Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NGPD505	Seismic Hazard Zonation	3	0	0	3

Course Objective
The primary aim of this course is to provide fundamental understanding of seismic zonation. It aims to establish a foundational knowledge for comprehending seismic hazard mapping across different strong motion parameters, offering practical insights for construction practices. The course encompasses earthquake source mechanics, hazards, their impacts, and includes instruction on earthquake measurement techniques and instrumentation.
Learning Outcomes
By participating in and understanding all facts of this course, a student will be able to quantify different earthquake hazards and its effects using different methods, which facilitate in planning new structures/project and retrofit old buildings and infrastructures.

	Topics to be Covered	Lecture Hours	Learning Outcome
1.	Introduction to seismic hazard zones; need of seismic hazards zonation, historical development of seismic macrozonation maps, Various scales, grades and types of zonation (Microzonation, Macrozonation and Nanozonation), steps for seismic hazard zonation.	06	Understanding of seismic zone, their need and scales.
2.	Seismic Sensors, strong motion sensors and Recorders, Seismic Networks	02	Understand the principles of operation of seismometers and earthquake data recording systems.
3.	Ground Response Analysis, Ground Motion Parameters, Seismogram interpretation, seismic phases	03	Steps to follow while generating seismic hazard maps for PSHA and DSHA
4.	Ground response computation	03	Calculating ground response via various techniques
5.	Empirical Ground motion Characteristics, Site Classification and Fourier Spectra, I	03	Analyze ground motion characteristics, Fourier, and response Spectra
6.	Empirical Ground motion Characteristics, Site Classification and Fourier Spectra II	03	Analyze ground motion characteristics, Fourier, and response Spectra
7.	Site response calculations	04	Anisotropic behaviour of Earth, Types of Anisotropy.

8.	Physics-based Ground Motion Modeling	**02**	Reference Earth models, Earth structure, temperature and density variations.
9.	Stochastic simulations	**03**	Factors and contributions various geological parameters related to site amplifications
10.	Dynamics of Soil Properties, 1-D ground motion analysis	**03**	Analyze seismic data and compute various ground motion parameters.
11.	Seismic input to structures Design response, Seismic Codes	**03**	Relate ground motion characteristics to the design of structures and buildings.
12.	DSHA and PSHA Calculations and Products, Deaggregations, uncertainty	**03**	Compute the earthquake hazard risk of an urban area.
13.	Global seismic hazard assessment programme (GSHAP), Various case histories related to microzonation, Seismic Zonation of India.	**04**	case studies related to seismic hazard zonation in India.
	Total	**42**	

Text books

1. Nath, S.K., "Seismic Microzonation Handbook", MoES, Govt. of India
2. Kramer, S. L., "Geotechnical Earthquake Engineering", Pearson Education.

Reference books

1. Reiter, L., "Earthquake Hazard Analysis, Issues and Insights", Columbia University Press
2. "Seismic Microzonation: Methodology for Vulnerable cities of South Asian Countries" SAARC Disaster Management Center, New Delhi, India
3. Ansal, A., "Recent Advances in Earthquake Geotechnical Engineering and Microzonation", Springer.
4. "Geotechnical/Geophysical Investigations for Seismic Microzonation Studies of Urban Centres in India-Technical Report", NDMA, New Delhi