

Course syllabus

Department of Civil Engineering, Indian Institute of Technology Madras

CE7120- Advanced topics in structural concrete

Credit Distribution: C:9 L:3 T:0 P:0 E:0 O:6 TH:0

Course Type: Theory

Description: To enable learning of certain research areas of structural concrete. The course material covers the analysis of behaviour of concrete members under different types of actions.

Course Content: 1. Behaviour of Concrete and Steel: Constitutive models and failure theories for concrete. Constitutive models for steel bars; 2. Behaviour of Members under Axial Load: a) Tie members: axial load versus deformation behaviour, effect of tension stiffening of concrete, b) Columns: axial load versus deformation behaviour, effect of confining the concrete; 3. Behaviour of Members under Flexure: a) Beams: moment versus curvature behaviour, ductility, b) Slabs: limit analysis: yield line method, strip method; 4. Behaviour of Members under Combined Flexure and Axial Load: a) Columns: moment versus curvature behaviour under axial load, ductility; 5. Behaviour of Members under Shear: a) Beams and columns: shear force versus deformation behaviour using linear truss models, b) Shear walls: shear force versus deformation behaviour using non-linear truss model; 6. Behaviour of Members under Torsion: a) Beams: torque versus twist behaviour using linear truss model, b) Box-girders: torque versus twist behaviour using non-linear truss model; 7. Behaviour of Beam-Column Joints: Joint distortion using strut-and-tie model; 8. Behaviour under Cyclic Load: Strength and stiffness degradation of members, hysteresis and pinching, modelling of damage; 9. Special Topics: a) Behaviour of floor diaphragms, b) Performance based analysis, c) Non-linear finite element modelling of structural concrete

Text Books

- Park, R. and Paulay, T., Reinforced Concrete Structures, Wiley India Pvt. Ltd., 2009.

Reference Books

- Chen, W. F., Plasticity in Reinforced Concrete, Cengage Learning India Pvt. Ltd., 2007.
- Hsu, T. T. C. and Mo, Y-L., Unified Theory of Concrete Structures, John Wiley & Sons, 2010.
- Nielsen, M. P., Limit Analysis and Concrete Plasticity, CRC Press, 1999.
- Park, R. and Gamble, W. L., Reinforced Concrete Slabs, John Wiley and Sons, 2000.
- Paulay, T. and Priestley, M. J. N., Seismic Design of Reinforced Concrete and Masonry Buildings, John Wiley and Sons, 1992.
- Penelis G. G. and Kappos, A. J., Earthquake-resistant Concrete Structures, E & FN Spon, 1997.
- Penelis G. G. and Penelis G. G., Concrete Buildings in Seismic Regions, CRC Press, 2014.
- Purushothaman, P., Reinforced Concrete Structural Elements, Tata McGraw Hill Pub. Co. Ltd., 1984.

Prerequisite: