Course Specification
(Bachelor)

Course Title:	Special Topics in Geotechnical Engineering
Course Code:	CE 4209
Program:	Bachelor of Science in Civil Engineering
Department:	Civil Engineering Department
College:	College of Engineering and Architecture
Institution:	Umm Al Qura University
Version:	1
Last Revision Date:	31 January 2025

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A. General information about the course:

1. Course Identification

1. Credit hours: (3)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	Others
B.	☐ Required		☒ Elective		
3. Level/year at which this course is offered: Level 9th , 10th / Year 5th					
4. Course General Description:					
This course covers advanced and emerging topics in geotechnical engineering, including soil behavior, foundation engineering, soil-structure interaction, geotechnical earthquake engineering, and ground improvement techniques. It aims to equip students with specialized knowledge and problem-solving skills related to geotechnical challenges. Special emphasis is given to advanced foundation engineering topics such as pile dynamics, foundation performance monitoring, deep excavation stability, and foundation retrofitting.					
5. Pre-requirements for this course (if any)**:**					
Department Approval					
6. Co-requisites for this course (if any)**:**					
7. Course Main Objective(s):					

- Introduce students to advanced concepts in geotechnical engineering.
- Provide an understanding of soil behavior under different loading conditions.
- Develop analytical and problem-solving skills related to geotechnical design.
- Familiarize students with modern techniques and software used in geotechnical engineering.
- Apply engineering principles to real-world geotechnical challenges.
- Deepen understanding of foundation engineering, including shallow, deep, and advanced foundation systems.

- Explore innovative foundation solutions for extreme loading conditions and geohazard mitigation.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		45

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Identify and analyze complex geotechnical engineering problems.	K1	• Lectures, Case Studies, Group Discussions	Exams, Assignments, Projects
1.2	Evaluate soil behavior under various loading and environmental conditions.	K2	• Lectures, Research Reports	• Exams, Reports, Presentations

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.0	**Skills**			
2.1	Design geotechnical solutions considering sustainability and safety.	S1	• Lectures, Group discussion.	• Exams, Reports.
3.0	**Values, autonomy, and responsibility**			
3.1	Demonstrate ethical responsibility in geotechnical engineering practices.	V1	• Ethical Case Studies, Group Discussions	• Written Reflections, Peer Reviews
3.2	Work effectively in multidisciplinary teams on geotechnical projects.	V2	• Group Projects, Collaborative Learning	• Team Presentations, Peer Evaluations

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to Special Topics in Geotechnical Engineering	3
2	Advanced Soil Mechanics and Laboratory Testing	3
3	Shallow Foundations: Bearing Capacity and Settlement Analysis	3
4	Deep Foundations: Piles and Drilled Shafts	3
5	Pile Dynamics and Load Testing	3
6	Soil-Structure Interaction	3
7	Geotechnical Earthquake Engineering	3
8	Ground Improvement Techniques	3
9	Retaining Structures and Slope Stability	3
10	Deep Excavation Stability and Bracing Systems	3
11	Offshore and Marine Geotechnics	3
12	Pavement Geotechnics and Subgrade Improvement	3
13	Foundation Performance Monitoring and Retrofitting	3
14	Reliability and Risk Assessment in Foundation Engineering	3
15	Case Studies in Advanced Foundation Engineering and Future Trends	3
Total		**45**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments	Weekly	10%
2.	Mid-Term	8	30%
3.	Team Project	14	10%
5.	Final Exam	16	50%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	• Das, B. M. "Principles of Geotechnical Engineering." Latest Edition.
Supportive References	• Bowles, J.E. "Foundation Analysis and Design." • • Poulos, H.G., and Davis, E.H. "Pile Foundation Analysis and Design."
Electronic Materials	• nline geotechnical databases, research portals, and simulation tools.
Other Learning Materials	• Journals and conference papers on foundation engineering

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Equipped with smart boards and projectors
Technology equipment (projector, smart board, software)	Geotechnical engineering software (e.g., PLAXIS, GeoStudio)
Other equipment (depending on the nature of the specialty)	Soil testing lab with geotechnical testing equipment

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Faculty, Students	Surveys, Peer Review
Effectiveness of Students assessment	Faculty	Exam Reviews, Rubric Analysis
Quality of learning resources	Faculty, Students	Feedback Forms, Resource Evaluation

Assessment Areas/Issues	Assessor	Assessment Methods
The extent to which CLOs have been achieved	Program Leaders	Performance Reports
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**CIVIL ENGINEERING COUNCIL**
REFERENCE NO.	**THE FIFTEENTH SESSION OF THE ACADEMIC YEAR 1446**
DATE	**30 APRIL 2025**

