Course Specification
(Bachelor)

Course Title:	Problematic Soil and Stabilization Techniques
Course Code:	CE4206
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 hours)					
2. Course type					
A.	☐University	☐College	☐Department	☐Track	Others
B.	☐Required		☒ Elective		
3. Level/year at which this course is offered: (Level 9 or 10 / 5th Year)					
4. Course General Description:					
This course illustrates geotechnical problems associated different soil types. This includes Expansive soils which will be covered through illustrating soil composition, identification, properties and special recommendations for foundations. Illustrated problematic soil types also include Collapsible soils through illustrating its composition, identification, properties and special recommendations for foundations. Soft soils and non-engineered fills will be also presented as well. Also, different stabilization techniques , such as physical and chemical treatment methods, of soil is covered and illustrated.					
5. Pre-requirements for this course (if any)**:**					
CE3203					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					
- Introducing various engineering problems associated with problematic soil. - Introducing physical and chemical treatment methods for improving geotechnical properties and performance					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	42	100
2	E-learning		

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

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	42
2.	**Laboratory/Studio**	
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		42

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	To illustrate different problematic soil types and identification techniques.	K1	Lectures	Home work Written examinations
1.2	To illustrate expected problematic soil performance as a foundation soil	K2	Lectures	Home work Written examinations
1.3	To demonstrate advanced stabilization techniques of problematic soil and	K3	Lectures	Team project

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	stabilizing agents.			
1.4	To demonstrate different problematic soil stabilization techniques and special foundation recommendation techniques.	K2	Lectures	Homework Team project
2.0	Skills			
2.1	To solve geotechnical engineering roblems applying mathematics, theories and principles of geotechnical engineering.	S1	Lectures Project and report	Team prject
2.2	To asses shear strength of soil and its interaction with soil bearing capacity, lateral earth pressure and stability analysis of slopes	S4	Home work Lecture	Team project
2.3	To design strategies of geotechnical special problem solving techniques.	S3	Lecture	Homework
2.4	To analyze, assess, and compare the design alternatives of problematic soil and overlaying foundations.	S4	Lecture	Homework Exam
3.0	**Values, autonomy, and responsibility**			
3.1	Creating proficiency in teamwork through collective assignments in	V1	Lecture	Homework Exam

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	preparing reports			
3.2	To demonstrate innovation in engineering science through tracking development in problematic soil stabilization techniques.	V2	Lecture	Homework Exam
...	To develop engagement with engineering community through scientific site visits to sites of existing problematic soil features.	V3	Lecture	Homework Exam

C. Course Content

No	List of Topics	Contact Hours
1.	**Geotechnical problems associated different soil types**	**3**
2.	**Expansive soils: Composition, identification, properties and special recommendations for foundations**	**3**
3.	**Collapsible soils: Composition, identification, properties and special recommendations for foundations**	**3**
4.	**Soft soils: Composition, identification, properties and special recommendations for foundations**	**3**
5.	**Non engineered fill soils: Composition, identification, properties and special recommendations for foundations**	**3**
6.	**Organic/peat soils: Composition, identification, properties and special recommendations for foundations**	**3**
7.	**Aired /Semi arid soils: Composition, identification, properties and special recommendations for foundations**	**3**
8.	**Tropical soils: Composition, identification, properties and special recommendations for foundations**	**3**
9.	**Stabilizing agents**	**3**
10.	**Stabilization methods**	**3**
11.	**Physical Stabilization methods**	**3**

12.	chemical Stabilization methods	3
13.	Factors affecting strength of stabilized soil	3
14.	Stablizing materials and properties	3
Total		42

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework	Bi-weekly	10%
2.	Mid-Term exam	7	25%
3.	Project	7 to 12	15%
4	Final Exam	15/16	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	ICE Manual of Geotechnical Engineering Vol 1: Geotechnical Engineering Principles, Problematic Soils and Site Investigation (ICE Manuals),2012 by John Burland (Author), Tim Chapman (Author), Hilary Skinner (Author), Michael Brown (Author)
Supportive References	List Essential References Materials (Journals, Reports, etc.) http://www.springer.com/Geotechnical+Rock+Soil+Stablization
Electronic Materials	-Rodriguez, A.R., del Castillo, H., and Sowers, G.F ,. ”SOIL ECHANICS IN HIGHWAY ENGINEERING”, Transtech Publications, 1988. - Schroeder, W.L” ,.SOILS IN CONSTRUCTION”, 3 rd. Edition, John Wiley, 1984. - Sowers, G.F” ,.INTRODUCTORY SOIL MECHANICS AND FOUNDATIONS: GEOTECHNICAL ENGINEERING”, 4th Edition, Macmillan Publication Co., 1979. - Spangler, M.G., and Handy, R.L” ,.SOIL ENGINEERING”, Harper & Row, Newyork, 4th Edition, 1982.
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**Classroom**
Technology equipment (projector, smart board, software)	**Datashow**
Other equipment (depending on the nature of the specialty)	**Lab equipped with computers and include software for soil and pavement**

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Direct
Effectiveness of Students assessment	Program Lead Students	Direct
Quality of learning resources	Peer Reviewer	Direct
The extent to which CLOs have been achieved	Faculty	Direct
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**

