



Course Specifications

Course Title:	Geotechnical Engineering I
Course Code:	CE 315
Program:	B.Sc. in Civil Engineering
Department:	Civil Engineering
College:	Jubail University College
Institution:	Jubail University College

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A. Course Identification

1. Credit hours:	4
2. Course type	
a.	University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b.	Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
3. Level/year at which this course is offered:	Level 4, second Year
4. Pre-requisites for this course (if any):	CE 204 Structural Mechanics I
5. Co-requisites for this course (if any):	None

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	✓	100
2	Blended		
3	E-learning		
4	Correspondence		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
Contact Hours		
1	Lecture	45
2	Laboratory/Studio	45
3	Tutorial	
4	Others (specify)	
	Total	90

B. Course Objectives and Learning Outcomes

1. Course Description	
<i>CE 315: Geotechnical Engineering I (3-3-4)</i>	<i>Prerequisite: CE 204</i>
Soil formation and identification; index properties and classification of soils; clay minerals; soil compaction; capillarity, swelling, shrinkage and effective stresses; the flow of water in soils; compressibility and consolidation; stress in soils; shear strength of cohesive and cohesionless soils; introduction to lateral earth pressure; Shallow foundation and introduction to slope stability analysis	
2. Course Main Objective	
The purpose of this course is to enable the students to get theoretical and practical knowledge of soil mechanics and its application.	

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge and Understanding	
1.1	Describe the engineering behavior of earth materials and design principle of shallow foundation	8
2	Skills :	
2.1	Determine the engineering properties of soil, permeability properties of soil, shear strength of soil.	1
2.2	Conduct laboratory experiments to estimate the basic engineering properties of soil and analyze the data and results	6
2.3	Calculate the compaction, consolidation settlement of the soil and Lateral Earth Pressure of retaining structures.	1
2.4	Design the shallow foundation.	1
2.5	Analyze the Slope Stability.	1
3	Values	
	N/A	

C. Course Content

No	List of Topics	Contact Hours
1	<u>Unit 1: Soil Formation and Basic Definitions</u> 1.1 Formation of soil 1.2 Clay mineralogy 1.3 Basic definitions 1.4 Three phase diagrams and phase relations	6
2	<u>Unit 2: Index Properties</u> 2.1 Particle size analysis – Sieve analysis and Sedimentation Analysis 2.2 Relative density 2.3 Soil Classification	12
3	<u>Unit 3: Capillary Water</u> 3.1 Types of soil water 3.2 Capillary rise in soils 3.3 Frost heave and frost boil 3.4 Shrinkage and swelling of soil	6
4	<u>Unit 4: Flow Of Water in Soils</u> 4.1 Permeability 4.2 Hydraulic head 4.3 Darcy's Law 4.4 Determination of coefficient of permeability – Laboratory and field methods 4.5 Seepage velocity	6
5	<u>Unit 5: Stresses in Soils</u> 5.1 Vertical stress 5.2 Horizontal stress 5.3 Effective stress	6
6	<u>Unit 6: Compressibility and Consolidation of Soil</u> 6.1 Compaction 6.2 Initial, Primary and Secondary consolidation 6.3 Consolidation test	12

	6.4 Settlement Analysis	
7	Unit 7: Shear Strength of Cohesive and Cohesion Less Soil 7.1 Mohr's circle 7.2 Mohr Coulomb Theory 7.3 Direct Shear test 7.4 Triaxial Test 7.5 Unconfined Compression Test 7.6 Vane Shear Test	12
8	Unit 8: Introduction to Lateral Earth Pressure 8.1 At rest Pressure 8.2 Active Earth Pressure 8.3 Passive Pressure 8.4 Lateral Earth Theory	12
9	Unit 9: Shallow Foundations 9.1 Types of shallow foundations 9.2 Principles of design of footings 9.3 Design of strip footing, spread footing and combined footing	6
10	Unit 10: Introduction to Slope Stability Analysis 10.1 Factor of Safety 10.2 Stability of finite and infinite slopes 10.3 Stability with seepage 10.4 Method of Slices.	12
Total		90

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	Knowledge and Understanding		
1.1	Describe the engineering behavior of earth materials and design principle of shallow foundation	Interactive learning Self-directed learning	Quiz 1, midterm, assignment 1, Quiz 2, assignment 2 & final
2.0	Skills		
2.1	Determine the engineering properties of soil, permeability properties of soil, shear strength of soil.	Interactive learning Self-directed learning	Quiz 1, midterm, assignment 1
2.2	Conduct laboratory experiments to estimate the basic engineering properties of soil and analyze the data and results		Midterm & final
2.3	Calculate the compaction, consolidation settlement of the soil and Lateral Earth Pressure of retaining structures.		Quiz 2, assignment 2 & final
2.4	Design the shallow foundation.		Quiz 2, assignment 2 & final
2.5	Analyze the Slope Stability.		Quiz 2, assignment 2 & final
3.0	Values		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	N/A		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quiz 1	4	5%
2	Assignment 1	6	5%
3	Mid-Term LT	8	20%
4	Mid-Term LB	9	5%
5	Quiz 2	12	5%
6	Assignment 2	14	5%
7	Final Exam -LB	16	10%
8	Performance LB	16	10%
9	Lab Record	16	5%
10	Final Exam-LT	17-19	30%

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

- Office hours 6 hr/week; students can go in times of office hours for teacher to explain what could not be understood from the lesson.
- Students can communicate with a staff member outside the official working hours by email.
- Students are also encouraged to visit their academic advisors.

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Braja, B. D. and Sobhan, K. (2014). Principles of Geotechnical Engineering, USA: Cengage Learning.
Essential References Materials	John, B., Tim, C., Hilary, S. and Michael, B. (2012), <i>Geotechnical Design, Construction and Verification</i> , UK London: ICE Manual of Geotechnical Engineering. Braja, B. D. (2007), <i>Fundamentals of Geotechnical Engineering</i> , USA: Cengage Learning.
Electronic Materials	None
Other Learning Materials	None

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Lecture rooms with a capacity of at least 25 students and fitted with multimedia projector and a computer. Laboratory with a capacity of at least 15 students and fitted with multimedia projector and a PC

Item	Resources
Technology Resources (AV, data show, Smart Board, software, etc.)	None
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Triaxial apparatus, Direct shear test apparatus, permeameters, odometer apparatus, compaction test apparatus, Particle Analysis apparatus, and soil characterization apparatus.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment as per QMS-Policy-006 Feedback Survey, QMS-QAP-116 Monitoring Students' Satisfaction	Students	Indirect: Analyzing the results of the following surveys Course Evaluation Survey(CES), Program Evaluation Survey (PES), Student Experience Survey (SES)
Quality of Exam papers and Verifying Standards of Student Achievement as per QMS-Policy-004 Policy for Examinations and Marking, QMS-ACP-102 Procedure for Marking Examinations	Examination Committee	Direct: Peer review of examination papers and review or double check a minimum of three or 10% of answer papers. Verifying the entries in the Activity Mark Sheet.
Achievement of learning outcomes as per QMS-Policy-001 Course Review, QMS-CDP-106, QMS-CDP-112 Curriculum Review	Faculty	Direct: Course Report (Section B-3)
Implementation of the action plans based on previous semester as per QMS-Policy-001 Course Review, QMS-CDP-106 Procedure for Course Review, QMS-CDP-112 Procedure for Curriculum Review	Faculty	Direct and Indirect: Course report (Section G-1, G-2)
Monitoring Teaching and Learning as per QMS-Policy-005 Monitoring of Teaching and Learning	Chairperson/Program Director/Course Director	Indirect: Feedback by Chairperson/Program director/Course director. Program Delivery Record.
Effectiveness of planned Teaching Strategies QMS-Policy-001 Course Review	Faculty	Indirect: Course Report (Section B-4)
Course effectiveness and planning for improvement as per QMS-Policy-001 Course Review, QMS-CDP-106 Procedure for Course	Faculty	Direct and Indirect: Course report (Section G-3)

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Review, QMS- CDP-112 Procedure for Curriculum Review		
Verifying Standards of Student Achievement and Quality of Exam papers as per QMS-ACP-119 External Assessment Review	Assessment External Reviewer	Direct: Report of assessment external reviewer. Review of sample of ten or 10% of student's assessments and coursework scripts.

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Civil Engineering Department Council
Reference No.	REG MIN-CED-10
Date	27-04-2020

Appendix A Revision Details

Revision no.	DESCRIPTION	Reference MoMs			
		DC		CDC	
		Sem	#	Sem	#
1	Revision of Course Teaching Strategies and action verbs based on the comments of NCAAA reviewer	392	4	392	4
2	Course Specification Template 2018	402			