



GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering

Subject Code 3724312

Semester II

Subject Name: Dynamics of Soil & Foundations

Type of course: Core-III

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

Rationale: To understand dynamic behaviour of soil and determination of dynamic properties of soil through both laboratory and in-situ tests. To analyse and design suitable type of foundation for reciprocating machines, impact machines and rotary machines as per codal guidelines. To understand liquefaction and its causes and remediation and select proper vibration isolation methods.

Teaching and Examination Scheme:

Teaching Scheme			Credits	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	Theory of Vibration Introduction – Nature of dynamic loads – vibrations of single degree freedom system – free vibrations of spring – mass systems – forced vibrations – viscous damping, Transmissibility – Principles of vibration measuring instruments effect of Transient and Pulsating loads – vibrations of multi degree freedom system.	8
2	Dynamic Soil Properties and Behaviour Dynamic stress – strain characteristics – principles of measuring dynamic properties – Laboratory Techniques – Field tests – Factors affecting dynamic properties - Typical values- Dynamic bearing capacity – Dynamic earth pressure.	10
3	Foundations for Reciprocating Machines Types of Machines and Foundations – General requirements – Modes of vibration of a rigid foundation, block method of analysis – Linear Elastic weightless spring method – Elastic half – space method – Analog models ; Design of Block foundation -- Codal Provisions	8
4	Foundation for Impact and Rotary Machines Dynamic analysis of impact type machines – Design of Hammer foundations – use of vibrator Absorbers – design – Codal recommendation. Special consideration for Rotary machines – Design criteria – Loads on Turbo Generator Foundation – method of analysis – Design; Dynamic soil – structure – Interaction, Codal Provisions.	8



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5	Liquefaction and Vibration Isolation Mechanism of Liquefaction–Influencing factors--Evaluation of Liquefaction potential based on SPT-Force Isolation – Motion Isolation – use of spring and damping materials – vibration control of existing machine foundation – screening of vibration – open trenches – Pile Barriers – salient construction aspects of machine Foundations	8
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Reference Books:

1. Das B.M., "Principles of Soils Dynamics", McGraw Hill, 1992.
2. Bowles. J.E (1997)“Foundation Analysis and Design”, McGraw-Hill International Edition, 5th Edn.
3. Donald P Coduto“Foundation Design Principles and Practices”, 2nd edition, Pearson India
4. Chris R.I. Clayton, Rick I. Woods, Andrew J. Bond, Jarbas Milititsky (2014)“Earth Pressure and Earth-Retaining Structures” CRC Press
5. Koerner, R.M. (2012)"Designing with Geosynthetics", 6th edition, Vol-1 and 2, Xlibriscorp.ion
6. Moore, P.J., "Analysis & Design of Foundations for Vibrations", Oxford & IBH, 2006
7. Swami Saran, "Soil Dynamics and Machine Foundation", Galgotia publications Pvt. Ltd., New Delhi 1999

Course Outcomes: Students will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Students will be familiar with identification and solution of a particular dynamic system.	15
CO-2	Students will be capable of analyzing dynamic behaviour of soil through wave propagation theory and also be able to determine the dynamic soil properties.	25
CO-3	Students will able to analyze and carry out the design of machine foundation and will be able to provide appropriate vibration isolation technique if necessary.	30
CO-4	Students will able to obtain dynamic response of geotechnical structures such as retaining walls and shallow foundations and suggest isolation techniques.	20
CO-5	Students will be able to quantify liquefaction potential and carry out suitable remedial measures.	10

List of Experiments/Tutorial:

1. Block vibration test
2. Dynamic/Cyclic triaxial test
3. Cross bore hole and down hole test
4. Dynamic cone penetration test

Minimum 5 assignment questions from above topics.



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List of Open Source Software/learning website:

1. NPTEL lecture series
2. MIT open source material