

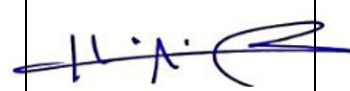
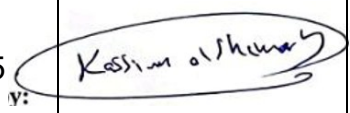
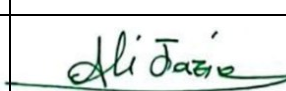
Republic of Iraq - Ministry of Higher Education and Scientific Research

Scientific Supervision and Evaluation Apparatus - Quality Assurance and Academic Accreditation Directorate

University of Al-Qadisiyah - College of Engineering - Department of Roads and Transport Engineering

Complete Academic Program Specification and Module Description Handbook

Fourth Stage (Academic Year 2025–2026)

Academic Program Description Form			
University Name:	University of Al-Qadisiyah		
College / Institute:	College of Engineering		
Scientific Department:	Department of Roads and Transport Engineering		
Academic Program Title:	Bachelor of Science (B.Sc.) in Roads and Transport Engineering		
Final Qualification Title:	B.Sc. Degree in Roads and Transport Engineering		
Academic Study System:	Semester / Annual System (Fourth Stage - Academic Year 2025/2026)		
Date of File Preparation:	12-10-2025		
File Date Filled:	12-10-2025		
Administrative Role	Full Name	Date	Signature / Endorsement
Head of Scientific Department	Assoc. Prof. Salam Maytham Jaber	20/1/2025	
Scientific Associate Dean	Prof. Dr. Haitham Ali Badi	20/1/2025	
Quality Assurance Director	Assoc. Prof. Qasim Kazem Humaid	22/1/2025	
Dean of College of Engineering	Prof. Dr. Ali Abdulhussein Al-Khalidi	22/1/2025	

University of Qadisiyah



College of Engineering - Roads and Transportation Department



Introduction

The educational program is a well-planned set of courses that include procedures and experiences arranged in the form of an academic syllabus. Its main goal is to improve and build graduates' skills so they are ready for the job market. The program is reviewed and evaluated every year through internal or external audit procedures and programs like the External Examiner Program.

The academic program description is a short summary of the main features of the program and its courses. It shows what skills students are working to develop based on the program's goals. This description is very important because it is the main part of getting the program accredited, and it is written by the teaching staff together under the supervision of scientific committees in the scientific departments.

This guide includes a description of the academic program after updating the subjects and paragraphs of the previous guide in light of the developments of the educational system in Iraq, adhering to the traditional annual/quarterly academic program description and national standards of the Iraqi Council for Accreditation of Engineering Education (ICAEE).

Key Concepts and Terminology:

Terminology	Definition and Academic Significance
Academic Program Description	Provides a brief summary of its vision, mission, and objectives, including an accurate description of the targeted learning outcomes according to specific learning strategies.
Course Description	Provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the students to achieve, proving whether they have made the most of available learning opportunities.
Program Vision	An ambitious picture for the future of the academic program to be sophisticated, inspiring, stimulating, realistic, and applicable.
Program Mission	Briefly outlines the objectives and activities necessary to achieve them and defines the program's development paths and directions.
Program Objectives	Statements that describe what the academic program intends to achieve within a specific period of time and are measurable and observable.
Curriculum Structure	All courses/subjects included in the academic program according to the approved learning system with the number of credit hours and units.
Learning Outcomes	A compatible set of knowledge, skills, and values acquired by students after successful completion of the academic program.
Teaching and Learning Strategies	Strategies used by faculty members to develop students' learning through classroom and extracurricular activities.

Academic Program Description Form (Stage 4)

Item / Concept	Official Academic Statement
University Name	University of Al-Qadisiyah
Faculty / Institute	College of Engineering
Scientific Department	Department of Roads and Transportation Engineering
Academic Program Name	Bachelor of Science in Roads and Transportation Engineering
Final Certificate Name	B.Sc. in Roads and Transportation Engineering
Academic System	Semester / Annual System (Fourth Stage - Academic Year 2025/2026)
Description Preparation Date	October 2026
Auditing & Accreditation Authority	Quality Assurance and Academic Accreditation Division - College of Engineering

1. Program Vision

The Department of Roads and Transportation Engineering at the University of Al-Qadisiyah seeks excellence, innovation, and leadership in the field of civil, highway, and transportation engineering education and scientific research in Iraq and the region, aligning with the national infrastructure development needs and modern technological advancements.

2. Program Mission

Contribute to societal prosperity and economic growth through the preparation of qualified professional civil and highway engineers equipped with distinguished scientific knowledge and technological creativity in highway geometric design, bridge engineering, traffic management, geotechnical engineering, and transport planning. The department is committed to quality assurance and academic accreditation in accordance with national and global engineering standards while upholding professional ethics.

3. Program Objectives

1. Provide students with comprehensive scientific and engineering knowledge in highway design, bridge engineering, pavement structural design, and foundation engineering.
2. Develop students' computational and technical skills using modern software packages (e.g., Civil 3D, STAAD Pro, HCS) to solve complex transportation and structural engineering problems.
3. Equip students with professional capabilities in quantity surveying, preparation of technical specifications, contract administration, and project management.
4. Foster critical thinking, effective communication, teamwork, environmental protection, traffic safety awareness, and lifelong learning.

4. Program Accreditation

The program adheres to the national accreditation requirements of the Iraqi Council for Accreditation of Engineering Education (ICAEE) and aligns with ABET accreditation guidelines.

5. Other External Influences

The program is sponsored and supported by the Ministry of Higher Education and Scientific Research, the Ministry of Construction and Housing, Municipalities and Public Works, and the State Commission for Roads and Bridges.

6. Program Structure (Fourth Stage Focus)

Program Component	Number of Courses	Credit Units	Percentage	Notes*
University Requirements	2	4	11%	Core (English IV & Engineering Ethics)
College Requirements	-	-	-	-
Department Requirements	12	32	89%	Core (Specialized Engineering Subjects)
Total Fourth Stage	14	36	100%	Core Requirements

7. Program Description (Fourth Stage Subjects)

Year / Level	Course Code	Course Title	Credit Hours Theory	Credit Hours Practical / Lab	Credit Hours Tutorial	Credit Units
Fourth Stage (1st Sem.)	R.E 400	Foundation Engineering (1)	2	0	1	3
Fourth Stage (1st Sem.)	R.E 405	Design of Concrete Structures (2)	2	0	1	3
Fourth Stage (1st Sem.)	R.E 410	Design of Steel Bridges (1)	2	0	1	3
Fourth Stage (1st Sem.)	R.E 415	Highways Design 1	2	0	1	3
Fourth Stage (1st Sem.)	R.E 431	Roads Maintenance and Safety	2	0	0	2

Fourth Stage (1st Sem.)	R.E 426	Quantity Surveying and Specifications	2	0	0	2
Fourth Stage (1st Sem.)	R.E 435	Computer Applications (3)	1	2	0	2
Fourth Stage (1st Sem.)	R.E 440	English Language (4)	2	0	0	2
Fourth Stage (1st Sem.)	R.E 445	Graduation Project of 1st Semester	1	2	0	2
Fourth Stage (2nd Sem.)	R.E 401	Foundation Engineering (2)	2	0	1	3
Fourth Stage (2nd Sem.)	R.E 406	Design of Concrete Bridges	2	0	1	3
Fourth Stage (2nd Sem.)	R.E 411	Design of Steel Bridges (2)	2	0	1	3
Fourth Stage (2nd Sem.)	R.E 416	Highways Design 2	2	0	1	3
Fourth Stage (2nd Sem.)	R.E 425	Transports Planning	2	0	0	2
Fourth Stage (2nd Sem.)	R.E 420	Hydrology	2	0	0	2
Fourth Stage (2nd Sem.)	R.E 436	Computer Applications (4)	1	2	0	2
Fourth Stage (2nd Sem.)	R.E 446	Engineering Ethics	2	0	0	2
Fourth Stage (2nd Sem.)	R.E 445	Graduation Project of 2nd Semester	1	2	0	2

8. Program Expected Learning Outcomes

Outcome Code	Expected Learning Outcomes of the Program
GO.1	An ability to distinguish, identify, define, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
GO.2	An ability to produce engineering designs that meet desired needs within specified constraints by applying both analysis and synthesis in the design process.
GO.3	An ability to create and carry out proper measurement and tests with quality assurance, analyze, and interpret results, and utilize engineering judgment to make inferences.
GO.4	An ability to skillfully communicate orally with a gathering of people and in writing with various managerial levels.
GO.5	An ability to perceive ethical and professional responsibilities in engineering cases and make brilliant judgments taking into account consequences in worldwide financial, ecological, and societal considerations.
GO.6	An ability to perceive the continual necessity for professional knowledge growth and how to find, assess, assemble, and apply it properly.
GO.7	An ability to work adequately on teams and to set up objectives, plan activities, meet due dates, and manage risk and uncertainty.

Knowledge

- **GO.1:** An ability to distinguish, identify, define, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics.
- **GO.6:** An ability to perceive the continual necessity for professional knowledge growth and how to find, assess, assemble, and apply it properly.

Skills

- **GO.2:** An ability to produce engineering designs that meet desired needs within certain constraints by applying both analysis and synthesis in the design process.
- **GO.3:** An ability to create and carry out proper measurement and tests with quality assurance, analyze, and interpret results, and utilize engineering judgment to make inferences.

Ethics

- **GO.4:** An ability to skillfully communicate orally with a gathering of people and in writing with various managerial levels.
- **GO.5:** An ability to perceive ethical and professional responsibilities in engineering cases and make brilliant judgments taking into account consequences in worldwide financial, ecological, and societal considerations.
- **GO.7:** An ability to work adequately on teams and to set up objectives, plan activities, meet due dates, and manage risk and uncertainty.

9. Teaching and Learning Strategies

1. **Theoretical Lectures:** To explain fundamental concepts and theoretical principles.
2. **Tutorials and Problem Solving:** To strengthen students' analytical problem-solving abilities.
3. **Laboratory and Computer Applications:** To provide practical experience in software tools and material testing.
4. **Homework and Assignments:** To encourage independent learning and continuous practice.
5. **Seminars and Design Projects:** To build teamwork skills, technical report writing, and presentation abilities.

10. Evaluation Methods

1. Daily, monthly, and mid-term written examinations.
2. Homework assignments, design sheets, and practical reports.
3. Classroom engagement, oral discussions, and quizzes.
4. Software modeling assessments and laboratory tests.
5. Project defense and poster presentations before scientific committees.
6. Final comprehensive written examinations.

11. Faculty (Fourth Stage Teaching Staff)

Faculty Member Name	Academic Rank	General Specialization	Special Requirements / Skills
Dr.Jalal Taqi Shaker Al-Obaedi	Professor	Civil Engineering	Roads and Airports Engineering
Dr.Saif Alzabeebee	Assist. Professor	Civil Engineering	Geotechnics
Dr.Hamsa Abbas Nayyef Zubaidi	Assist. Professor	Highway and Transportation Engineering	Highway and Transportation Engineering
Dr.Abeer Saeed Zebalah	Assist. Professor	Civil Engineering	Geotechnics

Dr. Salam Al-Obaidi	Assist. Professor	Civil Engineering	Structural Analysis and Design
Dr. Thulfiqar Salim	Lecturer	Civil Engineering	Building and Construction Engineering
Dr. Muhammed Abaaas Musa	Lecturer	Civil Engineering	Structural Engineering
Dr. Zaid Ali kadhim	Lecturer	Civil Engineering	Structural Engineering
Saba Mohammed Shaheed	Lecturer	Civil Engineering	Soil Mechanics
Rania Ihsan ALI	Assist. Lecturer	Roads and Transport Engineering	Roads and Transport Engineering
Rand Muhammed Jasim	Assist. Lecturer	Civil Engineering	Civil Engineering
Muhamed Jasim Shukan	Assist. Lecturer	Roads and Transport Engineering	Roads and Transport Engineering

12. Acceptance Criterion

Admission to the Bachelor's program in Roads and Transportation Engineering is governed by the Central Admission Rules of the Iraqi Ministry of Higher Education and Scientific Research based on High School GPA (Scientific / Applied tracks) and department capacity plans.

13. The Most Important Sources of Information About the Program

- A. College of Engineering Official Website.
- B. Handbook of the Roads and Transportation Engineering Department.
- C. National Standards of the Iraqi Council for Accreditation of Engineering Education (ICAEE).
- D. International Specifications (AASHTO, AISC, ACI, ASTM).

14. Program Development Plan

Continuous curriculum updating to keep pace with international universities, integration of Building Information Modeling (BIM) in road infrastructure, upgrading computing software licenses (Civil 3D, STAAD Pro, HCS), expanding field visits to highway construction sites, and aligning graduation projects with practical industry challenges.

Program Skills Map (Fourth Stage)

Course Code	Course Title	Core / Elective	GO.1	GO.2	GO.3	GO.4	GO.5	GO.6	GO.7
R.E 400	Foundation Engineering (1)	Core	✓	✓	✓				
R.E 401	Foundation Engineering (2)	Core	✓	✓	✓				
R.E 405	Design of Concrete Structures (2)	Core	✓	✓					
R.E 406	Design of Concrete Bridges	Core	✓	✓		✓			
R.E 410	Design of Steel Bridges (1)	Core	✓	✓					
R.E 411	Design of Steel Bridges (2)	Core	✓	✓		✓			
R.E 415	Highways Design 1	Core	✓	✓	✓				
R.E 416	Highways Design 2	Core	✓	✓	✓		✓		
R.E 431	Roads Maintenance and Safety	Core	✓	✓			✓	✓	
R.E 426	Quantity Surveying and Specifications	Core		✓		✓	✓		✓
R.E 425	Transports Planning	Core	✓	✓		✓	✓	✓	
R.E 420	Hydrology	Core	✓	✓	✓				
R.E 435	Computer Applications (3)	Core	✓	✓	✓			✓	
R.E 436	Computer Applications (4)	Core	✓	✓	✓			✓	
R.E 440	English Language (4)	Core				✓		✓	
R.E 446	Engineering Ethics	Core				✓	✓	✓	
R.E 445	Graduation Project	Core	✓	✓	✓	✓	✓	✓	✓

Fourth Stage

Course 1: Foundation Engineering (I)

No. & Field Header	Specification Details
1. Teaching Institution	College of Engineering / University of Al-Qadisiyah
2. University Department/Centre	Roads and Transportation Engineering
3. Course title/code	Foundation Engineering (I) / R.E 400
4. Programme(s) to which it contributes	Roads and Transportation Engineering Program
5. Modes of Attendance offered	Semester System ; Day Program, full-time face-to-face on campus. 15-week regular semester.
6. Semester/Year	1st Semester / Academic Year 2025–2026
7. Number of hours tuition (total)	45 hrs. / 3 hrs. per week (2 Theory + 1 Tutorial)
8. Date of production/revision of this specification	1-4-2026
9. Aims of the Course	The aims of the course are: 1. To develop an understanding of subsurface exploration, soil boring logs, and soil shear strength parameter determination. 2. To present shallow foundation ultimate bearing capacity theories (Terzaghi, Meyerhof, Hansen) under vertical, inclined, and eccentric loads. 3. To calculate elastic immediate settlement and primary consolidation settlement beneath shallow footings. 4. To build capacity in the structural and geotechnical design of combined footings, strap footings, and mat/raft foundations.

10. Learning Outcomes, Teaching, Learning and Assessment Method
By the end of this course, the student should be able to : a) Interpret subsurface site exploration data, SPT/CPT soil boring logs, and determine geotechnical design parameters. b) Calculate ultimate and allowable bearing capacity of shallow foundations using Terzaghi, Meyerhof, and Hansen equations.

- c) Evaluate bearing capacity reduction factors for footings subjected to eccentric and inclined loadings.
- d) Predict elastic (immediate) settlement and primary consolidation settlement in saturated cohesive soils.
- e) Perform geotechnical and structural design of rectangular and trapezoidal combined footings.
- f) Design strap footings, continuous strip footings, and rigid mat/raft foundations.
- g) Analyze flexible mat foundations using Winkler subgrade reaction spring models.
- h) Apply geotechnical mechanics and mathematical formulations to shallow foundation design problems.
- i) Produce foundation design solutions satisfying soil capacity, settlement limits, and structural code constraints.
- j) Interpret geotechnical laboratory and field test data to draw engineering design parameters.
- k) Work collaboratively in design teams to complete shallow foundation calculation sheets.
- l) Communicate shallow foundation designs via technical calculation reports and reinforcement drawings.
- m) Utilize specialized geotechnical software (PLAXIS/GeoStudio) for foundation stress and settlement analysis.

11. Teaching and Learning Methods

- 1. Lectures
- 2. Tutorials
- 3. Homework and assignments
- 4. Tests and Exams
- 5. In-Class questions and discussions
- 6. Connection between theory and application
- 7. Seminars
- 8. In- and Out-Class oral conversations
- 9. Reports, presentations, and posters

12. Assessment methods

- 1. Examinations, Tests, and Quizzes.
- 2. Extracurricular activities and homework.
- 3. Student engagement during lectures.

13. Course Structure

Week	Hours	Learning Outcomes (10)	Unit Module/Topic	Teaching Method (11)	Assessment Method (12)
1	3 (2 theo., 1 tut.)	a, h, j, l	Subsurface Site Exploration: Soil borings, sampling techniques, and planning	1	3
2	3 (2 theo., 1 tut.)	a, j, k, l	In-situ Field Testing: Standard Penetration Test (SPT), CPT, and soil boring logs	1-6	1-3
3	3 (2 theo., 1 tut.)	b, h, i, l	Bearing Capacity of Shallow Foundations: Terzaghi Bearing Capacity Theory	1-9	1-3
4	3 (2 theo., 1 tut.)	b, h, i, l	General Bearing Capacity Equation (Meyerhof, Hansen, Vesic shape/depth factors)	1-9	1-3
5	3 (2 theo., 1 tut.)	c, h, i, l	Design of Shallow Footings under Eccentric and Inclined Loads	1-9	1-3
6	3 (2 theo., 1 tut.)	d, h, i, j	Settlement of Shallow Foundations: Elastic (Immediate) Settlement calculations	1-9	1-3
7	3 (2 theo., 1 tut.)	d, h, i, j	Primary Consolidation Settlement calculation in saturated cohesive soils	1-9	1-3
8	3 (2 theo., 1 tut.)	e, h, i, k	Geotechnical and Structural Design of Rectangular Combined Footings	1-9	1-3
9	3 (2 theo., 1 tut.)	e, h, i, k	Geotechnical and Structural Design of Trapezoidal Combined Footings	1-9	1-3

10	3 (2 theo., 1 tut.)	f, h, i, l	Structural Design of Strap Footings and Continuous Strip Footings	1-9	1-3
11	3 (2 theo., 1 tut.)	f, h, i, l	Mat / Raft Foundations: Types, structural behavior, and Conventional Rigid Method	1-9	1-3
12	3 (2 theo., 1 tut.)	g, h, i, m	Flexible Method for Mat Foundations using Winkler Subgrade Spring Model	1-9	1-3
13	3 (2 theo., 1 tut.)	a-g, h-m	Design of Shallow Foundations under High Groundwater Table conditions	1-9	1-3
14	3 (2 theo., 1 tut.)	a-g, h-m	Structural Concrete Reinforcement Detailing for footings and mat slabs	1-9	1-3
15	3 (2 theo., 1 tut.)	a-m	Comprehensive Shallow Foundation Design Review and Term Exam	1-9	1-3

14. Infrastructure	Details
Required reading: • CORE TEXTS • COURSE MATERIALS • OTHER	Text Books: 1. <i>Principles of Foundation Engineering</i>, Braja M. Das, 9th Edition, Cengage Learning, 2019. 2. <i>Foundation Analysis and Design</i>, Joseph E. Bowles, 5th Edition, McGraw-Hill, 1996. References: 1. <i>Soil Mechanics in Engineering Practice</i>, K. Terzaghi, R. B. Peck, G. Mesri, 3rd Edition, Wiley, 1996. Others: 1. Class notebook and solved shallow foundation problem sheets.

Special requirements (include for example workshops, periodicals, IT software, websites)	1. Soil Mechanics Laboratory equipment. 2. Excel spreadsheets / PLAXIS 2D for footing settlement and mat analysis.
Community-based facilities (include for example, guest Lectures, internship, field studies)	Field visits to site investigation boring rigs and shallow foundation construction sites.

15. Admissions	Details
Pre-requisites	R.E 301, R.E 302
Minimum number of students	/
Maximum number of students	70

16. Course Instructor	Instructor Academic Profile
Primary Instructor	Assist. Prof. Dr. Saif Alzabeebee Ph.D. Civil Engineering – Geotechnics saif.alzabeebee@qu.edu.iq
Co-Instructor	N/A

Course 2: Design of Concrete Structures (II)

No. & Field Header	Specification Details
1. Teaching Institution	College of Engineering / University of Al-Qadisiyah
2. University Department/Centre	Roads and Transportation Engineering
3. Course title/code	Design of Concrete Structures (II) / R.E 405
4. Programme(s) to which it contributes	Roads and Transportation Engineering Program
5. Modes of Attendance offered	Semester System ; Day Program, full-time face-to-face on campus. 15-week regular semester.
6. Semester/Year	1st Semester / Academic Year 2025–2026
7. Number of hours tuition (total)	45 hrs. / 3 hrs. per week (2 Theory + 1 Tutorial)
8. Date of production/revision of this specification	1-4-2026
9. Aims of the Course	The aims of the course are:

	1. To present analysis and design methods for two-way edge-supported slab systems per ACI 318 code. 2. To design flat plates and flat slabs considering one-way and two-way punching shear. 3. To apply Yield Line Theory to determine ultimate flexural strength of concrete slabs. 4. To design slender concrete columns and beam sections under combined flexure, shear, and torsion.
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10. Learning Outcomes, Teaching, Learning and Assessment Method

By the end of this course, the student should be able to :

- a) Determine minimum thickness and calculate total static moment M_0 for two-way slabs per ACI 318.
- b) Apply the ACI Direct Design Method (DDM) and Equivalent Frame Method (EFM) to two-way slab systems.
- c) Evaluate punching shear strength and design shear stud rails/drop panels in flat plate floor systems.
- d) Apply Yield Line Theory and virtual work method to determine plastic collapse mechanisms of slabs.
- e) Evaluate column slenderness ratio (KL/r) and design slender columns using the Moment Magnification Method.
- f) Design reinforced concrete beam sections under combined flexure, shear, and torsional moment (T_u).
- g) Detail longitudinal and transverse reinforcement for two-way slabs, slender columns, and torsional members.
- h) Apply structural concrete mechanics and ACI 318 code equations to building frame problems.
- i) Produce concrete element designs satisfying ultimate strength, serviceability, and safety criteria.
- j) Work collaboratively in structural design teams to prepare complete floor slab calculation packages.

k) Communicate structural concrete designs through standard structural engineering drawings.

l) Utilize structural software (ETABS/SAFE) and design spreadsheets for slab and column analysis.

11. Teaching and Learning Methods

1. Lectures
2. Tutorials
3. Homework and design assignments
4. Tests and Exams
5. In-Class questions and discussions
6. Connection between theory and code specifications
7. Seminars
8. Structural drawing sheets
9. Reports and presentations

12. Assessment methods

1. Examinations, Tests, and Quizzes.
2. Structural design sheets and homework.
3. Student engagement during lectures.

13. Course Structure

Week	Hours	Learning Outcomes (10)	Unit Module/Topic	Teaching Method (11)	Assessment Method (12)
1	3 (2 theo., 1 tut.)	a, h, i, k	Two-Way Edge-Supported Slabs: Behavior, classification, minimum thickness	1	3
2	3 (2 theo., 1 tut.)	a, b, h, i, k	ACI Direct Design Method (DDM): Limitations, total static moment M_0	1-6	1-3
3	3 (2 theo., 1 tut.)	b, h, i, k	Distribution of bending moments into Column Strips and Middle Strips	1-9	1-3
4	3 (2 theo., 1 tut.)	b, h, i, l	Equivalent Frame Method (EFM): Frame idealization and structural analysis	1-9	1-3

5	3 (2 theo., 1 tut.)	c, h, i, k	Flat Plates and Flat Slabs: One-way vs two-way punching shear strength	1-9	1-3
6	3 (2 theo., 1 tut.)	c, h, i, k	Punching shear reinforcement design: Shear studs, stirrups, drop panels	1-9	1-3
7	3 (2 theo., 1 tut.)	d, h, i, k	Yield Line Theory: Virtual work principle and yield mechanisms in slabs	1-9	1-3
8	3 (2 theo., 1 tut.)	d, h, i, k	Yield line analysis for rectangular, triangular, and circular concrete slabs	1-9	1-3
9	3 (2 theo., 1 tut.)	e, h, i, k	Slender Columns: Slenderness ratio, sway vs non-sway frame classification	1-9	1-3
10	3 (2 theo., 1 tut.)	e, h, i, k	Moment Magnification Method for non-sway slender column design	1-9	1-3
11	3 (2 theo., 1 tut.)	e, h, i, k	Moment Magnification Method for sway slender frame column design	1-9	1-3
12	3 (2 theo., 1 tut.)	f, h, i, k	Torsion in Concrete Beams: Thin-walled tube analogy and cracking torque	1-9	1-3
13	3 (2 theo., 1 tut.)	f, h, i, k	Combined Shear, Flexure, and Torsional Moment Design per ACI 318	1-9	1-3
14	3 (2 theo., 1 tut.)	g, h, i, k	Reinforcement Detailing for Torsion: Closed stirrups and longitudinal bars	1-9	1-3
15	3 (2 theo., 1 tut.)	a-l	Comprehensive Concrete Structures Design Review and Term Exam	1-9	1-3

14. Infrastructure	Details
Required reading: • CORE TEXTS • COURSE MATERIALS • OTHER	Text Books: 1. <i>Design of Reinforced Concrete</i>, Jack C. McCormac, Russell H. Brown, 10th Edition, Wiley, 2015. References: 1. <i>Reinforced Concrete Mechanics and Design</i>, James K. Wight, 7th Edition, Pearson, 2016. Others: 1. ACI 318M Structural Concrete Building Code. 2. Collection of solved design sheets and exam archives.
Special requirements (include for example workshops, periodicals, IT software, websites)	1. Structural Engineering Software (ETABS, SAFE). 2. Excel spreadsheets for moment distribution and column interaction diagrams.
Community-based facilities (include for example, guest Lectures, internship, field studies)	Site visits to ongoing multi-story concrete building construction sites.

15. Admissions	Details
Pre-requisites	R.E 305, R.E 306
Minimum number of students	/
Maximum number of students	70

16. Course Instructor	Instructor Academic Profile
Primary Instructor	Assist. Prof. Dr. Salam Al-Obaidi Ph.D. Civil Engineering – Structural Analysis and Design salam.methem@qu.edu.iq
Co-Instructor	Lecturer Dr. Thulfiqar Salim Hussein Ph.D. Civil Engineering – Building and Construction Engineering Thulfiqar.Hussein@qu.edu.iq

Course 3: Design of Steel Structures (I)

No. & Field Header	Specification Details
1. Teaching Institution	College of Engineering / University of Al-Qadisiyah
2. University Department/Centre	Roads and Transportation Engineering
3. Course title/code	Design of Steel Structures (I) / R.E 410
4. Programme(s) to which it contributes	Roads and Transportation Engineering Program
5. Modes of Attendance offered	Semester System ; Day Program, full-time face-to-face on campus. 15-week regular semester.
6. Semester/Year	1st Semester / Academic Year 2025–2026
7. Number of hours tuition (total)	45 hrs. / 3 hrs. per week (2 Theory + 1 Tutorial)
8. Date of production/revision of this specification	1-4-2026
9. Aims of the Course	The aims of the course are: 1. To present structural steel material properties, AISC LRFD specifications, and safety factor principles. 2. To design steel tension members, considering gross yielding, net fracture, and block shear rupture. 3. To design steel compression columns considering flexural and local buckling. 4. To design high-strength bolted connections and welded joints under shear, tension, and eccentricity.

10. Learning Outcomes, Teaching, Learning and Assessment Method
By the end of this course, the student should be able to : a) Understand mechanical properties of structural steel grades and LRFD load combination philosophy. b) Calculate design tensile strength for tension members considering gross yielding, net fracture, and shear lag (U).

- c) Evaluate block shear rupture capacity in bolted tension connections and splice plates.
- d) Determine effective slenderness ratio (KL/r) and design steel compression columns per AISC specifications.
- e) Check local buckling limits for compact and non-compact steel compression elements.
- f) Design high-strength bolted connections (A325, A490) for bearing, shear, slip-critical, and eccentric loading.
- g) Design fillet and groove welded connections subjected to axial and eccentric forces.
- h) Apply structural steel mechanics and AISC LRFD specifications to steel framing problems.
- i) Produce structural steel element designs satisfying strength and serviceability requirements.
- j) Work collaboratively in teams to prepare structural steel connection calculation sheets.
- k) Communicate structural steel designs using standardized steel detailing drawings.
- l) Utilize steel design spreadsheets and software for automated section selection.

11. Teaching and Learning Methods

1. Lectures
2. Tutorials
3. Homework and design assignments
4. Tests and Exams
5. In-Class questions and discussions
6. Connection between theory and AISC code
7. Seminars
8. Structural steel drawing sheets
9. Reports and presentations

12. Assessment methods

1. Examinations, Tests, and Quizzes.
2. Steel design sheets and homework.
3. Student engagement during lectures.

13. Course Structure

Week	Hours	Learning Outcomes (10)	Unit Module/Topic	Teaching Method (11)	Assessment Method (12)
1	3 (2 theo., 1 tut.)	a, h, k	Structural Steel Properties: Grades, AISC LRFD design philosophy, safety factors	1	3
2	3 (2 theo., 1 tut.)	a, h, i, k	LRFD Load Factors, Load Combinations, and Resistance Factors (ϕ)	1-6	1-3
3	3 (2 theo., 1 tut.)	b, h, i, k	Design of Steel Tension Members: Gross section yielding vs net fracture	1-9	1-3
4	3 (2 theo., 1 tut.)	b, h, i, k	Net Section Area Calculations: Staggered bolt holes and shear lag factor (U)	1-9	1-3
5	3 (2 theo., 1 tut.)	c, h, i, k	Block Shear Rupture Strength and design of steel tension splice connections	1-9	1-3
6	3 (2 theo., 1 tut.)	d, h, i, k	Steel Column Stability: Euler buckling load, effective slenderness ratio (KL/r)	1-9	1-3
7	3 (2 theo., 1 tut.)	d, h, i, k	AISC Column Design Curves for flexural buckling strength determination	1-9	1-3
8	3 (2 theo., 1 tut.)	e, h, i, k	Local Buckling Limits: Compact vs non-compact sections in compression	1-9	1-3
9	3 (2 theo., 1 tut.)	d, e, h, i, j	Design of Built-Up Steel Compression Columns and lacing/batten plates	1-9	1-3
10	3 (2 theo., 1 tut.)	f, h, i, k	High-Strength Bolts (A325, A490): Bolt	1-9	1-3

			shear strength and bearing strength		
11	3 (2 theo., 1 tut.)	f, h, i, k	Slip-Critical Bolted Connections Design and eccentric bolted connections	1-9	1-3
12	3 (2 theo., 1 tut.)	g, h, i, k	Welding Processes: Fillet weld strength design and effective weld size	1-9	1-3
13	3 (2 theo., 1 tut.)	g, h, i, k	Complete Joint Penetration (CJP) and Partial (PJP) groove weld design	1-9	1-3
14	3 (2 theo., 1 tut.)	f, g, h, i, l	Design of Eccentric Welded Connections using elastic and ultimate strength methods	1-9	1-3
15	3 (2 theo., 1 tut.)	a-l	Comprehensive Steel Structures Design Review and Term Exam	1-9	1-3

14. Infrastructure	Details
Required reading: • CORE TEXTS • COURSE MATERIALS • OTHER	Text Books: 1. <i>Structural Steel Design</i>, Jack C. McCormac, Stephen F. Csernak, 6th Edition, Pearson, 2018. References: 1. <i>Steel Structures: Design and Behavior</i>, C. G. Salmon, J. E. Johnson, Pearson. Others: 1. AISC Steel Construction Manual (15th Edition). 2. Collection of steel connection design sheets.
Special requirements (include for example workshops, periodicals, IT software, websites)	1. AISC Interactive Steel Design Tables.

	2. Excel spreadsheets for tension, column, and connection design.
Community-based facilities (include for example, guest Lectures, internship, field studies)	Field visits to steel fabrication workshops and industrial steel portal frame sites.

15. Admissions	Details
Pre-requisites	R.E 310, R.E 311
Minimum number of students	/
Maximum number of students	70

16. Course Instructor	Instructor Academic Profile
Primary Instructor	Lecturer Dr.Muhammed Abaaas Musa Ph.D. Civil Engineering – Structural Engineering Mohammed.mousa@qu.edu.iq
Co-Instructor	N/A

Course 4: Highways Design (I)

No. & Field Header	Specification Details
1. Teaching Institution	College of Engineering / University of Al-Qadisiyah
2. University Department/Centre	Roads and Transportation Engineering
3. Course title/code	Highways Design (I) / R.E 415
4. Programme(s) to which it contributes	Roads and Transportation Engineering Program
5. Modes of Attendance offered	Semester System ; Day Program, full-time face-to-face on campus. 15-week regular semester.
6. Semester/Year	1st Semester / Academic Year 2025–2026
7. Number of hours tuition (total)	45 hrs. / 3 hrs. per week (2 Theory + 1 Tutorial)
8. Date of production/revision of this specification	1-4-2026
9. Aims of the Course	The aims of the course are: 1. To present highway functional classification, design controls, design vehicles, and traffic parameters per AASHTO Green Book.

	2. To calculate Stopping Sight Distance (SSD), Passing Sight Distance (PSD), and Decision Sight Distance (DSD). 3. To perform geometric design of simple circular, compound, and spiral transition horizontal alignment curves. 4. To design crest and sag vertical curves, earthwork volumes, and Mass-Haul Diagrams.
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10. Learning Outcomes, Teaching, Learning and Assessment Method

By the end of this course, the student should be able to :

- a) Classify rural and urban highway networks, design speed controls, and design vehicles.
- b) Compute Stopping Sight Distance (SSD), Passing Sight Distance (PSD), and Decision Sight Distance (DSD) on grades.
- c) Perform geometric design of circular horizontal curves, spiral transition curves, and check sight distance obstructions.
- d) Calculate superelevation runoff lengths, superelevation rates (e), and pavement widening on horizontal curves.
- e) Design crest and sag parabolic vertical curves satisfying sight distance, driver comfort, and drainage requirements.
- f) Compute highway cross-sectional areas, earthwork cut/fill volumes, and construct Mass-Haul Diagrams.
- g) Apply highway geometric principles and AASHTO guidelines to highway corridor problems.
- h) Produce highway geometric designs meeting terrain, safety, and operational constraints.
- i) Work collaboratively in design teams to complete full corridor geometric plan and profile sets.
- j) Communicate highway engineering designs through standard plan, profile, and cross-section sheets.
- k) Utilize highway CAD software (Autodesk Civil 3D) for 3D alignment and earthwork calculations.

11. Teaching and Learning Methods

- 1. Lectures
- 2. Tutorials
- 3. Homework and drawing assignments
- 4. Tests and Exams
- 5. In-Class questions and discussions
- 6. Connection between theory and AASHTO Green Book
- 7. Seminars
- 8. Highway design drawing sheets

9. Reports and presentations

12. Assessment methods

1. Examinations, Tests, and Quizzes.
2. Highway geometric drawing sheets and homework.
3. Student engagement during lectures.

13. Course Structure

Week	Hours	Learning Outcomes (10)	Unit Module/Topic	Teaching Method (11)	Assessment Method (12)
1	3 (2 theo., 1 tut.)	a, g, j	Highway Engineering Introduction: Functional classification, rural vs urban roads	1	3
2	3 (2 theo., 1 tut.)	a, g, h, j	Design Controls: Design vehicle, design speed, traffic volumes (ADT, DHV, K-factor)	1-6	1-3
3	3 (2 theo., 1 tut.)	b, g, h, j	Stopping Sight Distance (SSD) formulation on level terrain and steep grades	1-9	1-3
4	3 (2 theo., 1 tut.)	b, g, h, j	Passing Sight Distance (PSD) and Decision Sight Distance (DSD) calculations	1-9	1-3
5	3 (2 theo., 1 tut.)	c, d, g, h, j	Horizontal Alignment Mechanics: Side friction factor (f), superelevation (e)	1-9	1-3
6	3 (2 theo., 1 tut.)	c, d, g, h, j	Design of Simple Circular Horizontal Curves and sight distance obstructions	1-9	1-3
7	3 (2 theo., 1 tut.)	d, g, h, j	Superelevation Development Methods: Axis of rotation, runoff & tangent runout	1-9	1-3
8	3 (2 theo., 1 tut.)	c, d, g, h, j	Spiral Transition Curves Mechanics and pavement	1-9	1-3

			widening on horizontal curves		
9	3 (2 theo., 1 tut.)	e, g, h, j	Vertical Alignment: Maximum grades, critical length of grade, climbing lanes	1-9	1-3
10	3 (2 theo., 1 tut.)	e, g, h, j	Parabolic Vertical Curve Equations (Crest and Sag vertical curve geometry)	1-9	1-3
11	3 (2 theo., 1 tut.)	e, g, h, j	Geometric Design of Crest Vertical Curves for SSD and PSD requirements	1-9	1-3
12	3 (2 theo., 1 tut.)	e, g, h, j	Geometric Design of Sag Vertical Curves for headlight, comfort, and drainage	1-9	1-3
13	3 (2 theo., 1 tut.)	f, g, h, j	Highway Cross-Sectional Elements: Lanes, shoulders, medians, side slopes	1-9	1-3
14	3 (2 theo., 1 tut.)	f, g, h, k	Earthwork Volume Calculations: Average End Area Method & Mass-Haul Diagram	1-9	1-3
15	3 (2 theo., 1 tut.)	a-k	Comprehensive Highway Geometric Design Review and Term Exam	1-9	1-3

14. Infrastructure	Details
Required reading: • CORE TEXTS • COURSE MATERIALS • OTHER	Text Books: 1. <i>A Policy on Geometric Design of Highways and Streets</i> (AASHTO Green Book), 7th Edition, AASHTO, 2018. References: 1. <i>Highway Engineering</i>, Paul H. Wright, Karen Dixon, 7th Edition, Wiley, 2004. Others:

	1. Iraqi Highway Design Manual (IHDM). 2. Collection of highway plan and profile drawing sheets.
Special requirements (include for example workshops, periodicals, IT software, websites)	1. Highway Design CAD Software (Autodesk Civil 3D). 2. Excel spreadsheets for horizontal/vertical curve design and earthwork mass-haul.
Community-based facilities (include for example, guest Lectures, internship, field studies)	Field visits to highway earthwork and grading construction sites.

15. Admissions	Details
Pre-requisites	R.E 315
Minimum number of students	/
Maximum number of students	70

16. Course Instructor	Instructor Academic Profile
Primary Instructor	Prof. Dr. Jalal Taqi Shaker Al-Obaedi Ph.D. Civil Engineering – Roads and Airports Engineering jalal.alobaedi@qu.edu.iq
Co-Instructor	Assistant Lecturer Rania Ihsan Ali M.Sc. Civil Engineering – Roads and Transport Engineering rainaali.eng.road@qu.edu.iq

Course 5: Roads Maintenance and Safety

No. & Field Header	Specification Details
1. Teaching Institution	College of Engineering / University of Al-Qadisiyah
2. University Department/Centre	Roads and Transportation Engineering
3. Course title/code	Roads Maintenance and Safety / R.E 431
4. Programme(s) to which it contributes	Roads and Transportation Engineering Program
5. Modes of Attendance offered	Semester System ; Day Program, full-time face-to-face on campus. 15-week regular semester.
6. Semester/Year	1st Semester / Academic Year 2025–2026
7. Number of hours tuition (total)	30 hrs. / 2 hrs. per week (2 Theory)

8. Date of production/revision of this specification	1-4-2026
9. Aims of the Course	The aims of the course are: 1. To develop an understanding of Pavement Management Systems (PMS) and pavement condition evaluation. 2. To present flexible and rigid pavement distress identification techniques and Pavement Condition Index (PCI) calculations. 3. To build capacity in selecting appropriate preventive, corrective, and structural road maintenance treatments. 4. To develop knowledge in traffic safety management, crash data analysis, black-spot identification, and road safety audits.

10. Learning Outcomes, Teaching, Learning and Assessment Method
By the end of this course, the student should be able to : a) Explain the core components and operational framework of Pavement Management Systems (PMS). b) Identify and measure flexible pavement distresses (fatigue cracking, rutting, raveling, bleeding, edge cracking). c) Conduct field pavement condition surveys and compute Pavement Condition Index (PCI) per ASTM D6433. d) Select appropriate preventive maintenance treatments (crack sealing, fog seal, slurry seal, chip seal). e) Evaluate structural pavement distresses and select rehabilitation strategies (patching, milling, HMA overlays). f) Identify rigid pavement distresses (spalling, faulting, corner breaks) and select joint/slab repair techniques. g) Analyze traffic collision data, calculate accident rates, and construct collision diagrams.

- h) Identify high-accident locations (Black Spots) using statistical methods and safety performance functions.
- i) Conduct Road Safety Audits (RSA) across planning, design, and operational stages using standard checklists.
- j) Evaluate highway safety hardware including guardrails, median barriers, and crash cushions.
- k) Formulate work zone traffic management plans and safety measures during highway maintenance operations.
- l) Apply pavement maintenance guidelines and AASHTO Highway Safety Manual (HSM) procedures.
- m) Develop pavement rehabilitation and traffic safety solutions considering economic and safety impacts.
- n) Analyze field pavement distress and crash data using engineering judgment.
- o) Function effectively on multidisciplinary road safety auditing and pavement inspection teams.
- p) Communicate maintenance decisions and safety audit findings through technical reports.
- q) Utilize pavement management software (MicroPAVER) and statistical crash analysis tools.

11. Teaching and Learning Methods

1. Lectures
2. Tutorials
3. Homework and field reports
4. Tests and Exams
5. In-Class questions and discussions
6. Connection between theory and field distress photos/videos
7. Seminars
8. Case study analysis
9. Reports and presentations

12. Assessment methods

1. Examinations, Tests, and Quizzes.
2. Field distress reports and safety audit assignments.
3. Student engagement during lectures.

13. Course Structure

Week	Hours	Learning Outcomes (10)	Unit Module/Topic	Teaching Method (11)	Assessment Method (12)
1	2 theo.	a, l, p	Introduction to Pavement Management Systems (PMS) and road maintenance objectives	1	3
2	2 theo.	b, n, p	Flexible Pavement Distresses: Cracking types (Fatigue, Longitudinal, Transverse)	1-6	1-3
3	2 theo.	b, n, p	Flexible Pavement Distresses: Deformation (Rutting, Shoving), Surface defects	1-9	1-3
4	2 theo.	c, n, p	Pavement Condition Index (PCI) Survey Methodology per ASTM D6433	1-9	1-3
5	2 theo.	c, n, q	PCI Calculation Procedure: Distress density, deduct values, corrected deduct value	1-9	1-3
6	2 theo.	d, m, p	Preventive Maintenance Techniques: Crack sealing, fog seal, slurry seal, micro-surfacing	1-9	1-3
7	2 theo.	e, m, p	Corrective Maintenance & Rehabilitation: Patching, HMA overlays, asphalt recycling	1-9	1-3
8	2 theo.	f, m, p	Rigid Pavement Distresses (faulting, spalling, corner breaks) and repair methods	1-9	1-3
9	2 theo.	g, l, m, p	Fundamentals of Traffic Safety: Human, vehicle, and	1-9	1-3

			roadway environment factors		
10	2 theo.	g, h, n, p	Traffic Collision Data Collection, crash report analysis, accident rate calculations	1-9	1-3
11	2 theo.	h, n, q	Identification of High-Accident Locations (Black Spots): Statistical methods	1-9	1-3
12	2 theo.	h, n, p	Traffic Conflict Technique (TCT) and accident reconstruction principles	1-9	1-3
13	2 theo.	i, m, o, p	Road Safety Audit (RSA) stages, procedures, and safety checklists	1-9	1-3
14	2 theo.	j, m, p	Highway Safety Hardware: Longitudinal barriers, guardrails, crash cushions	1-9	1-3
15	2 theo.	k, m, p	Work Zone Traffic Control and Safety Measures during road maintenance operations	1-9	1-3

14. Infrastructure	Details
Required reading: • CORE TEXTS • COURSE MATERIALS • OTHER	Text Books: 1. <i>Highway Safety Manual</i> (HSM), 1st Edition, AASHTO, 2010. 2. <i>Pavement Maintenance Management</i>, AASHTO Maintenance Guide. References: 1. <i>ASTM D6433 Standard Practice for Roads Pavement Condition Index Surveys</i>.

	2. <i>Roadside Design Guide</i>, 4th Edition, AASHTO, 2011. Others: 1. MicroPAVER Pavement Management Software User Manual. 2. Collection of field pavement distress photos and traffic collision reports.
Special requirements (include for example workshops, periodicals, IT software, websites)	1. Pavement Distress Inspection Equipment. 2. Excel spreadsheets for PCI calculations and accident rate analysis.
Community-based facilities (include for example, guest Lectures, internship, field studies)	Field studies on urban arterial road distresses and safety audits.

15. Admissions	Details
Pre-requisites	R.E 315
Minimum number of students	/
Maximum number of students	70

16. Course Instructor	Instructor Academic Profile
Primary Instructor	Assist. Prof. Dr.Hamsa Abbas Zubaidi Ph.D. Highway and Transportation Engineering hamsa.alzubaidi@qu.edu.iq
Co-Instructor	Assist. Lecturer Muhamed Jasim Shukan M.Sc/ Road Eng. mohammed.jassim@qu.edu.iq

Course 6: Quantity Surveying and Specifications

No. & Field Header	Specification Details
1. Teaching Institution	College of Engineering / University of Al-Qadisiyah
2. University Department/Centre	Roads and Transportation Engineering
3. Course title/code	Quantity Surveying and Specifications / R.E 426

4. Programme(s) to which it contributes	Roads and Transportation Engineering Program
5. Modes of Attendance offered	Semester System ; Day Program, full-time face-to-face on campus. 15-week regular semester.
6. Semester/Year	1st Semester / Academic Year 2025–2026
7. Number of hours tuition (total)	30 hrs. / 2 hrs. per week (2 Theory)
8. Date of production/revision of this specification	1-4-2026
9. Aims of the Course	The aims of the course are: 1. To develop an understanding of quantity takeoff principles for highway, bridge, and earthwork engineering projects. 2. To present procedures for preparing standard Bill of Quantities (BOQ), unit rate analysis, and total project cost estimation. 3. To build capacity in interpreting Iraqi General Standard Specifications for Roads and Bridges (SORB). 4. To develop knowledge in engineering contracts, bidding procedures, and FIDIC conditions of contract.

10. Learning Outcomes, Teaching, Learning and Assessment Method
By the end of this course, the student should be able to : a) Interpret engineering contract documents, tender drawings, technical specifications, and legal contract structures. b) Perform detailed quantity takeoff for earthwork operations, including cut, fill, compaction factors, and borrow pits. c) Perform quantity takeoff for pavement structural layers (subbase, aggregate base, prime/tack coats, HMA). d) Compute concrete volumes, formwork areas, and prepare Bar Bending Schedules (BBS) for culverts and bridge structures. e) Conduct unit rate analysis incorporating raw material costs, equipment hourly rates, labor wages, overheads, and profit.

- f) Prepare priced Bills of Quantities (BOQ) structured according to standard Iraqi Ministry specifications.
- g) Process interim and final payment certificates, evaluate variation orders, and analyze engineering contract claims.
- h) Apply clauses of the Iraqi General Standard Specifications for Roads and Bridges (SORB).
- i) Apply terms and conditions of the FIDIC Conditions of Contract for Construction (Red Book).
- j) Apply mathematical mensuration formulas and engineering economics to cost estimation problems.
- k) Formulate construction cost estimates and contract documents meeting financial and legal constraints.
- l) Recognize ethical responsibilities and legal standards in bidding and contract administration.
- m) Work collaboratively in estimation teams to compile comprehensive project tender documents.
- n) Communicate cost estimates and contract terms through professional BOQ spreadsheets.
- o) Utilize spreadsheet software (MS Excel) for automated estimation and BBS generation.

11. Teaching and Learning Methods

- 1. Lectures
- 2. Tutorials
- 3. Homework and BOQ assignments
- 4. Tests and Exams
- 5. In-Class questions and discussions
- 6. Connection between theory and actual engineering drawings
- 7. Seminars
- 8. Spreadsheet exercises
- 9. Reports and presentations

12. Assessment methods

- 1. Examinations, Tests, and Quizzes.
- 2. Quantity takeoff sheets and BOQ assignments.
- 3. Student engagement during lectures.

13. Course Structure

Week	Hours	Learning Outcomes (10)	Unit Module/Topic	Teaching Method (11)	Assessment Method (12)
1	2 theo.	a, l, n	Introduction to Quantity Surveying, contract documents, and bidding procedures	1	3
2	2 theo.	a, i, l, n	Structure of Engineering Contracts, role of resident engineer and quantity surveyor	1-6	1-3
3	2 theo.	j, n, o	Quantity Takeoff Principles: Units of measurement and mensuration formulas	1-9	1-3
4	2 theo.	b, j, n	Highway Earthwork Quantity Calculation: Cut and fill from cross-section sheets	1-9	1-3
5	2 theo.	b, j, n	Earthwork Compaction Factors, shrinkage, swell, and mass-haul quantities	1-9	1-3
6	2 theo.	c, j, n	Quantity Takeoff for Pavement Layers: Subbase, aggregate base, prime/tack coat	1-9	1-3
7	2 theo.	c, j, n	Quantity Takeoff for Asphalt Binder and Wearing Courses (tons / m ²)	1-9	1-3
8	2 theo.	d, j, n	Quantity Takeoff for Box and Pipe Culverts: Excavation, bedding, concrete volume	1-9	1-3
9	2 theo.	d, j, n, o	Preparation of Bar Bending Schedules (BBS) for reinforced concrete culverts	1-9	1-3
10	2 theo.	d, j, n	Concrete and Steel Reinforcement Takeoff for bridge piers and deck slabs	1-9	1-3

11	2 theo.	e, j, k, n	Unit Rate Analysis: Material costs, equipment hourly rates, labor wages, overheads	1-9	1-3
12	2 theo.	f, k, m, n, o	Preparation of Standard Bill of Quantities (BOQ) per Iraqi Ministry formats	1-9	1-3
13	2 theo.	g, l, n	Payment Certificates (Interim and Final), variation orders, and claims	1-9	1-3
14	2 theo.	h, l, n	Iraqi Standard Specifications for Roads and Bridges (SORB) overview	1-9	1-3
15	2 theo.	i, l, n	Conditions of Contract for Construction (FIDIC Red Book) overview	1-9	1-3

14. Infrastructure	Details
Required reading: • CORE TEXTS • COURSE MATERIALS • OTHER	Text Books: 1. <i>Standard Specifications for Roads and Bridges</i> (SORB - Iraq), State Commission for Roads and Bridges. 2. <i>Estimating in Building Construction</i>, Frank R. Dagostino, 8th Edition, Pearson, 2014. References: 1. <i>FIDIC Conditions of Contract for Construction</i> (Red Book), 1st Edition, FIDIC, 1999. Others: 1. Sample BOQ forms from the Ministry of Construction and Housing. 2. Collection of highway contract drawing sets for takeoff practice.

Special requirements (include for example workshops, periodicals, IT software, websites)	1. MS Excel for BOQ spreadsheets and rate analysis. 2. Available websites related to FIDIC and Ministry specifications.
Community-based facilities (include for example, guest Lectures, internship, field studies)	Guest lectures by senior resident engineers and contract administrators.

15. Admissions	Details
Pre-requisites	R.E 326
Minimum number of students	/
Maximum number of students	70

16. Course Instructor	Instructor Academic Profile
Primary Instructor	Lecturer Dr Zaid Ali kadhim Ph.D. Civil Engineering – Structural Engineering zaidalzaidi20142016@gmail.com
Co-Instructor	N/A

Course 7: Computer Applications in Roads Engineering (III)

No. & Field Header	Specification Details
1. Teaching Institution	College of Engineering / University of Al-Qadisiyah
2. University Department/Centre	Roads and Transportation Engineering
3. Course title/code	Computer Applications in Roads Engineering (III) / R.E 435
4. Programme(s) to which it contributes	Roads and Transportation Engineering Program
5. Modes of Attendance offered	Semester System ; Day Program, full-time face-to-face on campus. 15-week regular semester.
6. Semester/Year	1st Semester / Academic Year 2025–2026
7. Number of hours tuition (total)	45 hrs. / 3 hrs. per week (1 Theory + 2 Practical Lab)
8. Date of production/revision of this specification	1-4-2026
9. Aims of the Course	The aims of the course are:

	1. To develop practical skills in Autodesk Civil 3D for 3D terrain modeling, contour analysis, and point group management. 2. To design 3D horizontal alignments, spiral transition curves, and superelevation in Civil 3D. 3. To design vertical profiles, vertical curves, custom assemblies, and 3D highway corridors. 4. To generate cross-sections, sample lines, earthwork volume reports, and Mass-Haul diagrams in Civil 3D.
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10. Learning Outcomes, Teaching, Learning and Assessment Method

By the end of this course, the student should be able to :

- a) Import survey point data, create 3D Digital Terrain Models (TIN surfaces), and perform contour editing in Civil 3D.
- b) Design horizontal highway alignments, spiral transition curves, and superelevation in Autodesk Civil 3D.
- c) Extract ground profiles, design vertical alignment layout profiles, and vertical curves in Civil 3D.
- d) Create custom assemblies/subassemblies and construct 3D highway corridors with target surfaces.
- e) Generate sample lines, section views, and compute earthwork cut/fill volumes and Mass-Haul diagrams in Civil 3D.
- f) Apply CAD software algorithms to solve complex highway geometric design problems.
- g) Produce integrated 3D highway corridor solutions meeting AASHTO geometric design constraints.
- h) Work collaboratively in computer laboratory teams to deliver full Civil 3D highway project files.
- i) Recognize professional responsibilities and verify accuracy of computer-generated CAD outputs.
- j) Communicate engineering designs effectively through computer-generated plan, profile, and section sheets.
- k) Master Civil 3D software tools for professional highway design practice.

11. Teaching and Learning Methods

1. Theoretical lectures explaining software algorithms
2. Computer laboratory sessions
3. Homework and software project assignments
4. Tests and Practical Exams
5. In-Class questions and software troubleshooting
6. Connection between theory and software operations
7. Seminars
8. Hands-on computer exercises
9. Software project reports and presentations

12. Assessment methods

1. Practical Examinations, Software Tests, and Quizzes.
2. Weekly software design files and project submissions.
3. Student engagement during laboratory sessions.

13. Course Structure

Week	Hours	Learning Outcomes (10)	Unit Module/Topic	Teaching Method (11)	Assessment Method (12)
1	3 (1 th., 2 lab)	a, f, j, k	Autodesk Civil 3D Interface, point styles, importing survey point files	1	3
2	3 (1 th., 2 lab)	a, f, j, k	Creating Point Groups, 3D surface generation (TIN surfaces), boundary definitions	1-6	1-3
3	3 (1 th., 2 lab)	a, f, j, k	Surface Analysis: Slope vectors, contour style editing, elevation analysis	1-9	1-3
4	3 (1 th., 2 lab)	b, f, g, j, k	Horizontal Alignment Design: Creating alignments from polylines, design criteria	1-9	1-3
5	3 (1 th., 2 lab)	b, f, g, j, k	Editing curve radius, adding spiral transition curves, design speed tables	1-9	1-3

6	3 (1 th., 2 lab)	b, f, g, j, k	Superelevation Wizard: Specifying lane widths, crown slope, runoff length	1-9	1-3
7	3 (1 th., 2 lab)	b, f, g, j, k	Superelevation View Creation and manual superelevation station editing	1-9	1-3
8	3 (1 th., 2 lab)	c, f, g, j, k	Existing Ground Surface Profile extraction along horizontal alignment	1-9	1-3
9	3 (1 th., 2 lab)	c, f, g, j, k	Design Vertical Profile Creation: Layout tools, grade lines, vertical curves	1-9	1-3
10	3 (1 th., 2 lab)	d, f, g, j, k	Assembly Creation: Subassemblies (lanes, shoulders, curbs, side slopes)	1-9	1-3
11	3 (1 th., 2 lab)	d, f, g, j, k	Corridor Modeling: Target surface assignment, frequency, corridor rebuilding	1-9	1-3
12	3 (1 th., 2 lab)	e, f, g, j, k	Sample Line Creation along corridor at specified station increments	1-9	1-3
13	3 (1 th., 2 lab)	e, f, g, j, k	Cross-Section View Creation, material list definition (Cut, Fill, Pavement)	1-9	1-3
14	3 (1 th., 2 lab)	e, f, g, j, k	Earthwork Volume Reports, Mass-Haul Diagram generation in Civil 3D	1-9	1-3
15	3 (1 th., 2 lab)	a-k	Comprehensive Civil 3D Highway Design Project Completion and Exam	1-9	1-3

14. Infrastructure	Details
Required reading: • CORE TEXTS • COURSE MATERIALS	Text Books: 1. <i>Autodesk Civil 3D Essentials User Guide</i>, Autodesk Press.

• OTHER	References: 1. <i>Mastering Autodesk Civil 3D</i> , Cyndy Davenport, Ishka Voiculescu, Sybex. Others: 1. Computer lab exercise sheets and sample CAD survey files.
Special requirements (include for example workshops, periodicals, IT software, websites)	1. CAD Computer Laboratory equipped with Civil 3D software licenses. 2. Available websites related to Autodesk Knowledge Network.
Community-based facilities (include for example, guest Lectures, internship, field studies)	Hands-on workshops led by certified Autodesk Civil 3D specialists.

15. Admissions	Details
Pre-requisites	R.E 335
Minimum number of students	/
Maximum number of students	70

16. Course Instructor	Instructor Academic Profile
Primary Instructor	Assist. Prof. Dr..Abeer Saeed Zebalah Ph.D. Civil Engineering – Geotechnics abeer.alkraway@qu.edu.iq
Co-Instructor	Assistant Lecturer Rand Muhammed Jasim M.Sc. Civil Engineering rand.mohammed.eng@qu.edu.iq

Course 8: English Language (IV)

No. & Field Header	Specification Details
1. Teaching Institution	College of Engineering / University of Al-Qadisiyah
2. University Department/Centre	Roads and Transportation Engineering

3. Course title/code	English Language (IV) / R.E 440
4. Programme(s) to which it contributes	Roads and Transportation Engineering Program
5. Modes of Attendance offered	Semester System ; Day Program, full-time face-to-face on campus. 15-week regular semester.
6. Semester/Year	1st Semester / Academic Year 2025–2026
7. Number of hours tuition (total)	30 hrs. / 2 hrs. per week (2 Theory)
8. Date of production/revision of this specification	1-4-2026
9. Aims of the Course	The aims of the course are: 1. To develop technical writing skills required for engineering reports, executive summaries, and research proposals. 2. To present specialized technical terminology related to highways, bridge structures, traffic, and soil engineering. 3. To build capacity in reading, interpreting, and describing engineering drawings, data tables, and charts in English. 4. To develop oral communication, public speaking, and presentation skills for academic project defenses.

10. Learning Outcomes, Teaching, Learning and Assessment Method
By the end of this course, the student should be able to : a) Distinguish between general English writing and professional engineering technical writing styles. b) Structure formal technical reports, executive summaries, methodology sections, and conclusions. c) Master specialized vocabulary in highway geometric design, pavement engineering, bridges, and soil mechanics. d) Draft formal business correspondence, method statements, technical emails, and project cover letters. e) Write technical project proposals and bidding letters following standard international formats.

- f) Describe engineering processes, experimental setups, flowcharts, and technical drawings in accurate English.
- g) Interpret data tables, graphs, and charts, and write clear data commentary on engineering trends.
- h) Structure academic oral presentations and design clean, visually effective PowerPoint slides.
- i) Demonstrate effective public speaking techniques, signposting language, and professional body language.
- j) Manage question and answer (Q&A) sessions effectively during technical presentations and thesis defenses.
- k) Apply advanced English language skills to technical communication in professional engineering contexts.
- l) Work collaboratively in teams to prepare joint presentation slide decks.
- m) Recognize ethical requirements regarding proper citation, avoiding plagiarism, and academic integrity.
- n) Formulate and refine technical writing outputs to meet formal academic and industrial standards.
- o) Communicate engineering concepts clearly and persuasively to both technical and non-technical audiences.

11. Teaching and Learning Methods

- 1. Lectures
- 2. Interactive exercises
- 3. Homework and writing assignments
- 4. Tests and Exams
- 5. In-Class oral presentations
- 6. Technical reading comprehension
- 7. Seminars
- 8. Individual presentation practice
- 9. Reports and slide portfolios

12. Assessment methods

- 1. Examinations, Tests, and Quizzes.
- 2. Technical writing assignments and vocabulary quizzes.
- 3. Oral technical presentations and student engagement.

13. Course Structure

Week	Hours	Learning Outcomes (10)	Unit Module/Topic	Teaching Method (11)	Assessment Method (12)
1	2 theo.	a, b, k, n, o	Principles of Technical Writing vs General Writing; Report structure and formatting	1	3
2	2 theo.	b, k, n, o	Writing Effective Abstract and	1-6	1-3

			Executive Summary sections for engineering reports		
3	2 theo.	c, k, o	Technical Vocabulary: Highway geometric design and pavement engineering terms	1-9	1-3
4	2 theo.	c, k, o	Technical Vocabulary: Bridge structures, concrete, steel, and foundation terms	1-9	1-3
5	2 theo.	d, k, o	Drafting Formal Business Letters, method statements, and professional emails	1-9	1-3
6	2 theo.	e, k, o	Writing Technical Proposals and bidding cover letters in clear English	1-9	1-3
7	2 theo.	f, k, o	Describing Process Flow, experimental procedures, and laboratory test setups	1-9	1-3
8	2 theo.	g, k, o	Data Commentary: Describing trends in graphs, charts, and statistical tables	1-9	1-3
9	2 theo.	f, g, k, m, o	Interpreting Technical Specifications and contract clause language in English	1-9	1-3
10	2 theo.	h, k, o	Structure of an Academic Oral Presentation; Designing effective visual slides	1-9	1-3
11	2 theo.	i, k, o	Public Speaking Techniques, body language, and signposting language during talks	1-9	1-3
12	2 theo.	j, k, o	Handling Question and Answer (Q&A) sessions during academic thesis defenses	1-9	1-3

13	2 theo.	h, i, j, k, l, o	Student Technical Presentations on graduation project topics (Session 1)	1-9	1-3
14	2 theo.	h, i, j, k, l, o	Student Technical Presentations on graduation project topics (Session 2)	1-9	1-3
15	2 theo.	a-o	Course Review, final technical essay writing, and presentation feedback	1-9	1-3

14. Infrastructure	Details
Required reading: • CORE TEXTS • COURSE MATERIALS • OTHER	Text Books: 1. <i>Technical English for Engineers</i>, Cambridge University Press. References: 1. <i>Oxford English for Careers: Engineering</i>, Lewis Lansford, Peter Astley, Oxford. Others: 1. Technical writing style guides and grammar handouts.
Special requirements (include for example workshops, periodicals, IT software, websites)	1. Multimedia classroom equipped with audio/video projection. 2. Presentation software (MS PowerPoint).
Community-based facilities (include for example, guest Lectures, internship, field studies)	Public speaking workshops and presentation practice sessions.

15. Admissions	Details
Pre-requisites	R.E 340
Minimum number of students	/
Maximum number of students	70

16. Course Instructor	Instructor Academic Profile
Primary Instructor	Lecturer Saba Mohammed Shaheed M.Sc. Civil Engineering – Soil Mechanics saba.shheed@qu.edu.iq
Co-Instructor	N/A

Course 9: Graduation Project (I)

No. & Field Header	Specification Details
1. Teaching Institution	College of Engineering / University of Al-Qadisiyah
2. University Department/Centre	Roads and Transportation Engineering
3. Course title/code	Graduation Project (I) / R.E 445-A
4. Programme(s) to which it contributes	Roads and Transportation Engineering Program
5. Modes of Attendance offered	Semester System ; Day Program, full-time face-to-face on campus. 15-week regular semester.
6. Semester/Year	1st Semester / Academic Year 2025–2026
7. Number of hours tuition (total)	45 hrs. / 3 hrs. per week (1 Advising + 2 Practical/Lab)
8. Date of production/revision of this specification	1-4-2026
9. Aims of the Course	The aims of the course are: 1. To select and formulate a research problem statement in roads, bridges, traffic, or geotechnical engineering. 2. To perform a comprehensive literature review of peer-reviewed journals, specifications, and design manuals. 3. To establish a research methodology, Gantt chart timeline, and initiate field traffic/survey data collection. 4. To present a mid-year progress seminar and submit Semester 1 project progress report.

10. Learning Outcomes, Teaching, Learning and Assessment Method
By the end of this course, the student should be able to : a) Formulate a clear engineering research problem statement, project scope, and specific objectives.

- b) Conduct a detailed literature review summarizing previous academic studies and design specifications.
- c) Develop a project work breakdown structure (WBS) and Gantt chart timeline.
- d) Plan and execute preliminary field data collection (traffic counts, topographic GPS surveys) and laboratory testing.
- e) Prepare and deliver a progress presentation before a scientific examining committee.
- f) Apply engineering principles to define complex roads infrastructure problems.
- g) Identify public health, safety, environmental, and economic factors relevant to project scope.
- h) Communicate research proposal and preliminary data through written reports and oral presentations.
- i) Function effectively on a student project team, establishing goals and meeting project milestones.
- j) Acquire new knowledge independently using peer-reviewed journals and design standards.

11. Teaching and Learning Methods

1. Weekly faculty advisor supervision sessions
2. Independent field surveys and laboratory experiments
3. Literature review research
4. Mid-year progress seminar
5. In-Class questions and discussions
6. Connection between theory and actual engineering projects
7. Seminars and draft proposal reviews
8. Oral rehearsal presentations
9. Progress report and poster defense

12. Assessment methods

1. Advisor progress evaluation.
2. Mid-year progress seminar defense before examining committee.
3. Written progress report submission.

13. Course Structure

Week	Hours	Learning Outcomes (10)	Unit Module/Topic	Teaching Method (11)	Assessment Method (12)
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1	3 (1 adv., 2 lab)	a, f, h, i	Project Allocation, assigning faculty advisors, team formation, and initial briefing	1	3
2	3 (1 adv., 2 lab)	a, f, g, h	Problem Statement Definition, scope definition, establishing project methodology	1-6	1-3
3	3 (1 adv., 2 lab)	c, h, i	Project Scheduling, Work Breakdown Structure (WBS), Gantt chart preparation	1-9	1-3
4	3 (1 adv., 2 lab)	b, h, j	Literature Review: Finding peer-reviewed journals, codes, and design manuals	1-9	1-3
5	3 (1 adv., 2 lab)	b, h, j	Summarizing Previous Studies and identifying the engineering research gap	1-9	1-3
6	3 (1 adv., 2 lab)	d, f, h, i	Planning Field Data Collection: Traffic volume counting, O-D surveys	1-9	1-3
7	3 (1 adv., 2 lab)	d, f, h, i	Field Data Collection Execution (traffic surveys, topographic GPS points)	1-9	1-3
8	3 (1 adv., 2 lab)	d, f, h, i	Laboratory Testing Execution (soil CBR, asphalt mix testing, aggregate)	1-9	1-3
9	3 (1 adv., 2 lab)	d, f, h, i	Statistical Processing and validation of field and laboratory datasets	1-9	1-3
10	3 (1 adv., 2 lab)	a-d, f, g, h	Methodology Formulation and initial analytical calculations	1-9	1-3
11	3 (1 adv., 2 lab)	a-d, f, g, h	Preliminary Software Model Setup (Civil 3D alignment or STAAD frame)	1-9	1-3

12	3 (1 adv., 2 lab)	e, h, i	Preparing Mid-Year Progress Presentation slides and abstract	1-9	1-3
13	3 (1 adv., 2 lab)	e, h, i, j	Mid-Year Progress Presentation Defense before department committee	1-9	1-3
14	3 (1 adv., 2 lab)	e, h, i	Advisor Feedback Implementation and refining project plan for semester 2	1-9	1-3
15	3 (1 adv., 2 lab)	a-j	Semester 1 Progress Report Submission and literature review approval	1-9	1-3

14. Infrastructure	Details
Required reading: • CORE TEXTS • COURSE MATERIALS • OTHER	Text Books: 1. <i>College of Engineering Graduation Project Writing & Formatting Guidebook.</i> 2. AASHTO, ACI, AISC, ASTM, and FHWA Official Design Standards and Manuals. References: 1. Peer-reviewed journal papers (ASCE Journal of Transportation Engineering).
Special requirements (include for example workshops, periodicals, IT software, websites)	1. Soil/Highway Testing Laboratories. 2. CAD/FEA Computer Lab (Civil 3D, STAAD Pro, HCS, MS Excel).
Community-based facilities (include for example, guest Lectures, internship, field studies)	Field traffic surveys and site soil sampling.

15. Admissions	Details
Pre-requisites	Successful completion of Stage 1, 2, and 3 subjects
Minimum number of students	/
Maximum number of students	70

16. Course Instructor	Instructor Academic Profile
Primary Instructor	VARIBLES
Co-Instructor	N/A

SECOND SEMESTER COURSES

Course 10: Foundation Engineering (II)

No. & Field Header	Specification Details
1. Teaching Institution	College of Engineering / University of Al-Qadisiyah
2. University Department/Centre	Roads and Transportation Engineering
3. Course title/code	Foundation Engineering (II) / R.E 401
4. Programme(s) to which it contributes	Roads and Transportation Engineering Program
5. Modes of Attendance offered	Semester System ; Day Program, full-time face-to-face on campus. 15-week regular semester.
6. Semester/Year	2nd Semester / Academic Year 2025–2026
7. Number of hours tuition (total)	45 hrs. / 3 hrs. per week (2 Theory + 1 Tutorial)
8. Date of production/revision of this specification	1-4-2026
9. Aims of the Course	The aims of the course are: 1. To compute Rankine and Coulomb lateral earth pressures under surcharge loads and water table conditions. 2. To perform stability analysis (overturning, sliding, bearing) and reinforcement design for cantilever retaining walls. 3. To design cantilever and anchored sheet pile walls using free and fixed earth support methods. 4. To evaluate axial load capacity, group efficiency, consolidation settlement, and downdrag on deep pile foundations.

10. Learning Outcomes, Teaching, Learning and Assessment Method

By the end of this course, the student should be able to :

- a) Calculate Rankine and Coulomb active, passive, and at-rest lateral earth pressures with surcharge and water table.
- b) Perform stability analysis against overturning, sliding, bearing failure, and base eccentricity for retaining walls.
- c) Detail structural concrete reinforcement for retaining wall stem, toe, and heel slabs.
- d) Design cantilever sheet pile walls in granular and cohesive soils.
- e) Design anchored sheet pile walls using Free Earth Support and Fixed Earth Support methods.
- f) Estimate static axial compressive capacity of single driven and bored piles in sand and clay (α, β, λ methods).
- g) Evaluate dynamic pile driving formulas, wave equation analysis, and pile group load distribution.
- h) Predict consolidation settlement of pile groups and analyze negative skin friction (downdrag) on piles.
- i) Apply geotechnical engineering principles and equations to earth retaining and deep foundation problems.
- j) Produce retaining structure and pile foundation designs satisfying safety codes and soil constraints.
- k) Work collaboratively in teams to complete deep foundation and retaining wall design sheets.
- l) Communicate earth retaining and pile designs via technical reports and reinforcement drawings.
- m) Utilize geotechnical software for pile capacity and retaining wall stability analysis.

11. Teaching and Learning Methods

- 1. Lectures
- 2. Tutorials
- 3. Homework and assignments
- 4. Tests and Exams
- 5. In-Class questions and discussions
- 6. Connection between theory and application

7. Seminars
8. In- and Out-Class oral conversations
9. Reports, presentations, and posters

12. Assessment methods

1. Examinations, Tests, and Quizzes.
2. Extracurricular activities and homework.
3. Student engagement during lectures.

13. Course Structure

Week	Hours	Learning Outcomes (10)	Unit Module/Topic	Teaching Method (11)	Assessment Method (12)
1	3 (2 theo., 1 tut.)	a, i, l	Lateral Earth Pressure: At-rest (K_0), active (K_a), and passive (K_p) states	1	3
2	3 (2 theo., 1 tut.)	a, i, l	Rankine Earth Pressure Theory for cohesionless and cohesive backfills	1-6	1-3
3	3 (2 theo., 1 tut.)	a, i, l	Coulomb Earth Pressure Theory considering wall friction and backfill slope	1-9	1-3
4	3 (2 theo., 1 tut.)	a, i, l	Earth Pressure under Surcharge Loading and Water Table conditions	1-9	1-3
5	3 (2 theo., 1 tut.)	b, i, j, l	Cantilever Retaining Walls: Proportions, components, and lateral forces	1-9	1-3
6	3 (2 theo., 1 tut.)	b, i, j, k	Stability Analysis of Retaining Walls against Overturning and Sliding	1-9	1-3
7	3 (2 theo., 1 tut.)	b, c, i, j	Soil Bearing Capacity failure check beneath wall base and Eccentricity check	1-9	1-3
8	3 (2 theo., 1 tut.)	c, i, j, l	Structural Concrete Reinforcement Design for Retaining Wall Stem and Base	1-9	1-3

9	3 (2 theo., 1 tut.)	d, i, j, l	Cantilever Sheet Pile Walls: Analysis and design in granular soils	1-9	1-3
10	3 (2 theo., 1 tut.)	e, i, j, l	Anchored Sheet Pile Walls Design: Free Earth Support Method	1-9	1-3
11	3 (2 theo., 1 tut.)	e, i, j, l	Anchored Sheet Pile Walls Design: Fixed Earth Support Method	1-9	1-3
12	3 (2 theo., 1 tut.)	f, i, j, l	Deep Foundations: Types of piles, driven vs bored piles, and installation	1-9	1-3
13	3 (2 theo., 1 tut.)	f, g, i, j	Static Axial Capacity of Single Piles in Sand (α, β, λ) and Clay soils	1-9	1-3
14	3 (2 theo., 1 tut.)	g, h, i, j	Pile Groups: Group efficiency, settlement, negative skin friction, laterally loaded piles	1-9	1-3
15	3 (2 theo., 1 tut.)	a-m	Comprehensive Deep Foundations & Retaining Walls Design Review and Exam	1-9	1-3

14. Infrastructure	Details
Required reading: • CORE TEXTS • COURSE MATERIALS • OTHER	Text Books: 1. <i>Principles of Foundation Engineering</i>, Braja M. Das, 9th Edition, Cengage Learning, 2019. 2. <i>Foundation Analysis and Design</i>, Joseph E. Bowles, 5th Edition, McGraw-Hill, 1996. References: 1. <i>Soil Mechanics in Engineering Practice</i>, K. Terzaghi, R. B. Peck, G. Mesri, 3rd Edition, Wiley.

	Others: 1. Solved retaining wall and pile design calculation sheets.
Special requirements (include for example workshops, periodicals, IT software, websites)	1. Geotechnical Software (PLAXIS 2D / GeoStudio). 2. Excel spreadsheets for retaining wall stability and pile group settlement.
Community-based facilities (include for example, guest Lectures, internship, field studies)	Field visits to bridge pile driving operations and deep excavation sheet piling sites.

15. Admissions	Details
Pre-requisites	R.E 400
Minimum number of students	/
Maximum number of students	70

14. Course Instructor	Instructor Academic Profile
Primary Instructor	Assist. Prof. Dr. Saif Alzabeebee Ph.D. Civil Engineering – Geotechnics saif.alzabeebee@qu.edu.iq
Co-Instructor	N/A

Course 11: Concrete Bridges Design

No. & Field Header	Specification Details
1. Teaching Institution	College of Engineering / University of Al-Qadisiyah
2. University Department/Centre	Roads and Transportation Engineering
3. Course title/code	Concrete Bridges Design / R.E 406
4. Programme(s) to which it contributes	Roads and Transportation Engineering Program
5. Modes of Attendance offered	Semester System ; Day Program, full-time face-to-face on campus. 15-week regular semester.
6. Semester/Year	2nd Semester / Academic Year 2025–2026
7. Number of hours tuition (total)	45 hrs. / 3 hrs. per week (2 Theory + 1 Tutorial)

8. Date of production/revision of this specification	1-4-2026
9. Aims of the Course	The aims of the course are: 1. To present AASHTO LRFD bridge live load systems (HL-93 truck, tandem, lane load, dynamic load allowance). 2. To calculate live load distribution factors for longitudinal bridge girders. 3. To perform structural design of reinforced concrete highway bridge deck slabs, longitudinal T-girders, and diaphragms. 4. To design concrete bridge piers, abutments, elastomeric bearings, and prestressed concrete bridge girders.

10. Learning Outcomes, Teaching, Learning and Assessment Method
By the end of this course, the student should be able to : a) Apply AASHTO LRFD highway bridge live load models (HL-93 truck, tandem, lane load, impact factor). b) Calculate live load distribution factors for interior and exterior longitudinal concrete bridge girders. c) Perform structural design and reinforcement detailing for reinforced concrete bridge deck slabs using Strip Method. d) Design longitudinal T-beam girders and transverse diaphragms for flexure, shear, and fatigue limit states. e) Analyze and design bridge substructure components including wall piers, abutments, and elastomeric bearings. f) Understand prestressed concrete bridge concepts, pre-stress loss calculations, and allowable stress limits. g) Apply structural mechanics and AASHTO LRFD specifications to solve concrete bridge design problems.

- h) Produce concrete bridge structures satisfying serviceability, safety, durability, and LRFD code criteria.
- i) Work effectively in structural design teams to prepare complete bridge calculation packages.
- j) Recognize professional and public safety responsibilities in highway bridge structural engineering.
- k) Communicate structural concrete bridge designs through standard engineering drawings.
- l) Utilize structural FEA software (STAAD Pro/ETABS) and design spreadsheets for bridge structural analysis.

11. Teaching and Learning Methods

- 1. Lectures
- 2. Tutorials
- 3. Homework and design assignments
- 4. Tests and Exams
- 5. In-Class questions and discussions
- 6. Connection between theory and code specifications
- 7. Seminars
- 8. Structural drawing sheets
- 9. Reports and presentations

12. Assessment methods

- 1. Examinations, Tests, and Quizzes.
- 2. Structural design sheets and homework.
- 3. Student engagement during lectures.

13. Course Structure

Week	Hours	Learning Outcomes (10)	Unit Module/Topic	Teaching Method (11)	Assessment Method (12)
1	3 (2 theo., 1 tut.)	a, g, j, k	Introduction to Bridge Engineering: AASHTO LRFD limit states & load factors	1	3
2	3 (2 theo., 1 tut.)	a, b, g, k	AASHTO LRFD Highway Live Loads: HL-93 Truck, Tandem, Lane Load, Impact	1-6	1-3

3	3 (2 theo., 1 tut.)	c, g, h, k	Structural Design of RC Highway Bridge Deck Slabs: Strip Method	1-9	1-3
4	3 (2 theo., 1 tut.)	c, g, h, k	Reinforcement Detailing of Bridge Deck Slabs for flexure and shrinkage	1-9	1-3
5	3 (2 theo., 1 tut.)	b, d, g, h	AASHTO Live Load Distribution Factors for longitudinal T- beam girders	1-9	1-3
6	3 (2 theo., 1 tut.)	d, g, h, l	Bending Moment and Shear Envelopes for multi- span T-beam bridge girders	1-9	1-3
7	3 (2 theo., 1 tut.)	d, g, h, k	Flexural and Shear Structural Design of Longitudinal Concrete T-Girders	1-9	1-3
8	3 (2 theo., 1 tut.)	d, g, h, k	Design of Transverse Diaphragms and End Cross Beams in concrete bridges	1-9	1-3
9	3 (2 theo., 1 tut.)	d, g, h, j	Serviceability Limit States: Deflection limits and fatigue stress checks	1-9	1-3
10	3 (2 theo., 1 tut.)	e, g, h, k	Bridge Substructures: Loads on abutments, wing walls, and wall piers	1-9	1-3
11	3 (2 theo., 1 tut.)	e, g, h, k	Structural Reinforcement Design for RC Bridge Piers and Pier Caps	1-9	1-3
12	3 (2 theo., 1 tut.)	e, g, h, k	Design of Elastomeric Bridge Bearings and Expansion Joints	1-9	1-3
13	3 (2 theo., 1 tut.)	f, g, h, j	Prestressed Concrete Bridges: Pre-tensioning vs Post-tensioning concepts	1-9	1-3

14	3 (2 theo., 1 tut.)	f, g, h, k	Pre-stress Loss Calculations and Allowable Flexural Stress Limits in girders	1-9	1-3
15	3 (2 theo., 1 tut.)	a-l	Comprehensive Structural Design Project Review of Multi-Span Concrete Bridge	1-9	1-3

14. Infrastructure	Details
Required reading: • CORE TEXTS • COURSE MATERIALS • OTHER	Text Books: 1. <i>AASHTO LRFD Bridge Design Specifications</i>, 9th Edition, AASHTO, 2020. 2. <i>Design of Highway Bridges: An LRFD Approach</i>, R. M. Barker, J. A. Puckett, Wiley, 2013. References: 1. <i>Reinforced Concrete Mechanics and Design</i>, James K. Wight, 7th Edition, Pearson. Others: 1. AASHTO LRFD bridge design example packages and solved calculation sheets.
Special requirements (include for example workshops, periodicals, IT software, websites)	1. Structural Engineering Software (STAAD Pro, ETABS). 2. Excel spreadsheets for moment envelopes and bridge girder design.
Community-based facilities (include for example, guest Lectures, internship, field studies)	Site visits to ongoing concrete highway bridge construction sites.

15. Admissions	Details
Pre-requisites	R.E 405

Minimum number of students	/
Maximum number of students	70

14. Course Instructor	Instructor Academic Profile
Primary Instructor	Assist. Prof. Dr. Salam Al-Obaidi Ph.D. Civil Engineering – Structural Analysis and Design salam.methem@qu.edu.iq
Co-Instructor	Lecturer Dr. Thulfiqar Salim Hussein Ph.D. Civil Engineering – Building and Construction Engineering Thulfiqar.Hussein@qu.edu.iq

Course 12: Design of Steel Bridges (II)

No. & Field Header	Specification Details
1. Teaching Institution	College of Engineering / University of Al-Qadisiyah
2. University Department/Centre	Roads and Transportation Engineering
3. Course title/code	Design of Steel Bridges (II) / R.E 411
4. Programme(s) to which it contributes	Roads and Transportation Engineering Program
5. Modes of Attendance offered	Semester System ; Day Program, full-time face-to-face on campus. 15-week regular semester.
6. Semester/Year	2nd Semester / Academic Year 2025–2026
7. Number of hours tuition (total)	45 hrs. / 3 hrs. per week (2 Theory + 1 Tutorial)
8. Date of production/revision of this specification	1-4-2026
9. Aims of the Course	The aims of the course are: 1. To design flexural steel beams, plastic moment M_p, and Lateral Torsional Buckling (LTB) per AASHTO LRFD. 2. To proportion built-up steel plate girders, web intermediate stiffeners, and bearing stiffeners. 3. To design composite steel-concrete bridge girders and headed stud shear connectors.

	4. To analyze and design steel truss highway bridges, floor beam stringer systems, and lateral bracing.
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10. Learning Outcomes, Teaching, Learning and Assessment Method

By the end of this course, the student should be able to :

- a) Evaluate plastic moment capacity (M_p), yield moment (M_y), and Lateral Torsional Buckling (LTB) in steel beams.
- b) Design rolled steel beams and built-up plate girders for flexure, shear, web crippling, and web bend-buckling.
- c) Proportion intermediate transverse web stiffeners and bearing stiffeners for steel plate girders per AASHTO LRFD.
- d) Perform structural design of composite steel-concrete bridge girders, including plastic moment and modular ratio.
- e) Design shear stud connectors (headed studs) for full and partial composite action in highway bridge decks.
- f) Analyze and design steel truss highway bridges (Pratt, Howe, Warren) and floor beam-stringer framing systems.
- g) Design lateral bracing systems (top/bottom sway bracing, portal frames) and steel bridge bearings.
- h) Apply structural steel mechanics and AASHTO LRFD specifications to steel bridge problems.
- i) Produce steel bridge design solutions satisfying strength, fatigue, serviceability, and constructability.
- j) Work collaboratively in teams to prepare structural steel bridge member designs.
- k) Communicate structural steel bridge designs using standardized steel detailing drawings.
- l) Use structural steel design software and spreadsheets for automated plate girder and truss design.

11. Teaching and Learning Methods

- 1. Lectures
- 2. Tutorials
- 3. Homework and design assignments

4. Tests and Exams
5. In-Class questions and discussions
6. Connection between theory and AISC/AASHTO codes
7. Seminars
8. Structural steel drawing sheets
9. Reports and presentations

12. Assessment methods

1. Examinations, Tests, and Quizzes.
2. Steel design sheets and homework.
3. Student engagement during lectures.

13. Course Structure

Week	Hours	Learning Outcomes (10)	Unit Module/Topic	Teaching Method (11)	Assessment Method (12)
1	3 (2 theo., 1 tut.)	a, b, h, k	Flexural Behavior of Steel Beams: Plastic moment M_p and yield moment M_y	1	3
2	3 (2 theo., 1 tut.)	a, b, h, k	Lateral Torsional Buckling (LTB) of steel beams: Unbraced length L_b limits	1-6	1-3
3	3 (2 theo., 1 tut.)	b, h, i, k	Shear Strength of Steel Beam Webs and web stiffener design requirements	1-9	1-3
4	3 (2 theo., 1 tut.)	b, h, i, k	Web Local Yielding, Web Crippling, and Sidesway Web Buckling design	1-9	1-3
5	3 (2 theo., 1 tut.)	c, h, i, k	Built-Up Steel Plate Girders for Bridges: Proportioning flanges and web	1-9	1-3
6	3 (2 theo., 1 tut.)	c, h, i, k	Web Bend-Buckling and flexural resistance of steel plate girders	1-9	1-3
7	3 (2 theo., 1 tut.)	c, h, i, k	Design of Intermediate Transverse Web Stiffeners and Bearing Stiffeners	1-9	1-3

8	3 (2 theo., 1 tut.)	d, h, i, k	Composite Steel- Concrete Bridge Girders: Elastic section stress analysis	1-9	1-3
9	3 (2 theo., 1 tut.)	d, h, i, k	Plastic Moment Capacity of composite steel girders and modular ratio	1-9	1-3
10	3 (2 theo., 1 tut.)	e, h, i, k	Design of Shear Connectors (headed studs) for full composite action	1-9	1-3
11	3 (2 theo., 1 tut.)	h, i, k	Fatigue and Fracture Considerations in welded steel plate bridge girders	1-9	1-3
12	3 (2 theo., 1 tut.)	f, h, i, k	Steel Truss Bridge Configurations: Pratt, Howe, and Warren truss types	1-9	1-3
13	3 (2 theo., 1 tut.)	f, h, i, l	Structural Analysis of Main Truss Members under HL-93 live loads	1-9	1-3
14	3 (2 theo., 1 tut.)	f, g, h, i	Structural Design of Truss Members, Gusset Plates, and Lateral Bracing	1-9	1-3
15	3 (2 theo., 1 tut.)	a-l	Comprehensive Structural Design Review of Steel Plate Girder Highway Bridge	1-9	1-3

14. Infrastructure	Details
Required reading: • CORE TEXTS • COURSE MATERIALS • OTHER	Text Books: 1. <i>AASHTO LRFD Bridge Design Specifications</i>, 9th Edition, AASHTO, 2020. 2. <i>Structural Steel Design</i>, Jack C. McCormac, Stephen F. Csernak, 6th Edition, Pearson, 2018. References:

	1. <i>Steel Structures: Design and Behavior</i>, C. G. Salmon, J. E. Johnson, Pearson. Others: 1. AISC Steel Construction Manual (15th Edition).
Special requirements (include for example workshops, periodicals, IT software, websites)	1. Structural Steel Design Software (STAAD Pro, RAM Structural System). 2. Excel spreadsheets for plate girder and truss member design.
Community-based facilities (include for example, guest Lectures, internship, field studies)	Field visits to steel fabrication workshops and steel bridge erection sites.

15. Admissions	Details
Pre-requisites	R.E 410
Minimum number of students	/
Maximum number of students	70

16. Course Instructor	Instructor Academic Profile
Primary Instructor	Lecturer Dr.Muhammed Abaaas Musa Ph.D. Civil Engineering – Structural Engineering Mohammed.mousa@qu.edu.iq
Co-Instructor	N/A

Course 13: Highways Design (II)

No. & Field Header	Specification Details
1. Teaching Institution	College of Engineering / University of Al-Qadisiyah
2. University Department/Centre	Roads and Transportation Engineering
3. Course title/code	Highways Design (II) / R.E 416
4. Programme(s) to which it contributes	Roads and Transportation Engineering Program

5. Modes of Attendance offered	Semester System ; Day Program, full-time face-to-face on campus. 15-week regular semester.
6. Semester/Year	2nd Semester / Academic Year 2025–2026
7. Number of hours tuition (total)	45 hrs. / 3 hrs. per week (2 Theory + 1 Tutorial)
8. Date of production/revision of this specification	1-4-2026
9. Aims of the Course	The aims of the course are: 1. To present subgrade soil characterization (CBR, M_r) and traffic load conversion into ESALs. 2. To perform structural design of flexible pavements using AASHTO 1993 Structural Number (SN) method. 3. To perform structural design of rigid concrete pavements (JPCP, JRCP, CRCP) per AASHTO guide. 4. To design rigid pavement contraction/expansion joints, dowel bars, tie bars, and subsurface pavement drainage.

10. Learning Outcomes, Teaching, Learning and Assessment Method
By the end of this course, the student should be able to : a) Characterize subgrade soils (CBR, M_r) and evaluate pavement material properties for base and subbase layers. b) Convert mixed traffic streams into Equivalent Single Axle Loads (ESALs) using load equivalency factors. c) Perform structural design of flexible pavements using the AASHTO 1993 Structural Number (SN) method. d) Perform structural design of rigid concrete pavements (JPCP, JRCP, CRCP) per AASHTO LRFD guidelines. e) Design rigid pavement contraction/expansion joints, load transfer dowel bars, and tie bars. f) Design highway surface drainage elements (gutters, inlets) and subsurface permeable drainage bases.

- g) Apply highway engineering principles and AASHTO design guidelines to pavement structural problems.
- h) Produce pavement structural designs meeting traffic loading, reliability, and environmental constraints.
- i) Work collaboratively in teams to prepare full pavement structural design packages.
- j) Communicate highway pavement designs through standard structural pavement section drawings.
- k) Utilize pavement software and design spreadsheets for automated layer thickness selection.

11. Teaching and Learning Methods

- 1. Lectures
- 2. Tutorials
- 3. Homework and drawing assignments
- 4. Tests and Exams
- 5. In-Class questions and discussions
- 6. Connection between theory and AASHTO manuals
- 7. Seminars
- 8. Highway design drawing sheets
- 9. Reports and presentations

12. Assessment methods

- 1. Examinations, Tests, and Quizzes.
- 2. Highway pavement drawing sheets and homework.
- 3. Student engagement during lectures.

13. Course Structure

Week	Hours	Learning Outcomes (10)	Unit Module/Topic	Teaching Method (11)	Assessment Method (12)
1	3 (2 theo., 1 tut.)	a, g, j	Pavement Types: Flexible vs Rigid pavement structural behavior and load distribution	1	3
2	3 (2 theo., 1 tut.)	a, g, h, j	Subgrade Characterization: CBR test, Plate Bearing test, Resilient Modulus (M_r)	1-6	1-3

3	3 (2 theo., 1 tut.)	a, g, h, j	Pavement Material Properties: Subbase, crushed aggregate base, HMA mix	1-9	1-3
4	3 (2 theo., 1 tut.)	b, g, h, j	Equivalent Single Axle Load (ESAL): Axle load equivalency factors (<i>LEF</i>)	1-9	1-3
5	3 (2 theo., 1 tut.)	c, g, h, j	AASHTO 1993 Flexible Pavement Design Equation and design variables	1-9	1-3
6	3 (2 theo., 1 tut.)	c, g, h, j	Reliability (<i>R</i>), overall standard deviation (<i>S₀</i>), and Serviceability (<i>PSI</i>)	1-9	1-3
7	3 (2 theo., 1 tut.)	c, g, h, j	Determination of Required Structural Number (<i>SN</i>) and layer coefficients (<i>a_i</i> , <i>m_i</i>)	1-9	1-3
8	3 (2 theo., 1 tut.)	c, g, h, i	Thickness Determination of HMA wearing, binder, base, and subbase layers	1-9	1-3
9	3 (2 theo., 1 tut.)	d, g, h, j	Rigid Pavement Types: JPCP, JRCP, CRCP, and prestressed concrete pavements	1-9	1-3
10	3 (2 theo., 1 tut.)	d, g, h, j	Westergaard Stress Equations for rigid pavements (Corner, Interior, Edge)	1-9	1-3
11	3 (2 theo., 1 tut.)	d, g, h, j	AASHTO 1993 Rigid Pavement Design Method (Slab thickness <i>D</i> selection)	1-9	1-3
12	3 (2 theo., 1 tut.)	e, g, h, j	Rigid Pavement Joint Design: Contraction, expansion, dowel bars, tie bars	1-9	1-3
13	3 (2 theo., 1 tut.)	f, g, h, j	Highway Surface Drainage Design: Inlets, gutters, and ditch hydraulics	1-9	1-3

14	3 (2 theo., 1 tut.)	f, g, h, k	Subsurface Pavement Drainage Design: Permeable bases and edge drains	1-9	1-3
15	3 (2 theo., 1 tut.)	a-k	Complete Structural Pavement Design Project Review and Term Exam	1-9	1-3

14. Infrastructure	Details
Required reading: • CORE TEXTS • COURSE MATERIALS • OTHER	Text Books: 1. <i>Pavement Analysis and Design</i>, Yang H. Huang, 2nd Edition, Pearson, 2004. 2. <i>AASHTO Guide for Design of Pavement Structures</i>, AASHTO, 1993. References: 1. <i>Highway Engineering</i>, Paul H. Wright, Karen Dixon, Wiley. Others: 1. AASHTO pavement design nomographs and calculation sheets.
Special requirements (include for example workshops, periodicals, IT software, websites)	1. Pavement Design Software (WinPAS / AASHTOWare Pavement ME). 2. Excel spreadsheets for pavement <i>SN</i> calculation and ESAL estimation.
Community-based facilities (include for example, guest Lectures, internship, field studies)	Field visits to asphalt paving sites and pavement testing laboratories.

15. Admissions	Details
Pre-requisites	R.E 415
Minimum number of students	/
Maximum number of students	70

16. Course Instructor	Instructor Academic Profile
Primary Instructor	Prof. Dr. Jalal Taqi Shaker Al-Obaedi Ph.D. Civil Engineering – Roads and Airports Engineering jalal.alobaedi@qu.edu.iq
Co-Instructor	Assistant Lecturer Rania Ihsan Ali M.Sc. Civil Engineering – Roads and Transport Engineering rainaali.eng.road@qu.edu.iq

Course 14: Transports Planning

No. & Field Header	Specification Details
1. Teaching Institution	College of Engineering / University of Al-Qadisiyah
2. University Department/Centre	Roads and Transportation Engineering
3. Course title/code	Transports Planning / R.E 425
4. Programme(s) to which it contributes	Roads and Transportation Engineering Program
5. Modes of Attendance offered	Semester System ; Day Program, full-time face-to-face on campus. 15-week regular semester.
6. Semester/Year	2nd Semester / Academic Year 2025–2026
7. Number of hours tuition (total)	30 hrs. / 2 hrs. per week (2 Theory)
Transports Planning 8. Date of production/revision of this specification	1-4-2026
9. Aims of the Course	The aims of the course are: 1. To develop an understanding of urban transport planning concepts, systems approach, and land-use transport interaction. 2. To present the Traditional Four-Step Travel Demand Forecasting Model (Trip Generation, Trip Distribution, Mode Choice, Traffic Assignment). 3. To build capacity in mathematically modeling travel demand and network traffic flows.

	4. To develop knowledge in economic evaluation of transport planning alternatives using Benefit-Cost ratio (B/C) and NPV methods.
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10. Learning Outcomes, Teaching, Learning and Assessment Method

By the end of this course, the student should be able to :

- a) Explain urban transportation planning concepts, systems analysis, and land-use transport interaction dynamics.
- b) Delineate Traffic Analysis Zones (TAZ) and design Origin-Destination (O-D) travel survey methodologies.
- c) Model Trip Generation (productions and attractions) using Multiple Linear Regression and Cross-Classification.
- d) Model Trip Distribution using Growth Factor methods (Fratar) and the Gravity Model.
- e) Calibrate Gravity Model friction factors (F_{ij}) and socio-economic adjustment factors (K_{ij}).
- f) Model Mode Choice (Modal Split) using Multinomial Logit utility models and compute choice probabilities.
- g) Calculate direct and cross-elasticities of travel demand with respect to travel time, cost, and transit service quality.
- h) Model Traffic Assignment using All-or-Nothing, Capacity Restraint (BPR function), and User Equilibrium (UE) methods.
- i) Perform economic evaluation of transport planning alternatives using Benefit-Cost ratio (B/C), NPV, and IRR.
- j) Apply transportation modeling theory and mathematical algorithms to urban transport network problems.
- k) Develop urban transport network solutions meeting mobility, accessibility, environmental, and financial goals.
- l) Analyze travel survey datasets and interpret network traffic model outputs using engineering judgment.
- m) Recognize global, societal, economic, and environmental impacts of long-term transport planning decisions.

- n) Work effectively in urban planning teams to evaluate multi-modal transport network alternatives.
- o) Communicate transport planning models and forecasting results through technical reports.
- p) Utilize transport planning software packages (CUBE, TransCAD, or VISUM) for network modeling.

11. Teaching and Learning Methods

1. Lectures
2. Tutorials
3. Homework and modeling assignments
4. Tests and Exams
5. In-Class questions and discussions
6. Connection between theory and urban case studies
7. Seminars
8. Mathematical modeling exercises
9. Reports and presentations

12. Assessment methods

1. Examinations, Tests, and Quizzes.
2. Modeling homework assignments and case study reports.
3. Student engagement during lectures.

13. Course Structure

Week	Hours	Learning Outcomes (10)	Unit Module/Topic	Teaching Method (11)	Assessment Method (12)
1	2 theo.	a, m, o	Introduction to Urban Transport Planning, systems approach, short vs long term planning	1	3
2	2 theo.	b, l, o	Data Collection: Origin-Destination (O-D) surveys and Traffic Analysis Zones (TAZ)	1-6	1-3
3	2 theo.	c, j, o	The Four-Step Travel Demand Model overview; Step 1: Trip Generation principles	1-9	1-3

4	2 theo.	c, j, o	Trip Production and Attraction Modeling using Multiple Linear Regression	1-9	1-3
5	2 theo.	c, j, o	Category Analysis / Cross-Classification method for trip generation modeling	1-9	1-3
6	2 theo.	d, j, o	Step 2: Trip Distribution principles; Growth Factor methods (Fratar Method)	1-9	1-3
7	2 theo.	d, e, j, o	Gravity Model formulation, friction factors (F_{ij}), socio-economic factors (K_{ij})	1-9	1-3
8	2 theo.	d, e, j, o	Gravity Model calibration and doubly-constrained gravity model iterations	1-9	1-3
9	2 theo.	f, g, j, o	Step 3: Mode Choice / Modal Split concepts; Transit vs auto choice factors	1-9	1-3
10	2 theo.	f, g, j, o	Utility Function concept and Multinomial Logit Model formulation	1-9	1-3
11	2 theo.	f, g, j, o	Mode Choice probability calculations and elasticity of travel demand	1-9	1-3
12	2 theo.	h, j, p	Step 4: Traffic Assignment concepts; Network link-node performance functions	1-9	1-3
13	2 theo.	h, j, p	All-or-Nothing assignment and Capacity Restraint assignment (BPR function)	1-9	1-3
14	2 theo.	h, j, p	User Equilibrium (UE) and System	1-9	1-3

			Optimal (SO) traffic assignment principles		
15	2 theo.	i, k, m, n, o	Economic Evaluation of Transport Plans: Benefit-Cost ratio (B/C), NPV, IRR	1-9	1-3

14. Infrastructure	Details
Required reading: • CORE TEXTS • COURSE MATERIALS • OTHER	Text Books: 1. <i>Modelling Transport</i>, Juan de Dios Ortúzar, Luis G. Willumsen, 4th Edition, Wiley, 2011. 2. <i>Transportation Engineering and Planning</i>, C.S. Papacostas, P.D. Prevedouros, Pearson. References: 1. <i>Urban Transportation Planning</i>, Michael D. Meyer, Eric J. Miller, McGraw-Hill. Others: 1. Class notes and solved transport planning problem sets.
Special requirements (include for example workshops, periodicals, IT software, websites)	1. Transport Planning Software (CUBE, TransCAD, or VISUM). 2. Excel spreadsheets for Gravity Model and Logit Model iterations.
Community-based facilities (include for example, guest Lectures, internship, field studies)	Extra lectures by urban transport planning authority directors.

15. Admissions	Details
Pre-requisites	R.E 325
Minimum number of students	/
Maximum number of students	70

16. Course Instructor	Instructor Academic Profile
Primary Instructor	Assist. Prof. Dr.Hamsa Abbas Zubaidi Ph.D. Highway and Transportation Engineering hamsa.alzubaidi@qu.edu.iq
Co-Instructor	Assist. Lecturer Muhamed Jasim Shukan M.Sc/ Road Eng. mohammed.jassim@qu.edu.iq

Course 15: Hydrology

No. & Field Header	Specification Details
1. Teaching Institution	College of Engineering / University of Al-Qadisiyah
2. University Department/Centre	Roads and Transportation Engineering
3. Course title/code	Hydrology / R.E 420
4. Programme(s) to which it contributes	Roads and Transportation Engineering Program
5. Modes of Attendance offered	Semester System ; Day Program, full-time face-to-face on campus. 15-week regular semester.
6. Semester/Year	2nd Semester / Academic Year 2025–2026
7. Number of hours tuition (total)	30 hrs. / 2 hrs. per week (2 Theory)
8. Date of production/revision of this specification	1-4-2026
9. Aims of the Course	The aims of the course are: 1. To develop an understanding of the hydrologic cycle, rainfall intensity analysis, and Intensity-Duration-Frequency (IDF) curves. 2. To present hydrograph analysis principles and Unit Hydrograph (UH) theory. 3. To build capacity in estimating peak storm runoff and flood discharge (Q_p) using Rational and SCS Curve Number methods. 4. To develop knowledge in the hydraulic design of highway culverts, roadside open channels, and flood routing.

10. Learning Outcomes, Teaching, Learning and Assessment Method

By the end of this course, the student should be able to :

- a) Describe the hydrologic cycle, drainage basin morphometry, and perform watershed boundary delineation.
- b) Analyze precipitation data, assess rain gauge network adequacy, and adjust missing data using double-mass curves.
- c) Construct Intensity-Duration-Frequency (IDF) curves from historical rainfall records for specified return periods.
- d) Compute infiltration losses and effective rainfall using the Horton equation and ϕ -index method.
- e) Analyze storm hydrographs, perform baseflow separation, and derive Direct Runoff Hydrographs (DRH).
- f) Derive Unit Hydrographs (UH) from storm records and apply Snyder and SCS Synthetic Unit Hydrograph methods.
- g) Estimate peak storm runoff discharge (Q_p) using the Rational Method ($Q = CIA$) and SCS Curve Number (CN) method.
- h) Calculate time of concentration (T_c) for agricultural and urban watersheds using Kirpich and FAA equations.
- i) Perform hydraulic design of highway box and pipe culverts under inlet control and outlet control conditions.
- j) Design roadside drainage ditches and channels using the Manning equation and permissible shear stress limits.
- k) Perform hydrologic channel routing using the Muskingum method and conduct statistical flood frequency analysis.
- l) Apply fluid mechanics and hydrologic principles to highway surface drainage problems.
- m) Produce highway drainage design solutions satisfying flood risk, public safety, and environmental criteria.
- n) Analyze hydrologic field rainfall/streamflow data to draw hydraulic design conclusions.
- o) Work collaboratively in teams to prepare complete highway watershed hydrologic design reports.

p) Communicate hydraulic design calculations through standard engineering sheets.

q) Utilize hydrologic/hydraulic software (HY-8, HEC-HMS, HEC-RAS) for culvert and watershed analysis.

11. Teaching and Learning Methods

1. Lectures
2. Tutorials
3. Homework and design assignments
4. Tests and Exams
5. In-Class questions and discussions
6. Connection between theory and FHWA hydraulics manuals
7. Seminars
8. Hydraulic calculation exercises
9. Reports and presentations

12. Assessment methods

1. Examinations, Tests, and Quizzes.
2. Hydrologic calculation sheets and homework.
3. Student engagement during lectures.

13. Course Structure

Week	Hours	Learning Outcomes (10)	Unit Module/Topic	Teaching Method (11)	Assessment Method (12)
1	2 theo.	a, l, p	Hydrologic Cycle Components, drainage basin characteristics, watershed delineation	1	3
2	2 theo.	b, n, p	Precipitation Types, rain gauges, station consistency (Double-Mass Curve)	1-6	1-3
3	2 theo.	b, c, l, p	Rainfall Intensity, Duration, Frequency analysis, building IDF curves	1-9	1-3
4	2 theo.	d, l, p	Evapotranspiration, soil moisture, infiltration process in watersheds	1-9	1-3

5	2 theo.	d, l, p	Infiltration Equations (Horton equation) and ϕ -index determination	1-9	1-3
6	2 theo.	e, n, p	Streamflow Measurement Methods, stage- discharge rating curves	1-9	1-3
7	2 theo.	e, l, p	Hydrograph Components: Baseflow separation, Direct Runoff Hydrograph (DRH)	1-9	1-3
8	2 theo.	f, l, p	Unit Hydrograph (UH) Definition, assumptions, derivation from storm data	1-9	1-3
9	2 theo.	f, l, p	Synthetic Unit Hydrograph Methods (Snyder method, SCS dimensionless UH)	1-9	1-3
10	2 theo.	g, h, l, p	Peak Runoff Estimation: Rational Method ($Q = CIA$) and runoff coefficient C	1-9	1-3
11	2 theo.	h, l, p	Time of Concentration (T_c) formulas (Kirpich, FAA equations)	1-9	1-3
12	2 theo.	g, h, l, p	SCS Curve Number (CN) Method for runoff volume and peak discharge	1-9	1-3
13	2 theo.	i, m, p, q	Highway Culvert Hydraulics: Inlet control vs Outlet control design nomographs	1-9	1-3
14	2 theo.	j, m, p	Roadside Ditch Hydraulic Design using Manning equation & permissible velocity	1-9	1-3
15	2 theo.	k, l, m, o, p	Reservoir and Channel Flood Routing (Muskingum method), statistical frequency	1-9	1-3

14. Infrastructure	Details
Required reading: • CORE TEXTS • COURSE MATERIALS • OTHER	Text Books: 1. <i>Applied Hydrology</i>, Ven Te Chow, David R. Maidment, Larry W. Mays, McGraw-Hill, 1988. 2. <i>Hydrology and Floodplain Analysis</i>, Philip B. Bedient, Wayne C. Huber, Pearson. References: 1. <i>FHWA Hydraulic Design of Highway Culverts</i> (HDS-5), Federal Highway Administration. Others: 1. Class notes and culvert design nomographs.
Special requirements (include for example workshops, periodicals, IT software, websites)	1. Hydrologic/Hydraulic Software (HY-8, HEC-HMS). 2. Excel spreadsheets for hydrograph convolution and routing.
Community-based facilities (include for example, guest Lectures, internship, field studies)	Field visits to highway culvert and bridge drainage sites.

15. Admissions	Details
Pre-requisites	R.E 320
Minimum number of students	/
Maximum number of students	70

16. Course Instructor	Instructor Academic Profile
Primary Instructor	Lecturer Dr.Zaid Ali kadhim Ph.D. Civil Engineering – Structural zaidalzaidi20142016@gmail.com
Co-Instructor	N/A

Course 16: Computer Applications in Roads Engineering (IV)

No. & Field Header	Specification Details
1. Teaching Institution	College of Engineering / University of Al-Qadisiyah
2. University Department/Centre	Roads and Transportation Engineering
3. Course title/code	Computer Applications in Roads Engineering (IV) / R.E 436
4. Programme(s) to which it contributes	Roads and Transportation Engineering Program
5. Modes of Attendance offered	Semester System ; Day Program, full-time face-to-face on campus. 15-week regular semester.
6. Semester/Year	2nd Semester / Academic Year 2025–2026
7. Number of hours tuition (total)	45 hrs. / 3 hrs. per week (1 Theory + 2 Practical Lab)
8. Date of production/revision of this specification	1-4-2026
9. Aims of the Course	The aims of the course are: 1. To present structural FEA software tools (STAAD Pro / ETABS) for 3D modeling and moving load analysis of bridges. 2. To build capacity in traffic capacity simulation and Level of Service (LOS) analysis using Highway Capacity Software (HCS). 3. To model signalized and unsignalized intersections, multilane highways, and two-lane rural roads in HCS. 4. To integrate CAD geometric corridor data with structural FEA and traffic capacity software outputs.

10. Learning Outcomes, Teaching, Learning and Assessment Method

By the end of this course, the student should be able to :

- a) Build 3D structural frame and plate element models of bridge structures in STAAD Pro / ETABS.
- b) Apply AASHTO HL-93 moving vehicle live loads and extract bending moment, shear force, and deflection envelopes.
- c) Model signalized and unsignalized intersections in Highway Capacity Software (HCS).
- d) Evaluate control delay, queue lengths, volume-to-capacity ratios, and Level of Service (LOS) using HCS.
- e) Evaluate two-lane highway and multilane highway segment capacity and performance in HCS.
- f) Integrate CAD geometric corridor data with structural finite element models and traffic capacity outputs.
- g) Apply computer software algorithms to solve bridge structural and traffic capacity problems.
- h) Produce integrated FEA and traffic engineering solutions meeting AASHTO and HCM constraints.
- i) Work collaboratively in laboratory teams to deliver multi-software bridge and traffic project files.
- j) Recognize professional ethics and verification responsibilities when relying on computer outputs.
- k) Communicate structural and traffic analysis results through professional software reports.
- l) Master advanced engineering software packages (STAAD Pro, ETABS, HCS) for professional practice.

11. Teaching and Learning Methods

- 1. Theoretical lectures explaining software algorithms
- 2. Computer laboratory sessions
- 3. Homework and software project assignments
- 4. Tests and Practical Exams
- 5. In-Class questions and software troubleshooting
- 6. Connection between theory and software operations
- 7. Seminars

8. Hands-on computer exercises
9. Software project reports and presentations

12. Assessment methods

1. Practical Examinations, Software Tests, and Quizzes.
2. Weekly software design files and project submissions.
3. Student engagement during laboratory sessions.

13. Course Structure

Week	Hours	Learning Outcomes (10)	Unit Module/Topic	Teaching Method (11)	Assessment Method (12)
1	3 (1 th., 2 lab)	a, g, k, l	STAAD Pro / ETABS Interface, node and member creation, material assignment	1	3
2	3 (1 th., 2 lab)	a, g, k, l	Assigning Member Cross-Sections (steel rolled shapes, concrete T-beams)	1-6	1-3
3	3 (1 th., 2 lab)	a, b, g, k	Support Conditions Definition, dead load, live load, and wind load application	1-9	1-3
4	3 (1 th., 2 lab)	b, g, k, l	Moving Load Generator setup in STAAD Pro for HL-93 truck loading	1-9	1-3
5	3 (1 th., 2 lab)	b, g, k, l	Structural Analysis Execution, shear force and bending moment diagrams	1-9	1-3
6	3 (1 th., 2 lab)	b, g, k, l	Frame Reinforcement Design Output and deflection check	1-9	1-3
7	3 (1 th., 2 lab)	a, b, g, k	Modeling Multi-Span Bridge Deck Structures and diaphragm beams	1-9	1-3
8	3 (1 th., 2 lab)	a, b, g, k	3D Finite Element Plate/Shell Modeling for bridge deck slabs	1-9	1-3
9	3 (1 th., 2 lab)	c, d, g, k	Introduction to Highway Capacity Software (HCS):	1-9	1-3

			Signalized intersection module		
10	3 (1 th., 2 lab)	c, d, g, k	Inputting Traffic Volumes, peak hour factor (PHF), geometry, signal timing	1-9	1-3
11	3 (1 th., 2 lab)	c, d, g, k	HCS Capacity Analysis Output: Delay, queue length, Level of Service (LOS)	1-9	1-3
12	3 (1 th., 2 lab)	c, d, g, k	Unsignalized TWSC and AWSC Intersection Analysis in HCS	1-9	1-3
13	3 (1 th., 2 lab)	e, g, k, l	Two-Lane Highway and Multilane Highway Segment Capacity Evaluation	1-9	1-3
14	3 (1 th., 2 lab)	f, g, h, k	Integration of Civil 3D Alignment Data with structural and traffic models	1-9	1-3
15	3 (1 th., 2 lab)	a-l	Final Integrated Computer Applications Project Submission and Practical Exam	1-9	1-3

14. Infrastructure	Details
Required reading: • CORE TEXTS • COURSE MATERIALS • OTHER	Text Books: 1. <i>STAAD Pro Structural Analysis Reference Manual</i>, Bentley Systems. 2. <i>Highway Capacity Manual</i> (HCM 6th Edition), Transportation Research Board. References: 1. <i>HCS Software User Guide</i>, McTrans, University of Florida. Others: 1. Lab exercise sheets and sample structural/traffic datasets.

Special requirements (include for example workshops, periodicals, IT software, websites)	1. Specialized Computer Lab equipped with STAAD Pro, ETABS, and HCS software licenses. 2. Available websites related to McTrans and Bentley Systems.
Community-based facilities (include for example, guest Lectures, internship, field studies)	Demonstrations led by certified structural FEA and traffic modeling software specialists.

15. Admissions	Details
Pre-requisites	R.E 435
Minimum number of students	/
Maximum number of students	70

16. Course Instructor	Instructor Academic Profile
Primary Instructor	Assist. Prof. Dr..Abeer Saeed Zebalah Ph.D. Civil Engineering – Geotechnics abeer.alkraway@qu.edu.iq
Co-Instructor	Assistant Lecturer Rand Muhammed Jasim M.Sc. Civil Engineering rand.mohammed.eng@qu.edu.iq

Course 17: Engineering Ethics

No. & Field Header	Specification Details
1. Teaching Institution	College of Engineering / University of Al-Qadisiyah
2. University Department/Centre	Roads and Transportation Engineering
3. Course title/code	Engineering Ethics / R.E 446
4. Programme(s) to which it contributes	Roads and Transportation Engineering Program
5. Modes of Attendance offered	Semester System ; Day Program, full-time face-to-face on campus. 15-week regular semester.
6. Semester/Year	2nd Semester / Academic Year 2025–2026
7. Number of hours tuition (total)	30 hrs. / 2 hrs. per week (2 Theory)
8. Date of production/revision of this specification	1-4-2026

9. Aims of the Course	The aims of the course are: 1. To develop an understanding of moral theories, professional engineering codes of ethics (ASCE, NSPE, IEEE), and legal duties. 2. To present procedures for analyzing ethical dilemmas regarding public health, safety, risk assessment, and liability. 3. To build capacity in identifying workplace issues like conflicts of interest, confidentiality, trade secrets, and whistleblowing. 4. To develop knowledge in environmental ethics, sustainable development, and anti-corruption in public works contracts.
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10. Learning Outcomes, Teaching, Learning and Assessment Method

By the end of this course, the student should be able to :

- a) Explain fundamental moral theories, philosophical frameworks, and principles of engineering professionalism.
- b) Analyze professional codes of ethics of major engineering institutions (ASCE, NSPE, IEEE, Iraqi Engineers Union).
- c) Apply moral reasoning, line-drawing methods, and conflict resolution techniques to ethical engineering dilemmas.
- d) Evaluate the engineer's paramount duty to protect public health, safety, and welfare in infrastructure projects.
- e) Analyze risk assessment, safety factors, and failure case studies of major engineering disasters.
- f) Understand tort law, professional negligence, legal liability, strict liability, and expert witness responsibilities.
- g) Identify workplace ethical issues including conflicts of interest, confidentiality, trade secrets, and non-disclosure.

- h) Evaluate moral justifications, proper procedures, legal protections, and consequences of whistleblowing.
- i) Apply environmental ethics and sustainable development principles to civil and transportation infrastructure.
- j) Analyze social responsibilities of engineers, global ethics, and cultural factors in international practice.
- k) Recognize anti-corruption standards, bidding integrity, extortion, bribery, and kickback prevention in public contracts.
- l) Understand intellectual property rights, patents, copyrights, trademarks, and software licensing ethics.
- m) Recognize ethical and professional responsibilities in engineering situations and make informed judgments.
- n) Evaluate the impact of engineering solutions in global, economic, environmental, and societal contexts.
- o) Function effectively in team debates and discussions on complex engineering ethics case studies.
- p) Communicate ethical arguments and legal case analyses through structured analytical essays and oral debates.

11. Teaching and Learning Methods

1. Lectures
2. Interactive case study analyses
3. Group debates and student discussions
4. Tests and Exams
5. In-Class questions and discussions
6. Connection between theory and real engineering disasters
7. Seminars
8. Essay writing exercises
9. Reports and presentations

12. Assessment methods

1. Examinations, Tests, and Quizzes.
2. Case study analytical essays and debate checks.
3. Student engagement during lectures.

13. Course Structure

Week	Hours	Learning Outcomes (10)	Unit Module/Topic	Teaching Method (11)	Assessment Method (12)
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1	2 theo.	a, m, p	Definition of Ethics, engineering professionalism, moral frameworks, and values	1	3
2	2 theo.	b, m, p	Code of Ethics of Professional Engineering Societies (ASCE, NSPE, IEEE)	1-6	1-3
3	2 theo.	c, m, p	Moral Reasoning, ethical problem- solving techniques, and line-drawing method	1-9	1-3
4	2 theo.	d, m, n, p	Engineer's Primary Responsibility to public health, safety, and welfare	1-9	1-3
5	2 theo.	e, m, n, p	Risk Assessment, safety factors, accepting risk, case study of structural failure	1-9	1-3
6	2 theo.	f, m, p	Liability, professional negligence, tort law, and strict liability in construction	1-9	1-3
7	2 theo.	g, m, p	Workplace Ethics: Conflict of interest definitions, types, and mitigation strategies	1-9	1-3
8	2 theo.	g, m, p	Confidentiality, proprietary information, trade secrets, and non- disclosure	1-9	1-3
9	2 theo.	h, m, o, p	Whistleblowing: Moral justifications, procedures, protection, and consequences	1-9	1-3
10	2 theo.	i, m, n, p	Environmental Ethics, sustainable development, ecological impact of highways	1-9	1-3
11	2 theo.	j, m, n, p	Social Responsibility of engineers, global ethics, and cultural context	1-9	1-3

12	2 theo.	k, m, p	Bidding Integrity, bribery, extortion, kickbacks, and anti- corruption measures	1-9	1-3
13	2 theo.	l, m, p	Intellectual Property Rights: Patents, copyrights, trademarks, software ethics	1-9	1-3
14	2 theo.	m, p	Expert Testimony, forensic engineering, acting as an ethical expert witness	1-9	1-3
15	2 theo.	a-p	Comprehensive Case Study Analysis Review and Final Ethical Essay Presentations	1-9	1-3

14. Infrastructure	Details
Required reading: • CORE TEXTS • COURSE MATERIALS • OTHER	Text Books: 1. <i>Ethics in Engineering</i>, Mike W. Martin, Roland Schinzinger, 4th Edition, McGraw-Hill, 2005. 2. <i>Engineering Ethics: Concepts and Cases</i>, C. E. Harris, M. S. Pritchard, Cengage. References: 1. <i>ASCE Code of Ethics</i>, American Society of Civil Engineers. Others: 1. Case study documentation of famous engineering disasters.
Special requirements (include for example workshops, periodicals, IT software, websites)	1. Multimedia room for case study video documentaries. 2. Available websites related to National Institute for Engineering Ethics (NIEE).

Community-based facilities (include for example, guest Lectures, internship, field studies)	Guest lectures by senior engineering union ethics board members.
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15. Admissions	Details
Pre-requisites	/
Minimum number of students	/
Maximum number of students	70

16. Course Instructor	Instructor Academic Profile
Primary Instructor	Lecturer Saba Mohammed Shaheed M.Sc. Civil Engineering – Soil Mechanics saba.shheed@qu.edu.iq
Co-Instructor	N/A

Course 18: Graduation Project (II)

No. & Field Header	Specification Details
1. Teaching Institution	College of Engineering / University of Al-Qadisiyah
2. University Department/Centre	Roads and Transportation Engineering
3. Course title/code	Graduation Project (II) / R.E 445-B
4. Programme(s) to which it contributes	Roads and Transportation Engineering Program
5. Modes of Attendance offered	Semester System ; Day Program, full-time face-to-face on campus. 15-week regular semester.
6. Semester/Year	2nd Semester / Academic Year 2025–2026
7. Number of hours tuition (total)	45 hrs. / 3 hrs. per week (1 Advising + 2 Practical/Lab)
8. Date of production/revision of this specification	1-4-2026
9. Aims of the Course	The aims of the course are: 1. To execute detailed engineering calculations, software modeling (Civil 3D, STAAD Pro, HCS), and structural/geometric design. 2. To evaluate economic feasibility (<i>B/C</i> ratio, NPV), environmental impacts, and traffic safety implications of proposed designs.

	3. To write a well-structured graduation thesis formatted strictly to College of Engineering academic guidelines. 4. To design scientific posters, deliver PowerPoint presentations, and defend thesis findings orally before an examining committee.
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10. Learning Outcomes, Teaching, Learning and Assessment Method

By the end of this course, the student should be able to :

- a) Execute detailed geometric and structural design calculations for highways, bridges, and pavement layers.
- b) Perform advanced computer simulation and FEA modeling (Civil 3D corridor, STAAD Pro frame, HCS capacity).
- c) Perform quantity takeoff, cost estimation, and evaluate economic feasibility (B/C ratio, NPV) of proposed designs.
- d) Conduct Environmental Impact Assessment (EIA) and traffic safety audits for the engineering project.
- e) Compile a comprehensive graduation thesis formatted strictly to College of Engineering academic guidelines.
- f) Design scientific posters and deliver oral PowerPoint presentations for formal academic examination.
- g) Apply engineering, science, and mathematics principles to solve complex infrastructure design problems.
- h) Apply engineering design to produce solutions meeting safety, public health, welfare, and economic needs.
- i) Communicate effectively with a range of audiences through written thesis books and oral defenses.
- j) Recognize ethical and professional responsibilities and evaluate global, economic, and environmental impacts.
- k) Function effectively on a student project team, establishing goals and meeting project deadlines.

l) Develop and conduct appropriate experimentation, analyze data, and use engineering judgment.

m) Acquire and apply new knowledge as needed using appropriate learning strategies and software tools.

11. Teaching and Learning Methods

1. Weekly faculty advisor supervision sessions
2. Independent field surveys and laboratory experiments
3. Computer software modeling and design
4. In-Class questions and discussions
5. Connection between theory and actual engineering projects
6. Seminars and draft thesis reviews
7. Oral rehearsal presentations
8. Thesis book, poster, and final oral defense

12. Assessment methods

1. Faculty advisor evaluation (20%).
2. Examining committee evaluation (35%).
3. Written thesis document evaluation (15%).
4. Final oral defense examination (15%).

13. Course Structure

Week	Hours	Learning Outcomes (10)	Unit Module/Topic	Teaching Method (11)	Assessment Method (12)
1	3 (1 adv., 2 lab)	a, g, h, i	Detailed Geometric Design Calculations for highway alignment / bridge components	1	3
2	3 (1 adv., 2 lab)	b, g, h, m	Computer Simulation Execution (Civil 3D corridor, FEA structural analysis)	1-6	1-3
3	3 (1 adv., 2 lab)	a, b, g, h	Structural Pavement Design Calculations / Bridge element reinforcement	1-8	1-3
4	3 (1 adv., 2 lab)	b, g, h, m	Traffic Capacity Analysis and Level of Service (LOS) evaluation in HCS	1-8	1-3

5	3 (1 adv., 2 lab)	c, g, h, i	Quantity Surveying and Cost Estimation for proposed engineering project	1-8	1-3
6	3 (1 adv., 2 lab)	d, h, i, j	Environmental Impact Assessment (EIA) and traffic safety audit	1-8	1-3
7	3 (1 adv., 2 lab)	a-d, g, h	Results Synthesis, preparing comparative design alternatives	1-8	1-3
8	3 (1 adv., 2 lab)	c, d, g, h, j	Economic Evaluation (<i>B/C</i> ratio, NPV) and project feasibility review	1-8	1-3
9	3 (1 adv., 2 lab)	e, i, j	Writing Conclusions and Engineering Recommendations chapter	1-8	1-3
10	3 (1 adv., 2 lab)	e, i, j	Compiling Complete Thesis Draft (Chapters 1 to 5) formatted to college style	1-8	1-3
11	3 (1 adv., 2 lab)	e, i, j, k	Advisor Thesis Review, corrections, and plagiarism software check	1-8	1-3
12	3 (1 adv., 2 lab)	e, i, j	Printing, binding final thesis copies, and submitting to project committee	1-8	1-3
13	3 (1 adv., 2 lab)	f, i, j, m	Preparing Final Defense PowerPoint Slides and scientific poster	1-8	1-3
14	3 (1 adv., 2 lab)	f, i, j, k	Rehearsal Presentation and oral defense practice	1-8	1-3
15	3 (1 adv., 2 lab)	a-m	Final Project Oral Defense Presentation before scientific examining committee	1-8	1-4

14. Infrastructure	Details
Required reading: • CORE TEXTS • COURSE MATERIALS	Text Books: 1. <i>College of Engineering Graduation Project Writing & Formatting Guidebook.</i>

• OTHER	2. AASHTO, ACI, AISC, ASTM, and FHWA Official Design Standards. References: 1. Peer-reviewed journal papers (ASCE Journal of Transportation Engineering).
Special requirements (include for example workshops, periodicals, IT software, websites)	1. Soil/Highway Testing Laboratories. 2. CAD/FEA Computer Lab (Civil 3D, STAAD Pro, HCS, MS Excel). 3. Plagiarism detection software (Turnitin).
Community-based facilities (include for example, guest Lectures, internship, field studies)	Field traffic surveys and site soil sampling. Consultations with resident engineers on active construction sites.

15. Admissions	Details
Pre-requisites	R.E 445-A
Minimum number of students	/
Maximum number of students	70

16. Course Instructor	Instructor Academic Profile
Primary Instructor	VARIBLES
Co-Instructor	N/A