Course Specification
(Bachelor)

Course Title:	Computer Applications in Soil Engineering and Foundation
Course Code:	8034458-3
Program:	Bachelor of Science in Civil Engineering
Department:	Civil Engineering Department
College:	College of Engineering& 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 9 -10/ 5th Year)					
4. Course General Description:					

This course introduces students to the use of computer-based tools and software for geotechnical engineering analysis and design. It covers the application of numerical methods, geotechnical modeling, and data interpretation techniques in soil mechanics and foundation engineering. Students will learn how to utilize specialized geotechnical software for soil classification, slope stability analysis, settlement estimation, and groundwater flow modeling. The course also emphasizes the integration of computational techniques with engineering judgment to solve real-world geotechnical problems. Hands-on exercises and case studies will provide practical experience in applying computer applications to geotechnical engineering projects.

5. Pre-requirements for this course (if any)**:**

8031104-2, 8034408-3

6. Co-requisites for this course (if any)**:**

N/A

7. Course Main Objective(s):

- **Enable the student to use computer software in the field of geotechnical engineering.**
- **To help students develop their abilities to know more information about computer applications in the field of geotechnical engineering.**

Introducing novel techniques to analyse behaviour of earth materials, earthwork and foundations for proposed structures.

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	25	100%
2	E-learning	N/A	
3	Hybrid • Traditional classroom • E-learning	N/A	
4	Distance learning	N/A	

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	25
2.	**Laboratory/Studio**	10
3.	**Field**	Site/ Visit investigation
4.	**Tutorial**	Software's
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	To know the design process, experimental design, design criteria and evaluation	K2	Lectures	Home work Lab examination Written examinations

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.2	To describe the knowledge acquired understand software related to geotechnical engineering, and to apply the software in design of geotechnical problems.	K3	Lectures	Home work Lab examination Written examinations
1.3	To help students to prepare borehole logs employing software program input values from site investigation and laboratory tests conducted.	K3	Lectures	Home work Lab examination Written examinations
2.0	**Skills**			
2.1	To operate effectively different related software of geotechnical engineering	S2	Lectures	Home work Written examinations
2.2	To design foundation systems soil stabilization techniques using geotechnical software	S3	Lectures	Home work Written examinations
2.3	To analyze output data of software program	S6	Lectures	Home work Written examinations
3.0	**Values, autonomy, and responsibility**			
3.1	To demonstrate commitment to professional and academic values and standards in the engineering profession To demonstrate commitment to ethical	V.1	Lectures	Home work Written examinations

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	code of conduct in the field of civil engineering			
3.2	Ability to use EXCEL for plotting engineering data and ability to interpret the graphs.	S.1	Lectures	Home work Written examinations

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to fundamentals of geotechnical analysis and design. Geotechnical site investigation (gINT) reporting and write technical report with recommendations for foundation. To prepare detailed borehole logs with associated tests. To classify soil according Unified Soil Classification System (USCS) to incorporate field and laboratory conducted soil index tests; correlations of index test results to engineering properties	6
2.	Geotechnical analysis of different rock masses based on physical and mechanical properties (KeyLab/gINT)	3
3.	Implement (GeoStudio) software to analyze permeability, seepage analysis, and internal stability of granular soil, granular filter design for internal hydraulic stability.	3
4.	Analyze water flow model in structures and impact on stability (GeoStudio)	3
5.	Compaction assessment of granular soil; engineered fills for earth dams, road bases, and backfills employing compaction analysis software (SCAN) attached with GPS receivers.	6
6.	To employ (GeoStudio) software to estimate soil shear strength at constant volume and ultimate limit state design of retaining walls	6
7.	To calculate pile driven force and analyze using (PDA Software Suite)	3
8.	Estimate one-dimensional consolidation of soil using DataSystem soil test software (ELE) (Automated) Practical hands-on software	3
	Total	33

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Home work	Weekly	10
2.	Mid-term exam	5	25
3.	Laboratory and project	1-10	25
4.	Final Exam	12	40

*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 Braja M; Principles of Geotechnical Engineering; Thomson Asia Pvt. Ltd. All associated manuals accomplished with the software used.
Supportive References	http://www.springer.com/Geotechnical+Rock+Soil+Stablization
Electronic Materials	The United States Geological Survey (USGS) @ https://www.usgs.gov/faq/geology
Other Learning Materials	The following software's are helpful for applications of the subjects to engineering projects: • • gINT (Reporting) • • GeoStudio Software • • Rocscience Software Suite • AutoCAD/MicroStation ArcView GIS

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	classroom 40seats, Soil Mechanics laboratory 20 students working in parallel
Technology equipment (projector, smart board, software)	Computer with multi-media, a printer, internet connection, data show, Microsoft Office, ArcView GIS, Rocscience Software Suite
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 of teaching	Faculty members who teach this course	• Students questioners running at the semester end, • Analysis of students` marks • Regular feedback of the students about the course and the teaching methods
Effectiveness of Students assessment	Faculty members who teach this course	• Students questioners running at the semester end, • Analysis of students` marks • Regular feedback of the students about the course and the teaching methods
Quality of learning resources	Faculty members who teach this course	• Frequent improvement for teaching and learning techniques. • Frequent survey for latest references. • Encouraging the students in team work cooperation and writing reports.
The extent to which CLOs have been achieved	Independent member(s) teaching staff	A sample of students answer sheets is revised by a specified committee of the department.

Assessment Areas/Issues	Assessor	Assessment Methods
Other	Faculty members who teach this course and those teaching other courses relevant to this course.	Regular revising and improving of the course contents and consulting the faculty members who teach this course and those teaching other courses relevant to this course.

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



Dr. Khalid Riyadh