

IF555: Structural Dynamics

Teaching and Examination Scheme:

CREDITS = 5 (L=3, T=2, P=0)

M. Tech First year, 1st Semester

Teaching and Assessment Scheme:

| Teaching Scheme | | | Credits | Assessment Scheme | | | | Total Marks |
|-----------------|---|---|---------|-------------------|-----|-----------|----|-------------|
| L | T | P | | Theory | | Practical | | |
| | | | ESE | CE | ESE | CE | | |
| 3 | 2 | 0 | 5 | 70 | 30 | 30 | 20 | 150 |

Course Contents:

| Unit No. | Topics | Teaching Hours |
|----------|---|----------------|
| 1 | Basic Seismology: Fundamentals of earthquake engineering, Engineering seismology, Causes of earthquake, types of earthquakes, earthquake parameters, seismicity of India, Lessons from past earthquakes | 02 |
| 2 | Response of single degree of freedom Systems: Response of single degree of freedom (SDOF) Systems to harmonic and periodic excitations, Force transmission and vibration isolation, Response of SDOF systems to general dynamic excitations, Concept of response spectrum & Combined D-V-A spectrum, Generalized SDOF systems, systems with distributed mass. | 12 |
| 3 | Response of multi degree of freedom Systems: Equations of motion for multi degree of freedom (MDOF) systems, Natural frequencies and mode shape for MDOF systems, Orthogonality of modes, Normalization of modes, Modal combination, Classical damping in structures, Dynamics analysis of MDOF systems by response spectrum method as per IS 1893 (Part 1):2002, Decoupling of lateral and torsional degree of freedoms for MDOF systems, Introduction to time history analysis | 12 |
| 4 | Seismic analysis of buildings: Seismic design philosophy, Behaviour of floor diaphragms, various structural irregularities, effect of various structural irregularities, concept of centre of mass, centre of stiffness and eccentricity, types of lateral load resisting systems, concept of orthogonal and non-orthogonal building systems, equivalent static lateral force method, lateral-torsional analysis of building as per IS 1893 (Part 1):2002. | 12 |

| Unit No. | Topics | Teaching Hours |
|----------|--|----------------|
| 5 | Ductile detailing: Ductile detailing of various structural elements such as beams, columns, shear walls as per provisions of IS 13920:1993 | 08 |
| 6 | Seismic analysis & design of masonry buildings: Seismic detailing of masonry buildings as per IS 4326:1993, Rigidity of masonry wall, Seismic analysis and design of masonry buildings. | 06 |
| 7 | Special topics: Introduction of performance based design method, Push over analysis, criteria for stiffness contribution of infill panels in moment resisting frames. | 02 |
| 8 | Structural controls: Introduction to base isolation, passive controls, active controls and semi-active controls, types of dampers and their importance. | 02 |

List of References:

1. Anil K. Chopra, *Dynamics of Structures* (Theory and Applications to Earthquake Engineering), Pearson Education.
2. Mario Paz, *Structural Dynamics (Theory and Computation)*, CBS Publications.
3. Pankaj Agrawal and Manish Shrikhande, *Earthquake Resistant Design of Structures - PHI Learning Pvt. Ltd*
4. S. K. Duggal, *Earthquake Resistant Design of Structures*, Oxford University Press.
5. R. W. Clough and J. Penzien, *Dynamics of Structures*, tata mc.
6. Jai Krishna, A. R. Chandrasekaran and Brijesh Chandra, *Elements of Earthquake Engineering*
7. P. C. Varghese, *Advanced Reinforced Concrete Design*, PHI Learning Pvt. Ltd
8. IS 456:2000, *Plain and Reinforced Concrete - Code of Practice*
9. IS 1893:2002, *Criteria for Earthquake Resistant Design of Structures (Part-1:General Provisions and Buildings)*
10. IS 4326:1993, *Earthquake Resistant Design and Construction of Buildings*
11. IS 13920:1993, *Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces*

