

EARTHQUAKE RESISTANT DESIGN AND CONSTRUCTION
One-Week Training Course for Practicing Architects

S. No.	TOPICS	L	S
1	<p>Building Safety from Natural Hazards: an Introduction</p> <p>Earthquake. Fire safety in buildings. Cyclone effects: High winds, storm surge, and cyclone safety aspects in buildings. Floods. Landslides</p>	1	
2	<p>Elementary Seismology:</p> <p>Earthquake occurrence in the world, plate tectonics, faults, earthquake hazard maps of India & the States. Causes of earthquake, seismic waves; magnitude, intensity, epicenter and energy release, characteristics of strong earthquake ground motions. Seismological Instruments: Seismograph, Accelerograph, Seismoscope/Multi SAR.</p>	1	
3	<p>Introduction to Theory of Vibrations:</p> <p>Single degree undamped & damped systems, resonance, response to earthquakes, elastic response, concepts of response spectrum. Flexibility of long & short period structures; concepts of response spectrum.</p>	2	
4	<p>Site Planning, Building Forms and Architectural Design Concepts for Earthquake Resistance:</p> <p>Historical experiences Site Selection Site Development Building forms:- Horizontal & vertical eccentricities, mass and stiffness distribution, soft storey etc. Seismic effects related to building configuration. Plan & vertical irregularities, redundancy & setbacks. Special Aspects:- Torsion, appendages, staircases, adjacency, pounding Contemporary international approaches</p>	3	6

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5	<p>Performance of Ground & Buildings in Past Earthquakes: Earthquake Effects:- On ground, soil rupture, liquefaction, landslides. Behaviors of various types of buildings, structures, power plants, switch yards, equipments, lifelines and collapse patterns Behaviour of Non Structural Elements like services, fixtures, mountings Social & Economic Consequences of earthquakes Lab simulation of models.</p>	1	2
6	<p>Seismic Design Principles: Concept of seismic design, stiffness, strength, period, ductility, damping, hysteric energy dissipation, center of mass, center of rigidity, torsion, design eccentricities. Ductility based design: Design of energy absorbing devices. Seismic base isolation and seismic active control.</p>	2	
7(a)	<p>Structural Detailing: Innovations & Selection of appropriate materials IS Code provisions for the bldgs:- IS:1893-2002, IS:4326-1993 Horiz. & vert.seismic co-efficients, valuation of base shear, distribution of shear forces in multistorey bldg. Seismic Detailing Provisions: Masonry & Wood Buildings (IS: 4326, IS: 13828), Adobe houses (IS: 13827) Seismic Designs & Detailing of RC & Steel Buildings: IS: 1893 – 2002; IS: 13920 – 1993; IS: 456 – 2000; IS: 800 – 2004. Special reinforcing and connection details in structural drawings.</p>	4	
7(b)	<p>Earthquake Resistant Construction Details: Various Types and construction details of: Foundations, soil stabilization, retaining walls, plinth fill, flooring, walls, openings, roofs, terraces, parapets, boundary walls, under ground and overhead tanks, staircases, and isolation of structures. <input type="checkbox"/> Local practices: traditional regional responses.</p>	2	5

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8	Construction Quality Control: <input type="checkbox"/> Sequence of Construction: Good supervision practices, Critical check points and certification at certain stages, reporting, maintenance of records, testing.	1	
9	Vulnerability Assessment & Seismic Strengthening of Buildings: Seismic vulnerability evaluation of existing buildings. Weakness in existing buildings, aging, weathering development of cracks Concepts in repair, restoration & seismic strengthening, materials & equipments for restoration of masonry & concrete structures. Methodologies for seismic retrofitting.	4	
10	Techno-legal & Techno-financial Aspects in Building Projects. Building Bye-laws. Cost Benefit Studies	3	
11	Architectural Design Projects: Design development by the participants in consultation with Structural Engineer Load Bearing 2 storey school/hospital in seismic Zone V. 5 Storied R.C. framed building with soft ground storey at Delhi, founded on soft non-liquefiable soil.		
	TOTAL	24	13

* Note: The studio hours to be used as practical sessions either with the help of sketch books or computers depending upon the availability.