

Subject: Analysis & Design of Reinforced Concrete Structures (1)

Class: Third year

Hours: 2hrs (Theoretical), 2hrs (Practical)

Objectives:

To develop an understanding of performance and design methodology for basic reinforced concrete structural elements.

Week	Syllabus
1&2&3	Analysis of the structures: Loads, Load combinations, Safety provisions of the ACI code, Analysis of beams and frames, ACI moment coefficients, Arrangement of live load.
4&5	Materials: Properties of concrete in compression, Modulus of elasticity, Stiffness, Properties of concrete in tension, Shrinkage and Temperature effects, Reinforcing steels for concrete.
6 &7& 8&9& 10&11	Flexural analysis and design of beams: Reinforced concrete beam behavior, Analysis of tension-reinforced rectangular beams, Design of rectangular beams, Design aids, Practical considerations in design of beams, Rectangular beam with tension and compression reinforcement, T-beams.
12&13& 14&15	Shear and diagonal tension in beams: Diagonal tension in homogeneous elastic beams, Reinforced concrete beams without shear reinforcement, Reinforced concrete beam with web reinforcement, ACI code provisions for shear design, Effect of axial forces, Deep beams.
16&17	Analysis and Design for torsion: Torsion in plain concrete members, Torsion in reinforced concrete members, Torsion plus shear, ACI code provisions for torsion design.
18&19& 20&21	Bond, Anchorage and development length: Fundamentals of flexural bond, Bond strength and development length, ACI- code provisions for development of tension reinforcement, Anchorage of tension bars by hooks, Development of bars in compression, Bar cutoff and bend points in beams, bar splices.
22&23& 24&25	Short columns: Axial compression, Lateral ties and spirals, Compression plus

&26	bending of rectangular columns, Strain compatibility analysis and interaction diagrams, Circular columns, ACI-code provisions for column design, Design aids, Biaxial bending, Load contour method.
27&28&29&30	Serviceability: Cracking in flexural members, ACI-code provisions for crack control, Control of deflections, Immediate deflections, deflections due to long term loads, ACI-code provisions for control of deflections, Deflections due to shrinkage and temperature changes.

Reference:

- 1. ACI 318-11: Building Code Requirements for Structural Concrete and Commentary**
- 2. "Design of Concrete Structures" by A.H. Nilson, D. Darwin, C.W. Dolan, 14th Ed., McGraw-Hill.**
- 3. "Design of Reinforced Concrete ACI 318-05 Code Edition." J.C. McCormac and James Nelson, 7th Ed, Wiley.**
- 4. "Design of Reinforced Concrete: A Fundamental Approach", by E.G. Nawy, 5th Ed., Prentice Hall.**
- 5. "Reinforced Concrete Fundamentals" by P.H. Ferguson, J.E. Breem, J.O. Jirsa, John Wiley & Sons, New York, 1988.**
- 6. "Practical Design of Reinforced Concrete" by Russell S. Fling, John Wiley & Sons.**
- 7. "Reinforced Concrete Design" by C.K. Wang, and C.G. Salmon, 6th Ed., Harper Collins.**
- 8. "Structural Concrete: Theory and Design" by M.N. Hassoun, Addison Wesley.**
- 9. "Reinforced Concrete Slabs" by R. Park and W.L. Gamble, Second Edition, Wiley–Interscience**
- 10. "Reinforced Concrete Design", by Chu-Kia Wang and Charles G. Salmon,**
- 11. "Reinforced Concrete Design" 7th edition, Limbrunner & Aghayere**