ADVANCED DESIGN OF CONCRETE STRUCTURES

Course Code: 13CE 2201

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Course Educational Objectives:

1. To impart knowledge about the RC design of flat slabs, grid floors, and chimneys.
2. To familiarize the student with knowledge of Bunkers, Silos and Void slabs.

Course Outcomes:

1. Students will demonstrate the ability to design reinforced concrete flat slabs, grid floors, and chimneys.
2. Students will demonstrate the ability to design reinforced concrete Bunkers, Silos and Void slabs.
3. To impart the students, with the knowledge of estimation of crack width and deflection of beams.
4. To impart the students, with the knowledge of Analysis and Design of Grid Floors.

UNIT – I

DEFLECTION AND CRACK WIDTH ESTIMATION:

Deflection of Reinforced Concrete Beams and Slabs: Introduction, Short-term deflection of beams and slabs, Deflection due to imposed loads, Short-term deflection of beams due to applied loads, Deflection of slabs by IS 456.

Estimation of Crack width in Reinforced Concrete Members: Introduction, Factors affecting crack width in beams, Mechanisms of flexural cracking, Calculation of crack width, Simple empirical method, Estimation of crack width in beams by IS 456, Shrinkage and thermal cracking.

UNIT – II

Analysis and Design of Grid Floors: Introduction, Analysis of flat grid floors, Analysis of rectangular grid floors by Timoshenko's plate theory. Analysis of grid by stiffness matrix method, Analysis of grid floors by equating joint deflections, Comparison of methods of Analysis, Detailing of steel in flat grids.

UNIT – III

Analysis and Design of flat slabs: Introduction, Proportioning of flat slabs, Determination of bending moment and shear force, the direct design method, Equivalent frame method, slab reinforcement details.

UNIT – IV

FIRE AND SEISMIC RESISTANCE OF CONCRETE STRUCTURES:

Design of Reinforced Concrete Members for Fire Resistance: Introduction, ISO 834 standard heating conditions, Grading or classifications, Effect of high temperature on steel and concrete, Effect of high temperatures on different types of structural members, Fire resistance by structural detailing from tabulated data, Analytical determination of the ultimate bending moment, Capacity of reinforced concrete beams under fire, Other considerations.

Ductile Detailing of Frames for Seismic Forces: Introduction, General principles, Factors that increase ductility, Specifications of materials for ductility, ductile detailing of beams – Requirements, Ductile detailing of columns and frame members with axial load (P) and moment (M) – Requirements. Shear walls, Joints in frames.

UNIT – V

Bunkers and Silos: Introduction, Design of rectangular bunkers, circular bunkers and silos

Chimneys: Introduction, Design factors, Stresses due to self weight, wind and temperature, Combinations of stresses.

TEXT BOOKS

1. Bhavikatti S. S. *"Advance RCC Design",* 3rd Edition, New Age International Private Limited, 2008
2. Krishnam Raju, N. *"Design of Reinforced Concrete Structures",* 2nd Edition, CBS Publishers and Distributors, New Delhi, 2007.

REFERENCES

1. Varghese P.C. *"Advanced Reinforced Concrete Design",* 2nd Edition, Prentice - Hall of India, , 2008
2. Indian Standarad Code 456 2000, *"Code of Practice for plan & reinforced centre"*, British Standard Code-2000.
3. Special Publications -16, *"Design Aids for Reinforced Concrete*", to Is: 456.
4. Purushothaman,P., *"Reinforced Concrete Structural Elements",* 3rd Edition, Tata Mc Graw- Hill Publishing Co, 2004.
5. Pillai and Devadas Menon, *"Reinforced Concrete Design",* 2nd Edition, Tata McGraw Hill Publishing Co. Ltd., 2003.