School of Planning and Architecture: Vijayawada
(An institution of National Importance under the Ministry of Human Resource Development, Govt. of India)
S.No. 71/1, NH-5, Nidamanuru, Vijayawada – 521 104, Andhra Pradesh, India

Department of Architecture

Course: 10110607 Disaster Resilient Buildings
Instructors: Dr. Faiz Ahmed
External Theor
Contact Periods/ week: 03 Lecture Periods
Time Table:
Attendance: Min 75%

Class: III Yr. VI Sem. B.Arch, 2017-18 A.Y
Internal Assessment: 50
External Theory Exam: 50
Total Marks: 100
Credits: 3
Min. Passing Marks: 40% each in Internal & External Assessment, 50% in Aggregate

Objective:

In the face of climate change, occurrence of natural disaster has become more frequent, influencing livelihoods and existence of human civilization. In this context, this course is designed to provide an overview of the occurrence, causes and consequences of disaster and understanding of fundamental concepts and application of disaster resilient design. The first module introduces the scenario of hazards caused due to natural disaster and provides a brief insight to disaster mitigation and management. Two modules cover the causes, impact and performance of structures, retrofitting and strengthening of existing structures both for cyclone and earthquake exclusively. The other two modules deals with basic principles, simulation techniques, design considerations, adaptable building construction techniques, codes and practices separately for cyclone and earthquake resilient buildings.

Out Line of the Course:

Intrdouction to Natural Disasters, Climate Change, Building and Zoning Regulations pertaining to Resilient Buildings, considerations of wind, topographys etc for design of earthquake, cyclone, etc. General Planning considerations.

LECTURE PLAN

S. No.	Week	TOPIC OF CLASS LECTURE & DISCUSSION	CLASS ACTIVITIES & ASSIGNMENTS
1	Week 1	Introduction to the course - Disaster Resilient Buildings. Discussion on the objectives, scope etc.	Orientation Lecture
2	Week 2	Brief introduction to different types of natural disaster, Occurrence of disaster in different climatic and geographical regions, hazard (earthquake and cyclone) map of the world and India	Lecture/Discussion
3	Week 3	Regulations for disaster risk reduction, Post disaster recovery and rehabilitation (socioeconomic consequences) - case studies.	Lecture/Discussion
4	Week 4	Climate change and its impact on tropical cyclone, Nature of cyclonic wind, velocities and pressure, Cyclone effects, Storm surge, Floods, Landslides. Behaviour of structures in past cyclones and wind storms, case studies.	Lecture/Discussion
5	Week 5	Cyclonic retrofitting, strengthening of structures and adaptive sustainable reconstruction. Life–line structures such as temporary cyclone shelter.	Lecture/Discussion
6	Week 6	Assessment I	
7	Week 7	Guest Lecture - Climate Change	Guest Lecture
8	Week 8	Basic wind engineering, aerodynamics of bluff bodies, vortex shedding and associated unsteadiness along and across wind forces. Lab: Wind tunnel testing, its salient features. Introduction to Computational fluid dynamics.	Lecture/Discussion

9	Week 9	General planning/design considerations under wind storms & cyclones; Wind effects on buildings, towers, glass panels etc, & wind resistant features in design. Codal Provisions, design wind speed, pressure coefficients;	Lecture/Discussion
10	Week 10	Coastal zoning regulation for construction & reconstruction phase in the coastal areas, innovative construction material & techniques, traditional construction techniques in coastal areas.	Lecture/Discussion
11	Week 11	Assessment II	
12	Week 12	Guest Lecture - Resilient Buildings - Earthquake	Guest Lecture
13	Week 13	Causes of earthquake, plate tectonics, faults, seismic waves; magnitude, intensity, epicenter, energy release and ground motions. Earthquake effects – On ground, soil rupture, liquefaction, landslides. Performance of ground and building in past earthquakes	Lecture/Discussion
14	Week 14	Behaviour of various types of buildings, structures, and collapse patterns; Behaviour of Non-structural elements like services, fixtures, mountings- case studies. Seismic retrofitting- Weakness in existing buildings, aging, concepts in repair, restoration and seismic strengthening.	Lecture/Discussion
15	Week 15	General Planning and design consideration; Building forms, horizontal and vertical eccentricities, mass and stiffness distribution, soft storey etc.; Seismic effects related to building configuration. Plan and vertical irregularities, redundancy and setbacks. Various Types and Construction details of: Foundations, soil stabilization, retaining walls, plinth fill, flooring, walls, openings, roofs, terraces, parapets, boundary walls, under-ground - overhead tanks, staircases and isolation of structures; innovative construction material and techniques; Local practices: traditional regional responses; Computational investigation techniques.	Lecture/Discussion
16	Week 16	Assessment III	

Note: l input in the form of screening of documentary film 1. Home; 2. Before the Floods, 3. The Inconvenient Truth shall be ca

Tentative break-up of Internal Assessment Marks:

S.No.	CATEGORIES OF EVALUATION	MARKS
1	Assessment I - Test	15
2	Assessment II - Test	15
3	Assessment III - Assignment	20
	Total	**50**

References:

1. Abbott, L. P. (2013). Natural disasters. 9th Ed. McGraw-Hill.
2. Agarwal, P. and Shrikhande, M. (2009). Earthquake Resistant Design of Structures. New Delhi : PHI Learning.
3. Bankoff, G., Frerks, G. and Hilhorst, D. (2004). Mapping Vulnerability: Disasters, Development and People. London : Earthscan.
4. Burby, R. J. (1998). Cooperating with Nature. Confronting Natural Hazards with Land-Use Planning for Sustainable Communities. Washington : Joseph Henry Press.
5. Dyrbye, C. D., Dyrbye, C. and Dyrbye, C. (1997). Wind Loads on Structures. John Wiley.
6. Foote, K. (2003). Shadowed Ground: How Americans deal with Places of Tragedy. Austin : University of Texas Press.
7. Holmes, J. D. (2007). Wind Loading of Structures. 2nd Ed. Taylor & Francis.
8. ICIMOD. (2007). Disaster Preparedness for Natural Hazards: Current Status in India. Kathmandu : ICIMOD.
9. Judy, L. B. (2012). Climate change, Disaster Risk and the urban poor – cities building resilience for a changing World. Washington DC : The World Bank.
10. Lee, B. Ed. (2008). Hazards and the Built Environment: Attaining Built-In Resilience. Oxon : Taylor and Francis.
11. McDonald, R. (2003). Introduction to Natural and Man-made Disasters and their Effects on Buildings. Burlington : Architectural Press.
12. Sinha, P. C. (2006). Disaster Mitigation, preparedness, recovery and Response. New Delhi : SBS Publishers.
13. Thomas, F. (2013). Designing to avoid disaster: The Nature of Fracture-Critical Design. London : Routledge.
14. Pelling, M. (2003). The Vulnerability of Cities: Social Resilience & Natural Disaster. London : Earthscan.
15. U.N.D.P. (2004). Reducing Disaster Risk: A Challenge for Development. New York : UNDP.
16. World Bank. (2009). Handbook for Reconstructing after Natural Disasters.

Course Instructor: **Head of the Department:**