

### **Soil-Structure Interaction 01GT0401 (PC)**

**Objective of the Course:** Objectives of introducing this subject at first year level 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

**Credits Earned: 5**

**Students learning outcomes:**

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

1. Evaluate the soil stiffness and damping ratio
2. Analyze the cases when to consider or neglect the soil-structure interaction effects
3. Analyze the structure with soil-structure interaction effects by lumped mass model

**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)	
4	0	2	5	50	20	30	25	25	150

**Detailed Syllabus**

Sr No.	Title of the unit	Number of hours
<b>1</b>	<b>Introduction</b>	
	Introduction to Soil-structure interaction(SSI) problems, history	2
	Static SSI,	1
	Dynamic SSI	2
	liquefaction	2
	Problems associated with SSI, Case studies	3
<b>2</b>	<b>Static SSI problems</b>	
	Contact pressure and its estimation	2
	Estimation of the settlement from the constitutive laws	3
<b>3</b>	<b>Dynamic SSI problems</b>	
	Free-field response	2
	Kinetic interaction	3
	Inertial interaction	4
<b>4</b>	<b>SSI Models</b>	
	Winkler model	3
	Elastic continuum	2
	Mult parameter models	2
	Codal provisions of India and others	3
<b>5</b>	<b>Structural analysis with SSI</b>	
	Shallow foundation & Raft foundation problems	3
	Analysis of highrise building with fixed base and flexible base	2
	SSI consideration in pile foundation	3
	Laterally loaded piles	4

**Suggested lists of experiments**

1. Estimation of soil shear wave velocity
2. Estimation of the soil damping
3. Estimation of the modulus of subgrade reaction of the soil
4. Evaluate the soil stiffness in lateral and longitudinal directions
5. Demonstration of effect of SSI through models on vibration table
6. Demonstration of liquefaction phenomena

**Suggested Theory Distribution**

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%	10%	15%	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

**Recommended Study Material:****Reference Books:**

1. John P. Wolf, Soil-structure interaction
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](http://nptel.ac.in/courses/105101004/6)
2. [nptel.ac.in/courses/105106142/15](http://nptel.ac.in/courses/105106142/15)
3. [nptel.ac.in/courses/114106025/31](http://nptel.ac.in/courses/114106025/31)
4. [nptel.ac.in/courses/105104136/Module%204/Lecture%2022.pdf](http://nptel.ac.in/courses/105104136/Module%204/Lecture%2022.pdf)
5. <http://nptel.ac.in/courses/105101005/>

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