Course Name:

Infrastructure Risk and Resilience

Course Number:

20008

Credit:

3

Course Content (outline):

- **Introduction**
    - Hazard
    - Infrastructure
    - Consequence
    - Man-made disasters
    - Natural disasters
    - Motivation: Case Study of 1396 Kermanshah Earthquake
- **Resilience-based engineering**
    - Definition of resilience
    - Design philosophies
        - Allowable stress design
        - Load and resistance factor design
        - Performance-based design
        - Resilience-based design
    - Quantification of resilience
    - Properties of resilience
        - Robustness
        - Resourcefulness
        - Rapidity
        - Redundancy
    - Sustainability versus resilience
- **Robustness quantification via risk analysis**
    - Fragility model

    - Discounting model
    - PEER's performance-based earthquake engineering framework
    - ATC-13 framework
    - FEMA-NIBS framework
    - Reliability-based framework
        - Multi-model reliability analysis
        - Multi-hazard risk analysis
- **Resourcefulness via Bayesian networks**
- **Recovery analysis via simulation**
    - Agent-based modeling
    - Recovery modeling in ***Rtx***

References:

- Cimellaro, G. P. (2016). Urban resilience for emergency response and recovery. Springer International Publishing, Switzerland.
- FEMA (2012). Seismic Performance Assessment of Buildings. FEMA P-58, Federal Emergency Management Agency, Washington, DC.
- FEMA-NIBS (2012). Earthquake Loss Estimation Methodology, HAZUS Technical Manual. Federal Emergency Management Agency and National Institute of Building Sciences, Washington, DC.
- ATC (1985). Earthquake Damage Evaluation for California. ATC-13, Applied Technology Council, Redwood City, CA.
- Various articles in top probabilistic journals.