



# Course: PE 821 CE RETROFITTING AND REHABILITATION OF STRUCTURES

PROFESSIONAL ELECTIVE – III

CBCS SCHEME (Semester VIII)

Bachelor of Engineering (B.E.), Year IV, Semester II

University College of Engineering, Osmania University

**Dr. Akshay Naidu, Professor,**

Civil Engineering, Methodist College of Engineering and Technology, Hyderabad – 500001



# Introduction to the Course

- **Syllabus, Credits and Periods**
- **Evaluation**
- **Sessional Evaluation**
- **Overview of the Course**

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# Introduction to the Course

- **Evaluation: CIE = 30; SEE = 70**
- **Sessional Evaluation**
  - **Internal Exams: Average of two (20 Marks)**
  - **Assignment: Presentation and report on topics selected from list - Maximum 2 students per group (5 Marks)**
  - **Quiz – 5 Marks**

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# COURSE OVERVIEW

- ▶ Structural Engineering Overview
- ▶ Introductory Definitions
- ▶ What will you learn in this course?
- ▶ Recommended Texts for Study
- ▶ Recommended Mode of Study
- ▶ Internal Assessment

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# (A) Structural Engineering Overview

- ▶ Phase 1: Planning
- ▶ Phase 2: Design
- ▶ Phase 3: Construction
- ▶ Phase 4: Maintenance and Repair

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# (A) Structural Engineering Overview

## ► Phase 1: Planning Phase

- Ground Level Surveying
- Geotechnical evaluation
- Environmental evaluation
- Government regulations

# (A) Structural Engineering Overview

- **Phase 2: Design Phase**
  - Architectural Design
  - Structural Analysis
  - Structural Design
  - Estimation and Costing (in detail)

# (A) Structural Engineering Overview

## ► Phase 3: Construction

- Ground excavation and ground improvement
- Foundation Engineering
- Construction Materials Technology
- Construction Technology
- Project Execution and Management

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# (A) Structural Engineering Overview

## ► Phase 4: Maintenance and Repair Phase

- Periodical Inspections
- Maintenance Strategies
- Health Monitoring Technology
- Damage Assessment
- Rehabilitation and Retrofitting

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# (B) Introductory Definitions

## ► **Condition Assessment of Structures:**

Condition Assessment of a structure provides a comprehensive building deficiency information and forecasts possible future maintenance or repair requirements for a single or multiple properties. It is also sometimes referred to as a Facility Condition Assessment or Property Condition Assessment.

Condition Assessments are carried out in two steps, the first being the site inspection, which is a systematic recording of the building systems with the use of photographs, note taking, drawings and information provided by the property owner. The second step is analyzing the data collected and turning it into a report that includes a summary of the building, its systems condition, tables that reflect the immediate and projected long-term costs of maintaining the building.

# (B) Introductory Definitions

## ► **Structural Health Monitoring:**

The process of implementing a damage detection and characterization strategy for engineering structures is referred to as **structural health monitoring (SHM)**.

Here damage is defined as changes to the material and/or geometric properties of a structural system, including changes to the boundary conditions and system connectivity, which adversely affect the system's performance.

The SHM process involves the observation of a system over time using periodically sampled dynamic response measurements from an array of sensors, the extraction of damage-sensitive features from these measurements, and the statistical analysis of these features to determine the current state of system health.

# (B) Introductory Definitions

- ▶ **Structural integrity** is the ability of an item—either a structural component or a structure consisting of many components—to hold together under a load, including its own weight, without breaking or deforming excessively.
- ▶ **Structural failure** refers to the loss of structural integrity, or the loss of load -carrying capacity in either a structural component, or the structure itself.

# (B) Introductory Definitions

- **Renovation:** Process of substantial repair or alteration that extends a building's useful life.
- **Rehabilitation:** An upgrade required to meet the present needs – being sensitive to building features and a sympathetic matching of the original construction.
- **Restoration:** More restrictive term than rehabilitation – suggests replicating the structure as originally built (Ref. Historical buildings)
- **Repair:** Process of reconstruction and renewal of the existing buildings, either in whole or in part

# (B) Introductory Definitions

- **Retrofit:** Upgrading certain building systems such as electrical, mechanical, or structural to improve performance or appearance.
- **Remodeling:** Essentially same as renovation – applied to residential structures.



## **(C) What you will learn in this course?**

- **Structural Material Behaviour**
- **Inspection and Evaluation Techniques**
- **Repair and Strengthening Methods**

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## **(D) Recommended Mode of Study?**

- ▶ **Learn with the fun of learning**
- ▶ **Do not be exam oriented – be learning oriented**
- ▶ **Regularity and attentiveness in classes**
- ▶ **Regular and systematic reading**

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