

M. Tech. I Semester II

Subject Name: Soil Dynamics and Machine Foundations

Subject Code: MTST14206

Type of course: PE - IV

Prerequisite: Soil Mechanics, Engineering Mechanics, Strength of Materials, Structural Analysis & Engineering Mathematics

Rationale: Due to rapid industrialization and development of high-speed machinery, buildings are subjected to time dependent forces. These forces cause vibrations in structures and supporting soil below. Hence it is important to study this course which will give deep insight to the dynamic aspects of soil and to the design of foundations supporting these machineries so that one can minimize the structural damages and increase the longevity of structures.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	150
3	0	2	4	60	25	15	30	20	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests) **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	Introduction: Definitions, Harmonic Motion, Vibration of Single Degree of Freedom System, Vibration Isolation, Theory of Vibration Measuring Instruments	07	15%
2	Wave Propagation and Dynamic Soil Properties: Elastic waves in Rods – Waves in elastic Half space, Field and Laboratory methods of determination – Uphole, Down hole and Cross hole methods – Cyclic plate load test – Block vibration test – Determination of Damping factor.	12	25%
3	Machine Foundations: Types, General Requirements, Dimensional Criteria, Dynamic Load induced in Simple Crank Mechanism, Permissible Amplitude and Bearing Pressures	05	10%
4	Design of Foundations: Analysis of Block Type and Frame Type Foundation - Principles of Design of Foundations for reciprocating, impact machines and turbo machines as per IS code.	16	35%
5	Vibration Isolation: Active and Passive Types of Isolation, Methods of Isolation, Isolation in Existing Machine Foundation, Properties of Isolating Materials, Numerical Examples	05	15%

Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	25	25	15	15	10

Legends: R: Remembrance, U: Understanding; A: Application, N: Analyze, E: Evaluate C: Create and above Levels (**Revised Bloom's Taxonomy**)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of Publication	Publication Edition
01	Soil Dynamics and Machine Foundations	Swamisaran	Galgotia Publications Pvt. Ltd. 978-8175154414	1999	1 st Edition
02	Hand book of Machine Foundations	Srinivasulu, P & Vaidyanathan	McGraw Hill Education 978-0070966116	2017	2 nd Edition
03	Foundations for Industrial Machines: Handbook for Practising Engineers	Dr. K. G. Bhatia	D-CAD Publishers 978-8190603225	2011	2 nd Edition
04	Dynamics of Bases and Foundations	D. D. Barkan	McGraw-Hill 978-0070036505	1962	1st Edition
05	Soil Dynamics	Samsher Prakash	McGraw Hill 978-0070506589	1981	1st Edition

Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % Weightage
CO-1	Understand and analyze the dynamic properties of soil (<i>R, U – Cognitive Level</i>)	25%
CO-2	Understand the various types of Machine Foundations and their sensitivity to different types of machines (<i>R, U, A, N – Cognitive Level</i>)	20%
CO-3	Understand the Codal Provisions for different types of machine foundation (<i>R, U, A, N, E, C – Cognitive Level</i>)	10%
CO-4	Understand and analyze the design criteria for the different types of machine foundation (<i>R, U, A, N, E, C – Cognitive Level</i>)	30%
CO-5	Understand the fundamentals of Vibration Isolation System used in Machine Foundations (<i>R, U, A, N, E, C – Cognitive Level</i>)	15%

FOR TUTORIAL SESSIONS:

List of Tasks:

- Group of Students have to prepare presentation based on topics of subject as well as individually students have to write / solve assignments
- Group of Students have to model application problem in Computer Software and undergo analysis / behavior study

List of Open Source/learning website:

- <https://nptel.ac.in/courses/105/101/105101005/>
 - Lecture Series on Soil Dynamics by Dr. Deepankar Choudhury, IIT Bombay.
- <https://freevideolectures.com/course/3137/soil-dynamics>
 - Lecture Series on Soil Dynamics by Dr. Deepankar Choudhury, IIT Bombay.