



GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering

Subject Code 3724311

Semester – II

Subject Name: Soil Structure Interaction

Type of course: PE-III

Prerequisite: Geotechnical Engineering, Applied Soil Mechanics, Foundation Engineering.

Rationale: To retain earth in an engineered way as per requirement is one of the major tasks for geotechnical engineers. As soil is heterogeneous material, it is very difficult to retain it under different situation. Many theories are available to analyse and design such structures. To deal with any earth retaining structure, the knowledge of its behavior on field is very important to take proper engineering decisions in practical situations.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE(E)	PA (M)	ESE (V)	PA(I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
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.	8
2	SSI problems: General soil-structure interaction problems- Shallow foundation, Sheet piles, Mat/Raft foundation, pile 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.	14
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
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.	10

Reference Books:



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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. Kameswara Rao, N.S.V., "Dynamics soil tests and applications", Wheeler Publishing, New Delhi, 2000
6. Selvadurai, A.P.S., "Elastic Analysis of Soil Foundation Interaction", Elsevier 1979
7. Hemsley, J.A, "Elastic Analysis of Raft Foundations", Thomas Telford, 1998

Course Outcomes: Students will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Understand various theories applicable to SSI and will have capacity to idealize soil response in order to analyze and design foundation elements subjected to different loadings.	10
CO-2	Calculate Contact pressure and settlement under shallow foundations, mat foundation, pile-raft foundation, settlement computation from constitutive laws.	25
CO-3	Understand Winkler's hypothesis and will be able to apply same to analyse foundations based on elastic theory, Calculate earth pressure on different retaining structures	25
CO-4	Can understand clearly role of SSI in analysing machine foundation and need of various parameters and predict lateral capacity of piles.	30
CO-5	Analyse retaining structures through various analytical and graphical approaches, and design supporting structures for excavations	10

List of Experiments/Tutorial:

Minimum 5 assignment questions from above topics.

List of Open Source Software/learning website:

1. NPTEL lecture series
2. MIT open source material