Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NGPC509	Earthquake Statistics and Hazards	3	1	0	4

Course Objective
The Earthquake Studies Program aims to foster interdisciplinary teaching and research related to natural, man-made and technological disasters. Earthquake Engineering and Active Tectonics Tracks focus on particularly in the area of earthquakes. While in Disaster Management Track discuss implementations in wide-ranging disasters.
Learning Outcomes
Upon successful completion of this course, students will be able to Students will learn that hazards are the phenomenon while risk is the likelihood of that consequence. This unit may be used as an introduction to the Natural Hazards and Risks. Develop performance-based earthquake engineering as a new paradigm for analysis, design, characterize and mitigate earthquake hazards; improve fundamental knowledge.

Unit No.	Details of Lectures	Lectures Hrs. (L+T)	Outcome
1.	Definition of Seismic hazard; Seismicity data analysis	4L + 1T	What is risk and hazards? And understanding of seismicity plots
2.	Compilation of seismic catalogue, removing duplicate events, foreshocks and aftershocks, Homogenizationof Magnitude scale	4L +1T	Introduction to seismic catalogue and its homogenization
3.	Methods to evaluate Mc (Catalogue based andnetwork based methods), Methods of declustering (window methods, cluster methods, Stochastic declustering, Model independent Stochastic declustering)	7L +3T	Various methods to calculate magnitude of completeness
4.	Basic models of seismicity, Point Processes, Long term temporal models, Stationary Poisson Models, Non-Stationary Poisson Models, Renewal/Recurrence Models (Gamma density, lognormal density functions, Weibull distribution.	6L + 3T	Earthquake occurrence models-Part 1

5.	Stress release models, The Epidemic type Aftershock sequence model (ETAS), the EEPAS (Every Earthquake is Precursor According to Scale) model, the double branching model, seismicity models based on coulomb stress calculations.	**6L + 2T**	Earthquake occurrence models-Part 2
6.	Definition of Exposure, Vulnerability and Risk; Grades of damages, direct and indirect damages, damage to structures, structure types, quantitative analysis	**4L + 1T**	Types of earthquake damages w.r.t. structures and their quantitative analysis
7.	Lessons learnt from past earthquakes; Seismic vulnerability assessment – various methodologies	**4L + 1T**	Seismic vulnerability assessments and methodologies
8.	Building stock inventory, sources of available information, census data; intensity scales; use of intensity scales for estimating seismic vulnerability	**4L + 1T**	Estimation of building stocks and their information sources using census data
9.	Convolution of hazard; vulnerability and exposure to quantify risk; loss ratios	**3L + 1T**	Assessment of earthquake related loss
	Total (Lectures + Tutorials)	**42L+14T**	

Text books

1. CORSSA: the Community Online Resource for Statistical Seismicity Analysis.
2. Kramer, S. L., "Geotechnical Earthquake Engineering", Pearson Education.
3. McGuire, Robin K., "Seismic Hazard and Risk Analysis", Earthquake Engineering Research Institute

Reference books

1. Stein, S. and Wysession, M., "An Introduction to Seismology, Earthquake and Earth Structures", Black Well Publications
2. Reiter, L. "Earthquake Hazard Analysis, Issues and Insights", Columbia University Press
3. Coburn, A. and Spence R., "Earthquake Protection", John Wiley and Sons, Ltd