# WIND AND EARTHQUKAE RESISTANT DESIGN OF BUILDINGS

**(Professional Elective- III)**

Course Code: **19CE2259**

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Course Outcomes:
At the end of the course, the student will be able to:

CO1: Familiarize with various aspects of wind effects.
CO2: Know the static and dynamic wind effects.
CO3: Calculate the design forces on tall structures due to wind.
CO4: Analyse and detail the multi-storeyed structures using I.S. codes by Response Spectrum methods.
CO5: Design and detail shear walls using I.S: 13920.

**UNIT- I** **(10-Lectures)**

**DESIGN BASIS**

Introduction – Review of analysis and design methods – Loads and load combinations on a structure- Preliminary design for fixing member sizes. Review of latest Revisions of Codes of practice of IS 875 (Part-1), IS 875 (Part-2), (IS 875 (Part-4) and IS 875 (Part-5).
Review of latest revision of relevant provisions of IS 456:2000.
**LO1:** Prepare the design including fixing of sizes of members.
**LO2:** Illustrate various design provisions of code ofpractice.

**UNIT- II** **(10-Lectures)**

**WIND LOADS**

Introduction – Wind – Basic wind speed – Boundary layer – Wind pressure – Gust – Types of wind – Pressure coefficients – Force coefficients – Evaluation of wind loads using analytical methods –

Interference effects – Dynamic effects – Lateral Sway. Computational and experimental methods
Review of IS 875 (Part-3): 2015 or latest revision.
**LO1:** Analyse the wind loads and how they are acting on a structure.
**LO2:** Devise apply various wind code provisions in design of structure.

**UNIT- III** **(10-Lectures)**
**WIND ANALYSIS AND DESIGN**
Analysis and Design of a multi storied building using Pressure coefficient method and Force coefficient method including detailing of reinforcement-Analysis and Design of a multi storied building using Gust factor method including detailing of reinforcement.
Analysis of a pitched roof rectangular clad building using pressure coefficients.
**LO1:** Analyse the multi storied building for wind loads.
**LO2:** Formulate the design for the forces obtained.

**UNIT- IV** **(10-Lectures)**
**EARTHQUAKE LOADS**
a) Seismology: Introduction – Structure of earth – Earthquake terminology – Body waves and Surface waves – Intensity and Magnitude of earthquakes.

b) Review of relevant provisions of IS 1893 (Part-1) : 2016 or latest – General principles and design criteria – Assumptions – Load combinations – Design acceleration spectrum – Design lateral force-Importance factor – Damping ratio – Response reduction factor – Lateral force resisting systems – Design imposed loads for earthquake force calculations – seismic weight – Storey Drift. Center of mass and center of rigidity

c) Review of relevant provisions of IS 13920 :2016 or latest – Ductile design and detailing – General specifications – Beams – Columns and

inclined members – Special confining reinforcement – Beam column joints – Special shear walls – Gravity columns in Buildings.
**LO1:** Evaluate earthquake loads and how they are acting on a structure.
**LO2:** Understand various provisions made in the earthquake codes in the design of structure.

**UNIT –V** **(10-Lectures)**
**EARTHQUAKE ANALYSIS AND DESIGN**
Analysis and design of a multi-storied building using linear static analysis (Equivalent static method)
Analysis and design of multi-storied building with Dynamic Analysis method – (Response spectrum method)
Example will be explained in the class room. But for the purpose of Examination, it is limited to procedure only.

Design of a special shear wall using IS 13920: 2016 including torsion provisions.
(Note: Detailed designs are not included)
**LO1:** Analyse the earthquake loads in the multi-storied building.
**LO2:** Design for the forces obtained.

TEXT BOOKS:
1. John D. Holmes.,Wind Loading of Structures, Spon Press, 2003.
2. Duggal S.K.,Earthquake Resistant Design of Structures, 1st edition, Oxford University Press, 2007
3. Pankaj Agarwal & Manish Shrikhande.,Earthquake Resistant Design of Structures, 9th Edition, PHI learning Pvt ltd, New Delhi, 2011.
4. Lawson T.V., Wind effects on Buildings,
5. Peter Sachs., Wind forces in engineering,

REFERENCES
1. IS 456 : 2000
2. IS 13920: 2016
3.IS 875 Part 1to 5
4.IS1893 (Part 1) : 2016