DEPARTMENT OF CIVIL ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY, JAMSHEDPUR
B.TECH. IV SEMESTER
CIVIL ENGINEERING

COURSE HANDOUT

Course No.: **CE 1704**
Credits: ***3-0-0 (3)***
Course Title: Structural Dynamics and Earthquake Resistant Design (Elective –II)
Instructor in Charge: Dr. S. Madhuri and Dr K K Sharma (smadhuri.ce@nitjsr.ac.in, kksharma.ce@nitjsr.ac.in)

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1. Course Objective

1. To introduce the concepts structural dynamics
2. To introduce the techniques on mathematical modelling of SDOF and make familiar with undamped and damped systems
3. To make student familiar on under damped, over damped and critically damped systems
4. To acquaint student on the prediction of response of SDOF (undamped and damped) systems under free and forced vibration
5. To introduce concepts of modelling MDOF and estimation of response under free and forced vibrations
6. To make familiar student in the estimation of earthquake induced loads and analysis if SDOF and MODF systems
7. To acquaint student on earthquake resistant analysis, design and detailing of structures

2. Course Outcome

1. At the end of the course, the student will be able to develop mathematical model of
   - SDOF and MDOF systems
2. Predict the response of SDOF and MDOF systems under free and forced vibrations
3. The student will be able to determine earthquake induced force on structure
4. Able to analyze and design earthquake resistant structures

3. Text/ Reference Books:

4. Dynamics of Structures: theory and applications to Earthquake Engineering by-A. K. Chopra
5. Structural Dynamics-theory and computation by-Mario Paz.
6. Design of Earthquake Resistant Structures by M. Shrikhande & Pankaj Agrawal
7. Earthquake Resistant Design of Structures by S. K. Duggal, Oxford Press

4. Course Plan

Lecture No.	Learning Objective	Topics	Chapter Reference
1-9	Mathematical model development of SDOF systems Free and forced vibrations of undamped and damped systems	**UNIT-I:** Formulation and solution of SDOF dynamical systems; undammed and damped Systems, free and forced vibrations	ppt/ Class Notes
10-18	To develop MDOF	**UNIT-II:** Formulation and solution of MDOF dynamical systems	ppt/ Class Notes
19-27	To introduce solution techniques	**UNIT-III:** Duhamel's integration; Dynamic load factor; Model Analysis.	ppt/ Class Notes
28-36	To introduce the concept of vibration and predict earthquake induced forces on structures	**UNIT-IV:** Introduction to random vibration Behaviour of structures during cyclone and earthquake.	ppt/ Class Notes
37-45	Analytical and design techniques under earthquake loading	**UNIT: V:** Analysis of framed structures due to earthquake with special reference to IS codes. **UNIT-VI:** Design and detailing criteria of earthquake resistant structures	ppt/ Class Notes

5. Evaluation Schedule

Component	Duration	Weightage (%)	Date & Time	Remarks
Mid-Term Exam	Two Hours	30	As per Acad. Cal.	Closed / Open Book
End Semester Exam	Three Hours	50	As per Acad. Cal.	Closed / Open Book
Assignments/ Teacher's Assessment		20		Open Book

6. Assignments

The Assignments are framed to add to understanding of the subject through theory and to motivate the learners to work out the numerical problems.

7. Consultation: By Email

Doubts can be emailed to course instructor(s)

S. Madhuri, K K Sharma
Instructor in Charge