Course syllabus

Department of Civil Engineering, Indian Institute of Technology Madras

CE7025 - SEISMIC risk assessment at urban scale

Credit Distribution: C:3 L:1 T:0 P:0 E:0 O:2 TH:0

Course Type: Theory

Description: To develop an understanding of the elements of seismic risk assessment and loss estimation, and their evolution to be able to identify appropriate approaches for different contexts. - To identify critical indicators of potential seismic damage and/or collapse in historical masonry constructions and modern RC constructions for vulnerability modelling. - To familiarize methods to develop damage functions, fragility and vulnerability curves. - To identify source of uncertainty and mathematical models to handle them in risk assessment

Course Content: 1. Introduction to Assessment at Urban Scale Hazard-Vulnerability-Risk; Applications: Scenario earthquake for disaster management/ strategies for disaster mitigation; Regular structures versus historical urban nuclei; Challenges: Building typology/distribution data collection and vulnerability model validation; Damage statistics in earthquakes; Effect of code revisions/retrofit interventions; 2. Overview of Direct Physical Damages in Earthquakes Definition of damage/collapse mechanisms and seismic vulnerability of historical/regular masonry structures (in-plane failure and out-of-plane failure); traditional and/or vernacular constructions abacus of damages; RC constructions; 3. Evolution of Seismic Vulnerability Approaches Inspection form-based methods; matrix methods; statistical methods; force based approaches; displacement-based approaches; Empirical fragility curves from damage statistics; 4. Developing Damage Functions Vulnerability models: Capacity curves; Hazard models (ground motion estimates): Demand curves; Limit states; Fragility curves/ Vulnerability curves; Handling uncertainties in hazard/vulnerability parameters; Loss estimation models; Non-structural damage; Handling retrofitted structures; 5. Expert Systems Approach 6. Post-earthquake Damage Assessment Forms Crucial data for model validation

Text Books

NIL

Reference Books

- Coburn, A. and Spence, R. Earthquake Protection, Wiley, 2nd Ed., 2002.
- 2. Handbook of Seismic Risk Analysis and Management of Civil Infrastructure Systems, Edited by Tesfamariam S. and Goda, K., Woodhead Publishing, 2013.
- Risk Assessment, Modeling and Decision Support, Strategic Directions, Edited by Bostrom, A., French, S.P., Gottlieb, S.J., Springer, 2008

Prerequisite: