

Course Description

- (190401701) Finite Element Method in Structural Engineering, 3 Cr. Hrs. (3+0).**
Theory of finite element, virtual work, formulation for trusses, beams and frames, plane stress problems, plane strain, axisymmetric and solid elastic elements, isoparametric formulation and implementation, plate and shell elements, application of the method using ready software packages.
- (190401702) Plastic Behavior and Design of Steel Structures, 3 Cr. Hrs. (3+0).**
General concepts of plasticity; plastic bending; collapse of structures; lower and upper bound theorems; limit analysis; deflection, rotation capacity; joint behavior; plastic design of multi-story structures; seismic requirements in steel structures.
- (190401703) Advanced Structural Dynamics, 3 Cr. Hrs. (3+0).**
Analysis of single and multi-degree-of-freedom structures subjected to various types of excitations and initial conditions; computational aspects of dynamic analysis; introduction to approximate methods of analysis; finite element formulation of equations of motion; advanced analysis techniques for discrete parameter systems; investigation of damping; analysis of continuous systems; applications to civil engineering structures.
- (190401704) Advanced Theory of Concrete Structures, 3 Cr. Hrs. (3+0).**
Inelastic theory of structural concrete members under flexure; axial load; combined flexure and axial compression; shear and torsion; yield line theory of slabs; limit analysis of beams and frames of reinforced and pre-stressed concrete.
- (190401705) Earthquake Structural Engineering, 3 Cr. Hrs. (3+0).**
Prerequisite (190401703)
Effects of earthquakes on structures and of design of structures to resist earthquake motions; earthquake mechanisms and ground motions; response of structures to earthquake motions; behavior of materials, structural elements and assemblages subjected to earthquakes; principles of earthquake-resistant design practice; soil-structure interaction; and special topics.
- (190401706) Advanced Numerical Analysis, 3 Cr. Hrs. (3+0).**
Computer precision, loss of significance; error propagation; linear and nonlinear systems of algebraic equations; interpolating polynomials; numerical differentiation and integration; numerical solution of ordinary differential and partial-differential equations; initial and boundary value problems; linear and nonlinear systems; approximation theory; iterative techniques (Eigen values); finite differences; boundary integral equation; Fourier approximations.
- (190401707) Theory of Plates and Shells, 3 Cr. Hrs. (3+0).**
Bending theory of rectangular and circular thin plates; approximate methods of plate analysis, plates on elastic foundation; introduction to shell theories, Membrane theory of shells of revolution; bending theory of shell of revolution loaded axi-symmetrically; membrane theory of cylindrical shells; approximate bending methods for any type of shells of revolution; analysis of shallow spherical shells.
- (190401708) Theory of Elasticity, 3 Cr. Hrs. (3+0).**
Equations of equilibrium and compatibility; stresses and strains in beams; flexure and torsion theories for solid and thin-walled members; Energy principles and variational methods.
- (190401709) Geotechnical Aspects of Earthquake Engineering, 3 Cr. Hrs. (3+0).**
Overview of Earthquake Engineering; ground motion parameters; seismic Hazard Analysis; determining seismic design parameters; dynamic soil properties; ground response analysis; evaluation of liquefaction hazard; seismic design of foundations (Shallow and Deep); seismic design of retaining walls; seismic slope stability; ground improvement for redemption of seismic hazards.
- (190401710) Structural Stability, 3 Cr. Hrs. (3+0).**
Equilibrium paths and critical point, bending of structural members subjected to axial and lateral loads. Buckling of compression members (columns) and frames in elastic range, lateral buckling of beams, Buckling of Plates.
- (190401711) Bridge Engineering, 3 Cr. Hrs. (3+0).**

Classification of bridges superstructures and substructures; bridge loadings according to AASHTO standards and other standards; transfer and longitudinal distribution; modeling and analysis of bridge decks; orthotropic plate theory and its application; composite bridges; girder slab and multi-beam types pre-stressed concrete bridges; design of reinforced and pre-stressed concrete bridges; bearing systems; software applications in bridge analysis.

(190401712) Advanced Foundation Engineering, 3 Cr. Hrs. (3+0).

Site investigation, general concept of foundation design, foundation design in relation to ground movement, spread foundations, control of groundwater in excavations, shoring and underpinning, foundation construction, structural aspects in the design of foundations, foundations on difficult soils, foundation remediation, behavior of deep foundation under axial and horizontal loading, grouped piles, deep foundation field tests, installation, inspection, and settlement.

(190401713) Composite Structures, 3 Cr. Hrs. (3+0).

Design and behavior of steel under tensile and compressive loading, bending and lateral buckling of beams, torsion in beams, beam - columns, buckling of plates, composite construction, design and behavior of composite beams and columns and beam –columns.

(190401714) Advanced Concrete Technology and Materials, 3 Cr. Hrs. (3+0).

Hydration and pore structure; uni-, bi- and tri-axial strength; special concretes and materials (properties and mix design): no slump concrete; roller compacted concrete; mass concrete; high-strength and ultra-high strength concrete; lightweight concrete; self-compacting concrete; pumped concrete; shotcrete.

(190401715) Special Topics in Civil Engineering, 3 Cr. Hrs. (3+0).

A course to be given at the discretion of the faculty in which topics of current interest in civil engineering will be presented.

(190401797) Seminar, 1 Cr. Hrs. (1+0).

Research presentations.

(190401798) Comprehensive Exam.

(190401795) Thesis, 3 Cr. Hrs. (3+0).

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(190401796) Thesis, 6 Cr. Hrs. (6+0).