



National University of Engineering (UNI)
School of Civil Engineering
Syllabus 2027-I

1. COURSE

CE3T8. Professional Competencies Workshop - Transportation (Mandatory)

2. GENERAL INFORMATION

2.1 Course	: CE3T8. Professional Competencies Workshop - Transportation
2.2 Semester	: 8 th Semester.
2.3 Credits	: 4
2.4 Hours	: 3 HT; 2 HP;
2.5 Duration of the period	: 16 weeks
2.6 Type of course	: Mandatory
2.7 Learning modality	: Face to face
2.8 Prerequisites	: 190Cr

3. PROFESSORS

Meetings after coordination with the professor

4. INTRODUCTION TO THE COURSE

Professional Competencies Workshop - Transportation is the capstone/synthesis course of the Vialidad, Geomática y Transporte (DAVG) specialization track. It integrates, around a real road or transportation project, the transportation planning and system-dynamics framework developed in Transportation Engineering with the applied field-surveying techniques developed in Basic and Applied Geomatics, and with the four principal practice domains of highway and traffic engineering developed in Highway Geometric Design and Traffic Engineering and Urban Road Design: vehicular traffic analysis, road safety auditing and inspection, road network inventory, highway geometric design, and microscopic traffic simulation and operational analysis. Rather than introducing new content, the workshop revisits and applies, at a professional level of integration, the knowledge units developed throughout the specialization's preceding courses.

5. GOALS

- Set the scope and baseline studies of a real transportation project to be developed throughout the workshop.
- Apply transportation planning principles and travel-demand/system-dynamics analysis to the project's study corridor.
- Apply field-surveying (topographic) techniques to characterize the project's terrain and support its design.
- Analyze vehicular traffic flow and capacity for the project's road network.
- Conduct a road safety audit and inspection and propose countermeasures for the project.
- Compile a road inventory of the project's existing infrastructure.
- Apply highway geometric design criteria to the project's horizontal alignment.
- Use microscopic simulation to evaluate the project's operational performance.

6. COMPETENCES

ABET-1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. (Usage)

ABET-2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. (Usage)

ABET-6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. (Usage)

7. TOPICS

Unit 1: Transportation Planning and Economics (15 hours)	
Competences Expected: ABET-1	
Topics	Learning Outcomes
• Transportation planning process and institutional framework • Travel demand modeling and forecasting methods • Four-step travel demand model • Data collection methods for transportation planning • Economic evaluation and benefit-cost analysis • Activity-based modeling and advanced forecasting techniques • Multimodal transportation planning and integration • Sustainable transportation and environmental considerations • Public participation and stakeholder engagement • Performance measures and system monitoring	• Explain the transportation planning process and institutional relationships [Familiarity] • Apply travel demand forecasting methods to predict future travel patterns [Assessment] • Implement the four-step travel demand model for regional analysis [Usage] • Design data collection programs for transportation studies [Assessment] • Conduct benefit-cost analysis for transportation projects [Usage] • Utilize activity-based models for advanced travel demand analysis [Assessment] • Develop integrated multimodal transportation plans [Usage] • Incorporate sustainability principles into transportation planning [Assessment] • Facilitate public participation processes in transportation planning [Familiarity] • Establish performance measures and monitoring systems for transportation networks [Assessment]
Readings : [Ortuzar2011]	

Unit 2: Workshop Project Scope and Baseline Studies (5 hours)	
Competences Expected: ABET-1	
Topics	Learning Outcomes
• Scope and location of the real road/transportation project to be developed in the workshop, and the general baseline studies (topographic, traffic, and socioeconomic context) that establish its starting conditions.	• Describe the scope, location, and baseline conditions of a real transportation project [Familiarizarse].
Readings : [Mannering2013]	

Unit 3: Topographic Mapping and Digital Terrain Models (5 hours)	
Competences Expected: ABET-1,ABET-6	
Topics	Learning Outcomes
• Contour representation and interpretation of terrain relief • Digital Terrain Model (DTM) generation from field or GNSS survey data • Topographic map production and cartographic conventions	• Generate a contour map from field survey data [Usage] • Build a digital terrain model (DTM) from a point-based topographic survey [Assessment]
Readings : [Ghilani2015], [Kavanagh2019]	

Unit 4: Traffic Flow Theory and Capacity Analysis (5 hours)	
Competences Expected: ABET-1	
Topics	Learning Outcomes
• Traffic flow characteristics and fundamental relationships • Highway capacity analysis using HCM methodology • Level of service concepts and analysis procedures • Traffic control devices and MUTCD standards • Signal timing and phasing design • Intersection capacity and delay analysis	• Explain traffic flow theory and fundamental traffic stream parameters [Familiarity] • Perform highway capacity analysis for various facility types [Assessment] • Determine level of service for transportation facilities [Usage] • Apply MUTCD standards for traffic control device design and placement [Assessment] • Design signal timing plans for isolated intersections [Usage] • Analyze intersection capacity and calculate control delay [Assessment]
Readings : [Roess2019], [HCM2022]	

Unit 5: Road Safety Engineering (10 hours)	
Competences Expected: ABET-6	
Topics	Learning Outcomes
• Crash data analysis and identification of high-risk locations • Road safety audits and systematic safety reviews • Vision Zero and the safe systems approach to street design • Pedestrian and bicycle safety countermeasures	• Analyze crash data to identify high-risk locations and contributing factors [Assessment] • Conduct a road safety audit for a roadway or intersection [Usage] • Explain the Vision Zero safe systems approach to street design [Familiarity] • Recommend pedestrian and bicycle safety countermeasures for a given location [Usage]
Readings : [HSM2010]	

Unit 6: Traffic Control Devices (10 hours)	
Competences Expected: ABET-2	
Topics	Learning Outcomes
• Classification and design of regulatory, warning, and guide signs • Sign placement, sizing, and retroreflectivity standards • Pavement marking types, materials, and placement standards • Traffic signal warrant analysis and justification studies • Signal phasing, sequencing, and vehicle/pedestrian detection design • Signal equipment, controllers, and maintenance considerations	• Classify traffic signs according to national/MUTCD-equivalent standards and select the appropriate sign for a given condition [Familiarity] • Specify sign placement, size, and retroreflectivity per design standards [Usage] • Design a pavement marking plan for a given roadway section [Assessment] • Conduct a signal warrant analysis to justify installing a traffic signal [Assessment] • Design signal phasing and detection layouts for an intersection [Usage] • Evaluate signal equipment and controller requirements for an installation [Familiarity]
Readings : [MUTCD2023], [Roess2019]	

Unit 7: Horizontal Alignment Design (10 hours)	
Competences Expected: ABET-2	
Topics	Learning Outcomes
• Simple circular curve geometry and layout • Spiral transition curves and their application • Superelevation design, rates, and runoff/transition lengths • Side friction factors and minimum radius determination • Horizontal sight distance and sight obstructions on curves • Compound and reverse curve design considerations	• Design simple circular horizontal curves for a given design speed [Usage] • Apply spiral transition curves where required by design speed and curvature [Assessment] • Design superelevation rates and transition/runoff lengths for a horizontal curve [Assessment] • Determine minimum curve radius from side friction and superelevation limits [Usage] • Verify horizontal sight distance and identify sight obstructions along a curve [Assessment] • Evaluate compound and reverse curve layouts against design guidance [Familiarity]
Readings : [AASHTO2018GreenBook], [GarberHoel2019]	

Unit 8: Traffic Operations and Management (10 hours)	
Competences Expected: ABET-1,ABET-6	
Topics	Learning Outcomes
• Arterial analysis and signal coordination • Freeway operations and bottleneck analysis • Traffic simulation and microsimulation modeling • Incident management and traffic management centers • Roundabout design and capacity analysis	• Develop coordinated signal systems for arterial corridors [Usage] • Evaluate freeway performance and identify operational bottlenecks [Assessment] • Utilize traffic simulation models for complex operational analysis [Usage] • Implement incident management strategies and traffic management operations [Assessment] • Design roundabouts and analyze their operational performance [Usage]
Readings : [Roess2019], [Barcelo2010]	

8. WORKPLAN

8.1 Methodology

Individual and team participation is encouraged to present their ideas, motivating them with additional points in the different stages of the course evaluation.

8.2 Theory Sessions

The theory sessions are held in master classes with activities including active learning and roleplay to allow students to internalize the concepts.

8.3 Practical Sessions

The practical sessions are held in class where a series of exercises and/or practical concepts are developed through problem solving, problem solving, specific exercises and/or in application contexts.

9. EVALUATION SYSTEM

***** EVALUATION MISSING *****

10. BASIC BIBLIOGRAPHY