

**Department of Civil Engineering
NIT Srinagar**

Syllabus for M.Tech. Structures (Sponsor category) for the session 2020-21

Analysis of stresses and strains: Forces and stresses. Conditions of equilibrium, compatibility and stress strain relations. Stress strain diagrams, Hooke's law, Modulus of elasticity (E), Ultimate & allowable stresses, factor of safety, Lateral strains, Poisson's ratio (μ), Multi-axial stress system, Volumetric strain, Bulk modulus (K), Composite sections, Shear stress concept, Modulus of rigidity (G). Temperature stresses in composite sections. Relation between E, μ and K. Members subjected to flexural loads: Reaction forces for planar structures (beams). Support conditions, statical determinacy & stability of beams, determination of shear forces & bending moments in beams, shear & moment diagrams, Analysis of beams for different loading conditions, Relation between load, shear force & bending moment. Members subjected to torsional forces: Preliminary concept of stress in shafts subjected to torsional forces, torsional stresses in circular shafts, solid and hollow shafts. Design of power transmission shafts, compound shafts.

BENDING AND SHEAR STRESS IN BEAMS: Flexural formula, bending stress and shear stress diagrams for homogeneous beam sections of various shapes.

COMPOUND STRESSES: Principal stresses and strains, evaluation by analytical and graphical methods - Mohr's Circle.

SLOPES AND DEFLECTIONS: Slope and deflection of determinate beams by differential equation, moment area, conjugate beam and energy methods. Castigliano's first energy theorem and its applications to deflection of simple determinate trusses.

COLUMNS: Stresses in columns, short and long columns, buckling phenomenon. Euler's theory - Crippling loads evaluation. Stresses in eccentrically loaded columns.

ANALYSIS OF BEAMS: Method of consistent deformation for analysis of indeterminate beams. Analysis of fixed beams by integration and Moment area methods. Three moment theorem and its application to analysis of continuous beams. Properties Of Concrete & Reinforcing Steel, Characteristic Strength, Stress Strain Curves, Shrinkage & Creep Phenomenon. Introduction to structural steel and their properties, rolled sections. Design philosophies General principles, methods of pre-stressing, pre-tensioning and post-tensioning, losses in prestress. Design of rectangular, T and I section beams.

Cement: Its Basic Chemistry, Types of Portland cement. Normal aggregates and their properties. Fresh Concrete and its properties. Strength of Concrete: Water/Cement ratio-Gel/Space Ratio, Influence of Temperature on Strength of Concrete and Bond between concrete and Reinforcement, mixing, handling, placing, and Concrete. Elasticity, Shrinkage and Creep of Concrete.

Special Concretes.

Design of RCC and Steel Structures.

Bridges and R wall Design.

The Structural Engineering Subjects having 50 percent questions from the above mentioned syllabus.

All other civil engineering subjects viz Construction Technology, Surveying, Fluid Mechanics Soil Mechanics, Transportation Engineering, Water resources etc will have weightage of 30 percent and General aptitude / mathematics having weightage of 20 percent.

The paper will be MCQ type.