GUJARAT TECHNOLOGICAL UNIVERSITY

CIVIL (GEOTECHNICAL ENGINEERING) (43)

SOIL STRUCTURE INTERACTION
SUBJECT CODE: 2724309
SEMESTER: II

Type of course: Major Elective II

Prerequisite: Fundamentals of Geotechnical Engineering I & II

Rationale: There are many geotechnical problems involving complicated geometries, loadings, and different soil properties which generally require the solution of ordinary or partial differential equations, which are not possible to obtain with the help of analytical mathematical solutions. Hence, geotechnical Engineers need to rely on numerical methods, such as the finite element method, finite difference method, and boundary element method etc., for acceptable solutions. Among these numerical methods, finite element method is such a widely accepted method that can be systematically programmed to accommodate complex and difficult problems.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks		Practical Marks				
				ESE (E)	PA (M)	ESE (V)		PA (I)		
						ESE	OEP	PA	RP	
3	2#	2	5	70	30	20	10	10	10	150

Content:

Sr. No.	Topics	Total hours	% Weightage
1	**Introduction to SSI:** Introduction to SSI, Importance of SSI, Applications and Examples of SSI for geotechnical engineer, Effect of structure roughness / smoothness on soil behaviour	08	10
2	**SSI problems:** General soil-structure interaction problems- Shallow foundation, Sheet piles, Mat/Raft foundation, etc., Contact pressure and soil-structure interaction for shallow foundation, Fixed/ Flexible base, Differential foundation settlement for high rise buildings, Pressure- settlement prediction from constitutive laws.	12	20
3	**SSI Models:** Elastic continuum, Winkler's model, Multi parameter models, Hybrid models, Codal provisions, Machine foundation - soil interaction, Laterally loaded pile supported on elastic medium,.	10	30
4	**SSI in Retaining Structures:** Curved failure surfaces, their utility and analytical / graphical predictions from Mohr – Coulomb envelope and circle of stress, Earth pressure computations by friction circle method, Earth pressure on wall with limited / restrained deformations, Earth pressure on sheet piles, braced excavations, Design of supporting system for excavations.	12	40

Reference Books:

1. Bowels, J.E., "Analytical and Computer methods in Foundation" McGraw Hill Book Co., New York.
2. Desai C.S. and Christian J.T., "Numerical Methods in Geotechnical Engineering" McGraw Hill Book Co. New York.
3. Soil Structure Interaction, the real behaviour of structures, Institution of Structural Engineers, 1989.
4. Elastic Analysis of Soil Foundation Interaction, Developments in Geotechnical Engg.vol-17, Elsevier Scientific Publishing Co.
5. Prakash, S., and Sharma, H. D., "Pile Foundations in Engineering Practice."John Wiley & Sons, New York, 1990.

Course Outcome:

After learning the course the students should be able to:

(a) Understand various theories applicable to SSI
(b) Calculate Contact pressure and settlement under foundations
(c) Calculate earth pressure on different retaining structures

List of Experiments/Tutorials:
Minimum 50 problems from above topics.

Open Ended Problems:

List of Open Source Software/learning website:
http://nptel.ac.in/ and http://ocw.mit.edu/courses/civil-and-environmental-engineering/

Review Presentation (RP): The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website