

# Higher Institute of Earthquake studies and Research

**Department: Earthquake Structural Engineering**

**COURSE: Seismic Upgrading of Structures**

**HOURS: (2 Hours Theoretical+2hours Practical) weekly**

**TEACHING STAFF:**

**Description:**

Historically seismic impacts took a considerable care and precautions for structures not to fail. In the recent years a great step towards safer structures and more profoundly “functional” structures after a major event, has been achieved. In detail two branches of seismic upgrading is utilized in order to achieve the best safety and functionality of the structure under extreme circumstances.

**Aims & Objectives:**

This course aims at giving structural engineers an insight into the most recent concepts used to define the problem of “Upgrading Structures Against Earthquake”

Categorizing the seismic upgrading into branches would lead the engineer into the most suitable method of upgrading according to the sever act (Demand) and the situation of the structure (Capacity).

In Addition, several methods are modeled via FEM software and, thus, engineer should be able to predict and use the most suitable modeling technique when faced with modeling problem.

**Syllabus:**

Background on traditional seismic upgrading techniques, advantages and disadvantages.

Brief look at simplified methods on seismic analysis of structure – static methods, and their drawbacks.

Design using elastic and inelastic response spectrum methods.

Braches of seismic Upgrading1: Isolation Systems

Braches of seismic Upgrading2: Strengthening Systems

Concept of Energy in the seismic design and its advantages.

Innovative seismic upgrading methods-1: Semi-Rigid Frames

Innovative seismic upgrading methods-2: Semi-Rigid Frames with self-centering mechanism

Innovative seismic upgrading methods-3: Braced frames with energy dissipative mechanisms

Modeling techniques for seismic upgrading methods

**Course Outline:**

Week 1+2+3: Background and simplified method of design

Week 4+5: Demand based design

Week 6+7: Seismic upgrading branches and energy concept

Week 8+9+10+11: Innovative methods

Week 12+13+14: Modeling techniques

**Instructional Methodology & Teaching Resources:**

Lectures, examples, applications

**Head of Department**

**Date:**

**Vice dean:**

**Date:**

**Dean:**

**Date:**

