

# **42Course Specification of Soil Mechanics 2**

I. (	Course Identification and Gene	eral Info	rmation:			
1	Course Title:	Soil Mech	nanics 2			
2	Course Code & Number:	CE301				
		С.Н			Credit	
3	Credit hours:	Th.	Tu.	Pr.	Tr.	Hours
		3	2	2		5
4	Study level/ semester at which this	4th level / first semester				
"	course is offered:	4th level / Thist semester				
5	Pre –requisite (if any):	Soil Mech	nanics 1			
6	Co –requisite (if any):		-			
8	Program (s) in which the course is	Civil Engineering				
	offered:					
9	Language of teaching the course:	English+ Arabic				
10	Location of teaching the course:	Class room				
11	Prepared By:	Dr. Ziad algbobi & En. Saddam alhadama				
12	Date of Approval					

Prepared by

Head of Department Dr. Abdulkareem Yahya Al khattabi Quality Assurance Unit Ass. Prof. Dr. Mohammad Algorafi

Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti



## **II.** Course Description:

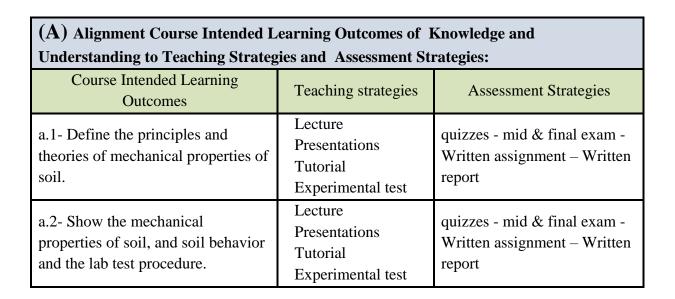
This course is one of the important courses in civil engineering. It deals with mechanical properties of soil such as compression and shear strength of soil . This course contributes to preparing the student; and providing him with the basic skills, to study the compression of fine and coarse soils. Also, it studies the compression parameters; the relationship of compression with physical properties, and teaches students how to find the amount and time of settlement. Moreover, it focuses on the soil resistance of the shearing forces and methods of their identification, types of lateral earth pressures of the soil, method of finding them, Types of slopes, slope stability, Factor of Safety of slope and methods of finding them. This course is taught through lectures, presentations, practical experiences, homework, and discussion. The students are evaluated through short exams, midterm and final exams, as well as other activities and assignments such as researches, laboratory experiments, and field visits.

III	. Course Intended learning outcomes (CILOs) of	Reference
	the course	<b>PILOs</b>
a.1	Define the principles and theories of mechanical properties of soil.	A1
a.2	Show the mechanical properties of soil, and soil behavior and the lab test procedure.	A2
b. 1	Discuss the calculate results to analysis engineering problems.	B1
b. 2	Evaluate the problems of soil in field, and suggest the appropriate solutions.	В2
<b>c.1</b>	Conduct the experimental tests by correct method.	C1
<b>c.2</b>	Apply the mathematical approach to calculate the mechanical properties of soil, lateral earth pressure, and factor of safety of slopes.	C2
d. 1	Enhance a student's ability to both verbally and in written experimental reports,	D1
d. 2	Develop your knowledge and technical abilities to evaluate the soil problems and there solutions.	D5

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(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:				
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies		
<b>b.1-</b> Discuss the calculate results to analysis engineering problems.	Lecture Presentations Tutorial Experimental test	Lab exam - mid & final exam - Written assignment — Written report		
<b>b.2-</b> Evaluate the problems of soil in field, and suggest the appropriate solutions.	Lecture Presentations Tutorial Experimental test	Quizzes - mid & final exam - Written assignment – Written report- field visits.		

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C Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:					
Course Intended Learning Outcomes Teaching strategies Assessment Strategies					
<b>c.1-</b> Conduct the experimental tests by correct method.	lab Lecture Tutorial Presentations	Reports, -Lab exam			
C.2- Apply the mathematical approach to calculate the mechanical properties of soil, lateral earth pressure, and factor of safety of slopes.	Lecture Presentations Tutorial Reading	Problem set- Written exam- Written assignment			

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching						
Strategies and Assessment Strategies:						
Course Intended Learning Outcomes						
<b>d.1-</b> Enhance a student's ability both verbally and in written reports,	lab Lecture Multimedia Presentations	Reports, -Lab exam				
d2- Develop a student's knowledge and technical abilities to evaluate the soil problems and there solutions.	lab Lecture Multimedia Presentations	Lab exam - mid & final exam - Written assignment — Written report				

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Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti







# **IV.** Course Content:

## A – Theoretical Aspect:

	A – Theoretical Aspect:				
Orde r	Units/Top ics List	Learning Outcomes	Sub Topics List	Number of Weeks	contact hours
1	Compress ibility of Soil	a1,a2, b1,b2,c1,c2, d1,d2	Introduction, compression of soil, types of compression in soil, consolidation settlement, fundamentals of consolidation (terzaghi theory). one-dimensional laboratory consolidation test, void ratio—pressure relationship, calculation of Compression Index ,swell Index ,consolidation settlements ,and time rate of consolidation	4	12
2	Shear Strength of Soil	a1,a2, b1,b2,c1,c2, d1,d2	Introduction, Shear strength parameters of soil Laboratory testing of soil under various drainage conditions to estimate the shear strength parameters .Effect of remolding on shear strength of cohesive soils. Effect of variation of shear strength depending on the direction of load application .Use of vane shear to obtain shear strength of saturated cohesive soils.	3	9
3	Shear Strength of Soil	a1,a2, b1,b2,c1,c2, d1,d2	Introduction, Shear strength parameters of soil Laboratory testing of soil under various drainage conditions to estimate the shear strength parameters. Effect of remolding on shear strength of cohesive soils. Effect of variation of shear strength depending on the direction of load application. Use of vane shear to obtain shear strength of saturated cohesive soils.	1	3

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4	Lateral Earth Pressure	a1,a2,a3,b1, b2,d1,d2	Introduction, At-Rest, Active, and Passive Pressures. Earth Pressure for Partially and fully Submerged Soil. Rankine's &Coulomb's earth pressure theory and there assumed.	3	9
5	Slope Stability	a1,a2,a3,b1, b2,d1,d2	Definition of factor of safety, Stability of infinite slopes, Stability of finite slopes with plane and circular failure surfaces. Analysis of the stability of finite slopes with steady-state seepage condition.	3	9
	Number of Weeks /and Units Per Semester			14	42

B - Tut	B - Tutorial Aspect:					
Order	Order Tasks/ Experiments		contact hours	Learning Outcomes		
1	Compressibility of Soil	4	8	a1,a2, b1,b2,c1,c2		
2	Shear Strength of Soil	4	8	a1,a2, b1,b2,c1,c2		
3	Lateral Earth Pressure	3	6	a1,a2, b1,b2,c1,c2		
4	Slope Stability	3	6	a1,a2, b1,b2,c1,c2		
Number of Weeks /and Units Per Semester		14	28			

C- Pra	C- Practical Aspect:						
Order	Tasks/ Experiments	Number of Weeks	contact hours	Learning Outcomes			
1	How write the report	1	2	a.1, a2,b1,c1,d1,d2			
2	Consolidation test	3	6	a2,c1,d1			
3	Direct shear test	1	2	a2,c1,d1			
4	Unconfined compression strength	2	4	a2,c1,d1			
5	Triaxial compression strength	3	6	a2,c1,d1			
6	Fane shear lab test	1	2	a2,c1,d1			

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7	Fane shear field test	3	6	a2,c1,d1
Number of Weeks /and Units Per Semester		14	28	

# V. Teaching strategies of the course:

Lecture

Multimedia Presentations

Presentations

Tutorial

quiz

Lab

VI.	VI. Assignments:						
No	Assignments	Week Due	Mark				
1	Compressibility of Soil	b1,b2,c1,c2,d1,d2	1,2,3,4	3			
2	Shear Strength of Soil	b1,b2,c1,c2,d1,d2	5,6,7,8	3			
3	Lateral Earth Pressure	b1,b2,c1,c2,d1,d2	9,10,11	3			
4	Slope Stability	b1,b2,c1,c2,d1,d2	12,13,14	3.5			

VII.	VII. Lab Reports:						
No	Reports Aligned CILOs(symbols)		Week Due	Mark			
1	Report 1 (Consolidation test)	b1,b2,c1,c2,d1,d2	2	6			
2	Report 2 (Direct shear test)	b1,b2,c1,c2,d1,d2	5	6			
3	Report 3 (Unconfined compression strength)	b1,b2,c1,c2,d1,d2	6	6			
4	Report 4 (Triaxial compression strength)	b1,b2,c1,c2,d1,d2	7	6			
5	Report 5 (Fane shear lab test)	b1,b2,c1,c2,d1,d2	9	6			
6	Report 6 (Fane shear field test)	b1,b2,c1,c2,d1,d2	10	7.5			

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## University of Sana'a **Faculty of Engineering**









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Yahya Al khattabi

Quality Assurance Unit Ass. Prof. Dr. Mohammad Algorafi

Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti







# VIII. Schedule of Assessment Tasks for Students during the Semester:

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No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1	assignment	1 to 14	12.5	5	b1,b2,c2,d1,d2
2	Participation	1 to 14	12.5	5	A1,a2,d1,d2
3	Quizzes	4 and 8	12.5	5	a1,a2,b1,b2,c1,c2
4	Reports.	1 to 10	37.5	15	B1,b2,c1,c2,d1,d2
5	Mid-term exam.	7 <sup>th</sup>	50	20	a1,a2, b1,b2,c1,c2
6	Final-exam.	16 <sup>th</sup>	125	50	a1,a2, b1,b2,c1,c2
	Sum		250	100%	

## IX. Learning Resources:

• Written in the following order: ( Author - Year of publication – Title – Edition – Place of publication – Publisher).

### 1- Required Textbook(s) (maximum two).

1- Braja M. Das , Khaled Sobhan ,2018 ,"Principles of Geotechnical Engineering " 9th Edition, Cengage Learning

### 2- Essential References.

1-Muni Budhu,(2015) "Soil Mechanics and fundamentals"

2- J. A. Knappett and R. F. Craig (2012)" Craig's Soil Mechanics" 8th Edition, Spon Press

### 3- Electronic Materials and Web Sites etc.

1-www.kutub.info/library/book/8474.

2-www.engaswan.com

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	X. Course Policies:
1	Class Attendance: The students should have more than 75 % of attendance according to rules and regulations of the faculty.
2	<b>Tardy:</b> The students should respect the timing of attending the lectures. They should attend within 1 minutes from starting of the lecture.
3	Exam Attendance/Punctuality: The student should attend the exam on time. The punctuality should be implemented according to rules and regulations of the faculty for midterm exam and final exam.
4	Assignments & Projects: The assignment is given to the students after each chapter, the student has to submit all the assignments for checking on time.
5	Cheating:  If any cheating occurred during the examination, the student is not allowed to continue and he/she has to face the examination committee for enquiries.
6	Plagiarism: The student will be terminated from the Faculty, if one student attends the exam on another behalf according to the policy, rules and regulations of the university.
7	Other policies: -All the teaching materials should be kept out the examination hallThe mobile phone is not allowedThere should be a respect between the student and his teacher.

Reviewed By	Vice Dean for Academic Affairs and Post Graduate Studies
	Dr. Tarek A. Barakat
	Dr. Mohammad Algorafi
	Deputy Rector for Academic Affairs Dr. Ibrahim AlMutaa
	Dr. Ahmed mujahed
	Dr. Munaser Alsubri

Prepared by Head

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# **Course Plan (Syllabus) of Soil Mechanics 2**

I. Information about Faculty Member Responsible for the Course:							
Name of Faculty Member	Dr. ziad algbobi			Office	Hour	'S	
Location& Telephone No.		SAT	SUN	MON	TUE	WED	THU
E-mail		2		2			

II.	II. Course Identification and General Information:					
	Course Title:	Soil Mechanics 2				
2-	Course Number & Code:	CE301				
			C.	H		Credit
3-	Credit hours:	Th.	Tu.	Pr.	Tr.	Hours
		3	2	2		5
4-	Study level/year at which this course is	4th Level/ first semester				
7-	offered:					
5-	Pre –requisite (if any):	Soil M	Iechanics 1			
6-	Co –requisite (if any):					
7-	<b>Program</b> (s) in which the course is	Civil Engineering				
,-	offered					
8-	Language of teaching the course:	English+ Arabic				
9-	System of Study:	Semester				
10-	Mode of delivery:	Lecture + practical + lab				
11-	Location of teaching the course:	Class 1	room +lab			

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## **III.** Course Description:

This course is one of the important courses in civil engineering. It deals with mechanical properties of soil such as compression and shear strength of soil. This course contributes to preparing the student; and providing him with the basic skills, to study the compression of fine and coarse soils. Also, it studies the compression parameters; the relationship of compression with physical properties, and teaches students how to find the amount and time of settlement. Moreover, it focuses on the soil resistance of the shearing forces and methods of their identification, types of lateral earth pressures of the soil, method of finding them, Types of slopes, slope stability, Factor of Safety of slope and methods of finding them. This course is taught through lectures, presentations, practical experiences, homework, and discussion. The students are evaluated through short exams, midterm and final exams, as well as other activities and assignments such as researches, laboratory experiments, and field visits.

## IV. Intended learning outcomes (ILOs) of the course:

- Brief summary of the knowledge or skill the course is intended to develop:
- **a.1** Define the principles and theories of mechanical properties of soil. A1
- **a.2** Show the mechanical properties of soil, and soil behavior and the lab test procedure. A2
- **b.1** Discuss the calculate results to analysis engineering problems. B1
- **b.2** Evaluate the problems of soil in field, and suggest the appropriate solutions. B2
- **c.1** Conduct the experimental tests by correct method.
- **c.2** Apply the mathematical approach to calculate the mechanical properties of soil, lateral earth pressure, and factor of safety of slopes. C2
- **d.1** Enhance a student's ability both verbally and in written experimental reports, D1
- **d.2** Develop a student's knowledge and technical abilities to evaluate the soil problems and there solutions.

  D5







## **V.Course Content:**

• Distribution of Semester Weekly Plan of Course Topics/Items and Activities.

## **A – Theoretical Aspect:**

Order	Topics List	Sub Topics List	Week Due	Contact Hours
1	Compress ibility of Soil	Introduction, compression of soil, types of compression in soil, consolidation settlement, fundamentals of consolidation (terzaghi theory). one-dimensional laboratory consolidation test, void ratio—pressure relationship, calculation of Compression Index ,swell Index ,consolidation settlements ,and time rate of consolidation	1,2,3,4	12
2	Shear Strength of Soil	Introduction, Shear strength parameters of soil Laboratory testing of soil under various drainage conditions to estimate the shear strength parameters .Effect of remolding on shear strength of cohesive soils. Effect of variation of shear strength depending on the direction of load application .Use of vane shear to obtain shear strength of saturated cohesive soils.	5,6,7	9
3		Midterm Exam	8	3
4	Shear Strength of Soil	Introduction, Shear strength parameters of soil Laboratory testing of soil under various drainage conditions to estimate the shear strength parameters .Effect of remolding on shear strength of cohesive soils. Effect of variation of shear strength depending on the direction of load application .Use of vane shear to obtain shear strength of saturated cohesive soils.	9	3
5	Lateral Earth Pressure	Introduction, At-Rest, Active, and Passive Pressures. Earth Pressure for Partially and fully Submerged Soil. Rankine's &Coulomb's earth pressure theory and there assumed.	10,11,1	9

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6	Slope Stability	Definition of factor of safety, Stability of infinite slopes, Stability of finite slopes with plane and circular failure surfaces. Analysis of the stability of finite slopes with steady-state seepage condition.	13,14,1 5	9
7		Final Exam	16	3
	Number of Weeks /and Units Per Semester			48

B - Tutorial Aspect:					
Order	Topics List	Week Due	<b>Contact Hours</b>		
1	Compressibility of Soil	1,2,3,4	8		
2	Shear Strength of Soil	5,6,7,8	8		
3	Lateral Earth Pressure	9,10,11	6		
4	Slope Stability	12,13,14	6		
Number of Weeks /and Units Per Semester		14	28		

C- Practical Aspect:				
Order	Topics List	Week Due	<b>Contact Hours</b>	
1	How write the report	1	2	
2	Consolidation test	3	6	
3	Direct shear test	1	2	
4	Unconfined compression strength	2	4	
5	Triaxial compression strength	3	6	
6	Fane shear lab test	1	2	
7	Fane shear field test	3	6	
Nu	mber of Weeks /and Units Per Semester	14	28	

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# VI. Teaching strategies of the course:

Lecture

**Multimedia Presentations** 

Presentations

**Tutorial** 

quiz

lab

7	VII. Assignments:						
No	Assignments	Aligned CILOs(symbols)	Week Due	Mark			
1	Compressibility of Soil	b1,b2,c1,c2,d1,d2	1,2,3,4	3			
2	Shear Strength of Soil	b1,b2,c1,c2,d1,d2	5,6,7,8	3			
3	Lateral Earth Pressure	b1,b2,c1,c2,d1,d2	9,10,11	3			
4	Slope Stability	b1,b2,c1,c2,d1,d2	12,13,14	3.5			

V	VIII.Lab Reports:					
No	Reports	Aligned CILOs(symbols)	Week Due	Mark		
1	Report 1 (Consolidation test)	b1,b2,c1,c2,d1,d2	2	6		
2	Report 2 (Direct shear test)	b1,b2,c1,c2,d1,d2	5	6		
3	Report 3 (Unconfined compression strength)	b1,b2,c1,c2,d1,d2	6	6		
4	Report 4 (Triaxial compression strength)	b1,b2,c1,c2,d1,d2	7	6		
5	Report 5 (Fane shear lab test)	b1,b2,c1,c2,d1,d2	9	6		
6	Report 6 (Fane shear field test)	b1,b2,c1,c2,d1,d2	10	7.5		

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IX. Schedule of Assessment Tasks for Students during the Semester:						
Assessment	Type of Assessment Tasks	Week Due	Mark	Proportion of Final Assessment		
1	assignment	1 to 14	12.5	5		
2	Participation	1 to 14	12.5	5		
3	quizzes	4 and 8	12.5	5		
4	Reports.	1 to 10	37.5	15		
5	Mid-term exam.	7 <sup>th</sup>	50	20		
6	Final-exam.	16 <sup>th</sup>	125	50		
	Sum		250	100%		

## X. Learning Resources:

• Written in the following order: ( Author - Year of publication – Title – Edition – Place of publication – Publisher).

### 1- Required Textbook(s) (maximum two).

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2-www.engaswan.com

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Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti



XI. Course Policies:
less otherwise stated, the normal course administration policies and rules of the Faculty of
- apply. For the policy, see:
Class Attendance:
The students should have more than 75 % of attendance according to rules and
regulations of the faculty.
Tardy:
The students should respect the timing of attending the lectures. They should attend
within 1 minutes from starting of the lecture.
Exam Attendance/Punctuality:
The student should attend the exam on time. The punctuality should be implemented
according to rules and regulations of the faculty for midterm exam and final exam.
Assignments & Projects:
The assignment is given to the students after each chapter, the student has to submit all
the assignments for checking on time.
Cheating:
If any cheating occurred during the examination, the student is not allowed to continue
and he/she has to face the examination committee for enquiries.
Plagiarism:
The student will be terminated from the Faculty, if one student attends the exam on
another behalf according to the policy, rules and regulations of the university.
Other policies:
-All the teaching materials should be kept out the examination hall.
-The mobile phone is not allowed.
-There should be a respect between the student and his teacher.

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