Department of Civil Engineering

Major Courses for Structural Engineering
Content

List of Major Courses for Structural Engineering

Sr. No.	Semester	Name of Course	Teaching Scheme	Duration	Instructor	Organizing Institute	Credits
01	V	Design of steel structures	4Hrs/week	12 Weeks	Prof. Damodar Maity	IIT Kharagpur	04
02	VI	Bridge Engineering	4Hrs/week	12 Weeks	Prof. Koushik Deb	IIT Kharagpur	04
03		Maintenance and Repair of Concrete Structures	4Hrs/week	12 Weeks	Prof. Radhakrishna G. Pillai	IIT Madras	04
04	VII	Theory of Plastic Analysis	4Hrs/week	12 Weeks	Prof. Amit Shaw, Prof. Biswanath Banerjee	IIT Kharagpur	04
05		Structural Dynamics	4Hrs/week	12 Weeks	Prof. Ramancharala Pradeep Kumar	IIIT Hyderabad	04

I) Course : Design of steel structures

Semester : V

Instructor: Prof. Damodar Maity

Content :

- Introduction: Material Overview
- Introduction: Design Overview
- Bolted Connections
- Welded Connections
- Eccentric Connections
- Failure and Strength Calculations of Tension Members
- Design of Tension Members
- Design of Compression Members
- Design of Lacing and Batten Systems
- Design of laterally supported Beams
- Design of laterally unsupported Beams
- Design of Column Base

- Special topics and case studies

II) Course : Bridge Engineering

Semester : VI

Instructor: Prof. Nirjhar Dhang

Content :

- Introduction, design considerations, loads and IRC codes
- Flexural and shear strength of reinforced concrete members
- Solid slab bridge design
- T-beam bridge design

III) Course : Maintenance and Repair of Concrete Structures

Semester : VI

Instructor: Prof. Radhakrishna G. Pillai

Content :

- Embedded metal corrosion
- Deterioration in cementitious systems
- Condition assessment of concrete structures
- Strategies and materials for surface repair
- Surface preparation and protective treatments
- Waterproofing
- Structural repair

IV) Course : Theory of Elasticity

Semester : VII

Instructor: Prof. Amit Shaw,
Prof. Biswanath Banerjee

Content :

- Mathematical Preliminaries Introduction to Tensor
- Concept of Stresses and Strains
- Material Behaviour– 1 General anisotropic material, strain energy density, constitutive relation
- Material Behaviour– 2 Material symmetry, linear elastic material, Generalized Hook's law
- Formulation of boundary value problems in elasticity Equilibrium, compatibility, formulation in Cartesian and Polar coordinates
- Solution of boundary value problems in elasticity– 1 Plane stress and plane strain problems
- Solution of boundary value problems in elasticity– 1 Problems in flexure

- Solution of boundary value problems in elasticity– 1 Problems in Torsion
- Introduction to Thermo-elasticity
- Introduction to photo-elasticity
- Introduction Nonlinear elasticity
- Introduction to photo-elasticity

V) Course : Structural Dynamics

Semester : VII

Instructor: Prof. Ramancharala Pradeep Kumar

Content :

- Basics of Structural Dynamics, Introduction of Structural Dynamics, Differential Equations in Civil Engineering, Types of Analysis/Static and Dynamic load, Degrees of Freedom (Ex: Generation of Stiffness matrix), Dynamic Equilibrium Equation, Solution of Equilibrium Equation
- Free Vibration of SDOF, Undamped free Vibration, Solution, Natural Period/Frequency, Energy in Free Vibration, Damped Free Vibration, Types of damping, Logarithmic decrement equation
- Forced Vibration of SDOF, Undamped Forced vibration, Amplitude & Phase Angle, Dynamic amplification factor for deflection (Rd), Damped Forced vibration, Relationship between Rd, Rv and Ra
- Force Transmission, Vibration Measurement, Resonant frequency and Half power band width, Force Transmission and Isolation, Design of Vibration Measuring Instruments
- Response to Arbitrary Motions, Response to Unit Impulse, Response to Arbitrary Force (Duhamel's Integral), Response to Step and Ramp Forces Response to Rectangular Pulse, Half Sinusoidal wave
- Numerical Methods of Solution, Time Stepping Methods, Central Difference Method, Newmark's Method

- Response Spectrum, Concept of Response Spectrum, Uses of Response Spectrum, Special Cases in Spectrum, Development of Tripartite Plot, Example: Base Shear and Base Moment, Response of Structure in Frequency Domain
- Multi-Degree of Freedom Systems, Equation of Motion for MDOF System, Solution of Equation, Natural Frequencies and mode Shapes (60), Modal Orthogonality, Approximate Method for finding Natural frequency
- Earthquake Response of MDOF Systems, Time History Analysis, Response Spectrum Analysis,3D Dynamic Analysis
- Dynamic Response of Continuous Systems, Vibration of Continuous systems, Shear behavior and bending behavior, Generalized SDOF
- Dynamics of Rigid Blocks, Dynamics of Rigid Blocks, Non Structural Elements, Floor Response Spectrum
- Vibration Control, Introduction to Vibration Control, Active Control, Passive Control, Design of Tuned Mass Damper