Earthquake Disaster Assessment and Mitigation (Elective)

Code	Credit Hours
DM – 821	3 – 0

Course Description:

Aims to give students understanding of seismic hazard assessment, emergency response to earthquakes, develop basic knowledge about earthquake resistant buildings / structures. It also focuses on introducing the students to the mechanism of disaster risk development with natural hazard, societal vulnerability, exposure and coping capacity that is introduced in the UN ISDR document entitled “At Risk - natural hazards, people’s vulnerability and disasters” (2004).

Course Content:

Topics	Learning Outcomes
Recent Large Scale Earthquake Disasters	Including: 2011 Great East Japan Earthquake 2010 Haiti Earthquake 2008 Wenchuan Earthquake in China 2007/2009 Earthquakes in Indonesia 2006 Pisco Earthquake in Peru 2005 Pakistan Earthquake 2004 Indian Ocean Tsunami
Basic Seismology	Internal Structure of the Earth, Plate Tectonics Faults, Elastic Rebound Theory, Other Sources of Earthquakes, Seismic Wave Propagation, Attenuation of Wave, Earthquake Magnitude, Ground Shaking intensity, Local Site Effects
Seismic Hazard	Geological Evidence, Historical Seismicity, Instrumental

Assessment	Seismicity, Modeling of Earthquake Sources, Probabilistic & Deterministic Seismic Hazard Analysis, Seismic Hazard Maps and their uses for Earthquake Disaster Mitigation, Seismic Micro-zonation
Earthquake – Induced Landslides	Types of Earthquake-Induced Landslides, Evaluation of Slope Stability, Remediation Measures
Liquefaction	Effects of Liquefaction (Sand Boils, Foundation Failures, Lateral Spreading, Evaluation of Liquefaction Hazards, Mitigation Measures
Emergency Responses and Recovery	Hyogo Framework for Action (HFA) 2005-2015, SFDRR 2015, United Nations International Strategy for Disaster Reduction (UNISDR), What is a natural disaster? Risk, Hazard and Vulnerability, Disaster management cycle (Rescue, Recovery, Disaster Prevention etc.), Future Issues: Adaptation, Aging society, Depopulation and Social Capital, Emergency Management, Search and Rescue, Medical Aspects of Earthquake and Tsunami Disasters, Shelter, food and Essential Services, Re-Establishing Public Confidence, Sectoral Recovery Plan, Repairing Economic Damage, Housing Policy (Accelerated Re-const, Loans and Grants), Turning Re-const into Future Protection
Cause and Recovery of Recent Huge Disasters	Rapid Urbanization, Raising of Awareness Building Control/Codes, Social and Economic aspects
Japanese Urban Disaster Management Systems	Japanese system, Japanese experiences
Strategies for Earthquake Protection	Creating a Safety Culture, National Disaster Preparedness Plan, Construction Control – Bldg Code

	Upgrading, Education, and Enforcement Building Stock Management-Bldg Improvement Grants, Influencing Consumer Demand, Earthquake Insurance, Targeting Weak Buildings, Education and Training for Engineers and Other Profession Public Awareness, Micro zoning and Land-Use Planning, Emergency Planning, Self-protection in and Earthquake
Improving Earthquake Resistance of Buildings	Strong and weak building types, How Buildings Resist Earthquakes, Structural Form and Materials Code of Practice for Engineering Buildings, Improving the Resistance of Non-Engineered Buildings, Repair and Strengthening Existing Buildings
Loss Estimation, Risk and Vulnerability Analysis	GIS-based loss Estimation, HAZUS, Vulnerability Assessment for Buildings, Lifelines, and other Structures, Estimation of Physical Damage, Social Losses (Casualties), Economic Losses, Application of Loss Estimation
Term Project	

Textbooks:

No textbook for this course. The course will be based on different reference books, reports, and conference and journal publications.

Reference Material:

1. W.F. Chen and C. Scawthorn, (2003), Earthquake Engg Handbook
2. P.M. Shearer, (1999). Introduction Seismology
3. S.L. Kramer, (1996), Geotechnical Earthquake Engg

A. Coburn and R. Spence, (2002). Earthquake Protection

B. Bolt Earthquake

C. H Scholz, the Mechanics of Earthquake and Faultings

4. H. Tiedemann, Earthquake and Volcanic Eruptions; a handbook on risk Assessment
5. W. Hays B. Mohammandioun and J. Mohammadioun, Seismic Zonation
6. T. Paulety and M. J. N. Priestley Seismic Design of Reinforced Concrete and Masonry Buildings
7. Comite Euro-Intl Du Beton, RC Frames under Earthquake Loading
8. Anil K Chopra Application of Earthquake Engineering, Prentice Hall
9. Clough and Penzien Dynamic of Structures
10. Mario Pazz Structural Dynamics

Pre-requisite:

DM-806 (Risk and Vulnerabilities Assessment for Climate Change and Disaster Management)

Assessment System

Quizzes	15%
Assignments	10%
Mid-Semester Exam	25%
Term Project/Paper	10%
End Semester Exam	40%