GUJARATTECHNOLOGICALUNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Geotechnical Engineering

Subject Code: ME02076011

Subject Name: Dynamics of Soils and Foundations

w.e.f.Academic Year:	2024-25
Semester:	2
Categoryof theCourse:	Professional Core Courses

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

Course Outcome:

After Completion of the Course, Student will able to:

No.	CourseOutcomes
01	Students will be familiar with identification and solution of a particular dynamic system.
02	Students will be capable of analyzing dynamic behaviour of soil through wave propagation theory and also be able to determine the dynamic soil properties.
03	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.
04	Students will able to obtain dynamic response of geotechnical structures such as retaining walls and shallow foundations and suggest isolation techniques.
05	Students will be able to quantify liquefaction potential and carry out suitable remedial measures.

Teaching and Examination Scheme:

Teaching Scheme(in Hours)			Total Credits L+T+(PR/2)	Assessment Pattern and Marks				TotalMarks
				Theory		Tutorial/Practical		
L	T	PR	C	ESE (E)	PA/ CA (M)	PA/CA(I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No.of Hours	% of Weightage
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.	6	15
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.	12	30
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	9	20
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.	9	15
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	9	20
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10	**20**	**25**	**25**	**10**	**10**

WhereR:Remember;U:Understanding;A:Application,N:AnalyzeandE:EvaluateC:Create(asperRevisedBloom'sTaxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Arya S.D, O'Neil, M. and Pincus, G., Design of structures and foundations for vibrating machines, Gulf Publishing Co., 1979.
2. Prakash, S. and Puri, V.K., Foundation for machines: Analysis and Design, John Wiley & Sons, 1998
3. Prakash, S., Soil Dynamics, McGraw Hill, 1981.
4. Kameswara Rao, N.S.V., Vibration analysis and foundation dynamics, Wheeler Publication Ltd., 1998.
5. Major, A., Dynamics in Civil Engineering: Analysis and Design Vol. I-III, Akademiai Kiado, 1980.
6. Richart, F.E. Hall J.R and Woods R.D., Vibrations of Soils and Foundations, Prentice Hall Inc., 1970.

(b) Open source software and website:

1. NPTEL lecture series
2. MIT open source material

List of Experiments/ Tutorials:

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

Suggested Project List: --- 1) Site Visit of Industry for machine foundation.

2) Preparing excel program for design of machine foundation as per codal guidelines.

Suggested Activities for Students: --- Students shall explore and compare bore-log report to compare soil parameters require for normal design of foundation and machine foundation

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