		and sanitation sector II	
Week 13			
	Class 49	Treatment and disposal of industrial effluents I	
	Class 50	Treatment and disposal of industrial effluents II	
	Class 51	Community management of water services I	
	Class 52	Community management of water services II	
Week 14			
	Class 53	Sludge treatment and disposal I	
	Class 54	Sludge treatment and disposal II	
	Class 55	Community management of sanitation services I	
	Class 56	Community management of sanitation services II	

ASSESSMENT STRATEGY

Components		Grading	CO	Bloom's Taxonomy
Continuous Assessment (40%)	Class Test/ Assignment (1-3)	20%	CO1, CO4	
	Class Participation	5%	CO2	
	Mid Term	15%	CO2, CO3	
Final Exam		60%	CO1	C1, C2
			CO2	C2
			CO3	C3, C4
			CO4	C2, C3, C4
Total Marks		100%		

(CO = Course Outcome, C = Cognitive Domain, P = Psychomotor Domain, A = Affective Domain)

REFERENCES BOOKS

1. Water Supply and Sanitation- Feroz Ahmed and Mujibur Rahman.
2. Environmental Engineering – Howard S. Peavy, Donald R. Rowe and George Tchobanoglous, McGraw Hill International Edition.
3. Environmental Sanitation, Wastewater Treatment and Disposal – Tanveer Ferdous Saeed, Abdullah Al-Muyeed, Tanvir Ahmed.
4. Introduction to Environmental Engineering – Gilbert M. Masters and Wendell P. Ela, 3rd ed., Prentice-Hall Inc.Wastewater Engineering- Metcalf and Eddy.
5. Water Supply and Sewerage- Terence J. McGhee.
6. Wastewater Engineering- Metcalf and Eddy.
7. Plumbing Practices – Syed Azizul Haq, Peng
8. Plumbing Installation and Design – L. V. Ripka, 4th ed.

REFERENCE SITE

http://classroom.google.com/...../.....

COURSE INFORMATION	
Course Code: EWCE 341	Credit Hour: 3.0
Course Title: Principles of Soil Mechanics	Contact Hour: 3.0
PRE-REQUISITE	

None

CURRICULUM STRUCTURE

Outcome Based Education (OBE)

SYNOPSIS/ RATIONALE

This is the introductory course on geotechnical engineering where students will be presented with basic knowledge on types and identification of soil, soil properties and theories on soil mechanics. Student will be further exposed to soil mechanics software which will be useful in later semesters and also in professional life.

OBJECTIVE

1. To gain insight on the basics of soil types and its different ground formations.
2. To understand the basic theories of soil mechanics and its practical applicability.

COURSE OUTCOMES & GENERIC SKILLS

No	Course Outcome	Corresponding POs	Bloom's Taxonomy*	CP	CA	KP	Assessment Methods
CO 1	Be able to **comprehend** the physical and index properties of soil and their use in engineering classification	PO – 1	C2	1		1, 3	T, F
CO 2	Be able to **estimate** the distribution of stresses within the soil mass due to overburden, pore water and external loading	PO – 2	C2	1		1, 3	T, M, F
CO 3	Be able to **analyze** the failure of soil mass considering stress-strain-strength characteristics, compressibility of soil and the effect of overburden and surface loading on earth retaining and bearing structures	PO – 3	C4	1, 3		1, 4	Asg/ CT, F
CO 4	Be able to **evaluate** the performance of soil due to consolidation processes.	PO – 3	C5	1, 3		1, 6	F

**Level of Bloom's Taxonomy:*

C1 - Remember C2 - Understand C3 - Apply C4 - Analyze C5 - Evaluate C6 - Create

(CP – Complex Problems, CA – Complex Activities, KP – Knowledge Profile, T – Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentation, R – Report, F – Final Exam)

COURSE CONTENT

Scope of Geotechnical Engineering: Soil Mechanics and foundation engineering, formation, type and identification of soils, soil composition, soil structure and fabric, index properties of soils, engineering classification of soils, soil compaction, principles of total and effective stresses, stress distribution within the soil mass due to

external loadings, permeability and seepage, stress-strain-strength characteristics of soils, compressibility and settlement behavior of soils, geo-environment.

SKILL MAPPING (CO – PO MAPPING)

No	Course Outcome	PROGRAM OUTCOMES (POs)											
		1	2	3	4	5	6	7	8	9	10	11	12
CO1	Be able to **comprehend** the physical and index properties of soil and their use in engineering classification	3											
CO2	Be able to **estimate** the distribution of stresses within the soil mass due to overburden, pore water and external loading		3										
CO3	Be able to **analyze** the failure of soil mass considering stress-strain-strength characteristics, compressibility of soil and the effect of overburden and surface loading on earth retaining and bearing structures			2									
CO4	Be able to **evaluate** the performance of soil due to consolidation processes.			2									

(Numerical method used for mapping which indicates 3 as high, 2 as medium and 1 as low level of matching)

JUSTIFICATION FOR CO – PO MAPPING

	Mapping	Corresponding Level of Matching	Justifications
	CO1 – PO1	3	Knowledge of mathematics, natural science and engineering fundamentals has to be applied to comprehend the physical and index properties of soil and their use in engineering classification.
	CO2 – PO2	3	In order to identify the problem specific solutions for estimating the distribution of stresses within the soil mass due to overburden, pore water and external loading.
	CO3 – PO3	2	To analyze the failure of soil mass considering stress-strain-strength characteristics, compressibility of soil and the effect of overburden and surface loading on earth retaining and bearing structures to design the foundation of infrastructure.
	CO4 – PO3	2	To evaluate the performance of soil due to consolidation processes for designing solution for complex engineering problem like foundation settlement.

TEACHING AND LEARNING STRATEGY

	Teaching and Learning Activities	Engagement (Hours)
	Face-to-face Learning • Lecture • Practical/ Tutorial/ Studio • Student – Centered Learning	 42 -- --
	Self- Directed Learning • Non-face-to-face learning • Revision of the previous lecture at home • Preparation for final examination	 9 18 46
	Formal Assessment • Continuous Assessment • Final Examination	 2 3
	Total	120

TEACHING METHODOLOGY
Lecture and Discussion, Problem Based Method

COURSE SCHEDULE

		Intended Topics to be Covered	Assessment
Week 1			
	Class 1	Introduction	
	Class 2	Scope of Geotechnical Engineering: Soil Mechanics and foundation engineering	
	Class 3	Formation, type and identification of soils	
Week 2			
	Class 4	Formation, type and identification of soils (cont.)	CT 1
	Class 5	Soil composition	
	Class 6	Soil structure and fabric	Mid Term Exam
Week 3			
	Class 7	Soil particle size	
	Class 8	Specific gravity	
	Class 9	Particle size distribution curve	
Week 4			
	Class 10	Weight-Volume Relationship	
	Class 11	Weight-Volume Relationship (cont.)	
	Class 12	Weight-Volume Relationship (cont.)	
Week 5			
	Class 13	Index properties of soils	
	Class 14	Engineering classification of soils	
	Class 15	Engineering classification of soils (cont.)	
Week 6			
	Class 16	Soil compaction	
	Class 17	Soil compaction (cont.)	
	Class 18	Principles of total and effective stresses	
Week 7			
	Class 19	Principles of total and effective stresses (cont.)	
	Class 20	Principles of total and effective stresses (cont.)	
	Class 21	Stress distribution within the soil mass due to external	

		loadings	
Week 8			
	Class 22	Seepage	
	Class 23	Seepage (cont.)	CT 2
	Class 24	Seepage (cont.)	
Week 9			
	Class 25	Permeability	
	Class 26	Permeability (cont.)	
	Class 27	Permeability (cont.)	
Week 10			
	Class 28	Stress-strain-strength characteristics of soils	
	Class 29	Stress-strain-strength characteristics of soils (cont.)	
	Class 30	Stress-strain-strength characteristics of soils (cont.)	
Week 11			
	Class 31	Shear strength of soil	
	Class 32	Shear strength of soil (cont.)	
	Class 33	Shear strength of soil (cont.)	
Week 12			
	Class 34	Lateral earth pressure	
	Class 35	Lateral earth pressure (cont.)	CT 3
	Class 36	Lateral earth pressure (cont.)	
Week 13			
	Class 37	Compressibility of soils	
	Class 38	Compressibility of soils (cont.)	
	Class 39	Compressibility of soils (cont.)	
Week 14			
	Class 40	Soil settlement	
	Class 41	Soil settlement (cont.)	
	Class 42	Review and problem solving	

ASSESSMENT STRATEGY

Components		Grading	CO	Bloom's Taxonomy
Continuous Assessment (40%)	Class Test/ Assignment (1-3)	20%	CO1, CO4	
	Class Participation	5%	CO2	
	Mid Term	15%	CO1, CO2	
Final Exam		60%	CO1	C1
			CO2	C2
			CO3	C3, C4
			CO4	C5
Total Marks		100%		

(CO = Course Outcome, C = Cognitive Domain, P = Psychomotor Domain, A = Affective Domain)

REFERENCES BOOKS

1. Foundation Engineering -R.B. Peck, W.E. Hanson and T.H. Thornbur.
2. Introduction to Geotechnical Engineering - B.M. Das.
3. "Geotechnical Engineering, Principles and Practices", by Donald P. Coduto.