III Year-I Semester
(20CE5641) Dynamics of Soil & Foundations

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

Pre- Requisites: Fundamentals of Geotechnical Engineering

Course Objectives:

- The basic course in soil mechanics/geotechnical engineering generally introduces the fundamental concepts, principles and applications of soil as engineering material with properties under static loading.
- About the fundamentals of vibrations
- About the behavior and properties/response of soil as a material which is subjected to various types of dynamic or cyclic time- dependent loadings.
- Phenomena like liquefaction and lateral spreading of soil are also discussed.
- Discusses about the laboratory and filed tests to compute the dynamic soil properties of the soil mass.

UNIT-I:

Introduction: Types of motion- SHM- Fundamental definitions- SDOF systems- Free and forced vibration with and without damping- Types of damping- Equivalent stiffness of springs in series and parallel- Principles of vibration measuring devices- Introduction to two and multi degree freedom systems

UNIT-II:

Theories of Vibration Analysis- EHS Theory and lumped parameter model- Different modes of vibration- Natural frequency of foundation soil system – Barkan and IS methods – Pressure bulb concept – Reisner Theory – Limitations of Reisner theory – Sung‟s solutions - - Pauw‟s Analogy – Heigh‟s Theory.

UNIT-III:

Dynamic properties of soils, Determination of E, G and Poisons ratio from field and laboratory tests, recommendations of Indian codes- Stress waves in bounded elastic medium- Use of wave theory in the determination of elastic properties, Elastic coefficients of soils and their determination- damping factor from free and forced vibration tests.

UNIT-IV:

Machine Foundations: Classification based on the type of dynamic force and structural form, design data, design criteria, foundations for reciprocating, impact and high speed machined like turbo generators- IS code provisions for the design of the same

UNIT-V:

Vibration Isolation and Special Topics: Transmissibility, Principles of isolation- Methods of isolation- Vibration isolators- Types and their characterizes - Liquefaction of soils, Dynamic bearing capacity, Earth retaining structures under dynamic loads- Pile foundations with dynamic loads

Course Outcomes:

S.No	Course Outcomes	BTL
1	Understand the fundamental behavior of geotechnical structures under dynamic loading	L2
2	Understand the theories of vibration analysis conduct various laboratory and field tests to determine the dynamic soil properties and its interpretation	L2
3	Design the machine foundations	L4
4	Design vibration isolators under any vibratory machines	L4
5	Analyse geotechnical structures under dynamic loads	L4

Text Books:

1. Vibrations of Soils and Foundations' by Richart Hall and Woods

Reference Books:

1. Vibrations of Soils and Foundations – Richart Hall and Woods
2. Vibration Analysis and Foundation Dynamics, NSV Kameswara Rao, Wheeler Publishing, New Delhi.
3. Foundations of Machines- Analysis and Design- Prakash and Puri
4. Analysis and design of Foundations for Vibrations- P J Moore
5. Fundamentals of Soil Dynamics- B M Das
6. Dynamics of bases and Foundations- D D Barka