Transportation Workforce Development

ITRE
Institute for Transportation Research and Education

NC STATE UNIVERSITY

Training

What can ITRE transportation training do for you?

- Receive practical **hands-on training** and **education** as well as **web-based** opportunities for the transportation workforce at all levels
- Stay up-to-date on **certifications** and **licensure**
- Obtain **new job skills** and **enhance existing skills**
- Learn from **instructors** with **real-world experience**
- Take advantage of **specialized training** offered by **employers**

LTAP | PE / FE Review | FEP | HEC | Highway Systems | Bike/Ped | Transit | Aviation | Calendar List View

https://itre.ncsu.edu/training/

How to Register: https://itre.ncsu.edu/training/ncdot/

Professional Development Opportunities for NCDOT Employees

The Institute for Transportation Research and Education offers courses to support professional development for NCDOT employees. These courses are offered at no direct cost to NCDOT employees and are sponsored by the Chief Engineer. The following information is only applicable to NCDOT employees. Employees should coordinate with their supervisor and training coordinator prior to registering.

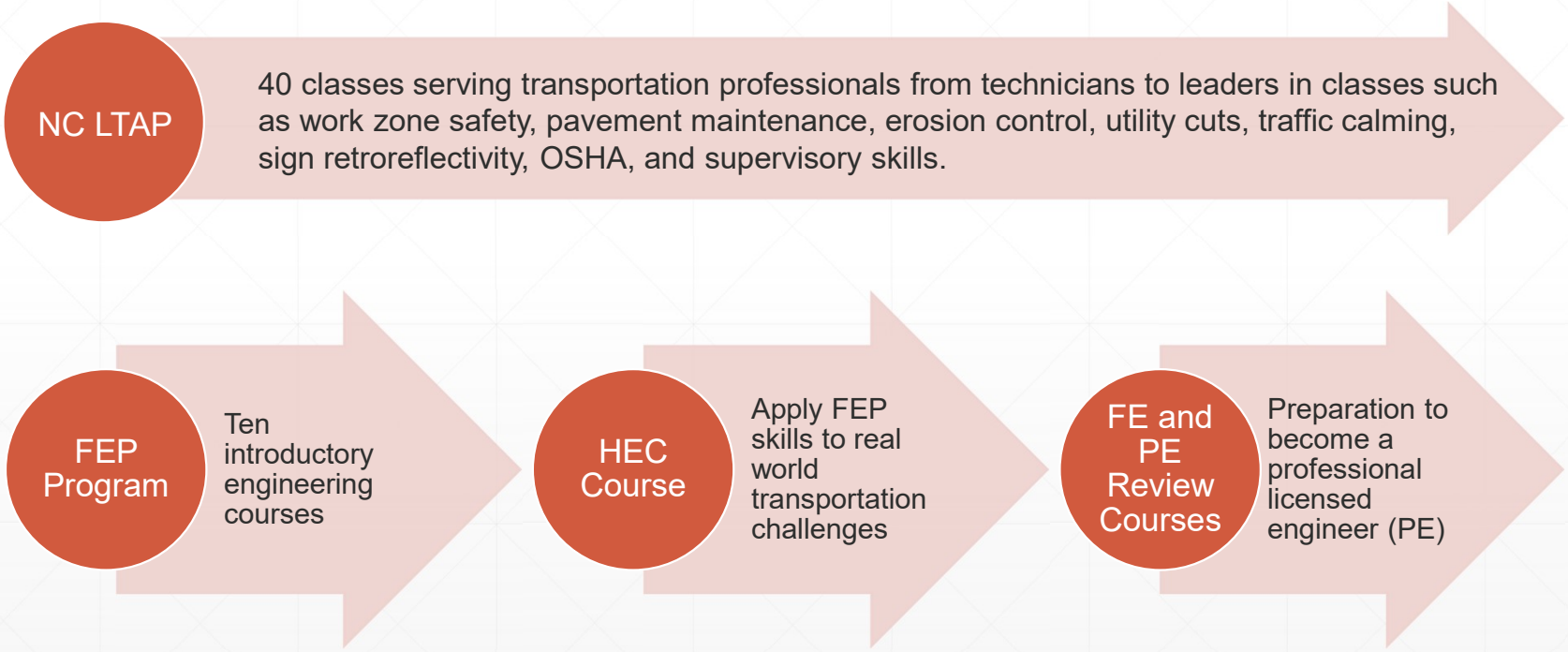
+ Fundamental Engineering Principles (FEP) Program

+ Highway Engineering Concepts (HEC) Program

+ Fundamentals of Engineering (FE) Civil Engineering Review Course

+ Professional Engineering (PE) Civil Engineering Review Course

ITRE Educational Opportunities for Technicians and Engineers



NC LTAP
Local Technical Assistance Program

Roads Scholar →

Advanced Roads Scholar

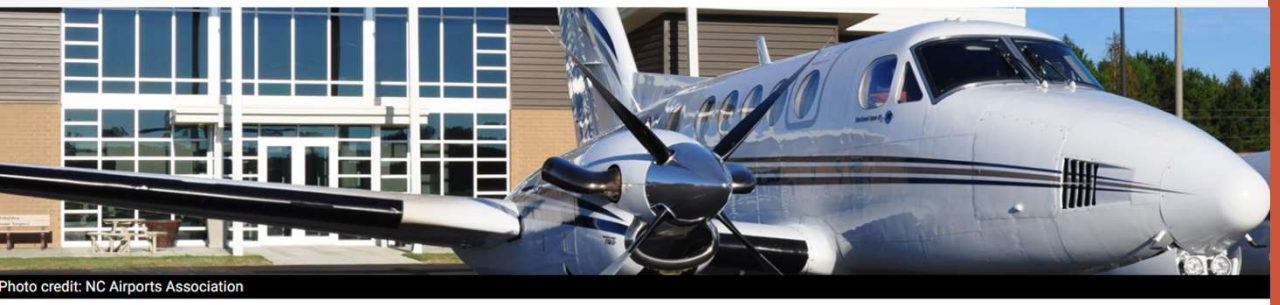
Master Roads Scholar →

NC LTAP

NC LTAP offers a variety of road maintenance, traffic control, and safety training courses at a reasonable cost.

Courses address topics of interest to local agencies as well as North Carolina Department of Transportation (NCDOT) employees and include courses such as *work zone safety, pavement maintenance, erosion control, utility cuts, traffic calming, sign retroreflectivity, OSHA,* and *supervisory skills*.

https://itre.ncsu.edu/focus/ltap/



News and Events | Education and Training | Technical Resources | Steering Committee | Contact

NC AirTAP

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF AVIATION

AirTAP

The North Carolina Airport Technical Assistance Program (NC AirTAP) is a joint effort of ITRE and the NCDOT Division of Aviation, with support from the NC Airports Association, to provide educational offerings, information resources and related assistance to the state's airport professionals.

NC AirTAP helps NC airports improve the safety, quality and efficiency of their operations and increase the use of new aviation materials and technology. The program also helps airport staff build a community network for exchanging best practices.

RailTAP

Coming Soon...

RailTAP is a training and education initiative aimed at improving safety and reducing crashes at highway-rail grade crossings. It focuses on raising awareness and providing safety education to key community stakeholders. The goals of RailTAP are to:

- Educate the public and workers about rail crossing risks.
- Promote safety practices to reduce crashes and injuries.
- Provide localized training for those involved with rail crossings.

ITRE
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Traffic Safety Marketing & Programs

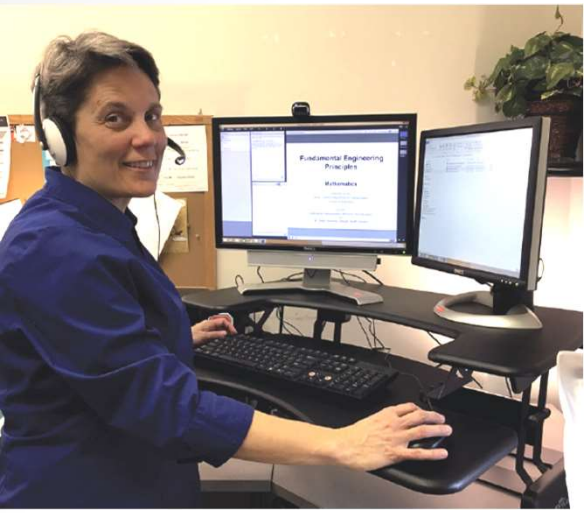
Traffic Safety Advocate Newsletter

Want to start a traffic safety culture initiative at your organization?

Want to share your passion for road safety on social media?

Want to support local organizations working to eliminate traffic deaths and serious injuries?

Sign up:
go.ncsu.edu/safetyadvocate



Course Topics:

- Mathematics
- Physics
- Geotechnical Engineering
- Statics
- Strength of Materials
- Structure Design
- Fluid Mechanics
- Hydraulics
- Horizontal and Vertical Alignment
- Highway Design

Fundamental Engineering Principles (FEP) Program

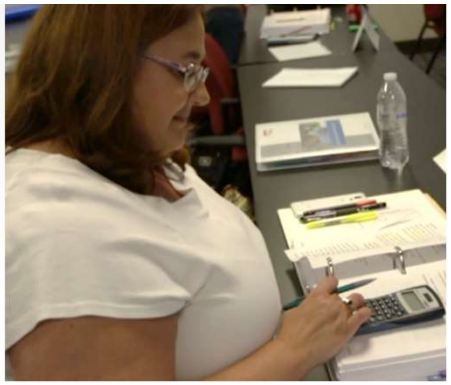
- ✓ Designed for technicians with little or no formal engineering education
- ✓ Live online virtual classroom or self-paced online content
- ✓ 10 courses
- ✓ 7 to 13 weeks per course
- ✓ 3 hours per week
- ✓ Weekly graded tests
- ✓ 3-hour in-person comprehensive final exam

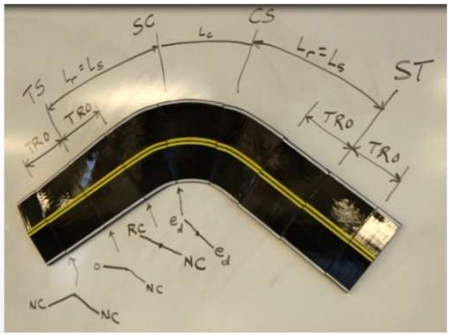
2024-2025 Scheduling Details:

- FEP courses meet in an online virtual classroom one morning per week from 8 am until 11 am.
- Students must complete (or bypass) Mathematics, then Physics, prior to registering for other courses. Fall courses must be completed (or bypassed) prior to corresponding spring courses.
- A sample pathway through the FEP Program is presented below. Please note that once prerequisites are met, courses can be completed in any order.
- Bypass exam administration dates are August 6 and February 4. Final exams are administered upon completion of individual courses: October 1; December 10 & 11; March 27; and June 3 and 4.
- Instructor will email detailed schedule, printable textbook, and online access information prior to class start.

Sample Pathway	FEP Course	Meeting Day	Start Date
Year 1	Mathematics*	Thursday	September 5
	Physics*	Thursday	February 13
	Geotechnical Engineering*	Thursday	April 3
Year 2, 3, or 4	Statics	Tuesday	August 13
	Strength of Materials	Tuesday	October 8
	Structure Design*	Tuesday	March 4
Year 2, 3, or 4	Fluid Mechanics	Monday	September 30
	Hydraulics	Monday	March 17
Year 2, 3, or 4	Horizontal and Vertical Alignment	Wednesday	September 25
	Highway Design*	Wednesday	March 19

***Certificate Available for Module Completion**





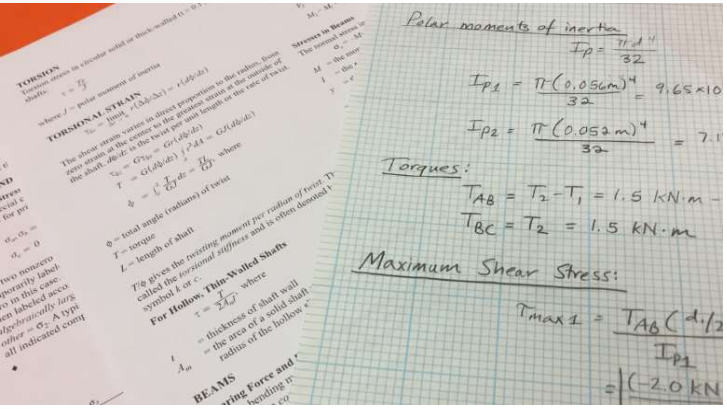
Course Topics:

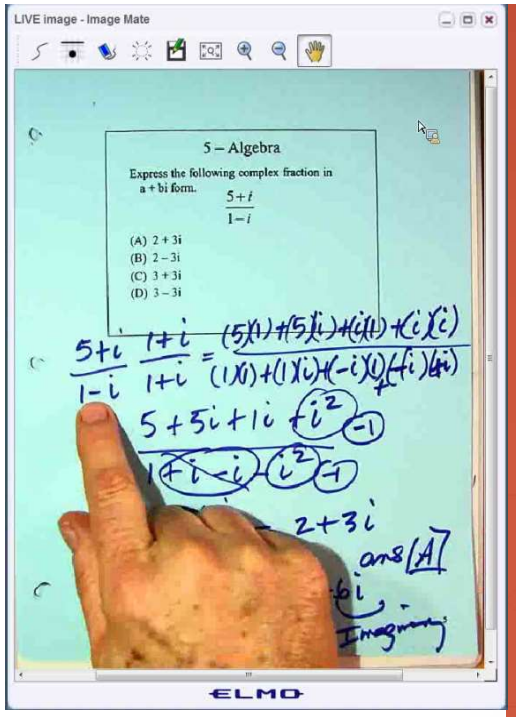
- Transportation Planning
- Highway Alignment and Design
- Geotechnical Engineering
- Statics
- Strength of Materials
- Structure Design
- Hydraulic Engineering
- Traffic Operations

Highway Engineering Concepts (HEC) Program

- ✓ Designed for technicians with prerequisite course experience
- ✓ Students apply FEP skills to real world transportation engineering situations
- ✓ In-person instruction, including a project-based capstone course
- ✓ 18 weeks
- ✓ 8 hours per week (one full day)
- ✓ Weekly graded tests and projects

FUNDAMENTAL ENGINEERING PRINCIPLES (FEP) PROGRAM





Course Topics:

- Test Strategy
- Math and Statistics
- Statics
- Dynamics
- Mechanics of Materials
- Fluid Mechanics
- Engineering Economics
- Ethics and Professional Practice
- Computational Tools
- Construction Materials
- Surveying
- Transportation Engineering
- Geotechnical Engineering
- Structural Engineering
- Hydraulic Engineering
- Environmental Engineering

Fundamentals of Engineering (FE) Review Course

- ✓ Designed for civil engineers meeting state eligibility requirements for the FE Exam
- ✓ Live online virtual classroom (self-paced option also available)
- ✓ 40 classes reviewing topics covered in the FE Exam
- ✓ 20 weeks
- ✓ 3 to 6.5 hours per week

Professional Engineering (PE) Review Course

- ✓ Designed for civil engineers who meet state eligibility requirements for the PE Exam
- ✓ Pre-recorded, self-paced instruction
- ✓ 22 classes reviewing topics covered in the PE Exam
- ✓ 3 hours per class

Course Topics:

- Geotechnical Engineering
- Water Resources and Environmental
- Structural Engineering
- Construction and Materials
- Transportation Engineering

PE Review Course Options

- In-Person (Friday/Saturday) in Raleigh, starting in January
- Synchronous Live Online Option (Tuesday/Thursday), starting in August [Requires Approval]
- Self-Paced Online Option, available at any time
  - NCDOT employees are also eligible to access a pre-recorded online class at a cost of $250

Recent Changes to the PE Exam

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Eligibility for FE and PE Exams

There are two common methods[2] (only 1 must be met) to be eligible to sit for the PE exam:

1. Pass the FE exam (as administered by the NCEES[3]) and graduate with 4-year engineering degree
2. Receive a waiver for the FE exam by providing evidence of 20 years of progressive engineering experience to NCBELS[4]

There are two requirements (both must be met) to apply for the PE license with NCBELS:

1. Pass the PE exam (as administered by the NCEES)
2. Gain the required engineering experience[5], which is a minimum of[6]:
   a. 4 years for applicants with a 4-year, master's, or doctoral EAC/ABET[7] engineering degree
   b. 8 years for applicants with a 4-year EAC/ABET engineering technology degree or a 4-year Non-EAC/ABET engineering or science degree[8]

Definition of Experience

- Not less than one-half of the required engineering experience shall be of a professional grade and character, and performed under the responsible charge of a licensed Professional Engineer.
- The term "progressive engineering experience" means that, during the period of time in which an applicant has made a practical utilization of acquired knowledge, continuous improvement, growth and development in the utilization of that knowledge have been shown, as revealed in the complexity and technical detail of the work product or work record.
- The applicant must show that greater individual responsibility for the work product has been continuously assumed over that period of time.
- Experience prior to graduation is not considered in the calculation of progressive engineering experience. ABET accredited engineering cooperative experience may be considered with a maximum allowable credit of one (1) year.

NCEES PE Civil Engineering Knowledge Area by Depth Topic [https://ncees.org/engineering/pe/civil-cbt/]

	Transportation [Effective 1/1/2022]	?s	Water Resources & Environmental [Effective 1/1/2022]	?s	Geotechnical [Effective 1/1/2022]	?s	Structural [Effective 1/1/2022]	?s	Construction [Effective 1/1/2022]	?s
1	Project Planning									4-6
2	Means and Methods									3-5
3	Soil Mechanics									5-8
4	Structural Mechanics									5-8
5	Hydraulics and Hydrology									6-9
6	Geometrics									3-5
7	Materials									5-8
8	Site Development									4-6
9	Traffic Engineering (Capacity Analysis and Transportation Planning)	10-15	Analysis and Design	4-6	Site Characterization	4-6	Analysis of Structures [illegible] ad applications	[illegible]6	[illegible]hwork [illegible]struction an [illegible]ut	
10	Horizontal Design	3-5	Hydraulics Closed Conduit	4-6	Soil Mechanics; Laborat[illegible] Testing; and An[illegible]	4	An[illegible] of Structures: Forc[illegible] and [illegible] effects		Es[illegible]ing [illegible]tities [illegible]sts	5-8
11	Vertical Design	3-5	Hydraulics [illegible]nnel	4-6	[illegible]d M[illegible]ls T[illegible]; Methods; [illegible]Safe	3-5	Desig[illegible]d Details of Struct[illegible] Materials and [illegible]aterial properties	4-6	Construction Operations and Methods	6-9
12	Intersection Geometry	[illegible]-5	Hydrology	[illegible]-9	[illegible]rthqua[illegible]ngine[illegible] and [illegible]ads	2-4	Design and Details of Structures: Component design and detailing	12-18	Scheduling	5-8
13	Roa[illegible] and Cr[illegible] Desi[illegible]	3-5	Groundw[illegible] and Wells	3-5	[illegible]h Structures	4-6	Codes and Construction: Codes; standards; and guidance documents	4-6	Material Quality Control and Production	5-8
14	Signal [illegible]gn	3-5	Wastewater Collection and Treatment	5-8	Groundwater and Seepage	3-5	Codes and Construction: Temporary structures and other topics	2-4	Temporary Structures	6-9
15	Traffic Control Design	3-5	Water Quality	3-5	Problematic Soil and Rock Conditions	3-5	*10 Design Standards*		Construction Health and Safety	3-5
16	Geotechnical and Pavement	4-6	Drinking Water Distribution and Treatment	5-8	Earth Retaining Structures (ASD or LRFD)	4-6			*8 Design Standards*	
17	Drainage	2-4	Engineering Economics Analysis	1-3	Shallow Foundations (ASD or LRFD)	4-6				
18	Alternatives Analysis	1-3	*2 Design Standards*		Deep Foundations (ASD or LRFD)	4-6				
	9 Design Standards				*16 Design Standards*					

NCEES notes that the examples specified in knowledge areas are not exclusive or exhaustive.

Pre-April 2024

INFORMATIONAL PURPOSES ONLY: This information is intended for informational purposes only. Some of the information may be dated and may not reflect the most current requirements and all possible scenarios. Refer to NCEES and NCBELS for official requirements and processes.

New!

- Project Management
- Traffic Engineering
- Roadside and Cross-Section Design
- Horizontal Design
- Vertical Design
- Intersection Geometry
- Traffic Signals
- Traffic Control Design
- Geotechnical and Pavement
- Drainage

Source: https://ncees.org/exams/pe-exam/civil/

	Number of Questions
1. Project Management	**6–9**
A. Quantity and cost estimating	
B. Project schedules (e.g., activity identification and sequencing)	
C. Economic analysis (e.g., present worth, lifecycle costs)	
2. Traffic Engineering (Capacity Analysis, Transportation Planning, and Safety Analysis)	**10–15**
A. Uninterrupted flow (e.g., level of service [LOS], capacity)	
B. Street segment interrupted flow (e.g., level of service [LOS], running time, travel speed)	
C. Intersection capacity (e.g., at grade, signalized, roundabout, interchange)	
D. Traffic analysis (e.g., volume studies, peak hour factor, speed studies, modal split, trip generation, traffic impact studies)	
E. Traffic safety analysis (e.g., conflict analysis, crash rates, collision diagrams)	
F. Nonmotorized facilities analysis (e.g., pedestrian, bicycle)	
G. Traffic forecasts and monitoring	
H. Highway safety analysis (e.g., crash modification factors, *Highway Safety Manual*)	
3. Roadside and Cross-Section Design	**7–11**
A. Forgiving roadside concepts (e.g., clear zone, recoverable slopes, roadside obstacles)	
B. Barrier design (e.g., barrier types, end treatments, crash cushions)	
C. Cross-section elements (e.g., lane widths, shoulders, bike lane, sidewalks, retaining walls)	
D. Nonmotorized design considerations (e.g., shared-use paths, bicycle facilities, pedestrian facilities, ADA compliance, traffic-calming features)	

4.	**Horizontal Design** A. Basic circular curve elements (e.g., middle ordinate, length, chord definition, radius definition, centerline stationing) B. Sight distance considerations C. Superelevation (e.g., rate, transitions, method, components) D. Special horizontal curves (e.g., compound/reverse curves, curve widening, coordination with vertical geometry)	**8–12**
5.	**Vertical Design** A. Vertical alignment (e.g., geometrics, vertical clearance) B. Stopping and passing sight distance (e.g., crest curve, sag curve)	**8–12**
6.	**Intersection Geometry** A. Intersection sight distance B. Interchanges (e.g., freeway merge, entrance and exit design, horizontal design, vertical design) C. At-grade intersection layout, including roundabouts	**7–11**
7.	**Traffic Signals** A. Traffic signal timing (e.g., clearance intervals, phasing, pedestrian crossing timing, railroad preemption) B. Traffic signal warrants C. Traffic signal design	**5–8**
8.	**Traffic Control Design** A. Permanent signs and pavement markings B. Temporary traffic control	**5–8**
9.	**Geotechnical and Pavement** A. Sampling, testing, evaluation, and soil stabilization techniques (e.g., soil classifications, subgrade resilient modulus, CBR, R-values, field tests, slope stability) B. Soil properties (e.g., strength, permeability, compressibility, phase relationships) C. Compaction, excavation, embankment, and mass balance D. Traffic characterization parameters, pavement design, and rehabilitation procedures (e.g., flexible and rigid pavement)	**6–9**
10.	**Drainage** A. Hydrology, including runoff and water quality mitigation measures B. Hydraulics, including culvert and stormwater collection system design (e.g., inlet capacities, pipe flow, hydraulic energy dissipation, peak flow mitigation/detention, open-channel flow)	**8–12**

ABBREVIATION	DESIGN STANDARD TITLE
AASHTO GDHS-7	*A Policy on Geometric Design of Highways and Streets,* 7th edition, 2018 (including October 2019 errata), American Association of State Highway & Transportation Officials, Washington, D.C., AASHTO PE Exam Collection.
AASHTO GDPS-4-M	*Guide for Design of Pavement Structures*, 4th edition, 1993 with 1998 supplement, American Association of State Highway & Transportation Officials, Washington, D.C., AASHTO PE Exam Collection.
AASHTO GPF-2	*Guide for the Planning, Design, and Operation of Pedestrian Facilities,* 2nd edition, 2021, American Association of State Highway & Transportation Officials, Washington, D.C., AASHTO PE Exam Collection.
AASHTO HSM-1	*Highway Safety Manual,* 1st edition, 2010, with 2014 Supplement (including September 2010, February 2012, and March 2016 errata), American Association of State Highway & Transportation Officials, Washington, D.C., AASHTO PE Exam Collection.
AASHTO MEPDG-3	*Mechanistic-Empirical Pavement Design Guide: A Manual of Practice,* 3rd edition, August 2022, American Association of State Highway & Transportation Officials, Washington, D.C., AASHTO PE Exam Collection.
AASHTO RSDG-4	*Roadside Design Guide,* 4th edition, 2011 (including February 2012 and July 2015 errata), American Association of State Highway & Transportation Officials, Washington, D.C., AASHTO PE Exam Collection.
FHWA HIF-12-026	*Hydraulic Design of Highway Culverts,* Hydraulic Design Series Number 5, 3rd edition, April 2012, U.S. Department of Transportation, Federal Highway Administration, Washington, D.C., www.fhwa.dot.gov.
HCM	*Highway Capacity Manual* (Volumes 1–4), 6th edition, 2016, Transportation Research Board, National Research Council, Washington, D.C., www.mytrb.org.
MUTCD	*Manual on Uniform Traffic Control Devices for Streets and Highways,* 2009, including Revisions 1 and 2 dated May 2012, U.S. Department of Transportation, Federal Highway Administration, Washington, D.C., www.mutcd.fhwa.dot.gov.

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Thank You!