COURSE CONTENT

DESIGN OF HIGH-RISE BUILDINGS (Professional Elective – III)								
II Semester: SE								
Course Code	**Category**	**Hours/ Week**			**Credits**	**Maximum Marks**		
2522049	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100
Contact Classes: 45	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisites: NIL								

Course Overview:

This course on High Rise and Advanced Structural Systems introduces the principles of loading and design for tall buildings, including gravity, wind, and earthquake effects. It covers equivalent lateral force and modal analysis along with combinations of loads using static and dynamic approaches. Students learn the behavior of structural systems such as rigid frames, braced and infilled frames, shear walls, tubular systems, and outrigger structures. The course also includes modeling and analysis techniques, design of structural elements, and effects like creep, shrinkage, and temperature. Stability concepts such as P-delta effects, buckling, and torsional instability are also emphasized for safe tall building design.

Course Objectives:

1. To introduce architectural and structural design principles specific to tall buildings including load paths, gravity systems, and lateral force-resisting systems.
2. To analyze wind and seismic effects on high-rise structures using dynamic and performance-based engineering approaches.
3. To evaluate shear walls, bracing systems, tube structures, outriggers, and composite systems for stability and serviceability.
4. To incorporate advanced modeling tools, materials, and construction technologies in high-rise building design.
5. To prepare students for practical application by integrating code provisions, safety considerations, and sustainability principles.

Course Outcomes: After completion of the course, students should be able to

1. Explain the principles of loading and design philosophies for tall buildings using static and dynamic approaches.
2. Classify various structural systems and their behaviour in high-rise constructions.
3. Analyse buildings using approximate and accurate modelling techniques, including 3D computerized methods.
4. Evaluate structural elements for strength, serviceability, and design considerations under various effects.
5. Assess the stability of tall buildings considering buckling, P-Delta effects, and foundation influences.

SYLLABUS:

UNIT - I

Loading and Design Principles: Loading- sequential loading, Gravity loading, Wind loading, Earthquake loading, - Equivalent lateral force, modal analysis - combination of loading, – Static and Dynamic approach - Analytical and wind tunnel experimental methods - Design philosophy - working stress method, limit state method and plastic design.

UNIT - II

Behaviour of Various Structural Systems: Factors affecting growth, height and structural form. High rise behaviour, Rigid Frames, braced frames, In filled frames, shear walls, coupled shear walls, wall-frames, tubulars, cores, outrigger - braced and hybrid mega systems.

UNIT - III

Analysis and Design: Modeling for approximate analysis, Accurate analysis and reduction techniques, Analysis of buildings as total structural system considering overall integrity and major subsystem interaction, Analysis for member forces, drift and twist - Computerized three dimensional analysis – Assumptions in 3D analysis – Simplified 2D analysis.

UNIT - IV

Structural Elements: Sectional shapes, properties and resisting capacity, design, deflection, cracking, prestressing, shear flow, Design for differential movement, creep and shrinkage effects, temperature effects and fire resistance.

UNIT - V

Stability of Tall Buildings: Overall buckling analysis of frames, wall-frames, Approximate methods, second order effects of gravity of loading, P-Delta analysis, simultaneous first-order and P-Delta analysis, Translational, Torsional instability, out of plumb effects, stiffness of member in stability, effect of foundation rotation.

REFERENCES:

1. Taranath B.S., "Structural Analysis and Design of Tall Buildings", McGraw Hill, 1988.
2. Beedle.L.S., "Advances in Tall Buildings", CBS Publishers and Distributors, Delhi, 1986.
3. Bryan Stafford Smith and Alexcoull, "Tall Building Structures - Analysis and Design", John Wiley and Sons, Inc., 2005.
4. Gupta.Y.P.(Editor), Proceedings of National Seminar on High Rise Structures - Design and Construction Practices for Middle Level Cities, New Age International Limited, New Delhi,1995.
5. Lin T.Y and Stotes Burry D, "Structural Concepts and systems for Architects and Engineers", John Wiley, 1988.

MATERIALS ONLINE:

1. Course template
2. Tutorial question bank
3. Definitions and terminology
4. Assignments
5. Model question paper–I
6. Model question paper–II
7. Lecture notes
8. E-Learning Readiness Videos(ELRV)