Course Specification
(Bachelor)

Course Title:	Introduction to Rock Engineering
Course Code:	CE 4205
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 6 / 4th Year)					
4. Course General Description:					
In this course, the fundamentals of rock mechanics are presented. The geological origin, composition, classification, and index properties of different types of rocks are detailed. Stress distribution in rock represents a major interest of this course. Rock strength, failure criteria, rock deformation, and strain are essential topics to prepare students for foundations on rock design. The course also presents different methods used to enhance the stability of rock masses.					
5. Pre-requirements for this course (if any)**:**					
CE 3203					
6. Co-requisites for this course (if any)**:**					
7. Course Main Objective(s):					
• Introducing different types of rock and their geotechnical properties. • Introduced to the concept of lab testing in rock mechanics. • Able to apply the principles and methods of mathematics, science, and engineering basics to formulate and solve rock mechanic problems. • Introducing codes of practice, specifications, and testing standards to evaluate different types of rocks as foundation soil.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100
2	E-learning	Not Applicable	
3	Hybrid • Traditional classroom • E-learning	Not Applicable	
4	Distance learning	Not Applicable	

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	Not Applicable
3.	**Field**	Not Applicable
4.	**Tutorial**	Not Applicable
5.	**Others (specify)**	Not Applicable
Total		

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	Knowledge of the basics of a subject.	**K.1**	Through lectures, module notes, tutorials, coursework, examinations, and group project work. Assignments, homework, quizzes, midterm and final.	Through lectures, module notes, tutorials, coursework, examinations, and group project work. Assignments, homework, quizzes, midterm and final
1.2	Knowledge of the fundamental physical and analytical principles of the subject.	K.1	Through lectures, Module notes, tutorials, coursework, examinations, and group project work.	Assignments, homework, quizzes, midterm and final.
2.0	**Skills**			
2.1	Ability to use the principles of the subject matter to identify and apply the basic laws to practical problems.	S.1	Through lectures, module notes, tutorials, coursework, examinations, and group project work.	Assignments, homework, quizzes, midterms, and finals.
2.2	Ability to use any engineering software related to the subject	S.1	Through lectures, module notes, tutorials, coursework, examinations, and group project work.	Assignments, homework, quizzes, midterms, and finals.
3.0	Values, autonomy, and responsibility			
3.1	To demonstrate Commitment to professional and academic values and	V.1	Lectures and training tutorials	The class works, written and oral examinations.

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	standards in the engineering profession.			
3.2	To demonstrate commitment to ethical code of conduct in the field of civil engineering.	V-2	Lectures and training tutorials	Projects and reports
3.3	Ability to use EXCEL for plotting engineering data and ability to interpret the graphs.	S.1	Through lectures, Module notes, tutorials, coursework, examinations, and group project work.	Assignments, homework, quizzes, midterm and final.

C. Course Content

No	List of Topics	Contact Hours
1.	Fundamentals of rock mechanics	3
2.	Geological classification of different types of rocks	3
3.	Index properties of rocks, Stresses in rock.	3
4.	Rock mass failure criteria, Rock Mass Rating (RMR), Rock Quality Designation (RQD)	6
5.	Stress-Strain at different planes (MOHR'S Circle)	6
6.	Application of Rock Mechanics to Rock Slope Engineering (Slope Stability Analysis).	6
7.	Measurement of rock stresses, Stress-strain relationship in rock	6
8.	Foundations on rocks, Improving rock mass stability	6
9.	Underground excavation in rock	6
Total		**45**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework Assignment	Bi-Weekly	5%
2.	Quizzes	Monthly	5%
3.	Mid-Term	6	30%
4.	Final Examination	13	50%
5	Class (In-Person) Attendance	-	10%

*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	-Introduction to Rock Mechanics, by R. E. Goodman, 1989 or 2010
Supportive References	- Practical Rock Engineering, by E. Hoek, 2007. -ENGINEERING ROCK MECHANICS - AN INTRODUCTION TO THE PRINCIPLES 1st Edition. 2016. by John A Hudson (Author), John P Harrison (Author)
Electronic Materials	http://www.springer.com/Geotechnical+Rock+Soil+Stablization The United States Geological Survey (USGS) @ https://www.usgs.gov/faq/geology
Other Learning Materials	The following softwares are helpful for applications of the subjects to engineering projects: • GeoStudio Softwares • Rocscience Software Suite ArcView GIS

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	White board and associated auxiliary items
Technology equipment (projector, smart board, software)	Computer with multi-media, a printer, internet connection, data show, Microsoft Office, ArcView GIS, gINT
Other equipment (depending on the nature of the specialty)	Printers and laptops for staff members with required computer software programs are required.

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness teaching and assessment	Faculty members who teach this course	Students questioners running at the semester end, Analysis of students` marks
Effectiveness student's assessment	Faculty members who teach this course	Homework, Assignments quizzes, and group oral discussions
Quality of learning resources	Independent member(s) teaching staff	Frequent improvement for teaching and learning techniques
The extent to which CLOs have been achieved	Specified target achieved	A sample of students' answer sheets needs to be revised by a specified committee of the department.
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**

Course Coordinator





Yahya Bin Mahfouz, Ph.D.