

Soil-Structure Interaction
01GT0304 (PEC)

Objective of the Course: Objectives of introducing this subject at in Masters of civil engineering are:

1. Explain the effects of soil flexibility in the response of the structure
2. Analyse the structure with soil structure interaction effects to obtain the realistic response
3. Given insight of SSI effects and in what circumstances it should be considered and/or neglected.

Credits Earned: 3

Students learning outcomes:

After the successful completion of the course student will be able to..

1. Understand the phenomena of soil-structure interaction and related terminologies
2. Apply the soil dynamic properties to estimate the response of the structure
3. Analyze the cases when to consider or neglect the soil-structure interaction effects
4. Design the structure with soil-structure interaction effects

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	CSE (M)	Internal (I)	Viva (V)	Term Work (TW)	
3	0	0	3	50	20	30	25	25	150

Detailed Syllabus

Sr No.	Title of the unit	Number of hours
1	Traditional approaches of foundation design	6
	Contact pressure and its estimation, Settlement from the constitutive laws Introduction to Soil-structure interaction(SSI) problems, history Problems associated with SSI, Case studies	
2	Dynamic SSI problems	8
	Free-field response Kinetic interaction Inertial interaction	
3	SSI Models	8
	Winkler model, Elastic continuum, Multi parameter models, Codal provisions of India and others	
4	Beam on Winkler foundation:	10
	solutions for infinite and semi-infinite beams Finite beams: method of initial parameters, method of superposition. Use of finite difference method, rigid and flexible beams, lift-off, non-homogeneous soil, non-linear soil, plastic yielding of soil.	
5	Plates on Elastic continuum:	4
	Raft or Mat foundations: thin rectangular plates, approximate theory of plates, circular plates.	
6	Pile on Winkler foundation	6
	Vertically loaded pile - rigid pile, evaluation of spring stiffness, non-homogeneous soil, compressible pile; Laterally loaded pile - rigid pile, Elastic pile, standard solutions for different end conditions	

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	5%	20%	30%	25%	15%

Instructional Method and Pedagogy:

1. Use of Learning Management system like canvas
2. Demonstration through ppt and videos and lectures
3. Brainstorming and group discussion sessions
4. Collaborative learning
5. Project based learning
6. Learning by doing

Recommended Study Material:**Reference Books:**

1. John P. Wolf, Soil-structure interaction, Prentice-Hall, Englewood Cliffs, N.J., 1985.
2. Bowels, J.E., "Analytical and Computer methods in Foundation" McGraw Hill Book Co., New York.
3. Desai C.S. and Christian J.T., "Numerical Methods in Geotechnical Engineering" McGraw Hill Book Co. New York.
4. Soil Structure Interaction, the real behaviour of structures, Institution of Structural Engineers, 1989.
5. Elastic Analysis of Soil Foundation Interaction, Developments in Geotechnical Engg.vol-17, Elsevier Scientific Publishing Co.
6. Prakash, S., and Sharma, H. D., "Pile Foundations in Engineering Practice." John Wiley & Sons, New York, 1990.

Web Resources:

1. nptel.ac.in/courses/105101004/6
2. nptel.ac.in/courses/105106142/15
3. nptel.ac.in/courses/114106025/31
4. nptel.ac.in/courses/105104136/Module%204/Lecture%2022.pdf
5. nptel.ac.in/courses/105101005/
