

Six-Week Module for Training of Faculty members of SRIs and nominated Engineers to be conducted by National Resource Institutions

1.	<p>SEISMIC HAZARD ASSESSMENT</p> <ul style="list-style-type: none"> - Engineering Seismology (Definitions, Introduction to Seismic hazard, Earthquake Phenomenon) - Seismotectonics and Seismic Zoning of India - Earthquake Monitoring and Seismic Instrumentation - Characteristics of Strong Earthquake Motion - Estimation of Earthquake Parameters - Microzonation - Assignments 	10
2.	<p>EARTHQUAKE EFFECTS ON STRUCTURES</p> <ul style="list-style-type: none"> - Dynamics of Structures <ul style="list-style-type: none"> . SDOFS/ MDOFS - Response Spectra/ Average Response Spectra/ Design Response Spectra - Evaluation of Earthquake Forces - IS Code 1893: 2002 - Effect of Earthquake on Different Types of Structures - Lessons Learnt From Past Earthquakes - Assignments 	15
3.	<p>CONCEPTS OF EARTHQUAKE RESISTANT DESIGN</p> <ul style="list-style-type: none"> - Structural Systems/ Types of Buildings - Causes of damage - Planning Considerations/ Architectural Concept (IS 4326-1993) - (Do's and Don'ts for protection of life and property) - Philosophy and Principle of Earthquake Resistant Design - Guidelines for Earthquake Resistant Design - Earthquake Resistant Earthen Buildings (IS 13827: 1993) - Earthquake Resistant Low Strength Masonry Buildings (IS 13828: 1993) - Earthquake Resistant Design of Masonry Buildings <ul style="list-style-type: none"> . Strength and structural properties of masonry . Lateral load analysis . Design consideration . Guidelines - Earthquake Resistant Design of R.C.C. Buildings <ul style="list-style-type: none"> . Material properties . Lateral load analysis 	25

4.	<ul style="list-style-type: none"> . Design and detailing (IS:13920: 1993) - Assignments - <p>GEOTECHNICAL EARTHQUAKE ENGINEERING</p> <ul style="list-style-type: none"> - Soil Dynamics - Geotechnical Failure of Foundations during Earthquake - Earthquake Resistant Design of Shallow Foundation - Earthquake Resistant Design of Pile Foundation - Liquefaction and Remedial Measures - Assignments 	10
5.	<p>SEISMIC BASE ISOLATION</p> <ul style="list-style-type: none"> - Basic Concept of Seismic Base Isolation - Seismic Isolation Systems - Case Studies - Assignments - 	5
6.	<p>EARTHQUAKE SAFE CONSTRUCTION OF NEW BUILDINGS</p> <ul style="list-style-type: none"> - General Precautions (Check list) - Detailing of Earthquake Resistance Practices - Field Supervision – (Check list) - Field Session (Visit a Construction Site, State-of-the-practice) - Assignments - 	5
7.	<p>VULNERABILITY ASSESSMENT OF EXISTING BUILDING</p> <ul style="list-style-type: none"> - Vulnerability Atlas of India/ States - Assessment and Retrofitting needs - Seismic Evaluation <ul style="list-style-type: none"> . Visual Inspection & Study of Drawings (Check list) . Insitu Testing . Modelling and Analysis - Vulnerability Assessment of Urban Areas/ Cities <ul style="list-style-type: none"> . Rapid Screening and Check List . Building Typology Studies (Classification of Buildings) . Field Session (Field Survey) - Assignments 	20
8	<p>SEISMIC VULNERABILITY REDUCTION</p> <ul style="list-style-type: none"> - Retrofitting Materials - Performance Levels for Retrofitting - Retrofitting of Masonry Buildings (IS 13935-1993) 	15

	<ul style="list-style-type: none"> - Retrofitting of R.C. Buildings - Field Session (Field visit for carrying out retrofitting exercise) - Assignments 	
9.	<p>TECHNO-LEGAL AND TECHNO-FINANCIAL ASPECTS</p> <ul style="list-style-type: none"> - Building Bye-Laws and Country Planning Acts - Legal Frame Work for Seismic Safety - Approval of Drawings & Checklist - Regulatory Mechanism for Compliance - Assignments 	5
10.	<p>ENGINEERING DRAWING AND GIS APPLICATION</p> <ul style="list-style-type: none"> - Understanding Engineering Drawing - Introduction, Advantages, Utility and Essential Components of GIS - GIS for mapping and monitoring for Engineering applications - GIS for Disaster Management and Mitigation - Assignments 	5
11.	<p>CYCLONE AND FIRE RESISTANT BUILDING CONSTRUCTIONS</p> <ul style="list-style-type: none"> - Cyclone Resistance Design of Buildings - Fire Resistant Building Construction - Panel Discussion - Assignments 	5
12.	<p>EVALUATION AND FEEDBACK</p> <ul style="list-style-type: none"> - Examination - Feedback - Award of Certificates 	

Total no of lectures 120

Note: *The number of lectures/ tutorials shown above is of 1.5 hours duration each. There will be three lectures in the morning session and one tutorial/ practical/ field work in the after noon.*

Two Weeks Module for Training of Serving & Practicing Engineers to be conducted by State Resource Institutions

S.No.	<u>Topics</u>	<u>Hours</u>
1.	<p>Elementary Seismology Occurrence and causes of earthquakes, faults, lineaments, seismotectonic units of India. Propagation of earthquake waves-body & surface waves, Magnitude, Intensity, Focus, Epicenter, characteristics of Earthquake Motion.</p>	2
2.	<p>Earthquake Effects And Earthquake Damage Ground cracks, subsidence, landslides, liquefaction; Earthquake effects on buildings, bridges, dams, industrial structures, special structures; Secondary effects: Fires, floods, tsunamis, release of poisonous gases, release of radiation. Causes of damage, Grades of damage G1, to G5; Damage survey forms, MSK-Intensity, Isoleismals, local site effects, Resonance & quasi-resonance.</p>	3
3.	<p>Concepts Of Earthquake Resistant Design</p> <ul style="list-style-type: none"> • Structural Systems/ Types of Buildings • Planning Considerations/ Architectural Concept (IS 4326-1993) • (Do's and Don'ts for protection of life and property) • Concept of response spectra • Response of structures • Philosophy and Principle of Earthquake Resistant Design (IS:1893 – 2002) • Earthquake Resistant Earthen Buildings (IS 13827: 1993) • Earthquake Resistant Low Strength Masonry Buildings (IS 13828: 1993) • Earthquake Resistant Design of Masonry Buildings • Earthquake Resistant Design of R.C.C. Buildings (IS:13920: 1993) • Precautions in foundations to counter earthquakes. 	15

4.	Earthquake Safe Construction Of New Buildings <ul style="list-style-type: none"> • General Precautions (Check list), Control on Quality of Construction. • Detailing of Earthquake Resistance Practices • Field Supervision – (Check list) • Field Session (Visit a Construction Site, State-of-the-practice) 	4
5.	Vulnerability Assessment Of Existing Building <ul style="list-style-type: none"> • Vulnerability Atlas of India/ States; Assessment and Retrofitting needs; Seismic Evaluation; Visual Inspection & Study of Drawings (Check list); Insitu Testing; Modeling and Analysis • Vulnerability Assessment of Urban Areas/ Cities; Rapid Visual Screening and Check List; Building Typology Studies (Classification of Buildings); Field Session (Field Survey) 	2 2
6.	Seismic Vulnerability Reduction Retrofitting Materials, Performance Levels for Retrofitting, Retrofitting of Masonry Buildings (IS:13935-1993), Retrofitting of R.C. Buildings, Field Session (Field visit for carrying out retrofitting exercise)	4
7.	Techno-Legal And Techno-Financial Aspects Building Bye-Laws and Country Planning Acts; Legal Frame Work for Seismic Safety; Regulatory Mechanism for Compliance	2
8.	Engineering Drawing Understanding and checking of Engineering Drawings	2
9.	Cyclone And Fire Resistant Building Constructions Cyclone Resistance Design of Buildings; Fire Resistant Building Construction	2
10.	Evaluation And Feedback <ul style="list-style-type: none"> • Examination • Feedback • Award of Certificates 	2
	Total lecture hours	40

Note: The number of lectures/ tutorials shown above is of 1.5 hours duration each.