use the Data They Create?**	Basic	1 hour	With increasing attention focused on connected and automated vehicles, this webinar will present the opportunities and challenges for their development and deployment. How can connected and automated vehicles transform various processes in the transportation system, especially through the data they generate? Will they have a profound impact on mobility, safety, and the environment? We will present a framework for analysis and demonstrate the use of modeling and simulation techniques. We will discuss work undertaken in a National Science Foundation and U.S. DOT-sponsored project on how higher driving volatility in a connected vehicles environment—such as hard accelerations or hard braking—relates to mobility, safety, and the environment. The implications of our analysis for travel behavior changes, future vehicle use, and transportation system performance will be discussed.	1.0 PDH	https://www.pcb.its.dot.gov/t3/s171011_Role_of_Connected_and_Automated_Vehicles.aspx	The target audience includes transportation practitioners and researchers, and undergraduate and graduate transportation engineering students.	No Cost	Web Based
ITS PCB - ITS Professional Capacity Building Program, Advancing ITS Education	**Traffic Incident Management-Part 2**	Basic	1.5 hours	Traffic Incident Management (TIM) consists of a planned and coordinated multidisciplinary approach to detect, respond to, and clear traffic incidents so that traffic flow may be restored as safely and quickly as possible. Effective TIM strategies reduce the duration and impacts of traffic incidents and improve the safety of motorists, crash victims, and emergency responders.	1.5 PDH	https://www.pcb.its.dot.gov/t3/s171214/s171214_Traffic_Incident_Management_Part2_presentation_Cyr.aspx	ITS and TIM Program Managers, police, fire, consultants, vendors, academia, and government officials—including local, State, Federal, DOT, and any other individuals or entities involved in the design, deployment, operation, and evaluation of TIM Programs, and the collection of TIM Performance Measures.	No Cost	Web Based

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
ITS PCB - ITS Professional Capacity Building Program, Advancing ITS Education	**Connected Vehicles and Rural Road Weather Management**	Basic	1 hour	In response to the need for a more reliable system, connected vehicle (CV) technology introduced the concept of using vehicles to communicate current roadway conditions. This presentation will introduce new advances in the field of rural road weather management and provide insight into the research conducted at the University of Wyoming to implement a Connected Vehicle Road Weather Condition System.	1.0 PDH	https://www.pcb.its.dot.gov/t3/s160728/s160728_Connected_Vehicles_and_Rural_Road_Weather_Management_presentation_Hammit.asp	The target audience includes academia and industry. Transportation planners, researchers, MPOs, and others who have an interest in how connected vehicle technology is being used to communicate weather-related roadway conditions will find interest in this webinar.	NO Cost	Web Based
ITS PCB - ITS Professional Capacity Building Program, Advancing ITS Education	**Connected Vehicle (CV) Technology for Improving Transit Operations**	Basic	1 hour	This webinar provides three presentations from the two research projects related to transit operation: Transit Signal Priority based on Connected Vehicle Technology (TSPCV): Jia Hu TSPCV Experiment at the Virginia Tech Smart Road: Seyedehsan Dadvar Perception and Acceptability Analysis on User Location-Based Transit Mobile Application: Young-Jae Lee and Seyedehsan Dadvar	1.0 PDH	https://www.pcb.its.dot.gov/t3/s170426/s170426_CV_Technology_Improving_Transit_Operations_presentation_Lee1.pdf	The target audience includes university faculty and students, transit agencies, and State and Federal Departments of Transportation (DOTs).	No Cost	Web Based
ITS Standards Training	**Module 10: Electronic Fare Payment Systems**	Basic	1.31 hours	This module provides a comprehensive overview of the standards, technologies, and techniques associated with traditional as well as leading edge electronic fare payment systems and their associated benefits, risks, and issues in order to enable participants to understand and select the solutions that best meet the needs of a specific agency.		www.pcb.its.dot.gov/StandardsTraining/Modules.aspx?Year1Transit=1&ModuleID=56#mod65	Transit ITS Contractors and Consultants Transit ITS Staff Transit Management Staff Transit Planning, Operations, and Maintenance Staff Transit Procurement Staff Transit Technology Vendors	No Cost	Web Based

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
ITS Standards Training	**Module 12: Electronic Fare Payment/Advanced Payment Systems: Open Payments Acceptance**	Basic	1.36 hours	The purpose of Module 12 is to provide an in-depth review of the key stakeholders within the bankcard industry as well as the standards and specifications, technologies, regulations and techniques associated with the procurement and implementation of Open Payments acceptance capability. Contents of the module will identify and explore the challenges, risks, and benefits associated with Open Payments acceptance in order to enable participants to understand this approach and to evaluate its use as part of an EFP solution.		www.pcb.its.dot.gov/StandardsTraining/Modules.aspx?Year1Transit=1&ModuleID=56#mod67	Metropolitan Planning Organizations (MPO) Staff Project Managers Traffic Management Center and Operations Managers Transit Budgeting and Accounting Staff Transit Finance and Revenue Management Staff Transit Grants Staff Transit IT Staff Transit ITS Contractors and Consultants Transit ITS Staff Transit Management Staff Transit Planning, Operations, and Maintenance Staff	No Cost	Web Based
ITS Standards Training	**Module 14 - Part 1: Applying General Transit Feed Specifications (GTFS) to Your Agency - Part 1 of 2**	Basic	1.43 hours	Module 14 Part 1 covers static GTFS data such as schedule, bus stops, station and terminus information, and general fare policy data commonly utilized by transit agencies. This module provides an overview of GTFS and training about the structure and content of GTFS. Transit agency staff and their consultants will learn about how they can begin deploying the GTFS specification. The module will discuss the data content, data management, tools to implement the specification, and several case studies of agencies that generate and use the data specification. Additionally, the module will discuss how GTFS feeds can be used by third party developers, planners, and other users.		www.pcb.its.dot.gov/StandardsTraining/Modules.aspx?Year1Transit=1&ModuleID=56#mod69	Consultants Developers Metropolitan Planning Organizations (MPO) Staff Transit IT Staff Transit ITS Staff Transit Management Staff Transit Oversight Staff Transit Planning, Operations, and Maintenance Staff	No Cost	Web Based
ITS Standards Training	**Module 14 - Part 2: Applying General Transit Feed Specifications (GTFS) to Your Agency - Part 2 of 2**	Basic	1.36 hours	The purpose of this second module on GTFS (Part 2 of 2) is to focus specifically on GTFS-real-time. As an extension of GTFS, the General Transit Feed Specification Real Time (GTFS-real-time) is a data feed specification that allows public transportation agencies to provide real-time updates about their fleet. The GTFS specification is an open data format for public transportation schedules and associated geographic information. GTFS-real-time was designed around ease of implementation, good interoperability, and a focus on passenger information. This module aims to assist transit agencies in applying the open and accessible GTFS-real-time specification.		www.pcb.its.dot.gov/StandardsTraining/Modules.aspx?Year1Transit=1&ModuleID=56#mod70	Consultants Developers Metropolitan Planning Organizations (MPO) Staff Transit IT Staff Transit ITS Staff Transit Management Staff Transit Oversight Staff Transit Planning, Operations, and Maintenance Staff	No Cost	Web Based

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
ITS Standards Training	**Module 15: Emerging Evacuation Standards of Communication/Incident Management (ISO 19083)**	Basic	1.33 hours	The purpose of Module 15 is to introduce the Emerging Evacuation Standard of Communication/Incident Management ISO 19083 standard-based framework, used to identify participating organization roles and responsibilities, establish criteria for use of public transport, and support the development of an Emergency Evacuation and Disaster Response and Recovery (EEDRR) Decision Support System (DSS). The DSS will be used to assist, coordinate, and direct all transportation services including those used by emergency management, traffic management, and public transport. This module also identifies guidelines to improve coordination among regional authorities when public transport disaster support is required		www.pcb.its.dot.gov/StandardsTraining/Modules.aspx?Year1Transit=1&ModuleID=56#mod71	Emergency Management and Public Safety Staff First Responders Transit Executives Transit Managers Transit Planning, Operations, and Maintenance Staff	No Cost	Web Based
ITS Standards Training	**Module 17: Accessible Transportation Technologies Research Initiative (ATTRI)**	Basic	1.13 hours	The purpose of Module 17 is to provide the background and scope of the ATTRI and specific activities. This module will discuss the five technology focus areas of the initiative and the four applications selected for prototype development. Discussion will include the ITS standards relevant to the application areas.		www.pcb.its.dot.gov/StandardsTraining/Modules.aspx?Year1Transit=1&ModuleID=56#mod73	Asset Management Staff Human Service Transportation Planners/Coordinators Metropolitan Planning Organizations (MPO) Staff Mobility Coordinators/Managers Transit IT Staff Transit ITS Staff Transit Management Staff Transit Planning, Operations, and Maintenance Staff Transit Procurement Staff	No Cost	Web Based
ITS Standards Training	**Module 18: Transit and the Connected/Automated Vehicle Environment/Emerging Technologies, Applications, and Future Platforms**	Basic	1.53 hours	Module 18 will provide transit agencies and other interested participants with an overview of developments in vehicle automation that complement vehicle connectivity for both bus and rail transit. This module will define relationships between connectivity and autonomy for transit vehicle operation. It will present examples of the state-of-the art transit vehicle automation applications including autonomous lane keeping and collision avoidance warning systems. This module also will describe how connectivity and automation are being deployed in rail transit, primarily in terms of train control systems for safety and capacity.		www.pcb.its.dot.gov/StandardsTraining/Modules.aspx?Year1Transit=1&ModuleID=56#mod74	Private and Public Sector Users including Manufacturers Transit Management Staff Transit Managers Transit Planning, Operations, and Maintenance Staff Transit Service Planners	No Cost	Web Based
ITS Standards Training	**Module 19: On-Board Transit Management Systems**	Basic	1.37 hours	The purpose of Module 19 is to provide details of on-board hardware and software standards. The information provided in this module will help participants further understand those standards that support On-board Transit Management functions for buses, specifically SAE J1587, J1708, and J1939 profiles, and how to procure systems using these standards. Topics covered in this module include single point logon/logoff, data upload/download from an on-board device, and the use of an interface control document (ICD).		www.pcb.its.dot.gov/StandardsTraining/Modules.aspx?Year1Transit=1&ModuleID=56#mod75	Consultants Specification Writers System Developers Transit IT Staff Transit Planning, Operations, and Maintenance Staff Transit Technology Vendors	No Cost	Web Based

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
ITS Standards Training	**Module 2: Transit Management Standards - Part 1 of 2**	Basic	2 hours	This module (Transit Management Standards, Part 1 of 2) is the first of the two course modules on transit management using standards. This module provides the background for understanding transit management functions and the standards that facilitate the implementation of systems and technologies that support those transit management functions by: Briefly explaining the transit management functions and systems within the context of National ITS Architecture; Describing the basic taxonomy that will help define where standards should be considered within the functions; Discussing the functions of transit management systems to conceptualize technology implementation at an agency so that participants understand where the standards can be used; and Introducing systems engineering process (SE) and its use in planning, procuring and deploying transit management systems.		www.pcb.its.dot.gov/StandardsTraining/Modules.aspx?Year1Transit=1&ModuleID=56#mod57	Transit and Traffic Systems Acquisitions Staff Transit ITS Contractors and Consultants Transit Management Staff Transit Procurement Staff Transit Technology Vendors	No Cost	Web Based
ITS Standards Training	**Module 20: Application of Arterial Management/Transit Signal Priority Standards**	Basic	1.18 hours	Module 20 provides additional details on the standards that support signal control priority and how to use those standards to develop, specify, and test a TSP implementation. In addition, this module will present several case studies on how different agencies implemented their TSP projects. These case studies discuss some of the constraints that those implementations faced, the architecture that was selected to implement TSP, how the appropriate standards were used in those implementations, and how testing was performed. This module will provide a use case on how transit signal priority was implemented in a connected vehicle environment		www.pcb.its.dot.gov/StandardsTraining/Modules.aspx?Year1Transit=1&ModuleID=56#mod76	Integrated Corridor Management Project and Operations Team Specification Writers Traffic Procurement Staff Transit ITS Contractors and Consultants Transit Planning, Operations, and Maintenance Staff Transit Procurement Staff	No Cost	Web Based
ITS Standards Training	**Module 4: Transit Communications Interface Profiles (TCIP: - Part 2 of 2: Structure and Elements of TCIP—Accessing TCIP via TIRCE and TCIP Tools**	Basic	1.43 hours	This course is the second of a two-module set on TCIP. It will introduce transit agency staff and vendors to the suite of tools needed to access and efficiently use the TCIP standard to create data exchange interfaces among various transit business systems. The tools are available as free downloads from the American Public Transportation Association (APTA). Information in this module will allow transit agency staff and vendors to apply a standards-based framework for procurement and deployment of ITS systems to better manage transit agency operations and assets, and to better serve customers.		www.pcb.its.dot.gov/StandardsTraining/Modules.aspx?Year1Transit=1&ModuleID=56#mod59	Transit IT Staff Transit ITS Contractors and Consultants Transit ITS Staff Transit Procurement Staff Transit Technology Vendors	No Cost	Web Based
ITS Standards Training	**Module 5: Transit Management Standards - Part 2 of 2**	Basic	1.46 hours	This module (Transit Management Standards, Part 2 of 2) is the second of the two course modules on Transit Management Standards. It introduces hardware and software standards in addition to TCIP, and how to use them. The information in this module will help participants identify which standards are most applicable to a particular situation so that an agency can reduce the life cycle cost of technologies that support Transit Management functions and facilitate the integration with legacy or future technology systems. The structure and use of data exchange standards for Transit Management systems are described along with how to apply standards to the development of procurement specifications. Case studies are incorporated to enhance participants' understanding of how to use the standards.		www.pcb.its.dot.gov/StandardsTraining/Modules.aspx?Year1Transit=1&ModuleID=56#mod60	Transit Electronic Maintenance Staff Transit IT Staff Transit ITS Contractors and Consultants Transit ITS Staff Transit Planning, Operations, and Maintenance Staff Transit Technology Vendors	No Cost	Web Based

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
ITS Standards Training	**Module 6: Traveler Information - Part 1 of 2**	Basic	1.42 hours	This module (Traveler Information Standards, Part 1 of 2) is the first of two course modules on Traveler Information using standards. This module provides the background for understanding Traveler Information systems and the standards that facilitate the implementation of these systems by: Briefly explaining Traveler Information systems within the context of National ITS Architecture; Describing the basic taxonomy that will help define where standards should be considered within the functions; and Discussing the functions of Traveler Information systems to conceptualize technology implementation at an agency so that participants understand where the standards can be used.		www.pcb.its.dot.gov/StandardsTraining/Modules.aspx?Year1Transit=1&ModuleID=56#mod61	Traffic Management Center and Operations Staff Transit IT Staff Transit ITS Contractors and Consultants Transit Management Staff Transit Technology Vendors	No Cost	Web Based
ITS Standards Training	**Module 7: Traveler Information - Part 2 of 2**	Basic	1.54 hours	Using the background knowledge provided in Module 6 (Traveler Information, Part 1 of 2), this module begins the process of applying the standards that facilitate the implementation of Traveler Information technologies. It will provide participants with the knowledge needed to identify and select the most appropriate standard for their particular situation, to use software and hardware standards introduced in the previous module, and to incorporate standards into procurements. The structure and use of data exchange standards for Traveler Information systems are described along with how to apply standards to the development of procurement specifications. Case studies are incorporated to enhance participants' understanding of how to use the standards.		www.pcb.its.dot.gov/StandardsTraining/Modules.aspx?Year1Transit=1&ModuleID=56#mod62	Transit IT Staff Transit Managers Transit Planning, Operations, and Maintenance Staff Transit Procurement Staff Transportation Operations Managers	No Cost	Web Based
ITS Standards Training	**Module 8: Arterial Management and Transit Signal Priority: Understanding User Needs for Signal Control Priority (SCP) Based on NTCIP 1211 Standard - Part 1 of 2**	Basic	1.16 hours	This module will introduce participants to the benefits of an SCP system, describe the components that may make up an SCP system, and provide an overview of how to identify and use applicable ITS standards to procure and operate an SCP system. This module also helps participants understand the scope of applicable ITS standards and assists in identifying the user needs of an SCP system. Although the discussion in the module will be for an SCP system in general, the focus will be on transit signal priority (TSP), which is a subset of SCP.		www.pcb.its.dot.gov/StandardsTraining/Modules.aspx?Year1Transit=1&ModuleID=56#mod63	Traffic Management Center and Operations Staff Transit and Traffic Systems Acquisitions Staff Transit Electronic Maintenance Staff Transit ITS Contractors and Consultants Transit Managers Transit Planning, Operations, and Maintenance Staff Transit Technology Vendors	No Cost	Web Based

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
ITS Standards Training	**Module 9: Arterial Management and Transit Signal Priority: Specifying Requirements for Signal Control Priority (SCP) Based on NTCIP 1211 Standard - Part 2 of 2**	Basic	1.23 hours	This module is the second of a two-modules set in arterial management. The first module provides the background for understanding the standards that facilitate arterial management by describing how an SCP system works, introducing the capabilities offered by an SCP system, and identifying the role of standards in an SCP system. This module builds on the content of Module 8 and provides participants with detailed information on how to identify and use applicable ITS standards to procure and operate a signal control priority system following a Systems Engineering process.		www.pcb.its.dot.gov/StandardsTraining/Modules.aspx?Year1Transit=1&ModuleID=56#mod64	Integrated Corridor Management Project and Operations Team Specification Writers Traffic Management Center and Operations Staff Transit Electronic Maintenance Staff Transit ITS Contractors and Consultants Transit Planning, Operations, and Maintenance Staff Transit Procurement Staff Transit Technology Vendors	No Cost	Web Based
ITS Standards Training	**Module 1: Introduction to ITS Transit Standards**	Introductory	1.13 hours	This introductory module provides an overview of Intelligent Transportation Systems (ITS) transit standards for practicing transit professionals and decision-makers who are engaged in the deployment of ITS for transit. This course will highlight the program and organizational benefits, costs of the adaptation, and use of ITS Standards to support the deployment of interoperable systems. This module will also summarize and provide the context for the more detailed subsequent modules of transit standards training, and provide the audience with a useful roadmap of other standards modules they might want to view.		www.pcb.its.dot.gov/StandardsTraining/Modules.aspx?Year1Transit=1&ModuleID=56#mod56	Transit ITS Contractors and Consultants Transit ITS Staff Transit Management Staff Transit Planning, Operations, and Maintenance Staff Vehicle Manufacturers	No Cost	Web Based
ITS Standards Training	**Module 11: Transit and the Connected Vehicle Environment/Emerging Technologies, Applications, and Future Platforms**	Introductory	1.36 hours	This module will provide participants with an introduction to the Transit Connected Vehicle environment, an understanding of its potential benefits to transit operators and users, and explain how to start preparing for the connected vehicle environment. The module will outline some of the data that may be exchanged between connected devices and the standards that support those exchanges, and illustrate how that information may be used to create a safe, stable, interoperable, and reliable transit system.		www.pcb.its.dot.gov/StandardsTraining/Modules.aspx?Year1Transit=1&ModuleID=56#mod66	Metropolitan Planning Organizations (MPO) Staff Private and Public Sector Users including Manufacturers Transit Management Staff Transit Managers Transit Planning, Operations, and Maintenance Staff	No Cost	Web Based

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
ITS Standards Training	**Module 13: An Introduction to Integrated Corridor Management (ICM)**	Introductory	1.46 hours	Module 13 provides an introduction to ICM that includes highlighting pertinent transit and other standards deployed through the use of ICM case studies. There are four basic concepts within ICM that will be briefly described in this module: (1) Corridor modes of operation; (2) Strategic areas for ICM; (3) Conceptual levels within the corridor; and (4) ICM environment.		www.pcb.its.dot.gov/StandardsTraining/Modules.aspx?Year1Transit=1&ModuleID=56#mod68	Consultants Metropolitan Planning Organizations (MPO) Staff Specification Developers Transit IT Staff Transit Management Staff Transit Service Planners Transit Technology Vendors Transportation Management Center (TMC) Staff	No Cost	Web Based
ITS Standards Training	**Module 16: Introduction to Transit Enterprise Architecture and Its Benefits for Transit**	Introductory	1.59 hours	The purpose of Module 16 is to provide an introduction to Enterprise Architecture (EA) for transit managers and staff. It describes the four layers commonly seen in transit enterprise architectures: Business Architecture Data or Information Architecture Applications Architecture Technology Architecture		www.pcb.its.dot.gov/StandardsTraining/Modules.aspx?Year1Transit=1&ModuleID=56#mod72	Asset Management Staff Metropolitan Planning Organizations (MPO) Staff Process Improvement Staff Project Managers Transit Budgeting and Accounting Staff Transit Enterprise Architects Transit IT Staff Transit ITS Staff Transit Management Staff Transit Managers Transit Planning, Operations, and Maintenance Staff Transit System Designers	No Cost	Web Based
ITS Standards Training	**Module 3: Transit Communications Interface Profiles (TCIP: - Part 1 of 2: Introduction to the Standard and Transit Architectures**	Introductory	1.24 hours	This course (TCIP 1) is the first of a two-module set on TCIP. This course will provide an introduction and overview of TCIP, concentrating on the contents of Volume 1 of the standard. The module describes the components of the standard, including the development of a transit agency architecture as a framework for procuring and implementing ITS systems, introduces the concepts of operations that illustrate how various business systems can be configured to exchange information, and describes the structural building blocks, data elements, data frames, messages, and dialogs that are used to standardize the exchange of information.		www.pcb.its.dot.gov/StandardsTraining/Modules.aspx?Year1Transit=1&ModuleID=56#mod58	Traffic Management Center and Operations Staff Transit IT Staff Transit ITS Contractors and Consultants Transit ITS Staff Transit Managers Transit Procurement Staff Transit Technology Vendors	No Cost	Web Based

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
Metro Florida Safety Council	**Advanced Level Maintenance of Traffic**	Advanced		Metro Florida Safety Council is an approved Florida Department of Transportation (FDOT) Maintenance of Traffic (MOT) Advanced Course provider # 140.	Renewed Certification (4 year qualification to perform work zone traffic control planning, design, implementation, inspection and/or supervising the selection, placement, or maintenance of traffic control schemes or devices in work zones.)	www.metrofloridasafetycouncil.com/advanced.htm	As required by FDOT this training course is required for personnel with responsibility or authority to decide on the specific Maintenance of Traffic requirements to be implemented.	$ 420.00	Classroom
Metro Florida Safety Council	**Advanced Refresher Maintenance of Traffic**	Advanced		This class is intended to cover the changed material only and not the original FULL class material. Attendees should have a working knowledge of the AMOT material covered in the original course they are refreshing.	Renewed Certification	www.metrofloridasafetycouncil.com/advanced-refresher.htm	Direct responsibility for placement of work zone traffic control devices Direct responsibility for field maintenance of work zone traffic control devices	$ 215.00	Classroom
Metro Florida Safety Council	**Flagger Training Maintenance of Traffic**	Basic		The primary objectives of the program are to train Flaggers to provide safe passage of traffic through and around work areas and to minimize confusion by bringing standard flagging procedures to our nation's highways. Controlling traffic through work areas is one of the most important — and dangerous — operations in construction maintenance.	Certificate of Completion	www.metrofloridasafetycouncil.com/flagger.htm	Novice construction work zone Flaggers in both one and two-person flagging operations	$ 99.00	Classroom
Metro Florida Safety Council	**OSHA 10 - Hour Roadway Construction Program**	Basic		The National Safety Council and the American Road & Transportation Builders Association (ARTBA) have teamed up to develop and distribute a new program, OSHA 10-Hour Training exclusively for the Roadway Construction Industry (OSHA-Roadway). This first-of-its-kind program focuses directly on the day-to-day hazards faced by roadway construction workers. Get a practical approach to recognizing and controlling OSHA-identified roadway construction hazards. We can train and certify your crew at your location or at one of our training centers.	OSHA Certificate of Completion	www.metrofloridasafetycouncil.com/training.htm	Employees from the transportation construction industry including: safety and health managers, site managers or supervisors should attend this course.	$ 199.00	Classroom

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MIT	**MODELING AND SIMULATION OF TRANSPORTATION NETWORKS**	Basic		Modeling and simulation methods are essential elements in the design and operation of transportation systems. Congestion problems in cities worldwide have prompted, at all levels of government and industry, a proliferation of interest in Intelligent Transportation Systems (ITS) that include advanced supply and demand management techniques. Such techniques include real-time traffic control measures and real-time traveler information and guidance systems whose purpose is to assist travelers in making departure time, mode, and route choice decisions. Transportation researchers have developed models and simulators for use in the planning, design, and operations of such systems. This course draws heavily on the results of recent research and is sponsored by the Intelligent Transportation Systems Laboratory of the Massachusetts Institute of Technology.	2.8 CEUs	professional.mit.edu/programs/short-programs/modeling-simulation-transportation-networks	This program is intended for individuals interested in theory, research, and practice and includes analysts, engineers, managers, and planners, as well as industry, government, and academics who seek to understand, analyze, and predict performance of transportation systems. Participants with backgrounds in diverse areas such as traffic engineering, systems engineering, transportation	$3,600 Scholarships are available for graduate students and faculty;	Classroom
National Academy of Sciences, Engineering and Medicine	**Spatial Modeling for Highway Performance Monitoring System Data: Part 1**	Basic	2 hours	TRB will conduct a webinar that will discuss how to incorporate spatial modeling and statistical tools to enhance the quality and productivity of travel monitoring data. Presenters will focus on the Highway Performance Monitoring System (HPMS), which is a compilation of roadway characteristics, including inventory, traffic, and performance data. They will describe a case study from the Hawaii Department of Transportation, which incorporated spatial modeling tools to fulfill a federal HPMS mandate.	2.0 PDH	webinar.mytrb.org/Webinars/Details/1148		$ 95.00	Webinar
National Academy of Sciences, Engineering and Medicine	**Spatial Modeling for Highway Performance Monitoring System Data: Part 2**	Basic	2 hours	Presenters will focus on the Highway Performance Monitoring System (HPMS), which is a compilation of roadway characteristics, including inventory, traffic, and performance data. They will describe how to visualize the spatial data and provide tips about generating HPMS data	2.0 PDH	webinar.mytrb.org/Webinars/Details/1152		$ 95.00	Webinar
National Academy of Sciences, Engineering and Medicine	**TRB Webinar: Intersection Control Evaluation for Roundabouts and Alternative Intersections**	Basic	2 hours	TRB will conduct a webinar on Tuesday, March 20, 2018 from 2:00 PM to 4:00 PM ET that explores how to use Intersection Control Evaluation (ICE) policies and procedures to develop intersection safety and mitigate congestion within roundabouts. Presenters will describe case studies from different state departments of transportation that implemented ICE in roundabouts, U-turn designs, and crossover designs. They will discuss the tools and policies that aided with implementation.	2.0 PDH	webinar.mytrb.org/Webinars/Details/1154		$ 95.00	Webinar
National Academy of Sciences, Engineering and Medicine	**TRB Webinar: Pavement Maintenance Programming Using 3D Laser Technology**	Basic	1.5 hours	TRB will conduct a webinar on Monday, March 26, 2018, from 2:00PM to 3:30PM ET that will present a systematic approach toward pavement maintenance and rehabilitation planning and programming using 3D laser technology and machine learning algorithms. The presenters will provide an overview of recent advances in automatic pavement distress detection. This webinar will also discuss case studies of automatic pavement condition assessment. This webinar was organized by the TRB Standing Committee on Pavement Preservation, the Standing Committee on Pavement Maintenance, and Standing Committee on Sealants and Fillers for Joints and Cracks.	1.5 Ph.	webinar.mytrb.org/Webinars/Details/1162		$ 95.00	Webinar

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
National Academy of Sciences, Engineering and Medicine	**TRB Webinar: Pavement Marking Maintenance: Practices and Proposed Standards**	Basic	1.5 hours	This webinar will focus on assessing pavement marking retroreflectivity to ensure roadways are safe for night-time travel. Presenters will provide a brief update on the proposed minimum standards to the Manual on Uniform Traffic Control Devices (MUTCD), and will describe their state department of transportation network-level maintenance practices. A presenter from the Florida Department of Transportation will describe the new pavement marking management system used in that state, and a presenter from the Michigan Department of Transportation will describe the roadway delineation practices in Michigan.	1.5 PDH	webinar.mytrb.org/Webinars/Details/1157		$ 95.00	Webinar
National Academy of Sciences, Engineering and Medicine	**Data Management and Governance Practices at Transportation Agencies**	Basic	1.5 hours	This webinar will discuss transportation agency data management practices and experiences. Presenters will demonstrate how agencies currently access, manage, use, and share data. They will explain how this information can be used to advance the current state of the practice in transportation data management and governance.	1.5 Hours	webinar.mytrb.org/Webinars/Details/1147		$ 95.00	Webinar
National Academy of Sciences, Engineering and Medicine	**Improving the Resilience of Transit Systems Threatened by Natural Disasters**	Basic	2 hours	This research provides "how to" steps to help transit agencies and others improve their resilience. Transit agencies across the U.S. face a multitude of threats from extreme weather and natural disasters. Ensuring that transit infrastructure and services are resilient to these threats is critical. This webinar will include presentations by several transit agencies featured in the guide. The presenters will provide first-hand accounts of their experiences and lessons learned as they implemented resilience strategies and projects.	Varied PDH	webinar.mytrb.org/Webinars/Details/1159		No Cost	Webinar
NHI - National Highway Institute	**Application of Crash Reduction Factors (CRF)**	Basic	2 hours	This is a blended course. Module 1 is a self-paced, Web-based training and provides a background of CRF, including terminology, the components of a CRF, and how to identify and interpret appropriate CRFs. Module 2 is an Instructor-led training session that provides a hands-on experience with safety diagnosis and the application of CRFs to compare the effectiveness of countermeasures.	0.2 CEUs	www.cmfclearinghouse.org/collateral/380093.pdf	Individuals that have the responsibility for identifying, recommending, selecting, installing, and maintaining appropriate countermeasures to help reduce the number of crashes.	$ 90.00	Web Based
NHI - National Highway Institute	**Planning and Designing for Pedestrian Safety**	Basic	3 days	This comprehensive course is designed to help state and local officials learn "HOW TO" address pedestrian safety issues in the development of a pedestrian safety action plan, and specific programs and activities tailored to their community. It is also intended to assist agencies in the further enhancement of their existing pedestrian safety plan, programs, and activities, including involving partners and stakeholders, collecting and analyzing data and information, prioritizing issues and concerns, selecting and implementing an optimal combination of education, enforcement, engineering strategies. This course goes into more detail on engineering strategies than the "Developing a Pedestrian Safety Action Plan" (NHI-380089) course.	1.8 PDH	www.nhi.fhwa.dot.gov/course-search?tab=0&key=planning+and+designing+for+pedestrian+safety&sf=0&course_no=380091	Engineers, planners, traffic safety and enforcement professionals, public health and injury prevention professionals, and decision-makers who have the responsibility of improving pedestrian safety at the state or local level.	$530 per participant	Instructor Led

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NHI - National Highway Institute/ FHWA	**Advanced Work Zone Management and Design**	Advanced	3 days	This course provides participants with advanced levels of knowledge and competencies with technical and nontechnical aspects of work zone traffic control practices including work zone planning, design, project management, and contract issues. The course is designed to provide maximum flexibility by including core, recommended, and optional lessons. Each participant receives a copy of the "Advanced Work Zone Management and Design" reference manual and a participant workbook that contains all lesson materials.	1.8 CEUs	www.nhi.fhwa.dot.gov/course-search?tab=0&key=133115&res=1&sf=0&course_no=133115	State, and local design engineers, traffic and safety engineers, senior work zone traffic engineers, transportation planners, employees of metropolitan planning organizations and board members, regional planners, regional construction engineers (with work zone experience), and senior engineering technicians.	$ 700.00	Instructor Led
NHI - National Highway Institute/ FHWA	**Maintenance of Traffic for Supervisors - WEB BASED**	Advanced	5 hours	The Maintenance of Traffic for Supervisors Web-based training presents information about the placement of, field maintenance required for, and inspection of traffic control devices. In addition, drafting work zone traffic control plans and flagging are discussed. This training focuses on the design of a traffic control plan, and how and why one needs to operate and implement traffic control in the work zone.		www.nhi.fhwa.dot.gov/course-search?tab=0&key=133117&res=1&sf=0&course_no=133117	This training is designed for personnel with responsibility or authority to decide on the specific maintenance of traffic requirements to be implemented. These positions include engineers responsible for work zone traffic control development and work site traffic supervisors. The target audience could be geographically dispersed, in need of immediate training or information, or not have access to travel funds.	$ 50.00	Web Based

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
NHI - National Highway Institute/ FHWA	**Engaging the Private Sector in Freight Planning**	Basic	1 day	Engaging the Private Sector in Freight Planning is a one-day workshop intended to provide techniques and strategies to help practitioners establish and strengthen relationships with the private sector. It is designed for practitioners addressing freight issues at metropolitan planning organizations (MPOs), State departments of transportation, local governments, and economic development agencies.		www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=139009&res=1&sf=0&course no=139009	The target audience for this course includes practitioners and others involved in transportation planning, project development, and project implementation specifically, State DOT Planners, Freight Transportation Specialists, MPO Staff, City/County Engineers and Planners, Economic Development Agency staff, Quasi-public Agencies (such as ports), FHWA Employees, and other Federal Employees. Private sector entities are	$ 515.00	Classroom
NHI - National Highway Institute/ FHWA	**Freight and Land Use Workshop**	Basic	1 day	This workshop provides specific guidance to planning practitioners on how to integrate freight and land use considerations within the transportation planning and programming process, and offers the tools and resources to assess the impacts of land use decisions on freight movements, as well as the impacts of freight development and growth on land use planning goals.		www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=139008&res=1&sf=0&course no=139008	a variety of transportation and planning professionals involved in transportation or land use planning, with a particular focus on municipal and county land use and transportation planners; and local, regional, or state economic development officials. This course is also relevant for State DOT planners; environmental specialists; engineers and specialists; MPO staff; Federal transportation employees, particularly FHWA	$ 515.00	Classroom

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
NHI - National Highway Institute/ FHWA	**Fundamentals of Freight Data Workshop**	Basic	1.5 days	The workshop will provide participants with a broad knowledge of freight data sources. As well as the ability to utilize freight data for transportation planning program/project development and policy analysis.		www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=139011&res=1&sf=0&course_no=139011	The target audience for this training includes those individuals directly involved in freight activities, including: State DOT transportation and freight planners, city and county planners who deal with freight issues, MPO staff, public sector transportation and freight planners, economic development analysts, and FHWA employees.	$ 750.00	Classroom
NHI - National Highway Institute/ FHWA	**Integrating Freight in the Transportation Planning Process**	Basic	6 hours	This Web-based training course will provide a greater understanding of freight trends, its stakeholders, and its issues, so that public-sector transportation planners are better able to incorporate freight into their respective transportation planning processes and programs.	0.6 CEUs	www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=139006W&res=1&sf=0&course_no=139006W	Transportation planners and freight transportation planners from State DOTs, MPOs, local governments, and Federal agencies	No Cost	Web Based
NHI - National Highway Institute/ FHWA	**Access Management, Location and Design**	Basic	3 days	This two-day course is designed to provide those who plan, operate, design, construct, or administer surface transportation or land use systems with a basic understanding of the access management concepts and tools available to them, the benefits of successful access management, and the costs of unsuccessful access management.	1.8 CEUs	www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=133078&res=1&sf=0&course_no=133078	This course is intended for both technical and non-technical professionals working in, or having a strong interest in, transportation or land use planning, operations, design, maintenance, and development review in the public and private sectors	$ 775.00	Instructor Led
NHI - National Highway Institute/ FHWA	**Construction Zone Safety Inspection**	Basic	1 day	This course provides training in the management of traffic control plans and the inspection of construction zone safety devices. Participants receive instruction in traffic control plan review, inspection of traffic control procedures and safety devices, and the resolution of discrepancies from the traffic control plan, as well as on deficiencies in safety hardware maintenance. The following major topics are covered: Inspection of traffic control plan operation, maintenance of work zone signs and markings, inspection of construction safety hardware, and resolution of discrepancies from contract requirements.	0.6 CEUs	www.nhi.fhwa.dot.gov/course-search?tab=0&key=133114&res=1&sf=0&course_no=133114	FHWA safety engineers, FHWA highway engineers, and State and local personnel involved in the management of traffic control plans and the inspection of construction zone safety devices.	$ 275.00	Instructor Led

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
NHI - National Highway Institute/ FHWA	**Construction Zone Safety Inspection (1.5 Day)**	Basic	1.5 days	This course provides training in the management of traffic control plans and the inspection of construction zone safety devices. Participants receive instruction in traffic control plan review, inspection of traffic control procedures and safety devices, and the resolution of discrepancies from the traffic control plan, as well as on deficiencies in safety hardware maintenance. The following major topics are covered: Inspection of traffic control plan operation, maintenance of work zone signs and markings, inspection of construction safety hardware, and resolution of discrepancies from contract requirements	0.9 CEUs	www.nhi.fhwa.dot.gov/course-search?tab=0&key=133114A&res=1&sf=0&course_no=133114A	FHWA safety engineers, FHWA highway engineers, and State and local personnel involved in the management of traffic control plans and the inspection of construction zone safety devices.	$ 350.00	Instructor Led
NHI - National Highway Institute/ FHWA	**Design and Operation of Work Zone Traffic Control**	Basic	3 days	This course provides participants with information on the safest and most efficient work zone traffic controls, including the application of effective design and installation concepts; and using signs and markings for detours, construction zones, and maintenance sites. The legal, administrative, and operational aspects also will be discussed. Classroom presentations include lectures, case histories, and workshops	0 CEU	www.nhi.fhwa.dot.gov/course-search?tab=0&key=133113&res=1&sf=0&course_no=133113	Design, construction, and maintenance personnel responsible for designing, installing, and monitoring work zone traffic control.	$ 700.00	Instructor Led
NHI - National Highway Institute/ FHWA	**Design and Operation of Work Zone Traffic Control**	Basic	1 day	This course provides participants with information on the safest and most efficient work zone traffic controls, including the application of effective design and installation concepts; and using signs and markings for detours, construction zones, and maintenance sites. The legal, administrative, and operational aspects also will be discussed. Classroom presentations include lectures, case histories, and workshops.	0.6 CEUs	www.nhi.fhwa.dot.gov/course-search?tab=0&key=133112&res=1&sf=0&course_no=133112	Design, construction, and maintenance personnel responsible for designing, installing, and monitoring work zone traffic control.	$ 275.00	Instructor Led
NHI - National Highway Institute/ FHWA	**Flagger Training - WEB-BASED**	Basic	1 hour	This is a basic training in the area of flagger training. It has been designed for someone learning the first steps in performing flagger duties. This training would be useful as a refresher course for all employees involved with work zone traffic control where flaggers are utilized.		www.nhi.fhwa.dot.gov/course-search?tab=0&key=133118&res=1&sf=0&course_no=133118	This training is intended for individuals that will be performing or are engaging in flagger duties on construction/ maintenance projects. The course will assist them in better understanding the importance and duties involved with flagging on a project. It would be beneficial to the entry level employee as well as the experienced flagger.	$ 25.00	Web Based

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
NHI - National Highway Institute/ FHWA	**Geometric Design: Applying Flexibility and Risk Management**	Basic	2 days	This transportation training provides participants with knowledge of the functional basis of critical design criteria to enable informed decisions when applying engineering judgment and flexibility. The training exercises and case studies provide practical applications of current knowledge from research and experience of safety and operational effects for various design elements.	1.2 CEUs	www.nhi.fhwa.dot.gov/course-search?tab=0&key=380095&res=1&sf=0&course_no=380095	This training targets transportation engineers responsible for selection of roadway design criteria in the development of street and highway projects. This training will be most advantageous for practicing engineers from state highway agencies, local agencies, engineering design consultants and FHWA field offices. We encourage participation from diverse agencies in this transportation training. A mixture of professional backgrounds will	$ 475.00	Classroom
NHI - National Highway Institute/ FHWA	**Interactive Highway Safety Design Model**	Basic	2 days	This course instructs highway design project managers, planners, designers, and traffic and safety reviewers in the application of the Interactive Highway Safety Design Model (IHSDM) software and provides guidance on interpretation of the output.		www.nhi.fhwa.dot.gov/course-search?tab=0&key=380071&res=1&sf=0&course_no=380071	Highway design project managers, planners, designers, and traffic and safety reviewers with at least one or two years of experience with highway design, preferably two-lane rural highway design.	$ 455.00	Classroom
NHI - National Highway Institute/ FHWA	**Intersection Safety Workshop**	Basic	1 day	The course focuses on the application of these countermeasures and design and safety operations best practices for substantive improvements to intersection safety. During the course, participants have the opportunity to present intersection safety situations that they are currently facing and discuss appropriate countermeasures and best practices to address those situations.		www.nhi.fhwa.dot.gov/course-search?tab=0&key=380077&res=1&sf=0&course_no=380077	Federal, State, and local transportation traffic and safety engineers, and planners involved in reducing intersection crashes.	$ 355.00	Classroom

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
NHI - National Highway Institute/ FHWA	**Maintenance Training Series: Basics of Work Zone Traffic Control**	Basic	1 day	Through a series of work zone scenarios, this training uses the MUTCD Part 6 to review fundamental concepts of setting up work zones, including proper signage, taper lengths, and flagging procedures. Participants are encouraged to compare their State's standards, if available, to the guidance established in the MUTCD and determine what additional requirements may need to be met to establish safe, compliant work zones.		www.nhi.fhwa.dot.gov/course-search?tab=0&key=134109I&res=1&sf=0&course_no=134109I	This course is designed for State, regional, and county personnel who manage operations programs and deal with oversight and quality assurance across broad geographic areas. This target audience also is involved with handling materials, scheduling, budgeting, and planning.	$ 25.00	Instructor Led
NHI - National Highway Institute/ FHWA	**Managing Travel for Planned Special Events**	Basic	1 day	This course provides practitioners with a working knowledge of the techniques and strategies they may wish to use for the successful planning and operation of a specific planned special event. Practitioners will gain an understanding of the collective tasks facing multidisciplinary and inter-jurisdictional stakeholder groups charged with developing and implementing solutions to acute and system-wide problems affecting travel during a special event. Instructors will identify all potential tasks and stakeholder activities conducted within individual phases of managing planned special events. The course will refer to FHWA's Managing Travel for Planned Special Events Handbook and guide participants on how to apply key concepts in the handbook.	.6 CEUs	www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=133099A&res=1&sf=0&course_no=133099A	any individual engaged in or responsible for directing agency resources related to the following five key phases associated with managing travel for planned special events: (1) program planning, (2) event operations planning, (3) implementation activities, (4) day-of-event activities, and (5) post-event activities. The 1-day introductory course is for individuals with limited or no experience with applying the recommended concepts and	$ 425.00	Instructor Led

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
NHI - National Highway Institute/ FHWA	**Managing Travel for Planned Special Events**	Basic	2 days	This course provides practitioners with a working knowledge of the techniques and strategies they may wish to use for the successful planning and operation of a specific planned special event. Practitioners will gain an understanding of the collective tasks facing multidisciplinary and inter-jurisdictional stakeholder groups charged with developing and implementing solutions to acute and system-wide impacts on travel during a special event. Instructors will identify all potential tasks and stakeholder activities conducted within individual phases of managing planned special events.	1.2 CEUs	www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=133099&res=1&sf=0&course_no=133099	Transportation agencies that will be involved in developing the plans and implementing transportation management plans for upcoming events. This course and the corresponding workshop are designed for any individual engaged in or responsible for directing agency resources related to the following five key phases associated with managing travel for planned special events: (1) program planning, (2) event	$ 875.00	Instructor Led
NHI - National Highway Institute/ FHWA	**National Traffic Incident Management Responder Training**	Basic	4 hours	This course provides first responders a shared understanding of the requirements for safe, quick clearance of traffic incident scenes; prompt, reliable and open communication; and motorist and responder safeguards. First responders learn how to operate more efficiently and collectively	0.4 Cues	www.nhi.fhwa.dot.gov/course-search?tab=0&key=133126&res=1&sf=0&course_no=133126	The target audience for the training is individuals from all TIM responder disciplines, including: Law Enforcement, Fire/ Rescue, Emergency Medical Service, Towing and Recovery, Emergency Management, Communications, Highway/ Transportation and Dispatch within States, regions and localities.		Web Based

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
NHI - National Highway Institute/ FHWA	**Principles of Evacuation Planning Tutorial**	Basic	6 hours	This course also presents current and emerging evacuation planning tools, methodologies, and trends, and offers insight into special considerations that evacuation planning stakeholders should take into account when designing, reviewing, or contributing to evacuation planning efforts. Emphasis is placed on multi-agency/jurisdictional planning as part of identifying effective practices used in the U.S		www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=133107&res=1&sf=0&course_no=133107	transportation and emergency planning stakeholders along with local leadership (e.g. local public and private emergency management stakeholders). This course also will be made available to a variety of other professionals with an interest in evacuation planning including Government jurisdictions below state level; transportation planners; metropolitan planning organizations; transportation planners	$ 50.00	Web Based
NHI - National Highway Institute/ FHWA	**Road Safety Audits/Assessments**	Basic	2 days	The training includes hands-on application of the training materials, which includes information on each stage of a road safety audit and easy-to-use-prompt lists. A copy of "FHWA Road Safety Audit Guidelines" is provided.	1.2 CEUs	www.nhi.fhwa.dot.gov/course-search?tab=0&key=380069&res=1&sf=0&course_no=380069	Personnel who are likely to serve on a road safety audit team including Federal, State, local transportation personnel, first responders and consultants who conduct highway safety studies should also attend.	$ 435.00	Instructor Led
NHI - National Highway Institute/ FHWA	**Safe and Effective Use of Law Enforcement Personnel in Work Zones**	Basic	2 hours	The purpose of this course is to provide basic knowledge to help save lives, avoid work zone crashes, and improve safety when working in a work zone. This course will provide tips for safe practices for law enforcement officers (LEO's) in work zones as well as providing for a safer work zone environment. This Web-based training will educate participants on the standards and guidelines related to temporary traffic control in work zones; the role of LEO's in work zones; the components of a typical work zone; and the proper practices and procedures related to the use of law enforcement officers in work zones.		www.nhi.fhwa.dot.gov/course-search?tab=0&key=133119&res=1&sf=0&course_no=133119	Safe and Effective User of Law Enforcement Personnel in Work Zones is a Web-based training course designed for LEO's. Specifically, this course targets state troopers, state, county, municipal officers, and highway patrol officers who will participate in work zone activities.	No Cost	Web Based

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
NHI - National Highway Institute/ FHWA	**Signalized Intersection Guidebook Workshop**	Basic	1 day	This course provides an overview of the "Signalized Intersections: Informational Guide FHWA-HRT-04-091." The guide is a comprehensive document containing methods for evaluating the safety and operations of signalized intersections and tools to remedy deficiencies. It takes a holistic approach to signalized intersections and considers the safety and operational implications of a particular treatment on all system users, including motorists, pedestrians, bicyclists, and transit users. Using the guide, participants learn to make insightful intersection assessments, understand the tradeoffs of potential improvement measures, and apply guidebook measures and best practices to reduce the incidence of intersection crashes.	0.6 CEU	www.nhi.fhwa.dot.gov/course-search?tab=0&key=380078&res=1&sf=0&course_no=380078	Federal, State, and local transportation, traffic and safety engineers, and planners involved in planning, designing, operating, and remedying crash problems for signalized intersections.	$ 340.00	Classroom
NHI - National Highway Institute/ FHWA	**Signing and Markings for Complex Freeway Interchanges**	Basic	1 day	In this course, participants will review the relationships between geometric freeway design, permanent signing, and roadway markings. The training will focus on freeway interchanges and expressways where complex lane transitions and configurations present signing and marking layout challenges.	0.6 CEUs	www.nhi.fhwa.dot.gov/course-search?tab=0&key=380118&res=1&sf=0&course_no=380118	Engineers, engineering practitioners, technologists, and engineering assistants involved in freeway and expressway design, construction, and operations including Sections such as Roadway Design, Traffic Engineering, District personnel with responsible charge of plan review of TCDs (striping, signing, other markings), plan preparation, development/revision of standards for the same and Consultant Management staff, as well as	$ 375.00	Classroom

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
NHI - National Highway Institute/ FHWA	**Strategies for Developing Work Zone Traffic Analyses**	Basic	6 hours	The purpose of this course is three-fold. First, it will educate the participants regarding the constraints and opportunities of work zone analysis associated with available transportation modeling approaches. Second, it will build familiarity with the various work zone factors influencing the selection of a transportation modeling approach. Third, it will provide the participants with practical experience in developing a transportation modeling approach in a collaborative process that considers issues ranging from work zone characteristics, performance measurement, technical risk assessment, and resource constraints. In conclusion, participants will be able to characterize a work zone and select and justify a transportation modeling approach based upon the work zone characterization.	0.4 CEUs	www.nhi.fhwa.dot.gov/course-search?tab=0&key=133110&res=1&sf=0&course_no=133110	The Strategies for Developing Work Zone Traffic Analyses (WBT) is designed for professionals employed by State DOTs (district engineers, corridor planners, project engineers, traffic engineers, and work zone planners), FHWA Division Offices Staff, transportation engineers, traffic staff, planners, MPOs, and consultants.	$ 50.00	Web Based
NHI - National Highway Institute/ FHWA	**Strategies for Developing Work Zone Traffic Analyses**	Basic	1 day	The course includes lecture, full-group interaction, and small group activities. The purpose of the course is three-fold. First, it will educate the participants regarding the constraints and opportunities of work zone analysis associated with available transportation modeling tools. Second, it will build familiarity for the participants with the various work zone factors influencing the development of a transportation analysis plan. Third, it will provide the participants with practical experience in developing analysis plans in a collaborative process considering issues ranging from work zone characteristics, performance measurement, technical risk assessment and resource constraints.	0.6 CEUs	www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=133109&res=1&sf=0&course_no=133109	A mix of experience with traffic analysis tools and work zone planning among participants is preferred. No prior experience with traffic analysis tools is required. The course is designed to promote interactions between participants. Therefore, the group is likely to benefit from a variety of viewpoints if participants have varied levels of analytical experience and diverse agency affiliations. The group may include:	$ 275.00	Instructor Led

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
NHI - National Highway Institute/ FHWA	**Systems Engineering for Signal Systems Including Adaptive Control**	Basic	2 days	The overall goal of this course is to assist traffic operations staff in identifying traffic control system objectives and needs to facilitate planning, designing and implementing a new traffic control system. The FHWA document, Model Systems Engineering Documents for Adaptive Signal Control Technology (ASCT) Systems, (FHWA-HOP-11-027) is used for the exercises of this course.	1.2 CEUs	www.nhi.fhwa.dot.gov/course-search?tab=0&key=133123&res=1&sf=0&course_no=133123	Professionals responsible for the planning, design, management or operation of traffic signal systems. This includes engineers, and technicians (advanced) of state/local agencies, consultants, and FHWA Operations staff.	$ 660.00	Classroom
NHI - National Highway Institute/ FHWA	**Traffic Signal Design and Operation**	Basic	2 days	There is a need to understand that the congestion and delays that exist on our streets and roadways can be better managed with a thorough understanding of effective traffic signal timing and optimization. Well-developed, designed, implemented, maintained, and operated traffic signal control projects are essential to this process. Engineering tools are available to design, optimize, analyze, and simulate traffic flow. This course addresses the application of the “Manual of Uniform Traffic Control Devices” (MUTCD) to intersection displays, as well as signal timing, computerized traffic signal systems, control strategies, integrated systems, traffic control simulation, and optimization software. The course is divided into two primary parts: Traffic Signal Timing and Design, and Traffic Signal Systems.	1.1 CEU	www.nhi.fhwa.dot.gov/course-search?tab=0&key=133121&res=1&sf=0&course_no=133121	Traffic engineering personnel from State, Federal, and local agencies involved in planning, design, operation or maintenance of traffic signals or traffic signal systems. The course will not assume any prior knowledge of computers and thus will describe the theory of operation and the manner in which it can be applied to traffic signal controls.	$ 770.00	Classroom
NHI - National Highway Institute/ FHWA	**Traffic Signal Timing Concepts**	Basic	2 days	Traffic Signal Timing Concepts is a two-day course to assist in building technical expertise in signal timing by focusing on the relationship between network context and operational objectives to inform the design of signal timing parameters. The course will expand on the traditional signal timing process by incorporating an objectives and performance driven approach that leads to selection of appropriate computational methods for design and operation of traffic signal timing.	1.2 CEUs	www.nhi.fhwa.dot.gov/course-search?tab=0&key=133122&res=1&sf=0&course_no=133122	Traffic Signal Timing Concepts is a two-day course for practitioners involved in or responsible for design, operations, or management of traffic signals including State/MPOs/Local Government personnel and consultants and contractors.	$ 675.00	Classroom

Organization	*Program/Course Name*	*Level*	*Time Period*	*Description*	*Credentials Earned*	*Website*	*Target Audience*	*Fees*	*Delivery Method*
NHI - National Highway Institute/ FHWA	**Value Engineering Workshop**	Basic	3 days	This course begins with a Web-based training (WBT) component that is completed prior to the first day of the class (134005A). The 3-day workshop involves training participants to be valued contributors to the Value Engineering team, conducting a Value Engineering study in a team environment. It is preferable that the host agency provides actual project(s) to be used in this course, although The National Highway Institute (NHI) can provide projects upon request. Depending on the projects selected for use in the course, and based on the request of the host agency, the 3-day classroom session can be expanded to 4 or 5 days in length (NHI-134005B and NHI-134005C).	1.8 CEUs	www.nhi.fhwa.dot.gov/course-search?tab=0&key=134005&res=1&sf=0&course_no=134005	The target audience for this course consists of FHWA and state highway agency personnel in management, administrative, and engineering disciplines who will participate as Value Engineering team members. Consultants or agency representatives of all technical disciplines associated with project design, development, construction, and maintenance can be included in order to provide the multiple perspectives needed to maximize	$ 925.00	Classroom
NHI - National Highway Institute/ FHWA	**Value Engineering Workshop**	Basic	5 days	This course begins with a Web-based training (WBT) component that is completed prior to the first day of the class (134005A). The 3-day workshop involves training participants to be valued contributors to the Value Engineering team, conducting a Value Engineering study in a team environment. It is preferable that the host agency provides actual project(s) to be used in this course, although The National Highway Institute (NHI) can provide projects upon request. Depending on the projects selected for use in the course, and based on the request of the host agency, the 5-day classroom session can be shortened to 3 or 4 days in length (NHI-134005 and NHI-134005B)	3 CEUs	www.nhi.fhwa.dot.gov/course-search?tab=0&key=134005C&res=1&sf=0&course_no=134005C	The target audience for this course consists of FHWA and state highway agency personnel in management, administrative, and engineering disciplines who will participate as Value Engineering team members. Consultants or agency representatives of all technical disciplines associated with project design, development, construction, and maintenance can be included in order to provide the multiple perspectives needed to maximize	$ 1,395.00	Classroom

Organization	*Program/Course Name*	*Level*	*Time Period*	*Description*	*Credentials Earned*	*Website*	*Target Audience*	*Fees*	*Delivery Method*
NHI - National Highway Institute/ FHWA	**Value Engineering Workshop**	Basic	4 days	This course begins with a Web-based training (WBT) component that is completed prior to the first day of the class. The 4-day workshop involves training participants to be valued contributors to the Value Engineering team, conducting a Value Engineering study in a team environment. It is preferable that the host agency provides actual project(s) to be used in this course, although The National Highway Institute (NHI) can provide projects upon request. Depending on the projects selected for use in the course, and based on the request of the host agency, the 3-day classroom session can be expanded to 3 or 5 days in length (NHI-134005 and NHI-134005C).	2.4 CEUs	www.nhi.fhwa.dot.gov/course-search?tab=0&key=134005B&res=1&sf=0&course_no=134005B	The target audience for this course consists of FHWA and state highway agency personnel in management, administrative, and engineering disciplines who will participate as Value Engineering team members. Consultants or agency representatives of all technical disciplines associated with project design, development, construction, and maintenance can be included in order to provide the multiple perspectives needed to maximize	$ 1,160.00	Part Web, In Class
NHI - National Highway Institute/ FHWA	**Work Zone Traffic Analysis Applications and Decision Framework**	Basic	2 days	The course provides an overview of the Federal Highway Administration's guidebook titled "Traffic Analysis Toolbox XII - Work Zone Traffic Analysis - Applications and Decision Framework. " Work Zone Traffic Analysis (WZTA) is the process of evaluating and determining the mobility and safety impacts within a transportation construction, maintenance, or rehabilitation project. The purpose of the course is to provide participants an understanding of the analytical methods involved in conducting and developing a WZTA as well as direction on where to go for more information.	1.2 CEUs	www.nhi.fhwa.dot.gov/course-search?tab=0&key=133120&res=1&sf=0&course_no=133120	Engineers, planners, modelers, and others responsible for framing a work zone traffic analysis, those who decide on and use work zone traffic analysis tools for which zone strategies to implement, and decision-makers considering work zone traffic analysis. These include State DOT staff, FHWA staff, Metropolitan Planning Organization staff, and consultants. This course is designed for those individuals seeking to supplement and expand their basic knowledge and	$ 600.00	Classroom

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
NHI - National Highway Institute/ FHWA	**Work Zone Traffic Control for Maintenance Operations**	Basic	3 days	This course provides guidance and training for field personnel working in the planning, selection, application, and operation of short-term work zones. The course addresses typical short-term maintenance activities occurring on two-lane rural highways and multilane urban streets and highways. The course covers the applicable standards for work zone protection contained in the "Manual on Uniform Traffic Control Devices" (MUTCD), discussing the need for proper application of devices, while addressing liability issues of highway agencies and individuals. Classroom presentation includes practical exercises to plan, set up, operate, and remove work zone safety devices, including appropriate flagging procedures for these operations.	0.6 CEUs	www.nhi.fhwa.dot.gov/course-search?tab=0&key=133113&res=1&sf=0&course_no=133113	State, county, and utility personnel, such as maintenance crews, survey crews, and utility crews, who are responsible for establishing traffic controls through short-term, utility, and maintenance work areas.	$ 275.00	Instructor Led
NHI - National Highway Institute/ FHWA	**An Overview of the Railroad-Highway Grade Crossing Improvement Program**	Basic	1 day	The goal of this one-day training course is to provide attendees with the knowledge and tools needed to plan, implement, and evaluate safety improvements to highway-rail grade crossings.	0.6 PDH	https://www.nhi.fhwa.dot.gov/course-search	State DOT personnel involved in highway-rail grade crossings; Public project engineers from railroad industries; Transportation consultants; FHWA safety engineers; MPO/City/county DOT personnel; and FRA crossing managers.	$ 330.00	Instructor Led
NHI - National Highway Institute/ FHWA	**Introduction to Value Engineering**	Introductory	0.5 hour	This Web-based training is intended to provide an overview of the Value Engineering process, know as the Value Engineering study. Included in the training is a discussion of the benefits of utilizing VE, the keys to completing a successful VE study, and an overview of the objectives and tasks completed by the VE team at each phase. Participants can complete this training independently. Those who plan on attending the 3-day Value Engineering classroom training must complete this online module prior to coming to class. Course certificates should be printed out and presented to the instructor on the first day to verify completion.		www.nhi.fhwa.dot.gov/course-search?tab=0&key=134005A&res=1&sf=0&course_no=134005A	The target audience for this course consists of FHWA and state highway agency personnel in management, administrative, and engineering disciplines who will participate as Value Engineering team members or who are interested in learning more about the process. Consultants or agency representatives of all technical disciplines associated with project design, development, construction, and maintenance who will participate in a	No Cost	Web Based

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
NHI - National Highway Institute/ FHWA	**Maintenance of Traffic for Technicians**	Introductory	5 hours	The Maintenance of Traffic for Technicians Web-based training presents information about the placement of, field maintenance required for, and inspection of traffic control devices. In addition, drafting work zone traffic control plans and flagging are discussed.		www.nhi.fhwa.dot.gov/course-search?tab=0&key=133116&res=1&sf=0&course_no=133116	This training is designed for all persons with duties that include: Direct responsibility for placement of work zone traffic control devices; Direct responsibility for field maintenance of work zone traffic control devices; Inspection of the placement or operational function of work zone traffic control devices; and Drafting or electronic generation of work zone traffic control plans. The target audience could be geographically dispersed, in need	$ 50.00	Web Based
NOCoE - National Operations Center of Excellence	**Securing Transportation Systems Webcast**	Basic		This webinar introduced the issues and concerns related to securing three types of ITS technologies and share best practices to help mitigate some of the potential vulnerabilities. The webinar will be hosted by Ray Murphy, ITS Specialist with FHWA Office of Technical Services.		transportationops.org/ondemand-learning/securing-transportation-systems-webcast-0	Associate Engineer, CEO / GM / Commissioner, Director / Program Manager, Engineer, Manager / First Line Supervisor, Maintenance Staff, Media / PIO, Operator, Principal Engineer, Public, Public Safety Officer, Researcher/Academic, Senior Engineer, Senior Manager, Technician, Transit Professional, Transportation Planner	No Cost	Archived Webinar
North Dakota State University Upper Great Plains Transportation Institute	**Access Management**	Basic		This webinar will present various points of view on the topic of Access Management. It is intended to give practitioners insights and tools for making access management decisions both prior to and during a project.		www.translearning.org/events/view.php?id=296	Traffic operations staff, urban corridor designers, DOT District and Regional Engineers, county and city planners and roadway superintendents.		Classroom

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
Northwestern University	**Advanced Geometric Design Workshop**	Advanced		The five-day workshop is intended to strengthen the expertise of geometric design engineers in specialized topics in the design of highways and interchanges and the reconstruction of existing highways. The course covers freeway interchange and ramp design, roadside design, design and operational improvements for rural two-lane highways and maintenance of traffic during reconstruction projects.	Certificate of Completion and PDH	registration.nucps.northwestern.edu/courseDisplay.cfm?schID=404	This workshop is intended for experienced designers who have taken the Fundamentals of Geometric Design Workshop and are familiar with the basic concepts and principles of geometric design of highways.		Classroom
Northwestern University	**Crash Reconstruction for Traffic Engineers**	Basic	5 days	Traffic engineers should have enough knowledge of crash investigation and reconstruction to assess the quality of data collection and analysis contained in police crash reports. In addition, many times it is necessary for the traffic engineer to conduct an independent investigation to determine how the crash occurred and to assess the potential involvement of the roadway design and traffic operational factors in crash causation. This ability is an important ingredient in identifying and correcting hazardous roadway features. It is also a critical step in evaluating the potential liability of a highway agency.	Certificate of Completion and PDH	registration.nucps.northwestern.edu/courseDisplay.cfm?schID=1071	Crash Reconstruction for Traffic Engineers is designed to introduce traffic engineers to the fundamentals of crash investigation and reconstruction. Participants should have a background in engineering or physics.		Classroom
Northwestern University	**Fundamentals of Geometric Design Workshop**	Basic		The objective of this five-day workshop is to strengthen the expertise of highway and traffic engineers in the fundamental design principles and concepts of geometric design of highways and intersections. The workshop includes geometric, functional and aesthetic aspects of street and highway design with emphasis placed on efficient and effective design techniques.	Certificate of Completion and PDH	registration.nucps.northwestern.edu/courseDisplay.cfm?schID=403	This workshop is intended for traffic and junior design engineers who are engaged in highway and intersection design.		Classroom
Northwestern University	**Highway Railroad Grade Crossing Workshop**	Basic		Highway-railroad grade crossings introduce potentially severe conflicts between trains and vehicular and pedestrian traffic. Grade crossing safety and operational concerns involve two components: the highway and the railroad. The highway component includes drivers, pedestrians, vehicles and roadway segments in the vicinity of the crossing. The railroad component includes the trains and the tracks at the crossing. The element of risk present at a given crossing depends on the characteristics of these two components and their corresponding elements.	Certificate of Completion and PDH	registration.nucps.northwestern.edu/courseDisplay.cfm?schID=406	This workshop is intended for personnel from state and local transportation departments and railroads with responsibilities for traffic operations, design and safety.		Classroom
Northwestern University	**Roundabout Design Workshop**	Basic		There is increasing interest in the modern roundabout as an intersection design form. Entry and circulating speeds are controlled by the geometric features of the roundabout, including the size of the central island and outer diameter of the circulating roadway, entry and exit radii and the length and shape of splitter islands. All vehicles enter the roundabout under yield control, minimizing intersection delay. Right-angle and left-turn crashes are essentially eliminated, reducing the average severity of intersection crashes. But these safety and efficiency advantages may not be realized if the roundabout is not properly designed or if traffic control devices are not properly applied. The workshop emphasizes criteria for selection of roundabouts as an intersection form, geometric design practices and procedures and design of traffic control devices.	Certificate of Completion and PDH	registration.nucps.northwestern.edu/courseDisplay.cfm?schID=409	This workshop is intended for geometric design and traffic engineers responsible for the design or operation of urban or rural intersections.		Classroom

Organization	*Program/Course Name*	*Level*	*Time Period*	*Description*	*Credentials Earned*	*Website*	*Target Audience*	*Fees*	*Delivery Method*
Northwestern University	**Traffic and Transportation Engineering Seminar 1**	Basic	3.5 days	Traffic and Transportation Engineering Seminar 1 presents a comprehensive overview of traffic and transportation engineering to professionals in the field. The seminar explores solutions for urban and rural transportation problems and strategies for facilitating the management of transportation systems. The Traffic and Transportation Engineering Seminar is taught by NUCPS staff and leading transportation and highway engineering professionals. Students receive a reference manual containing comprehensive coverage of all topics presented as well as a coordinated series of work problems and projects.	3.5 CEUs and 35 PDHs Awarded	registration.nucps.northwestern.edu/courseDisplay.cfm?schID=1072	Traffic and Transportation Engineering Seminar is designed primarily for graduate engineers with traffic or transportation responsibilities. This includes engineers within traffic engineering departments in larger cities, city engineers in smaller communities, civil engineers with county highway departments and engineers employed by state transportation agencies, consulting firms or the federal government.		Classroom
Northwestern University	**Traffic and Transportation Engineering Seminar 2**	Basic	3.5 days	Traffic and Transportation Engineering Seminar 2 builds on the concepts presented in Traffic and Transportation Engineering Seminar 1 and continues to explore solutions for urban and rural transportation problems and strategies for facilitating the management of transportation systems. The Traffic and Transportation Engineering Seminar is taught by NUCPS staff and leading transportation and highway engineering professionals.	3.5 CEUs and 35 PDHs Awarded	registration.nucps.northwestern.edu/courseDisplay.cfm?schID=1073	Traffic and Transportation Engineering Seminar is designed primarily for graduate engineers with traffic or transportation responsibilities. This includes engineers within traffic engineering departments in larger cities, city engineers in smaller communities, civil engineers with county highway departments and engineers employed by state transportation agencies, consulting firms or the federal government.		Classroom

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
Northwestern University	**Traffic Impact Analysis Workshop**	Basic	5 days	This one-week workshop presents the methodology, techniques and procedures used in the evaluation of proposed land developments, the determination of internal and external site transportation requirements, the development of transportation-related land use controls and the use of legal/administrative tools. The relationship between land use and traffic service is emphasized to ensure coordinated planning, practical design and implementation of recommendations.	Certificate of Completion and PDH	registration.nucps.northwestern.edu/courseDisplay.cfm?schID=1075	This workshop is designed for engineers and planners from city, county and state agencies and for consultants and others involved in the approval of new land development or the modification of existing facilities.		Classroom
Northwestern University	**Traffic Signal Workshop**	Basic	5 days	The Traffic Signal Workshop provides a working knowledge of the latest theory and application of the functional capabilities of traffic signal controllers and systems. Emphasis is on the development and evaluation of signal timing and phasing plans and the selection of signal control equipment. The goal is optimum efficiency and safety of traffic flow at intersections, on street systems and in roadway networks. The functional capabilities, flexibilities and limitations of traffic signal controllers and systems are presented, including the latest developments in micro-processor technology. The selection of appropriate traffic signal equipment, timing plans and programs are related to the physical restraints, geometric design features and traffic flow characteristics of the roadway.	Certificate of Completion and PDH	registration.nucps.northwestern.edu/courseDisplay.cfm?schID=1074	This workshop is designed for practicing engineers with responsibilities for traffic operations, traffic control devices, street improvement plans and programs of functional design of roadway systems. City engineering personnel from small communities, traffic and highway engineering staff from city, county and state agencies and consultants are intended participants.		Classroom
NTI - National Transit Institute	**Maintenance Leadership Workshop**	Basic	5 days	The workshop was created in response to an identified industry need that was supported through a survey of more than 250 transit professionals. The curriculum was shaped by an advisory board comprised of transit General Managers, maintenance managers, and representatives of both the public and private sectors. The workshop was developed by NTI in partnership with Gannon Consult and supported by the Federal Transit Administration.		www.ntionline.com/transit-maintenance-leadership-workshop/		Fee Based	Workshop/ Event
NTI - National Transit Institute	**NTI Effective Supervision**	Basic	2 days	Supervisors must learn how to lead others rather than do the work themselves. In addition, they must earn trust and respect, in order to motivate, and strike the right balance between delegation and control. Supervisors must become skilled in proactive communication, listen well, demonstrate sensitivity, and articulate clearly. Supervisors must become adept in working in a diverse environment. As we face the complex challenges of today's Transit environment, it becomes increasingly crucial that we examine our own behaviors as it relates to helping our organizations succeed.	1.40 CEUs	www.ntionline.com/effective-supervision-in-transit/	Experienced supervisors who wish to improve their leadership skills, increase their teams productivity, and become more confident in supervising people.		Seminar

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NTI - National Transit Institute	**NTI Fundamentals of Supervision**	Basic	1 day	The course is designed to provide transit supervisors with a better understanding of their role whether they are new to supervision or have been a supervisor for a while and are interested in brushing up on their skills.	0.60 CEUs	www.ntionline.com/fundamentals-of-transit-supervision/	Newly promoted supervisors		Seminar
NTI - National Transit Institute	**NTI Transit Academy**	Introductory	4.5 days	The Transit Academy is a comprehensive, behind-the-scenes study of a major transit system. It is designed to provide those new to transit with an in-depth understanding of the scope of responsibilities, variety of skills and range of activities that work together in delivering safe and efficient transit service. The academy is presented using lectures, demonstrations, hands-on activities and facility tours. Key transit agency personnel serve as instructors ready to share their knowledge and experience – you'll learn from those who do the work. The program covers the broad range of responsibilities and functions found in a major transit system – literally transforming the entire organization into a learning laboratory.	3.17 CEU	www.ntionline.com/transit-academy/	This four and a half day academy program is intended for professionals and decision-makers new to the transit industry and those who can benefit from an in-depth exposure to transit and its people.	$ 450.00	Workshop/ Event
NTI - National Transit Institute	**Using Regional ITS Architecture(s)**	Introductory	2 days	This course will discuss regional ITS architecture conformity and the ability to apply this information to the participant's agency, projects, and region. It is an introductory level course geared for people with little or no experience with ITS architectures or systems engineering, but who are involved or will be involved with an ITS project.	1.60 CEUs	www.ntionline.com/using-regional-its-architectures/	Transit professionals involved with the implementation of Intelligent Transportation Systems (ITS) projects, who act as project leads or have significant roles in ITS projects. This may include planners, engineers, and operators, as well as individuals employed by MPOs, DOTs, and transportation agencies.	$300.00 for Contractor, Consulting, Non-USA Transportation or Government Agency; Free for all others	
PDH Source	**Alternative Uses of Highway Right of Way**	Basic	5 hours	This course discusses the implications and feasibility of implementing renewable energy and fuel options in the ROW.	5.0 PDHs	https://pdhsource.com/find-a-course/	Civil, highway, and electrical engineers interested in the possibility of installing renewable energy in highway right of ways	$ 125.00	Web Based
PDH Source	**Barriers to Public Acceptance of Vehicle-to-Vehicle Communications**	Basic	4 hours	This online engineering PDH course describes the barriers to public acceptance of Vehicle-to-Vehicle (V2V) communication systems.	PDH units: 4.0 units	https://pdhsource.com/find-a-course/	Electrical, mechanical, civil, and transportation engineers concerned with automobile safety.	$ 100.00	Web Based
PDH Source	**Deploying Solar Arrays in the Right of Way**	Basic	3 hours	This online engineering PDH course describes various impacts associated with the deployment of solar arrays in right of ways (ROWs).	3.0 PDH	https://pdhsource.com/find-a-course/	Civil, highway, and electrical engineers interested in the possibility of installing solar arrays in highway right of ways	$ 75.00	Web Based

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PDH Source	**FHWA Best Practices for Road Weather Management**	Basic	7 hours	This course presents best management practices for attempting to decrease the number of crashes caused by bad weather and for reducing associated maintenance costs.	7.0 PDH	https://pdhsource.com/find-a-course/	Transportation engineers and managers concerned with the operation and maintenance of highway systems	$ 175.00	Web Based
PDH Source	**FHWA Guidelines to Accommodate Older Drivers and Pedestrians**	Basic	7 hours	This course contains updated recommendations excerpted from the 2001 handbook. The recommendations do not constitute a new standard of required practice but are instead intended to supplement existing standards and guidelines in the areas of highway geometry, operations, and traffic control devices.	7.0 PDH	https://pdhsource.com/find-a-course/	Civil and transportation engineers concerned with the design and maintenance of road systems	$ 175.00	Web Based
PDH Source	**Fundamentals of Signalized Intersections**	Basic	5 hours	This online engineering PDH course provides key background information on three aspects of signalized intersections: user needs, geometric design, and traffic design and illumination.	5.0 PDHs	https://pdhsource.com/find-a-course/	Traffic, civil and highway engineers	$ 125.00	Web Based
PDH Source	**Horizontal Curve Safety Treatments**	Basic	6 hours	The purpose of this course is to encourage you to use this information to evaluate problems and implement appropriate treatments for problem curve locations. These treatments should help reduce roadway departure crashes, injuries, and fatalities.	6.0 PDH	https://pdhsource.com/find-a-course/	Civil and Traffic Engineers	$ 150.00	Web Based
PDH Source	**Implementing a Bike-Share System**	Basic	2 hours	This online engineering PDH course describes how a bike-sharing system can be implemented in an urban environment for the purpose of making the environment more livable and sustainable. The course presents key aspects of implementation such as planning, maintenance, evaluation, technology, and required infrastructure.	2.0 PDH	https://pdhsource.com/find-a-course/	civil and transportation engineers concerned with the design and maintenance of gravel roads.	$ 50.00	Web Based
PDH Source	**Increasing Freeway Capacity by Using Safety Lanes as Travel Lanes**	Basic	8 hours	This course discusses the use of safety shoulders as travel lanes to increase the capacity of existing highways	8.0 PDH	https://pdhsource.com/find-a-course/	Transportation engineers and planners	$ 200.00	Web Based
PDH Source	**Intersection Geometric Design**	Basic	5 hours	This course summarizes and highlights the geometric design process for modern roadway intersections. The contents of this document are intended to serve as guidance and not as an absolute standard or rule.	5.0 PDHs	www.pdhsource.com/courses/intersection-geometric-design/	Civil, Transportation & Traffic Engineers	$ 125.00	Web Based
PDH Source	**Low-Volume Roads Engineering**	Basic	9 hours	This course presents an overview of the key planning, location, design, construction, and maintenance aspects of low-volume roads—defined as roads with an average daily traffic of less than 400 vehicles per day—that can cause adverse environmental impacts and lists Best Management Practices to prevent those impacts.	9.0 PDH	www.pdhsource.com/courses/low-volume-roads-engineering/	Civil, transportation, and construction engineers involved in the planning, construction and maintenance of low-volume roads	$ 225.00	Web Based
PDH Source	**Low Cost Traffic Engineering Improvements**	Introductory	2 hours	This course is designed to serve as a primer, or basic introduction, to the subject of low cost traffic engineering improvements. The goal is to provide practicing traffic engineers and planners with information describing the types of low cost actions that have been implemented in a variety of locations in the U.S. Costs and benefits are included in the discussion.	2.0 PDH	www.pdhsource.com/courses/low-cost-traffic-engineering-improvements/	Transportation engineers and planners	$ 50.00	Web Based
Small and Urban Rural Transit Center/ North Dakota State University	**Advanced Transit Professional Certificate**	Advanced		SURTC and the NDSU Office of Teaching and Learning have partnered to provide persons who have successfully completed TRANSIT I – The Foundations (formerly titled Principles of Transit Management) and TRANSIT II – The Pillars (formerly titled Advanced Transit Management) the designation of "Advanced Transit Professional."	Advanced Transit Professional Certificate (NDSU)	www.surtc.org/training/transit-management.php	This training is delivered on-site, and can be hosted by any local, regional and state transportation organization.		Workshop/ Event

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
Small and Urban Rural Transit Center/ North Dakota State University	**SURTC Rural Transit Manager Course**	Advanced	3 days	Principles of Transit Management is an intensive three-day course developed by SURTC that covers virtually all aspects of transit and paratransit management for operators of tribal transit programs across the country. This course is broken into individual modules which cover, human resource management, financial management, administration, operations and service design, procurement, vehicle and facility management, safety, security and emergency management, and drug and alcohol program compliance.	PDH	www.surtc.org/training/topics.php?id=1	Small urban and rural transit operators, local and regional transit associations, and state Departments of Transportation		Workshop/ Event
Small and Urban Rural Transit Center/ North Dakota State University	**Business Continuity and Crisis Management**	Basic	1-3 hours	The session includes strategies to continue operations when adverse conditions occur that significantly disrupt an agency's ability to function and how to handle a crisis situation to avoid damage to the agency's reputation.	PDH	www.surtc.org/training/topics.php	Small urban and rural transit operators, local and regional transit associations, and state Departments of Transportation		Workshop/ Event
Small and Urban Rural Transit Center/ North Dakota State University	**Emergency Management in Transit**	Basic	1-3 hours	This session instructs how to assess current capabilities; emergency preparedness; management responsibilities; examples of drills, simulations and exercises and how to assist in developing a sustainable agency program.	PDH	www.surtc.org/training/topics.php	Small urban and rural transit operators, local and regional transit associations, and state Departments of Transportation		Workshop/ Event
Small and Urban Rural Transit Center/ North Dakota State University	**Financial Management for Transit Operators**	Basic	1-3 hours	This workshop includes: accounting fundamentals; revenue management; contracting; local match; cost allocations; budgeting; audits; and developing 3 – 5 year management plans.	PDH	www.surtc.org/training/topics.php	Small urban and rural transit operators, local and regional transit associations, and state Departments of Transportation		Workshop/ Event
Small and Urban Rural Transit Center/ North Dakota State University	**Intelligent Transportation Systems**	Basic	1-3 hours	Examples of ITS in transit; needs assessment process; 3rd party vendors; data management; funding strategies and frequent ITS challenges are described within this session.	PDH	www.surtc.org/training/topics.php	Small urban and rural transit operators, local and regional transit associations, and state Departments of Transportation		Workshop/ Event
Small and Urban Rural Transit Center/ North Dakota State University	**Performance Measurement**	Basic	1-3 hours	Tools, strategies and suggestions to evaluate a transit system's performance; improve decision making and developing accurate tracking mechanisms.	PDH	www.surtc.org/training/topics.php	Small urban and rural transit operators, local and regional transit associations, and state Departments of Transportation		Workshop/ Event
Small and Urban Rural Transit Center/ North Dakota State University	**Safety and Risk Management**	Basic	1-3 hours	How to evaluate risks associated with property, people, and income by identifying possible causes of accidents or losses, and steps to prevent or better absorb the losses through risk control, risk transfer, risk removal, and risk retention.	PDH	www.surtc.org/training/topics.php	Small urban and rural transit operators, local and regional transit associations, and state Departments of Transportation		Workshop/ Event

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
Small and Urban Rural Transit Center/ North Dakota State University	**Strategic Planning**	Basic	1-3 hours	Developing agency mission, goals and objectives; core values; challenges and opportunities; long- and short-range goals; business decision making; and performance measures.	PDH	www.surtc.org/training/topics.php	Small urban and rural transit operators, local and regional transit associations, and state Departments of Transportation		Workshop/ Event
Small and Urban Rural Transit Center/ North Dakota State University	**Transit Coordination**	Basic	1-3 hours	This workshop will discuss the benefits of coordination between transit agencies. The session will examine coordination planning, required plan elements, implementing a plan and breaking down barriers to coordination efforts.	PDH	www.surtc.org/training/topics.php	Small urban and rural transit operators, local and regional transit associations, and state Departments of Transportation		Workshop/ Event
The Next Education	**V2I Fundamentals Course**	Basic	N/A	V2I and Infrastructure basics provide comprehensive technician level training. This class enables participants to gain an understanding of V2I concepts, onboard units, antenna functions and architecture. The course introduces key connected vehicle concepts, describes the current market landscape and the basic concepts of infrastructure-related installation	N/A	https://www.thenexted.com/courses/	The Next Field Worker	N/A	Web based
The Next Education	**Autonomy Fundamentals Course**	Basic	N/A	This course explains how increasingly autonomous vehicles are turning one hundred years of conventional wisdom on its head. No part of the industry will be left unchanged by this transition—from vehicle design and production volumes to ownership and insurance models, to urban planning and legal liability models.	n/a	https://www.thenexted.com/courses/	The Next Field Worker	N/A	Web based
The Next Education	**Connected Vehicle Fundamentals**	Basic	N/A	This course offers professionals a condensed flexible approach to begin their journey in connected and autonomous vehicle education. This course has a heavy emphasis on familiarizing management professionals with common terms and technologies to help start connected vehicle focused conversations within their companies.	n/a	https://www.thenexted.com/courses/	The Next Field Worker	N/A	Web based
The Next Education	**Connected Vehicle Standards**	Basic	N/A	Connected vehicle standards focus on the standards from various organizations including SAE International and the Institute of Electrical and Electronics Engineers (IEEE). This course provides an overview of major consortia and education in Vehicle-to- Vehicle (V2V), Vehicle-to-Infrastructure (V2I), and Vehicle-to-X (V2X) technologies.	n/a	https://www.thenexted.com/courses/	The Next Field Worker	N/A	Web based
The Next Education	**Drones Pilot & Fundamentals Course**	Basic	N/A	The program is specifically designed to provide basic airman knowledge, hands-on flying skill and preparation to apply and pass the FAAs UAV Remote Pilot Certification Test. Students will be required to demonstrate proficiency in the knowledge and operations of a sUAV through both written and flying skill tests throughout the program	n/a	https://www.thenexted.com/courses/	The Next Field Worker	N/A	Web based
The Next Education	**Fundamentals of Cybersecurity**	Basic	N/A	This course covers the theory and emerging best practices for securing automotive systems from cyber threats. This course provides a foundation for cybersecurity and data privacy issues surrounding connected vehicles, intelligent transportation infrastructure, and cloud-based services. Specific threats and consequences explored, together with creating and maintaining secure automotive systems and emerging best practices for data privacy. Participants can attend online or in person.	n/a	https://www.thenexted.com/courses/	The Next Field Worker	N/A	Web based

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
Transportation Curriculum Coordination Council	**Maintenance of Traffic for Supervisors**	Advanced	5 hours	The Maintenance of Traffic for Supervisors training presents information about the placement of, field maintenance required for, and inspection of traffic control devices. In addition, drafting work zone traffic control plans and flagging are discussed. This training focuses on the design of a traffic control plan, and how and why it's needed in the work zone.	5 PDHs and Certificate of Completion	training.transportation.org/item_details.aspx?ID=2564	This training is designed for personnel with responsibility or authority to decide on the specific maintenance of traffic requirements to be implemented. These positions include engineers responsible for work zone traffic control development and work site traffic supervisors.	Members- $125, Nonmembers- $250	Web Based
Transportation Curriculum Coordination Council	**Maintenance of Traffic for Technicians**	Basic	5 hours	The Maintenance of Traffic for Technicians training presents information about the placement of, field maintenance required for, and inspection of traffic control devices. In addition, drafting work zone traffic control plans and flagger operations are discussed.	Certification and 5 Hours	training.transportation.org/item_details.aspx?ID=2563	This training is designed for all people with duties that include direct responsibility for placement of work zone traffic control devices, direct responsibility for field maintenance of work zone traffic control devices, inspection of the placement or operational function of work zone traffic control devices, and drafting or electronic generation of work zone traffic control plans.	Members- $125, Nonmembers- $250	Web Based
Transportation Curriculum Coordination Council	**Maintenance Training Series: Basics of Work Zone Traffic Control**	Basic	1 hour	Through a series of work zone scenarios, this training uses Part 6 of the MUTCD to review fundamental concepts of setting up work zones, including proper signage, taper lengths, and flagging procedures. Participants are encouraged to compare their State's standards, if available, to the guidance established in the MUTCD and determine what additional requirements may need to be met to establish safe, compliant work zones.	1 PDH	training.transportation.org/item_details.aspx?ID=2519	This course is designed for those who manage operations programs and deal with oversight and quality assurance across broad geographic areas. This target audience also is involved with handling materials, scheduling, budgeting, and planning.	Members- $25, Nonmembers- $50	Web Based

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Transportation Tech	**ITS/CV Technician Training**	Basic	Varies	On-demand learning services for ITS/CV technician training established through input from industry practitioners, experts at the FHWA ITS Joint Program Office, and select members of the National Operations Center of Excellence is what Transportation Tech offers its customers. Capable of deployment on any internet connected platform allows access in classrooms, shops, or in the field. Training is formatted for direct, effective, technically rich learning via video demonstration, constant knowledge checks, quick guides, procedural checklists, and final exams which entail complex repair issues testing the student's understanding of the material while building their critical and systemic thinking skill sets.	Certification through Badge system	transportationtech.com/students/	Technician-level professionals		Classroom/Web
Transportation Tech	**ITS Basic Training Boot Camp**	Basic	varies	ITS Basic Training offers FREE high quality interactive education for students interested in learning more about Intelligent Transportation Systems and at a low cost for faculty providing the training online as part of a class. The training provides 10 online modules that will lay a firm foundation of ITS knowledge for any student to apply to a wide variety of subjects in the classroom. College faculty and STEM educators can impliment the program as a compliment to a wide variety of courses quickly and affordably, with no textbooks required.	Bootcamp Academic License	https://integrated-global-dimensions.lpages.co/transportationtech-edu/	STEM Students	Students - Free Non-student - $299/semester	Web
TRB SHRP	**TRB's SHRP 2 Tuesdays Webinar: DOT and Railroad Collaborations: Best Practices for Expediting Agreements and Successfully Delivering Projects (R16)**	Basic	1.5 hour	The presence of a highway across or alongside a railroad creates significant challenges to the rapid renewal of that highway facility. Moreover, freight analysis predicts an 88% increase in rail freight from 2002 to 2035. Highway renewal projects will also increase dramatically in the upcoming years as the highway infrastructure continues to age and require reconstruction. This project addresses how the issue of cooperation between railroads and public transportation agencies is more critical than ever. T	A certificate for 1.5 PDH will be provided to PEs who register and attend the webinar as an individual. For groups, only the person that registers and attends the session will receive a PDH certificate.	www.trb.org/StrategicHighwayResearchProgram2SHRP2/Blurbs/169188.aspx		No Cost	Webinar
TRB SHRP	**TRB's SHRP 2 Tuesdays Webinar: Integrating Freight Considerations into Collaborative Decision Making for Additions to Highway Capacity (C15)**	Basic	1.5 hour	Efficient freight movement is essential to the economic competitiveness and vitality of communities and regions. Freight operations also have a significant impact on air quality, land use, sustainability, and environmental conditions. Understanding how freight providers will use the transportation system may help practitioners consider reasonable future scenarios, sound investment decisions, and public safety. Effective freight planning requires multi-jurisdictional and multi-agency collaboration across local and state boundaries.	A certificate for 1.5 PDH was provided to PEs who registered and attended the webinar as an individual. For groups, only the person that registered and attended the session will receive a PDH certificate.	www.trb.org/StrategicHighwayResearchProgram2SHRP2/Blurbs/169696.aspx	The intended audience for this webinar is transportation planners at state DOTs and MPOs.	No Cost	Webinar

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
TRB SHRP	**TRB’s SHRP 2 Tuesdays Webinar: Advances in Travel Demand Forecasting**	Basic	2 hour	Partnership to Develop an Integrated, Advanced Travel Demand Model with Mode Choice Capability and Fine-Grained, Time-Sensitive Networks (C10A and C10B) developed two model sets that link the supply and demand sides of travel forecasting models so that network congestion may inform forecasts of route, time-of-day, and mode choices. SHRP 2 developed one model in partnership with the North Florida Transportation Planning Organization in Jacksonville, Florida. The other model was developed by SHRP 2 in partnership with the Sacramento Area Council of Governments in Sacramento, California. Integrated Advanced Travel Demand Models provide agencies with more behaviorally-based tools for estimating the effects of improving traffic operations, introducing priced roads, improving traveler information, and adding highway or transit capacity.	A certificate for 2 PDH will be provided to PEs who register and attend the webinar as an individual. For groups, only the person that registers and attends the session will receive a PDH certificate.	www.trb.org/StrategicHighwayResearchProgram2SHRP2/Blurbs/169436.aspx	The intended audience for this webinar is federal, state, and local agencies involved in planning efforts that improve travel demand forecasting. Planning efforts ultimately influence project selection, operation prioritization, and investment decision making. State department of transportation (DOTs) and Metropolitan Planning Organizations (MPOs) are key constituents of this research.	No Cost	Webinar
TRB SHRP	**TRB's SHRP 2 Tuesdays Webinar: Nondestructive Testing Technologies for Concrete Bridge Decks (R06A)**	Basic	1.5 hour	Concrete bridge decks in poor structural condition are a major problem affecting bridges in the United States. Nondestructive Testing (NDT) techniques have the potential to quickly and reliably provide information about under-the-surface conditions of these decks so that informed treatment decisions can be made. The report evaluates the capabilities and limitations of the most common NDT techniques for detecting and characterizing typical deterioration mechanisms in concrete bridge decks. The report includes an evaluation of the following NDT capabilities and limitations: accuracy, precision, ease of use, speed, and cost. It also documents the validation of promising technologies, and grades and ranks the technologies based on results of the validations. The main product of SHRP 2 Renewal Project R06A will be an electronic repository for practitioners, known as the NDToolbox, which will provide information regarding recommended technologies for the detection of a particular deterioration.	A certificate for 1.5 PDH will be provided to PEs who register and attend the webinar as an individual. For groups, only the person that registers and attends the session will receive a PDH certificate.	www.trb.org/StrategicHighwayResearchProgram2SHRP2/Blurbs/168779.aspx		There is no fee for employees of TRB sponsors who register using their work email address. In addition to employees of TRB sponsor organizations, the following are eligible to receive complimentary webinar registration: Other sites must pay $89 per site	Webinar

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
TRB SHRP	**TRB's SHRP 2 Tuesdays Webinar: Performance Specifications for Rapid Renewal (R07)**	Basic	1.5 hour	The benefits of performance specifications as compared with traditional means-and-methods specifications have been advocated by transportation owners, contractors, and materials suppliers for decades. It has been repeatedly demonstrated that performance specifications, when properly developed and implemented, provide creative solutions to save time, minimize disruption, and enhance durability. The project adopted a broad definition of performance specifications to address not only the performance of the physical products of construction (including pavements, bridges, and earthwork) but also contractor performance in terms of time, safety, work zone traffic control, and other important project parameters.	A certificate for 1.5 PDH will be provided to PEs who register and attend the webinar as an individual. For groups, only the person that registers and attends the session will receive a PDH certificate.	www.trb.org/StrategicHighwayResearchProgram2SHRP2/Blurbs/168927.aspx		There is no fee for employees of TRB sponsors who register using their work email address. In addition to employees of TRB sponsor organizations, the following are eligible to receive complimentary webinar registration: Other sites must pay $89 per site	Webinar
TRB SHRP	**TRB's SHRP 2 Tuesdays Webinar: Roadway Information Data from the SHRP 2 Naturalistic Driving Study (S04A and S04B)**	Basic	1.5 hour	The RID was populated with roadway and other contextual information from the six field study sites in the SHRP 2 Naturalistic Driving Study (NDS). The NDS gathered real-time, in-vehicle data from 3,147 participants in 6 sites across the United States who made 5.4 million trips covering almost 50 million miles. The RID includes new roadway data collected and quality assured by SHRP 2. It also contains existing data - such as roadway inventories, crash histories, traffic, weather, work zones, 511 information, and safety enforcement laws - acquired from government, public, and private sources. This geographic information system (GIS) database, which will be linked to the NDS database, will make it possible to relate driver behavior to characteristics of the roadway. Learning more about this relationship is critical to understanding how to diminish crash risk in the roadway design process.	A certificate for 1.5 PDH will be provided to PEs who register and attend the webinar as an individual. For groups, only the person who registers and attends the session will receive a PDH certificate.	www.trb.org/StrategicHighwayResearchProgram2SHRP2/Blurbs/170401.aspx		No Cost	Webinar
TRB SHRP	**TRB's SHRP 2 Tuesdays Webinar: SHRP 2 Naturalistic Driving Study**	Basic	1.5 hour	This webinar provides an overview of the SHRP 2 Naturalistic Driving Study (NDS), which gathered real-time, in-vehicle data from 3,147 participants in 6 sites across the United States who made 5.4 million trips covering almost 50 million miles. Researchers also introduced the data access website.	A certificate for 1.5 PDH was provided to PEs who register and attend the webinar as an individual. For groups, only the person who registers and attends the session received a PDH certificate.	www.trb.org/StrategicHighwayResearchProgram2SHRP2/Blurbs/170264.aspx		No Cost	Webinar

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
TRB SHRP	**TRB's SHRP 2 Tuesdays Webinar: A Framework for Collaborative Decision-Making on Additions to Highway Capacity**	Basic		This webinar will concentrate on the principles that grew out of the SHRP 2 research, including insights into successful collaboration, stakeholder involvement, and expediting project planning and environmental review. The webinar will feature a presentation by the South Carolina Department of Transportation (DOT) on their application of these principles. Additionally, representatives from the Federal Highway Administration and the American Association of State Highway and Transportation Officials will discuss their plans for long-term availability of the research results. This webinar is intended for a diverse audience of academia, public sector practitioners, and private industry interested in the science of transportation planning and group-level analysis to accommodate highway capacity additions.	A certificate for 2 PDH will be provided to attendees who register and attend the webinar as an individual. This webinar has also been approved by the American Institute of Certified Planners for 2 Certification Maintenance Credits.	www.trb.org/StrategicHighwayResearchProgram2SHRP2/Blurbs/171080.aspx	This webinar is intended for a diverse audience of academia, public sector practitioners, and private industry interested in the science of transportation planning and group-level analysis to accommodate highway capacity additions.	No Cost	Webinar
TRB SHRP	**TRB's SHRP 2 Tuesdays Webinar: Incorporating Reliability Performance Measures in Operations and Planning Modeling Tools (L04)**	Basic	1.5 hour	The objective of SHRP 2 Reliability Project L04 is to address travel time reliability in planning and operations models to account for factors that cause non-recurring congestion. The associated report and guide provide practical means of generating realistic reliability performance measures using simulation models. These publications also explain how to address reliability with regards to demand and supply considerations and how to deal with reliability factors, such as incidents and breakdown in flow, which should be treated outside or inside certain types of models.	A certificate for 1.5 PDH will be provided to PEs who register and attend the webinar as an individual. For groups, only the person that registers and attends the session will receive a PDH certificate.	www.trb.org/StrategicHighwayResearchProgram2SHRP2/Blurbs/171209.aspx		No Cost	Webinar
TRB SHRP	**TRB's SHRP 2 Tuesdays Webinar: Incorporation of Travel Time Reliability into the Highway Capacity Manual (L08)**	Basic	1.5 hour	This project developed new analytical procedures and prepared chapters about freeway facilities and urban streets for potential incorporation of travel-time reliability into the HCM. The methods are embodied in two computational engines, and a final report documents the research.	A certificate for 1.5 PDH will be provided to PEs who register and attend the webinar as an individual. For groups, only the person that registers and attends the session will receive a PDH certificate.	www.trb.org/StrategicHighwayResearchProgram2SHRP2/Blurbs/169626.aspx	The intended audience for this webinar is federal, state, and local agencies involved in project design, planning, preliminary engineering, and systems operations and management, specifically state departments of transportation (DOTs), and metropolitan planning organizations (MPOs). Within DOTs and MPOs, this webinar would be useful to planning and project design teams; operations system	No Cost	Webinar

Organization	*Program/Course Name*	*Level*	*Time Period*	*Description*	*Credentials Earned*	*Website*	*Target Audience*	*Fees*	*Delivery Method*
TRB SHRP	**TRB's SHRP 2 Tuesdays Webinar: Local Methods for Modeling, Economic Evaluation, Justification and Use of the Value of Travel Time Reliability in Transportation Decision Making (L35)**	Basic	1.5 hour	The objective of SHRP 2 Reliability Project L35 is to build support for investments in operations through pilot testing an economic value of travel time reliability in the modeling and business processes at a metropolitan planning organization (MPO) and a state department of transportation (DOT) in order to determine whether introducing reliability into the decision making process changes project priorities.	A certificate for 1.5 PDH will be provided to attendees who register and attend the webinar as an individual. This webinar has been approved by the American Institute of Certified Planners for 1.5 Certification Maintenance Credits.	www.trb.org/StrategicHighwayResearchProgram2SHRP2/Blurbs/171161.aspx		No Cost	Webinar
TRB SHRP	**TRB's SHRP 2 Tuesdays Webinar: New Strategies for Managing Complex Projects (R10)**	Basic	1.5 hour	Complex transportation projects have brought about the evolution of new strategies to help managers make rational resource allocations. In this webinar, participants will learn about a five-dimensional approach to plan and manage issues proactively, rather than retroactively. The five areas of the new project management approach address cost, schedule, engineering requirements, external influences, and financing.	A certificate for 1.5 PDH will be provided to attendees who register and attend the webinar as an individual. This webinar is approved by the American Institute of Certified Planners (AICP) for 1.5 Continuing Maintenance (CM) credits.	www.trb.org/StrategicHighwayResearchProgram2SHRP2/Blurbs/168714.aspx		There is no fee for employees of TRB sponsors who register using their work email address. In addition to employees of TRB sponsor organizations, the following are eligible to receive complimentary webinar registration: Other sites must pay $89 per site	Webinar
United Safety Council	**Advanced Maintenance of Traffic**	Advanced		The objective of these training courses is to provide every person involved with Work Zone Traffic Control with constant and consistent education to ensure that Department standards are followed in planning, designing, supervising, implementing, and maintaining work zone traffic control.	Renewed Certification	www.occsafety.com/maintenance-of-traffic.asp	All Department employees, contractors, consultants, surveyors, utility company personnel, local maintaining agency, or any other appropriate person responsible for work zone traffic control planning, design, implementation, inspection, and/or for supervising the selection	Call for price	Classroom

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
United Safety Council	**Advanced Refresher Maintenance of Traffic**	Advanced		The objective of these training courses is to provide every person involved with Work Zone Traffic Control with constant and consistent education to ensure that Department standards are followed in planning, designing, supervising, implementing, and maintaining work zone traffic control.	Renewed Certification	www.occsafety.com/maintenance-of-traffic.asp	All Department employees, contractors, consultants, surveyors, utility company personnel, local maintaining agency, or any other appropriate person responsible for work zone traffic control planning, design, implementation, inspection, and/or for supervising the selection	Call for price	Classroom
United Safety Council	**Basic Maintenance of Traffic Course**	Basic	4 hours	The Basic Flagger course will cover a variety of traffic safety topics which will include Part 6 of the Manual on Uniform Traffic Control Devices section 6e which covers Flagger Control, Fundamental Principles of Traffic Control, Components of a Work Zone, Appropriate Flagging Techniques, Hand Signaling Control, Work Zone safety, and Types of Traffic Control Devices.	Certificate of completion	www.occsafety.com/maintenance-of-traffic-courses.asp?course=basic	all persons performing the duty of flagging traffic.	Call for price	Classroom
United Safety Council	**Certified Occupational Safety Specialist Program (COSS)**	Basic	5 days	The Certified Occupational Safety Specialist (COSS) Program is designed for those in the safety and health field that coordinate the successful implementation of corporate safety and health plans; coordinate and maybe even conduct safety and health training; and/or provide support to safety and training managers.	COSS certification and four continuing education credits	www.occsafety.com/certified-occupational-safety-specialist.asp	Professionals	Member Cost: $1,699 | Non-Member Cost: $2,199	Classroom
United Safety Council	**Intermediate Maintenance of Traffic Course**	Basic	16 hours	Also included will be legal liability, record keeping, traffic control devices, installation and removal of traffic control devices, layouts for traffic control zones, and operation and maintenance of traffic control zones.	Renewed Certification	www.occsafety.com/maintenance-of-traffic-courses.asp?course=intermediate	Those who set up, maintain, inspect, or design work zones or traffic control devices	Call for price	Classroom
United Safety Council	**Intermediate Refresher Maintenance of Traffic Course**	Basic	7 hours	This refresher course is a DOT requirement every four years to renew certification. Take this class before your certification expires to avoid taking the 16 Hr. Intermediate MOT class. It is a FDOT requirement that participants provide a copy of their current IMOT certificate.	Renewed Certification	www.occsafety.com/maintenance-of-traffic-courses.asp?course=intermediate-refresher	Those who set up, maintain, inspect, or design work zones or traffic control devices	Call for price	Classroom
University of Denver	**Non-Credit Professional Development**	Basic	4 days	Strengthen your transportation decision-making by learning the essentials of transportation operations, processes and trends! This 4-day non-credit professional development course offered by the Transportation Institute at the University of Denver will prepare early-career transportation professionals to develop effective solutions for their companies within and across transportation modes. Take the next steps on your career path by developing the skills to create effective transportation business solutions through an enhanced understanding of the industry.	PDH	www.du.edu/transportation/short-courses/index.html	Professionals with at least one year of transportation experience who want to increase their value to their organizations and teams are ideal participants.	$ 2,800.00	Workshop/ Event

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
University of Maryland	**Operations Academy**	Advanced	2 Weeks	Operational Leadership, Performance Measurement and Data Visualization, Communicating the Value of Operations, Managing for Safety, Advanced Operations Techniques, TSMO Program Planning, Customer Service, and Workforce Development; Formal classroom training consists of the following topics: (1) Operational Leadership, (2) Performance Measurement and Data Visualization, (3) Communicating the Value of Operations, (4) Managing for Safety, (5) Advanced Operations Techniques, (6) TSMO Program Planning, (7) Customer Service, and (8) Workforce Development. Speakers are invited to present on topics such as: Facilitating Goods Movement through Operations, Connected/Automated Vehicles, Smart Cities, Mobil Devices and How they Impact Traveler Information, and Privatization Initiatives. Workshops include two group exercises, with specific roles assigned to each participant. Participants will address difficult TSMO challenges, and propose solutions based on the principles provided during the classroom training. Solutions will be presented to fill participants during the two-week program.	10 CEUs or 100 PDH	operationsacademy.org/program-description/	The Senior Management Program is designed for mid to high level managers whose existing or future responsibilities include transportation management and operations.	$ 3,692.00	Classroom
University of Michigan College of Engineering	**CAV Connected and Automated Vehicles**	Basic	4 days	Leading researchers at the University of Michigan have developed a ground-breaking four-day course on connected and automated vehicles (CAV). Learn about the latest concepts, CAV safety standards, and key challenges facing the industry, as well as new technologies and effective solutions being developed here in Ann Arbor. The course combines interactive classroom sessions with tours, demonstrations, simulations, and discussions in order to connect many aspects of CAV while providing a balanced and rewarding learning experience. As the world advances towards a driverless future, the need for dependable research and improved safety has never been more urgent.		http://isd.engin.umich.edu/professional-programs/connected-and-automated-vehicles/index.htm	engineers, managers, and other professionals interested in mobility in the automotive industry	$ 2,580.00	Classroom
University of Tenn. Center for Transportation Research	**Traffic Signal Academy**	Basic	6 days	The academy offers a comprehensive discussion on standards, warrants, installation and maintenance guidelines, and strategies to minimize the adverse effects of liability issues. Topics for each of the 6 days of the academy are as follows: MUTCD and Signalized Intersections Signal Timing Detection and Advanced Operations Traffic Signal Installation and Maintenance Traffic Signal Controller Programming Traffic Signal Systems in Oversaturated Conditions		trafficsignalacademy.utk.edu	Federal, state, county and city agencies plus consultant firms	$150 per day	Classroom
University of Tenn. Transportation Assistance Program	**Advanced Work Zone Design and Operations**	Advanced	8.5 hours	This course provides participants with information on the safest and most efficient work zone traffic controls, including the application of effective design and installation concepts; and using signs and markings for detours, construction zones, and maintenance sites. The legal, administrative, and operational aspects will also be discussed. Classroom presentations include lectures, case histories, and workshops.	12 PDH ; Counts towards TATE Certification	ttap.utk.edu/training/ttapclass.php?id=490&loc=1	This workshop is best suited for design, construction, and maintenance personnel responsible for designing, installing, and monitoring work zone traffic control.	$ 275.00	Classroom

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
University of Tenn. Transportation Assistance Program	**Basic Railroad Track Maintenance**	Basic	2 days	This workshop provides two days of classroom instruction on basic track maintenance practices, with an emphasis on shortline, branchline, and industrial freight track of FRA Class 1 or 2 (25 mph or less). The course presents the basic elements of railroad track, identifies maintenance issues, presents principles of maintenance planning, and discusses maintenance approaches suited for this type of track. Focus areas include drainage, turnouts and track crossings, crossties, continuous welded rail, and track geometry.	12 PDH	ctr.utk.edu/CTRrailcourses/railclass.php?id=497&loc=1	Persons with responsibility for or interest in track maintenance will benefit from this class. These include shortline, regional, and Class I railroads; transit railroads; railroad contractors and consultants; state and local government agencies associated with railroad operation, finance, and regulation; and consultants.	$ 495.00	Classroom
University of Tenn. Transportation Assistance Program	**Railroad Track Design**	Basic	2.5 days	This 2½ day class addresses the design of railroad track, including horizontal and vertical alignment, cross section, turnouts and crossings, component selection, earthwork, drainage, and clearances. The design approaches highlight applicable AREMA standards and general industry practices. The attendee will learn how traffic characteristics and operational requirements affect design. The coverage distinguishes between high-speed, conventional, rapid transit, and light-rail systems. The course includes exercises to provide experience with typical design procedures. On completion, this attendee may take credit for 15 professional development hours. An engineering or engineering technology background is preferred.	15.0 PDH	ctr.utk.edu/CTRrailcourses/railclass.php?id=498&loc=1	Track inspection personnel from shortline, regional, and Class I railroads; railroad contractors and consultants; state and local government officials associated with railroad operation, finance, and regulation; and railway engineers have all benefited from attending this workshop.	$ 565.00	Classroom
University of Tenn. Transportation Assistance Program	**Railroad Track Inspection & Safety Standards**	Basic	5 days	Track is the foundation of the railroad's physical plant. Although railroad track components are relatively simple in concept, they interact in a complex fashion to form a system capable of withstanding the extremely large forces applied by rail vehicles. Safe and reliable train operations rely upon the track system remaining within established specifications. Because the combined effects of traffic and environment degrade track, regular inspection is essential to identify defects and initiate remedial action before problems develop. This course describes track defects and acceptable corrective actions, presents a recommended methodology for conducting inspections, and discusses in depth the Federal Track Safety Standards in 49 CFR, Part 213.	27 PDH	ctr.utk.edu/CTRrailcourses/railclass.php?id=492&loc=1	Track inspection personnel from shortline, regional, and Class I railroads; railroad contractors and consultants; state and local government officials associated with railroad operation, finance, and regulation; and railway engineers have all benefited from attending this workshop.	$ 765.00	Classroom

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
University of Tenn. Transportation Assistance Program	**Design of Modern Roundabouts**	Basic	8 hours	The primary purpose of this course is to increase the understanding and awareness of the many advantages of roundabouts, and thereby to increase their popularity and usage. This will be accomplished by discussing roundabout operational and safety advantages, with a focus on the conditions where roundabouts are the preferred solution, and to present the fundamental design principles. This will include discussion of roundabout geometric design elements, associated roadway design considerations, and the basic design checks and measurements.	6.0 PDH	ttap.utk.edu/training/ttapclass.php?id=501&loc=1	This course is appropriate for local and state government engineering, planning and public works employees, consulting personnel, and others involved in the evaluation and design of roadway and intersection improvements. The workshop material will serve as an excellent source of current information for people with different levels of experience and participation in the subject matter, and could even prove valuable for administrators,	$ 120.00	Classroom
University of Tenn. Transportation Assistance Program	**Flagger/Highway Safety**	Basic	8.5 hours	his course provides guidance and training for field personnel; such as maintenance crews and utility crews in the planning, selection, application, and operation of flagging procedures as they apply to short-term work zones. The course material was developed with regards to typical short-term maintenance and utility activities. The training covers the applicable standards for work zone protection as contained in Part 6 of the Manual on Uniform Traffic Control Devices (MUTCD), as well as addressing liability issues of highway agencies, utilities, and individuals. However, the emphasis is on appropriate flagging procedures, duties and performance of the Flagger.	Carry Card identifying them as a trained Flagger (valid for three years)	ttap.utk.edu/training/ttapclass.php?id=489&loc=1	This course is best suited for the state, county, city, and utility who are responsible for establishing traffic controls within utility or maintenance roadway work areas.	$ 50.00	Classroom
University of Tenn. Transportation Assistance Program	**Work Zone Traffic Control/Flagging**	Basic	8.5 hours	This course provides guidance and training for field personnel such as maintenance crews, survey crews and utility crews in the planning, selection, application, and operation of short-term work zones. The course material is developed around typical short-term maintenance and utility activities. The training covers the applicable standards for work zone protection as contained in Part 6 of the Manual on Uniform Traffic Control Devices (MUTCD),discusses the need for proper application of devices, addresses liability issues of highway agencies and individuals, and offers practical exercises to plan, set up, operate, and remove work zone safety devices. The course also includes training on appropriate flagging procedures for these operations.	6.0 PDH	ttap.utk.edu/training/ttapclass.php?id=491&loc=1	This course is best suited for state, county, city, and utility personnel who are responsible for establishing traffic controls through short-term utility and maintenance work areas	$ 120.00	Classroom

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
University of Tenn. Transportation Assistance Program	**Railroad Bridge Inspection**	Basic	3 days	Present and describe bridge terminology and functions of bridge components. Present bridge Inspection procedures and a format for documentation of the inspection process. Acquire an understanding of the basic maintenance and rehabilitation Practices.		ctr.utk.edu/CTRrailcourses/railclass.php?id=465&loc=1	Persons having bridge inspection and maintenance responsibilities at shortline, regional, and Class I railroads; railroad contractors and consultants; and state and local government officials associated with railroad operation, finance, and regulation will find this workshop beneficial.	$ 595.00	Classroom
University of Tenn. Transportation Assistance Program	**Urban Street Design-Complete Streets**	Basic	8 hours	The art of street design in urban areas has evolved to a significant degree in recent decades. No longer are we almost singularly focused on designing for motorized traffic, but there is recognition that other users such as pedestrians, bicyclists and transit riders both desire and deserve reasonable and safe accommodation. This class will explore current thinking that has driven this revolution, and introduce key concepts and standards such as Complete Streets, Accessibility (ADA/PROWAG) and NACTO Urban Street Design. Other urban street design considerations to be discussed include Traffic Calming, Signalization, Roundabouts and Road Diets.	6.0 PDH; Credit towards TATE Certificate	ttap.utk.edu/training/ttapclass.php?id=462&loc=1	This course is for city and county public works employees, consulting personnel, and others involved in traffic engineering or the design of local and collector roadways.	$ 120.00	Classroom
University of Tenn. Transportation Assistance Program	**Designing Pedestrian Facilities for Accessibility**	Basic	2 days	Facilities in the public right-of-way (including walkways, ramps, curb ramps and landings, crosswalks, and pedestrian overpasses and underpasses) must be designed, constructed and maintained to serve all users. To meet the needs of all users, those involved with designing, building and maintaining infrastructure need a clear understanding of the wide range of abilities that occur within the population and the challenges in the public right-of-way faced by persons with disabilities. This course will identify applicable laws, regulations, guidelines and standards pertaining to accessibility for persons with disabilities.	10 PDH	ttap.utk.edu/training/ttapclass.php?id=499&loc=1	The target audience for this workshop is local and state personnel with responsibility for designing, constructing and maintaining facilities in the public right-of-way. These include engineers, MPO staff, technicians, public works directors, street supervisors and crew leaders.	TDOT employees $180.00 Consultants/others $250.00 City/County Employees $ 70.00	Classroom

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
University of Tenn. Transportation Assistance Program	**Introduction to Highway Capacity Analysis**	Introductory	8 hours	This course will introduce participants to the basic concepts and principles of highway capacity analysis. The methodologies established by the most recent edition of the Transportation Research Board's Highway Capacity Manual, HCM2010, will be addressed, with an overview provided of the terms and concepts used throughout the HCM and the procedures for the capacity of: urban streets, two-lane highways, multilane highways, unsignalized intersections, signalized intersections, and freeway facilities. The course will also describe the use of microsimulation packages in capacity analysis, and will contrast these with the HCM approaches.	6.0 PDH; Counts toward TATE Certification	ttap.utk.edu/training/ttapclass.php?id=493&loc=1	This course will benefit both transportation planners and engineers who are responsible for the design or operation of streets and highways. The methodologies introduced in the course are vital to the evaluation of proposed roadway changes to ensure that adequate capacity is provided in both present and future years. This course may also be useful to non-technical staff or supervisors who wish to learn more about the highway capacity process.	$ 120.00	Classroom
USA Safety & Training	**Basic Flagger Course**	Basic	4 hours	During this course students will learn Part 6 of the Manual on Uniform Traffic Control Devices section 6e, which includes Flagger Control, Fundamental Principles of Traffic Control, Components of a Work Zone, Appropriate Flagging Techniques, Hand Signaling Control, Work Zone safety, and Types of Traffic Control Devices	Completion Card	http://www.occsafety.com/maintenance-of-traffic-courses.asp?course=intermediate-refresher	Those who set up, maintain, inspect, or design work zones or traffic control devices	Call for price	Classroom
USA Safety & Training	**MOT Intermediate Refresher**	Basic	8 hours	USA Safety & Training refresher course is a DOT requirement every four years to renew certification. Take this class before your certification expires to avoid taking the 16 Hour Intermediate MOT class. It is a FDOT requirement that participants provide a copy of their current IMOT certificate.	Renewed Certification	http://www.occsafety.com/maintenance-of-traffic-courses.asp?course=intermediate-refresher	Those who set up, maintain, inspect, or design work zones or traffic control devices	Call for price	Classroom
USDOT	**Leveraging Big Data for Transportation Improvement: Gaps and Opportunities**	Basic	1.5 hours	The U.S. Department of Transportation ITS Joint Program Office would like to invite members of the University Transportation Center community to share insights and perspectives on current and future transportation trends and opportunities. Please join us for the following webinars to participate in discussions about existing connected vehicle research programs and share your perspective on the implications and uses of the abundance of data available to travelers and state and local governments.	1.5 PDH	www.pcb.its.dot.gov/t3/s120517_new_analytics.asp	Member of University Transportation Centers	No Cost	Webinar
USDOT	**ITS Architecture, the ARC-IT software toolset, and Systems Engineering**	Basic		U.S. DOT offers training courses and workshops related to ITS Architecture, the ARC-IT software toolset, and Systems Engineering. Delivery options range from convenient web-based training for individuals to facilitated workshops for one or more regions. Select a course/workshop to learn more about it.	Varied PDH	local.iteris.com/arc-it/html/resources/training.html		No Cost	Web Based

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USDOT	**National Connected Vehicle Field Infrastructure Footprint**	Basic	1.5 hours	The Footprint Analysis project team has developed a preliminary general concept of a national connected vehicle (CV) field infrastructure footprint. The team was co-led by the Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO), in cooperation with partners in the CV field. The Footprint Analysis helped the team to conceptualize a policy foundation for the CV environment, including a set of desired outcomes.	1.5 PDH	www.pcb.its.dot.gov/t3/s140522_cv_footprint_analysis.asp	Highway managers, including local, State, and Federal, and others interested in the development, deployment, or use of vehicle-to-infrastructure (V2I) applications Suppliers of roadside equipment used in V2I communications State ITS coordinators Industry representatives (CVO, rail, telecom, transit, environment, weather, aftermarket devices, OEMs, security, privacy) Consultants/contrac	No Cost	Webinar
USDOT	**Network-Wide Impacts of Connected Vehicles on Mobility: An Agent-Based Modeling Approach**	Basic	1 hour	Part one of the webinar will focus on the mobility impacts of a connected vehicle environment, pursuing an agent-based modeling approach, especially in a mixed environment with various CV market penetration levels. The main applications of this research are two-fold. The first is understanding the traffic flow characteristics of a mixed environment, simulating a highway corridor with a specific speed reduction zone and considering different levels of CV market penetration to assess the impacts through analyzing the shockwave propagation, travel trajectories, and queuing characteristics. Second is to understand the benefits of CV communications in a network routing optimization context with specific travel patterns. Both applications focus on marking the critical thresholds of CV market penetration; that is, when its impact on system performance becomes noticeable, and examining the corresponding effectiveness of the system at each stage of the transition period.	1.0 PDH	https://www.pcb.its.dot.gov/t3/s160616_Network-Wide_Impacts_of_Connected_Vehicles_on_Mobility.aspx	The target audience of this webinar will include researchers and transportation planners who are interested in traffic flow modeling and the mobility impacts of connected vehicle technology in the transition phase.	No Cost	Webinar
USDOT	**Performance Measures and Benefit-Cost Analysis for Weather Responsive Traffic Management**	Basic	1.5 hours	This webinar will present current experiences in measuring and assessing the performance of traffic management strategies during adverse weather. It will highlight experiences from two State DOTs that are seeking to develop innovative performance measurement programs. A presentation on a benefit-cost approach of weather responsive traffic management will conclude the webinar.	1.5 PDH	www.pcb.its.dot.gov/t3/s140708_its_weather_responsive.asp	The target audience for this webinar includes State and city Department of Transportation staff who are involved in economic analysis, planning, traffic management, operations and maintenance of the transportation system, and others interested in these topics.	No Cost	Webinar

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
USDOT	**Using Mobile Data for Weather Responsive Traffic and Maintenance Management**	Basic	1.5 hours	This webinar will present three projects the FHWA RWMP is doing with State transportation agencies to improve their mobile data collection approaches, as well as their decision-support capabilities for traffic management and maintenance management when weather affects the roads. The WRTM applications using mobile data developed in Wyoming, South Dakota, and Michigan will provide information and guidance to other agencies that are interested in implementing similar technologies and systems for traffic operations and maintenance management during adverse weather.	1.5 PDH	www.pcb.its.dot.gov/t3/s150326_WRTM.asp	The target audience for this webinar includes State and local/city transportation agency personnel who are involved in traffic management, safety management, operations, and maintenance of the transportation system. This webinar will also benefit other practitioners and professionals who are interested in this topic.	No Cost	Webinar
USDOT	**Next Generation Traveler Information System**	Basic	1.5 hours	The purpose of the webinar is to present a recently completed project called "Next Generation Traveler Information System: A Five Year Outlook." The webinar will identify current and emerging technologies in traveler information systems for the next five years. It will also provide recommendations to transportation agencies for proactively addressing technology advancements, changes in traveler information business models and decisions, and public expectations as they occur, as well as provide recommendations for further research.	1.5 PDH	www.pcb.its.dot.gov/t3/s150923_nextgen_traveler_info_service.asp	Transit operations and customer information managers, developers of transit applications, consultants, vendors, academia, government officials, including those in local, state, and Federal Departments of Transportation (DOTs), and any other individuals or entities involved in the design, procurement, deployment, integration, management, or evaluation of ITS and traveler information technologies	No Cost	Webinar

Organization	Program/Course Name	Level	Time Period	Description	Credentials Earned	Website	Target Audience	Fees	Delivery Method
USDOT	**Transit Safety and Mobility Applications in a Connected Vehicle World**	Basic	1.5 hours	This T3 Webinar will provide an overview of the two projects, description of the applications, results, and lessons learned, and objectives of the independent evaluations. Steve Mortensen and Ronald Boenau of the FTA Office of Research, Demonstration, and Innovation will provide opening remarks and an overview of the Department's transit connected vehicle safety and mobility research. David Valentine of Battelle will then provide a presentation on the TRP project, followed by Thomas Timcho of Battelle who will provide a presentation on the IDTO project. U.S. DOT and the presenters will then take questions from the audience.	1.5 PDH	www.pcb.its.dot.gov/t3/s140514_cv_transit_apps.asp	Transit agencies and other transportation services providers, State DOT and MPO ITS program managers and engineers, Consultants and vendors, government officials	No Cost	Webinar
USDOT	**ITS Standards Training Module: Vehicle-to-Infrastructure (V2I) ITS Standards for Project Managers**	Introductory	1.73 hours	This module provides an introduction to the connected vehicle environment and a description of the potential benefits and capabilities of a Vehicle-to-Infrastructure (V2I) environment. The module presents several V2I safety, mobility, and environmental applications and discusses the types of information that may be exchanged between the different devices that make up the V2I environment. The module then presents the ITS Standards that help support the deployment of a V2I application and a V2I infrastructure. The module also introduces some of the challenges to designing and implementing a V2I infrastructure, and provides some strategies and approaches to deploying the V2I infrastructure.		www.pcb.its.dot.gov/StandardsTraining/Modules.aspx?ModuleID=68	Private and Public Sector Users including Manufacturers Procurement Managers/Decision Makers Public Sector Project Managers		Webinar

Appendix D. Example TSMO Position Descriptions

Traffic Data Scientist/Statistician

<table>
<tr><td>Job Title:</td><td>Traffic Data Scientist / Statistician</td><td rowspan="2">Job Category:</td><td rowspan="2">☐Management
☐Engineering
☐Specialist
☒Systems and Data Management</td></tr>
<tr><td>Minimum Years of Experience/Position Level:</td><td>0-5 Years/Entry-Level</td></tr>
<tr><td>Applicable to:</td><td colspan="2">☒DOT
☒County
☒City</td><td>☐MPO
☒Private
☒Toll Agency</td></tr>
<tr><td colspan="4">General Summary of Position / Purpose of Position</td></tr>
<tr><td colspan="4">The Traffic Data Scientist/Statistician is responsible for extracting, organizing, integrating, analyzing, and communicating information obtained from a variety of traffic and/or toll data sources. The purpose of this role is to develop predictive analytics and performance measures, to enhance the planning process, and to enable data driven decision-making for the Transportation System Management and Operations (TSMO) Office. The successful candidate will possess strong technical skills for grappling with big data, the ability to communicate with diverse groups of stakeholders to share information and provide guidance for technical decisions, and the curiosity to examine current practices and push the department toward new and better ways of thinking. The overall vision is that the Traffic Data Scientist/Statistician will enable new approaches to solving traffic/transportation problems to improve safety, system efficiency and quality of life in our community.</td></tr>
</table>

Roles and Responsibilities	
1.0 Technical	**% of Time**
1.1 Leverage strong foundational analytical skills (e.g. programming, statistical analysis) to develop a data management and utilization work plan. 1.2 Establish protocols and develop robust data sets through coordinated extraction and integration of multiple data sources. 1.3 Support development and implementation of data management, data sharing, and data use policies and protocols. 1.4 Manipulate and analyze big data to develop trends and summary statistics. 1.5 Develop spatial databases (GIS) and relevant spatial analyses and statistics. 1.6 Provide guidance to the organization with respect to structuring and preparing internal data sets for usage within GIS-based systems, as well as identifying and recommending public and/or commercial datasets. 1.7 Effectively use GIS and other analytical tools such as Excel, SPSS/STATA, traffic simulation and signal timing software (e.g. VISSIM, CORSIM, Synchro), etc., to create information from data that can enhance decision-making. 1.8 Participate on committees, task teams and in other groups as needed. 1.9 Oversee lead team / group activity, documenting results and related presentations as necessary. 1.10 Act as a technical advisor on the use of traffic engineering and intelligent transportation system (ITS) data, standards, policies and best practices to other departments, local governments, and agencies. 1.11 Carry out geospatial duties.	60%
2.0 Customer Service	**% of Time**
2.1 Participate in meetings, on committees, task teams and other groups with internal and external customers to support TSMO interests and provide technical guidance related to traffic data/analysis. 2.2 Provide accurate and timely responses to the public, contractors, and other department personnel.	20%

2.3 Promote good public relations with internal and external stakeholders while adhering to internal policies. 2.4 Communicate effectively (strong written and verbal communication skills) and work well with team members from diverse technical backgrounds.	
3.0 Project Management	**% of Time**
3.1 Develop and manage data acquisition and analysis portions of consultant contracts and other types of agreements that support TSMO functions and/or relate to performance targets. 3.2 Develop documentation for data acquisition and analysis in contract funding, request for proposal (RFP) and related documents, and participate on technical review committees (TRC).	10%
4.0 Strategic Planning	**% of Time**
4.1 Develop and implement data acquisition/use aspects of TSMO business and related plans to guide resource allocation and achieve unit performance targets. 4.2 Collaborate with others in plan development, reporting plan results, linking performance targets to specific, measurable, achievable, relevant, time-bound, (SMART) objectives in staff expectations, identifying and making resource recommendations. 4.3 Develop data-driven support to ensure funding and resources are utilized in the most cost effective and beneficial manner. 4.4 Ensure the most current program elements, performance measures and functions are being implemented based on state of the art in traffic data science/management.	5%
5.0 Other	**% of Time**
5.1 Perform other duties as required.	5%
Education	
☐High School Degree ☐Technical Degree/Associate Degree ☐Bachelor's Degree in Related Field ☐Bachelor's Degree in Engineering ☐Bachelor's Degree in Computer science ☐Bachelor's Degree in Business ☐Bachelor's Degree in Environmental science ☒Bachelor's Degree in Science, Economics, Statistics, or another Quantitative Field ☐Master's Degree in Engineering ☐Master's Degree in Engineering (preferred but not required) ☒Master's Degree in Quantitative Field (preferred but not required) ☐PhD in Civil Engineering, Transportation Engineering, Electrical or Computer Engineering, Computer Science, or related field (preferred but not required)	
Certificates, Licenses, Registrations	
☐Registered Engineer in Training ☐Registered Professional Engineer ☐Professional Traffic Operations Engineer ☐Certified Information Systems Security Professional	

TSMO Manager/Chief/Bureau Director

Job Title:	TSMO Manager / Chief / Director	**Job Category:**	☒Management ☐Engineering ☐Specialist ☐Systems and Data Management
Minimum Years of Experience/Position Level:	10 or More Years/Senior-Level		
Applicable to:	☒DOT ☒County ☒City		☒MPO ☐Private ☒Toll Agency

General Summary of Position / Purpose of Position
Responsible for the planning, development, and administration of the Transportation System Management and Operations (TSMO) Program designed to reduce congestion and improve the safety, security, mobility, and efficient utilization of existing highway system.

Roles and Responsibilities	
1.0 Managerial	**% of Time**
1.1 Direct and supervises staff. 1.2 Meet regularly with employees to assign work, establish work objective and timelines to ensure working objectives are met. 1.3 Evaluate employees' performance, during established time frames, throughout the year and at formal review periods. 1.4 Motivate and train and/or ensure required training is available for staff. 1.5 Communicate regularly with direct reports, both individually and in staff meetings. 1.6 Develop and apply policies and procedures that support the advancement of TSMO in the daily activities of the agency. 1.7 Ensure that all the paperwork required for processing pay documents and human resource matters, including performance appraisals, disciplinary actions, filing vacant positions and separations, are completed accurately and processed in a timely manner.	20%
2.0 Strategic Planning	**% of Time**
2.1 Combine systems management, technology, traffic engineering, and operations into an integrated program designed to improve safety and mobility through innovative strategies. 2.2 Develop a TSMO Strategic Plan to set priorities, focus energy and resources, strengthen operations, ensure that employees are working toward common goals, establish agreement around intended outcomes/results, and assess and adjust the organization's direction in response to a changing environment as needed. 2.3 Collaborate with others in plan development, linking performance targets to specific, measurable, achievable, relevant, time-bound, (SMART) objectives, identifying and making resource recommendations. 2.4 Ensure funding and resources are utilized in the most cost effective and beneficial manner. 2.5 Ensure the most current program elements, performance measures and functions are being implemented. 2.6 Develop TSMO policy and procedures for use across the organization. 2.7 Interpret federal, state, county, and city laws and their impact to agency operations, including policy development.	30%
3.0 Customer Service	**% of Time**
3.1 Participate in meetings, on committees, task teams and other groups with internal and external customers to represent TSMO interests. 3.2 Maintain professional contact with elected officials, private companies, public, government agencies, and officials doing business with the agency.	20%

3.3 Promote good public relations with the persons contacted while adhering internal policies. 3.4 Provide accurate and timely responses to the public, contractors, and other department personnel. 3.5 Promote the resolution of outstanding technical and contractual issues. 3.6 Communicate effectively (strong written and verbal communication skills) and work well with team members from diverse technical backgrounds.	
4.0 Project Management	**% of Time**
4.1 Develop and manage consultant contracts and other types of agreements that support TSMO functions and/or relate to performance targets. 4.2 Develop documentation for contract funding, request for proposal (RFP) and related documents, participation on technical review committees (TRC), evaluation of contract work products, consultant evaluation and invoice processing approval.	10%
5.0 Technical	**% of Time**
5.1 Act as a technical advisor on the use of traffic engineering, intelligent transportation system (ITS), and tolling standards, policies and best practices to other departments, local governments, and agencies. 5.2 Participate on committees, task teams and in other groups as needed. 5.3 Oversee lead team / group activity, documenting results and related presentations as necessary.	5%
6.0 Other	**% of Time**
6.1 Perform other duties as required.	5%

Education
☐High School Degree ☐Technical Degree/Associate Degree ☒Bachelor’s Degree in Related Field ☐Bachelor’s Degree in Engineering ☐Bachelor’s Degree in Computer science ☐Bachelor’s Degree in Business ☐Bachelor’s Degree in Environmental science ☐Bachelor’s Degree in Science, Economics, Statistics, or another Quantitative Field ☐Master’s Degree in Engineering ☒Master’s Degree in Engineering (preferred but not required) ☐Master’s Degree in Quantitative Field (preferred but not required) ☐PhD in Civil Engineering, Transportation Engineering, Electrical or Computer Engineering, Computer Science, or related field (preferred but not required)

Certificates, Licenses, Registrations
☐Registered Engineer in Training ☐Registered Professional Engineer ☐Professional Traffic Operations Engineer ☐Certified Information Systems Security Professional

TSMO Program Manager

Job Title:	TSMO Program Manager	Job Category:	☒Management ☐Engineering ☐Specialist ☐Systems and Data Management
Minimum Years of Experience/Position Level:	10 or More Years/Senior-Level		
Applicable to:	☒DOT ☒County ☒City		☒MPO ☐Private ☒Toll Agency

General Summary of Position / Purpose of Position
This position is a professional, licensed transportation engineer that provides advanced engineering and technical guidance for the Transportation System Management and Operations (TSMO) Office.

Roles and Responsibilities	
1.0 Managerial	**% of Time**
1.1 Direct and supervise staff. 1.2 Meet regularly with employees to assign work, establish work objective and timelines to ensure working objectives are met. 1.3 Evaluate employees' performance, during established time frames, throughout the year and at formal review periods. 1.4 Motivate and train and/or ensure required training is available for staff. 1.5 Communicate regularly with direct reports, both individually and in staff meetings. 1.6 Develop and apply policies and procedures that support the advancement of TSMO in the daily activities of the agency. 1.7 Ensure that all the paperwork required for processing pay documents and human resource matters, including performance appraisals, disciplinary actions, filing vacant positions and separations, are completed accurately and processed in a timely manner.	20%
2.0 Strategic Planning	**% of Time**
2.1 Execute the Statewide TSMO Strategic Plan. 2.2 Develop and implement TSMO business and related plans to guide resource allocation and achieve unit performance targets. 2.3 Collaborate with others in plan development, reporting plan results, linking performance targets to specific, measurable, achievable, relevant, time-bound, (SMART) objectives in staff expectations, identifying and making resource recommendations. 2.4 Ensure funding and resources are utilized in the most cost effective and beneficial manner. 2.5 Ensure the most current program elements, performance measures and functions are being implemented.	20%
3.0 Customer Service	**% of Time**
3.1 Participate in meetings, on committees, task teams and other groups with internal and external customers to represent TSMO interests. 3.2 Maintain professional contact with elected officials, private companies, public, government agencies, and officials doing business with the State. 3.3 Promote good public relations with the persons contacted while adhering internal policies. 3.4 Provide accurate and timely responses to the public, contractors, and other department personnel. 3.5 Promote the resolution of outstanding technical and contractual issues. 3.6 Communicate effectively (strong written and verbal communication skills) and work well with team members from diverse technical backgrounds.	20%
4.0 Project Management	**% of Time**

4.1 Develop and manage consultant contracts and other types of agreements that support TSMO functions and/or relate to performance targets. 4.2 Develop documentation for contract funding, request for proposal (RFP) and related documents, participation on technical review committees (TRC), evaluation of contract work products, consultant evaluation and invoice processing approval.	20%
5.0 Technical	**% of Time**
5.1 Act as a technical advisor on the use of traffic engineering, intelligent transportation system (ITS), and tolling standards, policies and best practices to other departments, local governments, and agencies. 5.2 Advocate for the appropriate traffic engineering countermeasures during the planning, design and construction phase of highway projects as appropriate. 5.3 Participate on committees, task teams and in other groups as needed. 5.4 Oversee lead team / group activity, documenting results and related presentations as necessary. 5.5 Sign and seal technical reports, specifications, documents, etc. as required.	20%
6.0 Other	**% of Time**
6.1 Perform other duties as required.	5%

Education
☐High School Degree ☐Technical Degree/Associate Degree ☐Bachelor’s Degree in Related Field ☒Bachelor’s Degree in Engineering ☐Bachelor’s Degree in Computer Science ☐Bachelor’s Degree in Business ☐Bachelor’s Degree in Environmental Science ☐Bachelor’s Degree in Science, Economics, Statistics, or another Quantitative Field ☐Master’s Degree in Engineering ☒Master’s Degree in Engineering (preferred but not required) ☐Master’s Degree in Quantitative Field (preferred but not required) ☐PhD in Civil Engineering, Transportation Engineering, Electrical or Computer Engineering, Computer Science, or related field (preferred but not required)
Certificates, Licenses, Registrations
☐Registered Engineer in Training ☒Registered Professional Engineer ☐Professional Traffic Operations Engineer ☐Certified Information Systems Security Professional

Computer Engineer

<table>
<tr><td>Job Title:</td><td>Computer Engineer</td><td rowspan="2">Job Category:</td><td rowspan="2">☐Management
☒Engineering
☐Specialist
☐Systems and Data Management</td></tr>
<tr><td>Minimum Years of Experience/Position Level:</td><td>5-10 Years/Mid-Level</td></tr>
<tr><td>Applicable to:</td><td colspan="2">☒DOT
☒County
☒City</td><td>☒MPO
☒Private
☒Toll Agency</td></tr>
<tr><td colspan="4">General Summary of Position / Purpose of Position</td></tr>
<tr><td colspan="4">This position is a professional, licensed engineering specialist that provides advanced engineering and technical guidance for computer systems used in Transportation System Management and Operations (TSMO).</td></tr>
</table>

Roles and Responsibilities	
1.0 Managerial	**% of Time**
1.1 Direct and supervise staff. 1.2 Meet regularly with employees to assign work, establish work objective and timelines to ensure working objectives are met. 1.3 Evaluate employees' performance, during established time frames, throughout the year and at formal review periods. 1.4 Motivate and train and/or ensure required training is available for staff. 1.5 Communicate regularly with direct reports, both individually and in staff meetings.	10%
2.0 Strategic Planning	**% of Time**
2.1 Develop and maintain plans for the organization's TSMO computer systems including inventories, architectures, technical information, application documentation, proposed projects, funding and timelines. 2.2 Collaborate with others related to overall TSMO planning. 2.3 Ensure computer system funding and resources are utilized in the most cost effective and beneficial manner. 2.4 Ensure the most current program elements, performance measures and functions are being implemented for computer systems.	15%
3.0 Customer Service	**% of Time**
3.1 Participate in meetings, on committees, task teams and other groups with internal and external customers to represent TSMO interests related to computer systems. 3.2 Maintain professional contact with elected officials, private companies, public, government agencies, and officials doing business with the State related to computer systems. 3.3 Promote good public relations with the persons contacted while adhering internal policies. 3.4 Provide accurate and timely responses to the public, contractors, and other department personnel. 3.5 Promote the resolution of outstanding technical and contractual issues. 3.6 Communicate effectively (strong written and verbal communication skills) and work well with team members from diverse technical backgrounds. 3.7 Coordinate with agency information technology (IT) staff whether within agency or separate state agency.	10%
4.0 Project Management	**% of Time**
4.1 Develop and manage internal work orders for system improvements performed by internal staff.	20%

4.2 Develop and manage consultant contracts and other types of agreements that support TSMO functions and/or relate to performance targets. 4.3 Develop documentation for contract funding, request for proposal (RFP) and related documents, participation on technical review committees (TRC), evaluation of contract work products, consultant evaluation and invoice processing approval.	
5.0 Technical	**% of Time**
5.1 Act as a technical advisor on computer systems that support the TSMO program. These include user workstations, servers, data networks, TSMO applications, support applications, operating systems, device firmware, various data network technologies and topographies, may include knowledge of legacy systems and others. Supports the operations and maintenance of these systems. 5.2 Design computer systems and related software applications that support TSMO systems such as closed-circuit television, count and speed detection stations, dynamic message signs, weather stations, traffic signal systems, tolling, connected and automated vehicles, and others. 5.3 Collaborate with other technical staff such as Information Technology to assure system compatibility, operability, interoperability, and synchronization with other computer related planning and improvement efforts. 5.4 Participate on committees, task teams and in other groups as needed. 5.5 Oversee lead team / group activity, documenting results and related presentations as necessary. 5.6 Sign and Seal technical reports, plans, specifications, documents, etc. as required.	40%
6.0 Other	**% of Time**
6.1 Perform other duties as required.	5%

Education
☐High School Degree ☐Technical Degree/Associate Degree ☐Bachelor's Degree in Related Field ☒Bachelor's Degree in Engineering; or ☒Bachelor's Degree in Computer Science ☐Bachelor's Degree in Business ☐Bachelor's Degree in Environmental Science ☐Bachelor's Degree in Science, Economics, Statistics, or another Quantitative Field ☐Master's Degree in Engineering ☐Master's Degree in Engineering (preferred but not required) ☐Master's Degree in Quantitative Field (preferred but not required) ☐PhD in Civil Engineering, Transportation Engineering, Electrical or Computer Engineering, Computer Science, or related field (preferred but not required)

Certificates, Licenses, Registrations
☐Registered Engineer in Training ☒Registered Professional Engineer ☐Professional Traffic Operations Engineer ☐Certified Information Systems Security Professional

Artificial Intelligence Scientist

<table>
<tr><td>Job Title:</td><td>Artificial Intelligence Scientist</td><td rowspan="2">Job Category:</td><td rowspan="2">☐Management
☐Engineering
☒Specialist
☐Systems and Data Management</td></tr>
<tr><td>Minimum Years of Experience/Position Level:</td><td>5-10 Years/Mid-Level</td></tr>
<tr><td>Applicable to:</td><td colspan="2">☒DOT
☒County
☒City</td><td>☒MPO
☒Private
☒Toll Agency</td></tr>
<tr><td colspan="4">General Summary of Position / Purpose of Position</td></tr>
<tr><td colspan="4">The Artificial Intelligence (AI) Scientist will lead selection and development of next generation AI/machine learning (ML) enabled Internet of Things (IoT) solutions for traffic systems operations and management / intelligent transportation system (ITS). Areas of focus include traffic data analysis, traffic flow theory, traffic signal operation/control, traffic network management, tolling and connected and automated vehicles (CAV). The successful candidate will apply analytics, artificial intelligence, machine learning, big data, IoT, and cloud technologies knowledge in creating the foundations for the next generation smart and cloud connected systems and services that will transform our multi-modal transportation system toward a more sustainable and safer environment. This position provides a unique opportunity to shape the department's innovation agenda and make a difference through advanced technologies.</td></tr>
</table>

Roles and Responsibilities	
1.0 Technical	**% of Time**
1.1 Effectively use programming/simulation skills to enhance traffic system management and performance capabilities. 1.2 Apply and integrate AI and ML techniques to solve complex TSMO problems. 1.3 Develop cyber security protocols and monitoring systems. 1.4 Test and develop/implement continuous improvement processes for transportation system hardware and software. 1.5 Participate on committees, task teams and in other groups as needed. 1.6 Oversee lead team / group activity, documenting results and related presentations as necessary. 1.7 Act as a technical advisor on the development of traffic engineering, ITS, tolling, standards, policies and best practices to other departments, local governments, and agencies.	50%
2.0 Strategic Planning	**% of Time**
2.1 Develop ITS aspects of TSMO business and related plans to guide resource allocation and achieve unit performance targets. 2.2 Collaborate with others in plan development, reporting plan results, linking performance targets to specific, measurable, achievable, relevant, time-bound, (SMART) objectives in staff expectations, identifying and making resource recommendations. 2.3 Develop data-driven support to ensure funding and resources are utilized in the most cost effective and beneficial manner. 2.4 Define and drive a technical and strategic vision for integrating ML/AI into all aspects of TSMO practice.	20%
3.0 Project Management	**% of Time**
3.1 Develop and manage ITS-related portions of consultant contracts and other types of agreements that support TSMO functions and/or relate to performance targets. 3.2 Develop documentation for ITS/TSMO in contract funding, request for proposal (RFP) and related documents, and participate on technical review committees (TRC). 3.3 Participate in acceptance testing for applicable systems.	15%

4.0 Customer Service	% of Time
4.1 Participate in meetings, on committees, task teams and other groups with internal and external customers to support TSMO interests and provide technical guidance. 4.2 Provide accurate and timely responses to the public, contractors, and other department personnel. 4.3 Promote good public relations with internal and external stakeholders while adhering to internal policies. 4.4 Communicate effectively (strong written and verbal communication skills) and work well with team members from diverse technical backgrounds. 4.5 Communicate effectively (strong written and verbal communication skills) and work well with team members from diverse technical backgrounds.	10%
5.0 Other	**% of Time**
5.1 Perform other duties as required.	5%

Education
☐High School Degree ☐Technical Degree/Associate Degree ☐Bachelor's Degree in Related Field ☒Bachelor's Degree in Engineering; or ☒Bachelor's Degree in Computer Science; or ☒Bachelor's Degree in Business; or ☐Bachelor's Degree in Environmental Science ☒Bachelor's Degree in Science, Economics, Statistics, or another Quantitative Field ☒Master's Degree in Engineering ☐Master's Degree in Engineering (preferred but not required) ☐Master's Degree in Quantitative Field (preferred but not required) ☒PhD in Civil Engineering, Transportation Engineering, Electrical or Computer Engineering, Computer Science, or related field (preferred but not required)
Certificates, Licenses, Registrations
☐Registered Engineer in Training ☐Registered Professional Engineer ☐Professional Traffic Operations Engineer ☐Certified Information Systems Security Professional

Telecommunications Engineer

Job Title:	Telecommunications Engineer	**Job Category:**	☐Management ☒Engineering ☐Specialist ☐Systems and Data Management
Minimum Years of Experience/Position Level:	5-10 Years/Mid-Level		
Applicable to:	☒DOT ☒County ☒City		☐MPO ☒Private ☒Toll Agency
General Summary of Position / Purpose of Position			
This position is a engineering specialist that provides advanced engineering and technical guidance for telecommunications systems used in Transportation System Management and Operations (TSMO).			

Roles and Responsibilities

1.0 Managerial	**% of Time**
1.1 Direct and supervise staff. 1.2 Meet regularly with employees to assign work, establish work objective and timelines to ensure working objectives are met. 1.3 Evaluate employees' performance, during established time frames, throughout the year and at formal review periods. 1.4 Motivate and train and/or ensure required training is available for staff. 1.5 Communicate regularly with direct reports, both individually and in staff meetings.	10%
2.0 Strategic Planning	**% of Time**
2.1 Develop and maintain strategic plans for the organization's TSMO telecommunications systems including inventories, architectures, technical information, proposed projects, funding and timelines. 2.2 Collaborate with others related to overall TSMO planning. 2.3 Ensure telecommunications funding and resources are utilized in the most cost effective and beneficial manner. 2.4 Ensure the most current program elements, performance measures and functions are being implemented for telecommunications systems.	15%
3.0 Customer Service	**% of Time**
3.1 Participate in meetings, on committees, task teams and other groups with internal and external customers to represent TSMO interests related to telecommunications. 3.2 Maintain professional contact with elected officials, private companies, public, government agencies, and officials doing business with the State related to telecommunications. 3.3 Promote good public relations with the persons contacted while adhering internal policies. 3.4 Provide accurate and timely responses to the public, contractors, and other department personnel. 3.5 Promote the resolution of outstanding technical and contractual issues. 3.6 Communicate effectively (strong written and verbal communication skills) and work well with team members from diverse technical backgrounds.	10%
4.0 Project Management	**% of Time**
4.1 Develop and manage internal work orders for system improvements performed by internal staff. 4.2 Develop and manage consultant contracts and other types of agreements that support TSMO functions and/or relate to performance targets.	20%

4.3 Develop documentation for contract funding, request for proposal (RFP) and related documents, participation on technical review committees (TRC), evaluation of contract work products, consultant evaluation and invoice processing approval.	
5.0 Technical	**% of Time**
5.1 Act as a technical advisor on telecommunications systems that support the TSMO program. These include fiber optic systems, wireless systems, leased telecommunications and others. Support the operations and maintenance of these systems. Telecommunications systems may include technologies such as Internet Protocol (IP), Dedicated Short Range Communications (DSRC), cellular data systems, various data network technologies and topographies, various wireless and wireline data technologies, and may include knowledge of legacy systems. 5.2 Design telecommunications systems that support TSMO systems such as closed-circuit television, count and speed detection stations, dynamic message signs, tolling, weather stations, traffic signal systems, connected and automated vehicles (CAV) and others. 5.3 Collaborate with other technical staff such as Information Technology to assure system compatibility, operability, interoperability, and synchronization with other telecommunications planning and improvement efforts. 5.4 Participate on committees, task teams and in other groups as needed. 5.5 Oversee lead team / group activity, documenting results and related presentations as necessary. 5.6 Sign and seal technical reports, plans, specifications, documents, etc. as required. 5.7 Connect agency's systems as needed/applicable.	40%
6.0 Other	**% of Time**
6.1 Perform other duties as required.	5%

Education
☐High School Degree ☐Technical Degree/Associate Degree ☐ Bachelor's Degree in Related Field ☒Bachelor's Degree in Engineering ☐Bachelor's Degree in Computer Science ☐Bachelor's Degree in Business ☐Bachelor's Degree in Environmental Science ☐Bachelor's Degree in Science, Economics, Statistics, or another Quantitative Field ☐Master's Degree in Engineering ☐Master's Degree in Engineering (preferred but not required) ☐Master's Degree in Quantitative Field (preferred but not required) ☐PhD in Civil Engineering, Transportation Engineering, Electrical or Computer Engineering, Computer Science, or related field (preferred but not required)

Certificates, Licenses, Registrations
☐Registered Engineer in Training ☐Registered Professional Engineer ☐Professional Engineer Traffic Operations Engineer ☐Certified Information Systems Security Professional

Data Management Specialist

<table>
<tr><td>Job Title:</td><td>Data Management Specialist</td><td rowspan="2">Job Category:</td><td rowspan="2">☐Management
☐Engineering
☒Specialist
☒Systems and Data Management</td></tr>
<tr><td>Minimum Years of Experience/Position Level:</td><td>5-10 Years/Mid-Level</td></tr>
<tr><td>Applicable to:</td><td colspan="2">☒DOT
☒County
☒City</td><td>☒MPO
☒Private
☒Toll Agency</td></tr>
<tr><td colspan="4">General Summary of Position / Purpose of Position</td></tr>
<tr><td colspan="4">The Data Management Specialist is responsible for using a wide variety of information, knowledge, and tools to develop, modify, and administer databases used to store and retrieve data and to develop standards for the handling of data. This work often involves difficult and complex problems in the administration of databases, in the modification of data elements, retrieval, and reporting of information from the databases, and insuring the security of data. The role requires the ability to lead projects related to data management and to work across disciplines.</td></tr>
<tr><td colspan="4">Roles and Responsibilities</td></tr>
</table>

1.0 Technical	**% of Time**
1.1 Develop, design, and maintain agency databases. 1.2 Develop file organization, indexing methods, and security procedures for data access and development and ensure compliance with data management standards. 1.3 Develop data dictionaries, data models, metadata repositories, and other data management tools. 1.4 Generate complex queries and reports 1.5 Develop, implement, and maintain database back-up and recovery procedures and ensure data integrity, security, recoverability is built into the DOT's processes and applications. 1.6 Perform a wide range of database administration functions, including running test queries, troubleshooting database problems, maintaining version control of database entities, advising customers on new database features, and leading studies to evaluate the effectiveness of current database methods and procedures. 1.7 Ensure agency is remaining in line with state of practice regarding performance, security, and data management techniques. 1.8 Participate on committees, task teams and in other groups as needed, providing technical expertise and support for evaluating and recommending data management products. 1.9 Oversee lead team / group activity, documenting results and related presentations as necessary. 1.10 Act as a technical advisor on the use of traffic engineering, intelligent transportation system data, tolling data, standards, policies and best practices to other departments, local governments, and agencies.	65%

2.0 Customer Service	**% of Time**
2.1 Participate in meetings, on committees, task teams and other groups with internal and external customers to support TSMO interests and provide technical guidance related to traffic data management. 2.2 Provide accurate and timely responses to the public, contractors, and other department personnel. 2.3 Promote good public relations with internal and external stakeholders while adhering to internal policies. 2.4 Communicate effectively (strong written and verbal communication skills) and work well with team members from diverse technical backgrounds.	15%

3.0 Project Management	% of Time
Lead the implementation of data management projects across divisions, but particularly those related to TSMO. Develop documentation for data acquisition and management in contract funding, request for proposal (RFP) and related documents, and participate on technical review committees (TRC).	15%
4.0 Other	**% of Time**
4.1 Perform other duties as required.	5%

Education
☐High School Degree ☐Technical Degree/Associate Degree ☐ Bachelor's Degree in Related Field ☒Bachelor's Degree in Engineering; or ☒Bachelor's Degree in Computer Science; or ☒Bachelor's Degree in Business ☐Bachelor's Degree in Environmental Science ☐Bachelor's Degree in Science, Economics, Statistics, or another Quantitative Field ☐Master's Degree in Engineering ☐Master's Degree in Engineering (preferred but not required) ☐Master's Degree in Quantitative Field (preferred but not required) ☐PhD in Civil Engineering, Transportation Engineering, Electrical or Computer Engineering, Computer Science, or related field (preferred but not required)
Certificates, Licenses, Registrations
☐Registered Engineer in Training ☐Registered Professional Engineer ☐Professional Traffic Operations Engineer ☐Certified Information Systems Security Professional

Visualization Specialist

<table>
<tr><td>Job Title:</td><td>Visualization Specialist</td><td rowspan="2">Job Category:</td><td rowspan="2">☐Management
☐Engineering
☒Specialist
☐Systems and Data Management</td></tr>
<tr><td>Minimum Years of Experience/Position Level:</td><td>0-5 Years/Entry-Level</td></tr>
<tr><td>Applicable to:</td><td colspan="2">☒DOT
☒County
☒City</td><td>☒MPO
☒Private
☒Toll Agency</td></tr>
<tr><td colspan="4">General Summary of Position / Purpose of Position</td></tr>
<tr><td colspan="4">This position is a specialist that provides technical guidance, training and support for various visualization tools used in Transportation System Management and Operations (TSMO) including augmented and virtual reality, data visualization, data analytics and others.</td></tr>
<tr><td colspan="4">Roles and Responsibilities</td></tr>
</table>

1.0 Managerial	**% of Time**
1.1 May be a lead worker to other specialists or technicians providing mentoring or training.	5%
2.0 Strategic Planning	**% of Time**
2.1 Collaborate with others related to overall TSMO planning.	15%
3.0 Customer Service	**% of Time**
3.1 Participate in meetings, on committees, task teams and other groups with internal and external customers to represent TSMO interests related to visualization systems. 3.2 Maintain professional contact with elected officials, private companies, public, government agencies, and officials doing business with the State related to visualization systems. 3.3 Promote good public relations with the persons contacted while adhering internal policies. 3.4 Provide accurate and timely responses to the public, contractors, and other department personnel. 3.5 Promote the resolution of outstanding technical and contractual issues. 3.6 Communicate effectively (strong written and verbal communication skills) and work well with team members from diverse technical backgrounds.	10%
4.0 Project Management	**% of Time**
4.1 Coordinate with project managers and other staff to incorporate visualization technology into system development and enhancement projects.	20%
5.0 Technical	**% of Time**
5.1 Act as a technical advisor on visualization systems and tools for TSMO including augmented and virtual reality, data visualization, data analytics and others. Visualization systems and tools may be used to provide training, help end users visualize real time data, performance measures and other TSMO data, such as tolling data. Visualization systems include software, hardware, and other related elements. 5.2 Identify potential added value applications for visualization systems. 5.3 Identify and recommend software and hardware systems for visualization systems. 5.4 Support implementation of visualization systems. 5.5 Collaborate with other technical staff to assure system compatibility and operability with other systems. 5.6 Train users on the use of visualization tools and systems. 5.7 Participate on committees, task teams and in other groups as needed. 5.8 Develop technical reports, presentations, training materials, etc. as required.	45%

6.0 Other	% of Time
6.1 Perform other duties as required.	5%

Education

☐ High School Degree
☒Technical Degree/Associate Degree
☐Bachelor's Degree in Related Field
☐Bachelor's Degree in Engineering
☐Bachelor's Degree in Computer Science
☐Bachelor's Degree in Business
☐Bachelor's Degree in Environmental Science
☐Bachelor's Degree in Science, Economics, Statistics, or another Quantitative Field
☐Master's Degree in Engineering
☐Master's Degree in Engineering (preferred but not required)
☐Master's Degree in Quantitative Field (preferred but not required)
☐PhD in Civil Engineering, Transportation Engineering, Electrical or Computer Engineering, Computer Science, or related field (preferred but not required)

Certificates, Licenses, Registrations

☐Registered Engineer in Training
☐Registered Professional Engineer
☐Professional Engineer Traffic Operations Engineer
☐Certified Information Systems Security Professional

Connected and Automated Vehicles Program Manager

Job Title:	Connected and Automated Vehicles Program Manager	**Job Category:**	☐Management ☐Engineering ☐Specialist ☒Systems and Data Management
Minimum Years of Experience/Position Level:	10 or More Years/Senior-Level		
Applicable to:	☒DOT ☒County ☒City		☒MPO ☒Private ☒Toll Agency

General Summary of Position / Purpose of Position
The Connected and Automated Vehicles (CAV) Program Manager will lead and manage the strategic approach of the DOT to developing an integrated, safe, and efficient CAV system. The role requires creativity, innovation, and a willingness to address a variety of challenges. The successful candidate must be able to communicate effectively with diverse stakeholders and to bring together community partners to create an environment supportive for deployment of state of the art technologies. Knowledge of local and state policies and commitment to driving change in both policy and practice is a requirement.

Roles and Responsibilities

1.0 Technical	**% of Time**
1.1 Develop relevant policies, practices, and procedures for CAV implementation. 1.2 Apply new communication technologies and/or new techniques to improve existing wireless technologies such as DSRC and/or cellular, for safety, mobility, tolling and other transportation related applications, in both real world and closed track testing environment. 1.3 Promote, integrate, and educate internal and external program partners to develop, deliver, and implement a CAV strategic plan. 1.4 Assist pilot deployment program management of CAV with collaboration from device vendors, industry consortiums, universities, or other internal/external stakeholders. 1.5 Participate on committees, task teams and in other groups as needed. 1.6 Oversee lead team / group activity, documenting results and related presentations as necessary. 1.7 Act as a technical advisor on CAV implementation and policy to other departments and represent the DOT in discussions and forums with local governments and national agencies. 1.8 Stay abreast of technological advances and emerging practice so that the DOT is a thought leader in CAV implementation.	50%
2.0 Strategic Planning	**% of Time**
2.1 Develop and implement CAV aspects of TSMO business and related plans to guide resource allocation and achieve unit performance targets. 2.2 Collaborate with others in plan development, reporting plan results, linking performance targets to specific, measurable, achievable, relevant, time-bound, (SMART) objectives in staff expectations, identifying and making resource recommendations. 2.3 Develop data-driven support for CAV implementation to ensure funding and resources are utilized in the most cost effective and beneficial manner. 2.4 Ensure the most current CAV program elements, performance measures and functions are being implemented based on state of the art and practice in CAV.	20%
3.0 Project Management	**% of Time**
3.1 Develop and manage CAV aspects of consultant contracts and other types of agreements that support TSMO functions (relevant to CAV) and/or relate to performance targets.	10%

3.2 Develop documentation for CAV implementation/pilots in contract funding, request for proposal (RFP) and related documents, and participate on technical review committees (TRC).	
4.0 Customer Service	**% of Time**
4.1 Participate in meetings, on committees, task teams and other groups with internal and external customers to support TSMO interests and provide technical guidance related to CAV. 4.2 Provide accurate and timely responses to the public, contractors, and other department personnel. 4.3 Promote good public relations and develop partnerships with internal and external stakeholders while adhering to internal policies. 4.4 Develop public relations and communications plans, training, and education related to CAV for a wide range of stakeholders. 4.5 Communicate effectively (strong written and verbal communication skills) and work well with team members from diverse technical backgrounds.	10%
5.0 Other	**% of Time**
5.1 Perform other duties as required.	5%

Education
☐High School Degree ☐Technical Degree/Associate Degree ☐Bachelor’s Degree in Related Field ☒Bachelor’s Degree in Engineering; or ☒Bachelor’s Degree in Computer Science; or ☒Bachelor’s Degree in Business ☐Bachelor’s Degree in Environmental Science ☐Bachelor’s Degree in Science, Economics, Statistics, or another Quantitative Field ☐Master’s Degree in Engineering ☒Master’s Degree in Engineering (preferred but not required) ☐Master’s Degree in Quantitative Field (preferred but not required) ☐PhD in Civil Engineering, Transportation Engineering, Electrical or Computer Engineering, Computer Science, or related field (preferred but not required)
Certificates, Licenses, Registrations
☐Registered Engineer in Training ☐Registered Professional Engineer ☐Professional Traffic Operations Engineer ☐Certified Information Systems Security Professional

Traffic Incident Management Program Manager

Job Title:	Traffic Incident Management Program Manager (Area/Region)	**Job Category:**	☒Management ☐Engineering ☐Specialist ☐Systems and Data Management
Minimum Years of Experience/Position Level:	5-10 Years/Mid-Level		
Applicable to:	☒DOT ☒County ☒City		☐MPO ☒Private ☒Toll Agency

General Summary of Position / Purpose of Position	
This management position oversees the organization's statewide or regional Traffic Incident Management (TIM) program and provides advanced guidance for TIM operations.	
Roles and Responsibilities	
1.0 Managerial	**% of Time**
1.1 Direct and supervise staff that may include freeway service patrol and other emergency and incident response staff. 1.2 Meet regularly with employees to assign work, establish work objective and timelines to ensure working objectives are met and to ensure that safety practices are being followed. 1.3 Evaluate employees' performance, during established time frames, throughout the year and at formal review periods. 1.4 Provide performance-based management of the TIM program through response and incident data tracking and analysis 1.5 Motivate and train and/or ensure required training is available for staff. 1.6 Communicate regularly with direct reports, both individually and in staff meetings.	20%
2.0 Strategic Planning	**% of Time**
2.1 Collaborate with others to develop and maintain strategic and response plans for TIM. 2.2 Collaborate with others related to overall transportations systems management and operations (TSMO) planning. 2.3 Ensure TIM funding and resources are utilized in the most cost effective and beneficial manner. 2.4 Ensure the most current program elements, performance measures and functions are being implemented for TIM.	15%
3.0 Customer Service	**% of Time**
3.1 Participate in meetings, on committees, task teams and other groups with internal and external customers to represent TSMO interests related to TIM. 3.2 Maintain professional contact with elected officials, private companies, public, federal, local and state government agencies, emergency response agencies, and other officials related to TIM. 3.3 Promote good public relations with the persons contacted while adhering to internal policies. 3.4 Provide accurate and timely responses to the public, contractors, and other department personnel. 3.5 Promote the resolution of outstanding technical and contractual issues. 3.6 Communicate effectively (strong written and verbal communication skills) and work well with team members from diverse technical backgrounds.	10%
4.0 Project Management	**% of Time**

4.1 Assist in the development and management of contracts and other types of agreements that support TIM functions and/or relate to performance targets. 4.2 Assist in the development of documentation for contract funding, request for proposal (RFP) and related documents, participation on technical review committees (TRC), evaluation of contract work products, consultant evaluation and invoice processing approval.	10%
5.0 Technical	**% of Time**
5.1 Act as a technical advisor on the TIM program. This includes incident response practices, incident command protocols, operating procedures, best practices, performance measures, training, safety policies, and other areas related to TIM. 5.2 Provide on-call response to major highway incidents. 5.3 Serve as agency incident commander or unified commander on-scene, as appropriate. 5.4 Train internal and external staff on TIM operating procedures, incident command, equipment operation, materials usage, traffic control and other areas of TIM. 5.5 Participate on committees, task teams and in other groups as needed. 5.6 Oversee and lead team / group activity, documenting results and related presentations as necessary. 5.7 Review technical reports, plans, specifications, documents, etc. as required.	40%
6.0 Other	**% of Time**
6.1 Perform other duties as required.	5%

Education
☐High School Degree ☒Technical Degree/Associate Degree ☒Bachelor's Degree in Related Field ☐Bachelor's Degree in Engineering ☐Bachelor's Degree in Computer Science ☐Bachelor's Degree in Business ☐Bachelor's Degree in Environmental Science ☐Bachelor's Degree in Science, Economics, Statistics, or another Quantitative Field ☐Master's Degree in Engineering ☐Master's Degree in Engineering (preferred but not required) ☐Master's Degree in Quantitative Field (preferred but not required) ☐PhD in Civil Engineering, Transportation Engineering, Electrical or Computer Engineering, Computer Science, or related field (preferred but not required)

Certificates, Licenses, Registrations
☐Registered Engineer in Training ☐Registered Professional Engineer ☐Professional Engineer Traffic Operations Engineer ☐Certified Information Systems Security Professional

Cyber Security Engineer

Job Title:	Cyber Security Engineer	**Job Category:**	☐Management ☐Engineering ☒Specialist ☐Systems and Data Management
Minimum Years of Experience/Position Level:	5-10 Years/Mid-Level		
Applicable to:	☒DOT ☒County ☒City		☐MPO ☒Private ☒Toll Agency

General Summary of Position / Purpose of Position
The Cyber Security Engineer will assist in building cyber security into crucial operations systems to ensure safe TSMO activities. Candidate should be knowledgeable in both commercial and open source information security technology. The ideal candidate will be responsible for the design, development, implementation, and integration of architectures, systems, or system components. This position will ensure that the architecture and design of development and operational systems are functional, secure, and will assist in the development of innovative approaches to drive change in cyber security risk management across the DOT to prevent or minimize disruptions to critical information infrastructure. This position contributes to the assessment of current cyber security systems, policies, and processes to enforce standards and identify vulnerabilities and capability gaps, and to synthesize this data to reduce cyber security risk. Special attention is given to intrusion detection, finding and fixing unprotected vulnerabilities, traceability, compartmentalization, and ensuring that remote access points are well secured.

Roles and Responsibilities

1.0 Technical	**% of Time**
1.1 Lead and execute advanced cyber security risk analysis and examine results of vulnerability analysis and cyber security control compliance in order to perform a detailed risk assessment. 1.2 Interpret information technology (IT) policies, standards, and guidelines. 1.3 Develop cyber security protocols and monitoring systems, managing all aspects of network, operating systems, and systems security. 1.4 Manage the installation and integration of systems fixes, updates, and enhancements. 1.5 Testing and optimizing the functionality of systems, networks, and data. 1.6 Assist with documentation and building cyber into modernization programs. 1.7 Participate on committees, task teams and in other groups as needed. 1.8 Oversee and lead team / group activity, documenting results and related presentations as necessary. 1.9 Act as a technical advisor providing advice and guidance on a wide range and variety of complex IT and cyber security issues.	60%
2.0 Strategic Planning	**% of Time**
2.1 Develop cyber security related plans to guide resource allocation and achieve unit performance targets. 2.2 Collaborate with others in plan development, reporting plan results, linking performance targets to specific, measurable, achievable, relevant, time-bound, (SMART) objectives in staff expectations, identifying and making resource recommendations. 2.3 Develop data-driven support to ensure funding and resources are utilized in the most cost effective and beneficial manner. 2.4 Define and drive a technical and strategic vision for ensuring data and system integrity, minimal risk, and state of the art cyber security protocols for all aspects of TSMO practice.	20%
3.0 Project Management	**% of Time**

3.1 Develop and manage cyber security related portions of consultant contracts and other types of agreements that support TSMO functions and/or relate to performance targets. 3.2 Develop documentation for cyber security functions in contract funding, request for proposal (RFP) and related documents, and participate on technical review committees (TRC). 3.3 Participate in system acceptance testing as needed.	10%
4.0 Customer Service	**% of Time**
4.1 Participate in meetings, on committees, task teams and other groups with internal and external customers to support TSMO interests and provide technical guidance. 4.2 Provide accurate and timely responses to the public, contractors, and other department personnel. 4.3 Promote good public relations with internal and external stakeholders while adhering to internal policies. 4.4 Communicate effectively (strong written and verbal communication skills) and work well with team members from diverse technical backgrounds. 4.5 Coordinate with agency security officer or state security agency.	5%
5.0 Other	**% of Time**
5.1 Perform other duties as required.	5%
Education	
☐High School Degree ☐Technical Degree/Associate Degree ☒Bachelor's Degree in Related Field; or ☒Bachelor's Degree in Engineering; or ☒Bachelor's Degree in Computer Science ☐Bachelor's Degree in Business ☐Bachelor's Degree in Environmental Science ☐Bachelor's Degree in Science, Economics, Statistics, or another Quantitative Field ☐Master's Degree in Engineering ☐Master's Degree in Engineering (preferred but not required) ☐Master's Degree in Quantitative Field (preferred but not required) ☐PhD in Civil Engineering, Transportation Engineering, Electrical or Computer Engineering, Computer Science, or related field (preferred but not required)	
Certificates, Licenses, Registrations	
☐Registered Engineer in Training ☐Registered Professional Engineer ☐Professional Engineer Traffic Operations Engineer ☒Certified Information Systems Security Professional	

Transportation Data Ethicist

<table>
<tr><td>Job Title:</td><td>Transportation Data Ethicist (Area/Region)</td><td rowspan="2">Job Category:</td><td rowspan="2">☐Management
☐Engineering
☒Specialist
☒Systems and Data Management</td></tr>
<tr><td>Minimum Years of Experience/Position Level:</td><td>5-10 Years/Mid-Level</td></tr>
<tr><td>Applicable to:</td><td colspan="2">☒DOT
☒County
☒City</td><td>☒MPO
☒Private
☒Toll Agency</td></tr>
<tr><td colspan="4">General Summary of Position / Purpose of Position</td></tr>
<tr><td colspan="4">This position is a specialist that provides technical guidance, training and support for transportation data ethics related to Transportation System Management and Operations (TSMO). The position requires the ability to apply ethical criteria to make decisions related to data privacy and security, appropriate uses and management of datasets, and to assess risks related to data storage and use.</td></tr>
<tr><td colspan="4">Roles and Responsibilities</td></tr>
<tr><td colspan="3">1.0 Managerial</td><td>% of Time</td></tr>
<tr><td colspan="3">1.1 May be a lead worker to other specialists or technicians providing mentoring or training.</td><td>5%</td></tr>
<tr><td colspan="3">2.0 Strategic Planning</td><td>% of Time</td></tr>
<tr><td colspan="3">2.1 Collaborate with others related to overall TSMO planning.</td><td>10%</td></tr>
<tr><td colspan="3">3.0 Customer Service</td><td>% of Time</td></tr>
<tr><td colspan="3">3.1 Participate in meetings, on committees, task teams and other groups with internal and external customers to represent TSMO interests related to data ethics.
3.2 Maintain professional contact with elected officials, private companies, public, government agencies, and officials doing business with the State related to data ethics.
3.3 Promote good public relations with the persons contacted while adhering internal policies.
3.4 Provide accurate and timely responses to the public, contractors, and other department personnel.
3.5 Promote the resolution of outstanding technical and contractual issues.
3.6 Communicate effectively (strong written and verbal communication skills) and work well with team members from diverse technical backgrounds.</td><td>15%</td></tr>
<tr><td colspan="3">4.0 Project Management</td><td>% of Time</td></tr>
<tr><td colspan="3">4.1 Coordinate with project managers and other staff to incorporate data ethics into system development and enhancement projects.</td><td>20%</td></tr>
<tr><td colspan="3">5.0 Technical</td><td>% of Time</td></tr>
<tr><td colspan="3">5.1 Act as a technical advisor on implementing data ethics related to TSMO. Implementation of data ethics includes both new systems and legacy systems. The transportation data ethicist will be involved in the design and audit of software, hardware, and manual procedures.
5.2 Through collaboration and research, the transportation data ethicist will stay abreast of agency, social and regulatory issues related to data ethics and will understand how the data ethics requirements of outside data sources will impact the TSMO systems.
5.3 Identify policies and best practices related to data ethics.
5.4 Support the development of data management and data sharing policies, processes and protocols.
5.5 Identify and recommend software, hardware, procedures, and best practices for data ethics.
5.6 Collaborate with other technical staff to assure system compatibility with other systems.</td><td>45%</td></tr>
</table>

5.7 Train users on the data ethics. 5.8 Participate on committees, task teams and in other groups as needed. 5.9 Develop technical reports, presentations, training materials, etc. as required.	
6.0 Other	**% of Time**
6.1 Perform other duties as required.	5%

Education
☐High School Degree ☐Technical Degree/Associate Degree ☒Bachelor's Degree in Related Field ☐Bachelor's Degree in Engineering, or ☐Bachelor's Degree in Computer Science ☐Bachelor's Degree in Business ☐Bachelor's Degree in Environmental Science ☐Bachelor's Degree in Science, Economics, Statistics, or another Quantitative Field ☐Master's Degree in Engineering ☐Master's Degree in Engineering (preferred but not required) ☒Master's Degree in Quantitative Field (preferred but not required) ☐PhD in Civil Engineering, Transportation Engineering, Electrical or Computer Engineering, Computer Science, or related field (preferred but not required)

Certificates, Licenses, Registrations
☐Registered Engineer in Training ☐Registered Professional Engineer ☐Professional Engineer Traffic Operations Engineer ☐Certified Information Systems Security Professional

Surface Weather Specialist

Job Title:	Surface Weather Specialist	**Job Category:**	☐Management ☐Engineering ☒Specialist ☐Systems and Data Management
Minimum Years of Experience/Position Level:	5-10 Years/Mid-Level		
Applicable to:	☒DOT ☒County ☒City		☐MPO ☒Private ☒Toll Agency

General Summary of Position / Purpose of Position
This position is a specialist that provides advanced transportation systems management and operations (TSMO) as it relates to weather applications.

Roles and Responsibilities

1.0 Managerial	**% of Time**
1.1 Direct and supervise staff. 1.2 Meet regularly with employees to assign work, establish work objective and timelines to ensure working objectives are met. 1.3 Evaluate employees' performance, during established time frames, throughout the year and at formal review periods. 1.4 Motivate and train and/or ensure required training is available for staff. 1.5 Communicate regularly with direct reports, both individually and in staff meetings. 1.6 Ensure that all the paperwork required for processing pay documents and human resource matters, including performance appraisals, disciplinary actions, filing vacant positions and separations, are completed accurately and processed in a timely manner.	10%

2.0 Strategic Planning	**% of Time**
2.1 Develop and implement TSMO business and related plans to guide resource allocation and achieve unit performance targets. 2.2 Collaborate with others in plan development, reporting plan results, linking performance targets to specific, measurable, achievable, relevant, time-bound, (SMART) objectives in staff expectations, identifying and making resource recommendations. 2.3 Ensure funding and resources are utilized in the most cost effective and beneficial manner. 2.4 Ensure the most current program elements, performance measures and functions are being implemented.	10%

3.0 Customer Service	**% of Time**
3.1 Participate in meetings, on committees, task teams and other groups with internal and external customers to represent TSMO interests. 3.2 Maintain professional contact with elected officials, private companies, public, government agencies, and officials doing business with the State. 3.3 Promote good public relations with the persons contacted while adhering internal policies. 3.4 Provide accurate and timely responses to the public, contractors, and other department personnel. 3.5 Promote the resolution of outstanding technical and contractual issues. 3.6 Communicate effectively (strong written and verbal communication skills) and work well with team members from diverse technical backgrounds.	10%

4.0 Project Management	**% of Time**
4.1 Develop and manage consultant contracts and other types of agreements that support TSMO functions and/or relate to performance targets.	20%

4.2 Develop documentation for contract funding, request for proposal (RFP) and related documents, participation on technical review committees (TRC), evaluation of contract work products, consultant evaluation and invoice processing approval.	
5.0 Technical	**% of Time**
5.1 Incorporate detailed weather information in the operational decision-making processes. 5.2 Collect and take advantage of advanced technology, such as connected vehicle data and information transmissions, to increase situational awareness, improve roadway levels of service, and optimize use of resources and materials. 5.3 Use innovative applications and systems to inform decisions as well as increase the ability to respond quickly and appropriately to adverse weather and roadway surface conditions to reduce or eliminate weather-related crashes and delays. 5.4 Assess the nature and magnitude of storms, determine staffing needs, plan road treatment strategies and timing, and activate pre/posttreatment systems. 5.5 Generate improved plans and recommendations to maintenance personnel, providing expanded data acquisition from fixed and remote sensors as well as from mobile sources. 5.6 Apply advanced systems such as Variable Speed Limits for Weather-Responsive Traffic Management (WRTM), Signalized Intersection for WRTM, Road Weather Information (RWINFO) for Maintenance and Fleet Management Systems, Road Weather Information (RWINFO) for Freight Carriers, Road Weather Information (RWINFO) and Routing Support for Emergency Responders, etc. 5.7 Assess the potential for connected vehicle data to enhance and transform road weather performance measurement and management processes in traffic management and maintenance operations.	45%
6.0 Other	**% of Time**
6.1 Perform other duties as required.	5%

Education
☐High School Degree ☐Technical Degree/Associate Degree ☒Bachelor's Degree in Related Field ☐Bachelor's Degree in Engineering; or ☐Bachelor's Degree in Computer Science ☐Bachelor's Degree in Business ☒Bachelor's Degree in Environmental Science ☐Bachelor's Degree in Science, Economics, Statistics, or another Quantitative Field ☐Master's Degree in Engineering ☐Master's Degree in Engineering (preferred but not required) ☐Master's Degree in Quantitative Field (preferred but not required) ☐PhD in Civil Engineering, Transportation Engineering, Electrical or Computer Engineering, Computer Science, or related field (preferred but not required)

Certificates, Licenses, Registrations
☐Registered Engineer in Training ☐Registered Professional Engineer ☐Professional Traffic Operations Engineer ☐Certified Information Systems Security Professional

Systems Engineer

Job Title:	Systems Engineering	**Job Category:**	☐Management ☒Engineering ☐Specialist ☐Systems and Data Management
Minimum Years of Experience/Position Level:	5-10 Years/Senior-Level		
Applicable to:	☒DOT ☒County ☒City		☒MPO ☒Private ☒Toll Agency

General Summary of Position / Purpose of Position	
This position is an engineering specialist that provides advanced engineering and technical guidance for systems engineering applications.	
Roles and Responsibilities	
1.0 Managerial	**% of Time**
1.1 Direct and supervises staff. 1.2 Meet regularly with employees to assign work, establish work objectives and timelines to ensure working objectives are met. 1.3 Evaluate employees' performance, during established time frames, throughout the year and at formal review periods. 1.4 Motivate and train and/or ensure required training is available for staff. 1.5 Communicate regularly with direct reports, both individually and in staff meetings. 1.6 Ensure that all the paperwork required for processing pay documents and human resource matters, including performance appraisals, disciplinary actions, filing vacant positions and separations, are completed accurately and processed in a timely manner.	10%
2.0 Strategic Planning	**% of Time**
2.1 Develop and implement transportation systems management and operations (TSMO) business and related plans to guide resource allocation and achieve unit performance targets. 2.2 Collaborate with others in plan development, reporting plan results, linking performance targets to specific, measurable, achievable, relevant, time-bound, (SMART) objectives in staff expectations, identifying and making resource recommendations. 2.3 Ensure funding and resources are utilized in the most cost effective and beneficial manner. 2.4 Ensure the most current program elements, performance measures and functions are being implemented.	10%
3.0 Customer Service	
3.1 Participate in meetings, on committees, task teams and other groups with internal and external customers to represent TSMO interests. 3.2 Maintain professional contact with elected officials, private companies, public, government agencies, and officials as needed. 3.3 Promote good public relations with the persons contacted while adhering internal policies. 3.4 Provide accurate and timely responses to the public, contractors, and other agency personnel. 3.5 Promote the resolution of outstanding technical and contractual issues. 3.6 Ensure that team members and management are well informed of activities. 3.7 Consider both the business and the technical needs of all customers with the goal of providing a quality product that meets the user needs. 3.8 Communicate effectively (strong written and verbal communication skills) and work well with team members from diverse technical backgrounds.	10%
4.0 Project Management	**% of Time**

4.1 Reduce the risk of schedule and cost overruns for projects 4.2 Produce weekly status reports detailing project activities. 4.3 Coordinate and develops project concepts, objectives, resource needs, and specifications. 4.4 Define budget and schedule constraints. 4.5 Manage budget and schedule for systems engineering tasks. 4.6 Conduct project coordination and review meetings. 4.7 Provide project coordination and supervision.	25%
5.0 Technical	**% of Time**
5.1 Analyze engineering designs, specifications and test plans for systems and equipment based on customer/contract requirements. 5.2 Ensure design best practice is followed. 5.3 Lead the design of business processes for systems and operations solutions. 5.4 Oversee, lead team / group activity, documenting results and related presentations as necessary. 5.5 Develop engineering designs, specifications and test plans for systems and equipment based on customer/contract requirements. 5.6 Support efforts for the analysis and review process for new proposed engineering software tools. 5.7 Learn and apply standard engineering techniques and ensure that assigned designs follow appropriate regulatory codes. 5.8 Assist in writing proposals that include job assignments, scopes of work, validation plans and procedures. 5.9 Measure system performance. 5.10 Make presentations before management and customers. 5.11 Assist with trade-off analyses. 5.12 Improve stakeholder participation. 5.13 Deploy more adaptable, resilient systems, with verified functionality and fewer defects, and higher level of reuse from one project to the next. 5.14 Help meet Federal Highway Administration (FHWA) Rule 940 when required. 5.15 Apply systems engineering concepts. 5.16 Define customer needs and required functionality early in the development cycle. 5.17 Support integration of multiple systems and development of custom software.	40%
6.0 Other	**% of Time**
6.1 Perform other duties as required.	5%

Education
☐High School Degree ☐Technical Degree/Associate Degree ☐Bachelor’s Degree in Related Field ☒Bachelor’s Degree in Engineering; or ☒Bachelor’s Degree in Computer Science ☐Bachelor’s Degree in Business ☐Bachelor’s Degree in Environmental Science ☐Bachelor’s Degree in Science, Economics, Statistics, or another Quantitative Field ☒Master’s Degree in Engineering (preferred but not required) ☐Master’s Degree in Engineering (preferred but not required) ☐Master’s Degree in Quantitative Field (preferred but not required) ☐PhD in Civil Engineering, Transportation Engineering, Electrical or Computer Engineering, Computer Science, or related field (preferred but not required)

Certificates, Licenses, Registrations
☐Registered Engineer in Training ☐Registered Professional Engineer ☐Professional Traffic Operations Engineer ☐Certified Information Systems Security Professional

TSMO Modeling Specialist

Job Title:	TSMO Modeling Specialist	Job Category:	☐Management ☒Engineering ☐Specialist ☐Systems and Data Management
Minimum Years of Experience/Position Level:	5-10 Years/Mid-Level		
Applicable to:	☒DOT ☒County ☒City		☒MPO ☒Private ☒Toll Agency

General Summary of Position / Purpose of Position
This position is a professional, licensed engineering specialist that provides advanced engineering and technical guidance for traffic and transportation modeling used in Transportation System Management and Operations (TSMO) focused on mesoscale analyses.

Roles and Responsibilities	
1.0 Managerial	**% of Time**
1.1 Direct and supervise staff. 1.2 Meet regularly with employees to assign work, establish work objective and timelines to ensure working objectives are met. 1.3 Evaluate employees' performance, during established time frames, throughout the year and at formal review periods. 1.4 Motivate and train and/or ensure required training is available for staff. 1.5 Communicate regularly with direct reports, both individually and in staff meetings.	10%
2.0 Strategic Planning	**% of Time**
2.1 Collaborate with others related to overall TSMO planning. 2.2 Employ TSMO modeling to enhance TSMO planning. 2.3 Ensure TSMO modeling funding and resources are utilized in the most cost effective and beneficial manner.	10%
3.0 Customer Service	**% of Time**
3.1 Participate in meetings, on committees, task teams and other groups with internal and external customers to represent TSMO interests related to TSMO modeling. 3.2 Maintain professional contact with elected officials, private companies, public, government agencies, and officials doing business with the State related to TSMO modeling. 3.3 Promote good public relations with the persons contacted while adhering internal policies. 3.4 Provide accurate and timely responses to the public, contractors, and other department personnel. 3.5 Promote the resolution of outstanding technical and contractual issues. 3.6 Communicate effectively (strong written and verbal communication skills) and work well with team members from diverse technical backgrounds.	10%
4.0 Project Management	**% of Time**
4.1 Develop and manage consultant contracts and other types of agreements that support TSMO functions and/or relate to performance targets. 4.2 Develop documentation for contract funding, request for proposal (RFP) and related documents, participation on technical review committees (TRC), evaluation of contract work products, consultant evaluation and invoice processing approval.	20%
5.0 Technical	**% of Time**

5.1 Act as a technical advisor on modeling tools for TSMO. Modeling tools may include microscopic, mesoscopic, and macroscopic models such as TransCAD Transportation Planning Software™, Highway Capacity Software™, Aimsun Next™, PTV Vissim™, TSIS CORSIM™, Synchro™, customized applications, or others. 5.2 Implement modeling for analysis, visualization, planning and training related to TSMO programs. 5.3 Identify potential added value applications for modeling tools. 5.4 Identify and recommend software and hardware systems for TSMO modeling. 5.5 Collaborate with other technical staff to assure system compatibility and operability with other systems. 5.6 Train users on the use of modeling tools. 5.7 Participate on committees, task teams and in other groups as needed. 5.8 Develop technical reports, presentations, training materials, etc. as required.	45%
6.0 Other	**% of Time**
6.1 Perform other duties as required.	5%

Education
☐High School Degree ☐Technical Degree/Associate Degree ☐Bachelor's Degree in Related Field ☒Bachelor's Degree in Engineering ☐Bachelor's Degree in Computer Science ☐Bachelor's Degree in Business ☐Bachelor's Degree in Environmental Science ☐Bachelor's Degree in Science, Economics, Statistics, or another Quantitative Field ☐Master's Degree in Engineering ☒Master's Degree in Engineering (preferred but not required) ☐Master's Degree in Quantitative Field (preferred but not required) ☐PhD in Civil Engineering, Transportation Engineering, Electrical or Computer Engineering, Computer Science, or related field (preferred but not required)

Certificates, Licenses, Registrations
☐Registered Engineer in Training ☒Registered Professional Engineer ☒Professional Traffic Operations Engineer ☐Certified Information Systems Security Professional

Emerging Technologies Industry Liaison

<table>
<tr><td>Job Title:</td><td>Emerging Technologies Industry Liaison</td><td rowspan="2">Job Category:</td><td rowspan="2">☐Management
☐Engineering
☒Specialist
☐Systems and Data Management</td></tr>
<tr><td>Minimum Years of Experience/Position Level:</td><td>5-10 Years/Mid-Level</td></tr>
<tr><td>Applicable to:</td><td colspan="2">☒DOT
☒County
☒City</td><td>☒MPO
☒Private
☒Toll Agency</td></tr>
<tr><td colspan="4">General Summary of Position / Purpose of Position</td></tr>
<tr><td colspan="4">The Emerging Technologies Industry Liaison will lead and manage the strategic approach of the agency to collaborate with the private sector and other public agencies for the testing and eventual integration of connected and automated vehicles (CAV) and Smart Cities initiatives into the transportation system. The role requires creativity, innovation, and a willingness to address a variety of challenges. The successful candidate must be able to communicate effectively with diverse stakeholders and to bring together community partners to create an environment supportive for deployment of state of the art technologies. Knowledge of local and state policies and commitment to driving change in both policy and practice is a requirement.</td></tr>
</table>

Roles and Responsibilities	
1.0 Technical	**% of Time**
1.1 Assist in the development of relevant policies, practices, and procedures for CAV and Smart Cities applications testing and implementation. 1.2 Facilitate the development and application of a decision process for evaluating, selecting and advancing new technologies. 1.3 Assist in establishing safe test environment to analyze CAV and other Smart Cities technologies. 1.4 Promote, integrate, and educate internal and external program partners to test, develop, deliver, and implement Smart Cities strategies. 1.5 Assist pilot deployment program management of Smart Cities applications with collaboration from device vendors, industry consortiums, universities, or other internal/external stakeholders. 1.6 Participate on committees, task teams and in other groups as needed. 1.7 Oversee and lead team / group activity, documenting results and related presentations as necessary. 1.8 Act as a technical advisor on Smart Cities implementation and policy to other departments. 1.9 Stay abreast of technological advances and emerging practice so that the agency is a thought leader in Smart Cities application testing and eventual implementation.	40%
2.0 Strategic Planning	**% of Time**
2.1 Develop and implement Smart Cities aspects of TSMO business and related plans to guide resource allocation and achieve unit performance targets. 2.2 Facilitate the development and application of a decision process for evaluating, selecting and advancing new technologies. 2.3 Collaborate with others in plan development, reporting plan results, linking performance targets to specific, measurable, achievable, relevant, time-bound, (SMART) objectives in staff expectations, identifying and making resource recommendations. 2.4 Develop a data-driven approach to testing of Smart Cities applications. 2.5 Ensure the most current Smart Cities elements are being tested based on state of the art and practice.	20%

3.0 Project Management	% of Time
3.1 Develop and manage aspects of consultant contracts and other types of agreements that support TSMO functions (relevant to Smart Cities) and/or relate to performance targets. 3.2 Develop documentation for Smart Cities application pilots in contract funding, request for proposal (RFP) and related documents, and participate on technical review committees (TRC).	10%
4.0 Customer Service	**% of Time**
4.1 Participate in meetings, on committees, task teams and other groups with internal and external customers to support TSMO interests and provide technical guidance related to Smart Cities. 4.2 Provide accurate and timely responses to the public, private sector, and other agency personnel. 4.3 Promote good public relations and develop partnerships with internal and external stakeholders while adhering to internal policies. 4.4 Develop public relations and communications plans, training, and education related to Smart Cities for a wide range of stakeholders. 4.5 Communicate effectively (strong written and verbal communication skills) and work well with team members from diverse technical backgrounds.	20%
5.0 Other	**% of Time**
5.1 Perform other duties as required.	5%

Education
☐High School Degree ☐Technical Degree/Associate Degree ☒Bachelor's Degree in Related Field; or ☐Bachelor's Degree in Engineering; or ☐Bachelor's Degree in Computer Science; or ☒Bachelor's Degree in Business ☐Bachelor's Degree in Environmental Science ☐Bachelor's Degree in Science, Economics, Statistics, or another Quantitative Field ☐Master's Degree in Engineering ☐Master's Degree in Engineering (preferred but not required) ☐Master's Degree in Quantitative Field (preferred but not required) ☐PhD in Civil Engineering, Transportation Engineering, Electrical or Computer Engineering, Computer Science, or related field (preferred but not required)
Certificates, Licenses, Registrations
☐Registered Engineer in Training ☐Registered Professional Engineer ☐Professional Traffic Operations Engineer ☐Certified Information Systems Security Professional

Transportation Systems Performance Manager

Job Title:	Transportation Systems Performance Manager	**Job Category:**	☐Management ☐Engineering ☐Specialist ☒Systems and Data Management
Minimum Years of Experience/Position Level:	5-10 Years/Mid-Level		
Applicable to:	☒DOT ☒County ☒City		☒MPO ☒Private ☒Toll Agency

General Summary of Position / Purpose of Position

The Transportation Systems Performance Manager is responsible for analyzing and communicating information obtained from a variety of traffic data sources to different stakeholders. The purpose of this role is to use this data to enhance the planning process and to enable data driven decision-making for the Transportation Systems Management and Operations (TSMO) Office. The successful candidate will possess strong technical skills for grappling with big data, the ability to communicate with diverse groups of stakeholders to share information and provide guidance for technical decisions, and the curiosity to examine current practices and push the agency toward new and better ways of thinking. The overall vision is that the Transportation Systems Performance Manager will enable new approaches to solving traffic/transportation problems to improve safety, efficiency and quality of life in our community with a multimodal approach.

Roles and Responsibilities

1.0 Technical	**% of Time**
1.1 Leverage strong analytical skills to develop a data utilization and applicability work plan. 1.2 Analyze big data to develop trends and summary statistics. 1.3 Develop relevant spatial analyses and statistics. 1.4 Create corridor or area dashboards for decision support. 1.5 Make operational decisions based on performance metric to improve traffic operations at a network level. 1.6 Integrate multimodal data into transportation operations. 1.7 Use data to support funding revision and request for the maintenance and operations of TSMO infrastructure. 1.8 Participate on committees, task teams and in other groups as needed. 1.9 Oversee lead team / group activity, documenting results and related presentations as necessary. 1.10 Act as a technical advisor on the use of traffic, tolling and ITS data, standards, policies and best practices to other departments, local governments, and agencies.	55%
2.0 Customer Service	**% of Time**
2.1 Participate in meetings, on committees, task teams and other groups with internal and external customers to support TSMO interests and provide technical guidance related to traffic data/analysis. 2.2 Provide accurate and timely responses to the public, contractors, and other department personnel. 2.3 Promote good public relations with internal and external stakeholders while adhering to internal policies. 2.4 Communicate effectively (strong written and verbal communication skills) and work well with team members from diverse technical backgrounds.	10%
3.0 Project Management	**% of Time**
3.1 Develop and manage data analysis portions of consultant contracts and other types of agreements that support TSMO functions and/or relate to performance targets.	10%

3.2 Develop documentation for data acquisition and analysis in contract funding, request for proposal (RFP) and related documents, and participate on technical review committees (TRC).	
4.0 Strategic Planning	**% of Time**
4.1 Develop and implement data acquisition/use aspects of TSMO business and related plans to guide resource allocation and achieve unit performance targets. 4.2 Collaborate with others in plan development, reporting plan results, linking performance targets to specific, measurable, achievable, relevant, time-bound, (SMART) objectives in staff expectations, identifying and making resource recommendations. 4.3 Develop data-driven support to ensure funding and resources are utilized in the most cost effective and beneficial manner. 4.4 Ensure the most current program elements, performance measures and functions are being implemented based on state of the art in traffic data science/management.	20%
5.0 Other	**% of Time**
5.1 Perform other duties as required.	5%

Education
☐High School Degree ☐Technical Degree/Associate Degree ☐Bachelor’s Degree in Related Field ☐Bachelor’s Degree in Engineering ☐Bachelor’s Degree in Computer Science ☐Bachelor’s Degree in Business ☐Bachelor’s Degree in Environmental Science ☒Bachelor’s Degree in Science, Economics, Statistics, or another Quantitative Field ☐Master’s Degree in Engineering ☐Master’s Degree in Engineering (preferred but not required) ☒Master’s Degree in Quantitative Field (preferred but not required) ☐PhD in Civil Engineering, Transportation Engineering, Electrical or Computer Engineering, Computer Science, or related field (preferred but not required)

Certificates, Licenses, Registrations
☐Registered Engineer in Training ☐Registered Professional Engineer ☐Professional Traffic Operations Engineer ☐Certified Information Systems Security Professional

Integrated Corridor Management Manager

Job Title:	Integrated Corridor Management Manager	**Job Category:**	☐Management ☒Engineering ☐Specialist ☐Systems and Data Management
Minimum Years of Experience/Position Level:	5-10 Years/Mid-Level		
Applicable to:	☒DOT ☒County ☒City		☐MPO ☒Private ☒Toll Agency

General Summary of Position / Purpose of Position
The Integrated Corridor Management Manager is responsible for better leveraging underutilized capacity in the form of parallel roadways, single-occupant vehicles, and transit services to improve person throughput and reduce congestion. The purpose of this role is to manage corridors as a multimodal system and make operational decisions for the benefit of the corridor as a whole. The overall vision is that the Integrated Corridor Management Manager realizes significant improvements in the efficient movement of people and goods through institutional collaboration and aggressive, proactive integration of existing infrastructure along major corridors. The Integrated Corridor Management Manager will enable new approaches to solving traffic/transportation problems to improve safety, efficiency and quality of life in our community.

Roles and Responsibilities

1.0 Technical	**% of Time**
1.1 Support the development, deployment and operations of an Integrated Corridor Management (ICM)System, including at least a data fusion environment, a decision support system, and an information exchange network. 1.2 Develop and update Standard Operating Guidelines (SOGs) to support ICM operations. 1.3 Oversee day-to-day operations of the ICM Program. 1.4 Analyze incident data and corresponding traffic impacts to formulate enhancements to the ICM operations. 1.5 Utilize the ICMS on a regular basis to calculate performance measures utilizing models and collected data. 1.6 Implement response plans and update as needed. 1.7 Participate on committees, task teams and in other groups as needed. 1.8 Oversee and lead team / group activity, documenting results and related presentations as necessary. 1.9 Act as a technical advisor on the use of traffic engineering, tolling and intelligent transportation system data, standards, policies and best practices to other departments, local governments, and agencies.	50%
2.0 Customer Service	**% of Time**
2.1 Work with partner agencies to include them in ICM operations. 2.2 Participate in meetings, on committees, task teams and other groups with internal and external customers to support TSMO interests and provide technical guidance related to traffic data/analysis. 2.3 Provide accurate and timely responses to the public, contractors, and other department personnel. 2.4 Promote good public relations with internal and external stakeholders while adhering to internal policies. 2.5 Communicate effectively (strong written and verbal communication skills) and work well with team members from diverse technical backgrounds. 2.6 Work in unison with partner agencies to develop response plans.	20%
3.0 Project Management	**% of Time**

3.1 Develop and manage ICM consultant contracts and other types of agreements that support TSMO functions and/or relate to ICM. 3.2 Develop documentation for ICM in contract funding, request for proposal (RFP) and related documents, and participate on technical review committees (TRC).	10%
4.0 Strategic Planning	**% of Time**
4.1 Develop and implement ICM aspects of TSMO business and related plans to guide resource allocation and achieve unit performance targets. 4.2 Collaborate with others in plan development, reporting plan results, linking performance targets to specific, measurable, achievable, relevant, time-bound, (SMART) objectives in staff expectations, identifying and making resource recommendations. 4.3 Develop data-driven support to ensure funding and resources are utilized in the most cost effective and beneficial manner. 4.4 Ensure the most current program elements, performance measures and functions are being implemented based on state of the art in traffic data science/management.	15%
5.0 Other	**% of Time**
5.1 Perform other duties as required.	5%

Education
☐High School Degree ☐Technical Degree/Associate Degree ☐Bachelor's Degree in Related Field ☒Bachelor's Degree in Engineering ☐Bachelor's Degree in Computer Science ☐Bachelor's Degree in Business ☐Bachelor's Degree in Environmental Science ☐Bachelor's Degree in Science, Economics, Statistics, or another Quantitative Field ☒Master's Degree in Engineering ☐Master's Degree in Engineering (preferred but not required) ☐Master's Degree in Quantitative Field (preferred but not required) ☐PhD in Civil Engineering, Transportation Engineering, Electrical or Computer Engineering, Computer Science, or related field (preferred but not required)
Certificates, Licenses, Registrations
☐Registered Engineer in Training ☒Registered Professional Engineer ☒Professional Traffic Operations Engineer preferred ☐Certified Information Systems Security Professional

Transportation Management Center Manager

Job Title:	Transportation Management Center Manager	**Job Category:**	☒Management ☐Engineering ☐Specialist ☐Systems and Data Management
Minimum Years of Experience/Position Level:	10 or More Years/Senior-Level		
Applicable to:	☒DOT ☒County ☒City		☐MPO ☐Private ☒Toll Agency

General Summary of Position / Purpose of Position
The Transportation Management Center (TMC) Manager is responsible for providing support and supervision in Transportation Systems Management and Operations (TSMO) Control Room. The purpose of this role is to oversee the day-to-day operations of the TSMO Program strategies deployed within the geographical area covered by the TMC. The successful candidate will possess managerial skills, be process oriented, knowledgeable of TSMO strategies, and be capable to integrating multiple TSMO strategies into daily processes such as active arterial management, freeway traffic management, incident management, etc. The overall vision is that the TMC Manager will enable smooth operations between the Control Room staff, the field staff – such as road rangers/service patrol and first responders – to improve safety, system efficiency and quality of life in our community. The TMC Manager will be responsible to integrate new technologies into TMC Standard Operating Guidelines and be aware of when these new technologies, such as CAV, will start affecting daily operations.
Roles and Responsibilities

1.0 Managerial	**% of Time**
1.1 Direct and supervise staff. 1.2 Meet regularly with employees to assign work, establish work objective and timelines to ensure working objectives are met. 1.3 Evaluate employees' performance, during established time frames, throughout the year and at formal review periods. 1.4 Motivate and train and/or ensure required training is available for staff. 1.5 Communicate regularly with direct reports, both individually and in staff meetings. 1.6 Ensure that all the paperwork required for processing pay documents and human resource matters, including performance appraisals, disciplinary actions, filing vacant positions and separations, are completed accurately and processed in a timely manner. 1.7 Handling of Control Room Staff administrative/personnel issues such as: hiring, and time-sheets.	30%
2.0 Strategic Planning	**% of Time**
2.1 Assist in the development of the Statewide TSMO Strategic Plan. 2.2 Implement TSMO business and related plans to guide resource allocation and achieve unit performance targets. 2.3 Collaborate with others in plan development, reporting plan results, linking performance targets to specific, measurable, achievable, relevant, time-bound, (SMART) objectives in staff expectations, identifying and making resource recommendations. 2.4 Ensure the most current program elements, performance measures and functions are being implemented.	10%
3.0 Customer Service	**% of Time**
3.1 Participate in meetings, on committees, task teams and other groups with internal and external customers to represent TSMO interests. 3.2 Promote good public relations with the persons contacted while adhering internal policies.	20%

3.3 Provide accurate and timely responses to the public, contractors, and other department personnel. 3.4 Promote the resolution of outstanding technical issues. 3.5 Communicate effectively (strong written and verbal communication skills) and work well with team members from diverse technical backgrounds.	
4.0 Project Management	**% of Time**
4.1 Develop and manage consultant contracts and other types of agreements that support TSMO functions and/or relate to performance targets. 4.2 Develop documentation for contract funding, request for proposal (RFP) and related documents, participation on technical review committees (TRC), evaluation of contract work products, consultant evaluation and invoice processing approval.	15%
5.0 Technical	**% of Time**
5.1 Act as a technical advisor on the use of traffic engineering and intelligent transportation system (ITS) standards, policies and best practices to other departments, local governments, and agencies. 5.2 Advocate for the appropriate traffic engineering countermeasures during the planning, design and construction phase of highway projects as appropriate. 5.3 Participate on committees, task teams and in other groups as needed. 5.4 Oversee lead team / group activity, documenting results and related presentations as necessary. 5.5 Develop and update Standard Operating Guidelines (SOGs) 5.6 Ensuring all pertinent documentation is filed in accordance with the project document control procedures. 5.7 Providing support and supervision in the Control Room. 5.8 Coordinating ITS field devices repair and maintenance activities with the IT/ITS Manager or designee. 5.9 Oversee Traffic Incident Management (TIM) coordination. 5.10 Identifying and developing solutions to improve TMC Operations efficiency. 5.11 Coordinating and testing software upgrades, as well as other applications related to TMC Operations.	20%
6.0 Other	**% of Time**
6.1 Perform other duties as required.	5%

Education

☐High School Degree
☐Technical Degree/Associate Degree
☒Bachelor's Degree in Related Field
☐Bachelor's Degree in Engineering
☐Bachelor's Degree in Computer Science
☒Bachelor's Degree in Business
☐Bachelor's Degree in Environmental Science
☐Bachelor's Degree in Science, Economics, Statistics, or another Quantitative Field
☐Master's Degree in Engineering
☐Master's Degree in Engineering (preferred but not required)
☐Master's Degree in Quantitative Field (preferred but not required)
☐PhD in Civil Engineering, Transportation Engineering, Electrical or Computer Engineering, Computer Science, or related field (preferred but not required)

Certificates, Licenses, Registrations

☐Registered Engineer in Training
☐Registered Professional Engineer
☐Professional Traffic Operations Engineer
☐Certified Information Systems Security Professional