

**University of Engineering and Technology, Taxila**  
Department of Civil Engineering

Course Title: CE409 Design of Structures

Pre-requisite(s): CE102 civil Engineering materials; CE206 and CE 301 Theory of structures 1 and 2; CE306 Reinforce concrete I; CE401 Reinforce Concrete II; CE307 Design of Steel Structures; CE305 Computer Applications. CE 101 Civil Engineering Drawings, CE 208, CE303 Soil Mechanics I&II; CE 405 Foundation Engineering.

Credit Hours: 1+3

Contact Hours: 1+9

Reference Books: Design of structures by R.H Nilson

ACI-318-14,

ASCE-07

ASTM Specifications

**Catalog Data:**

Drawing office Practice, Specifications and codes of Practice, Choice of forms of structures for various conditions,

**Course Objectives:**

- Students will be able to understand and apply the standard codes of practice and specifications in their design
- Students will be able to use already learned basic design concepts to design simple and complex RC structures
- Student will be able to produce working structural drawings
- Students will have basic understanding of earthquake-resistant design of structures

**Course Learning Outcomes:**

At the end of this course, the students will:

CLO:1 Students will apply fundamental concepts of Drawings and RC design

CLO:2 Students will apply advance knowledge of structural analysis to solve real life structures

CLO:3 Students will demonstrate the skills to choose the best structural system for given conditions

CLO:4 students will be able for detailing of Miscellaneous Structural Elements,

## Course content

### **Theory Part**

1. Specifications codes and Practice (4weeks)
2. Choice and forms of Structures for various conditions (2weeks)
3. Drawing office Practice for preparation of detailed working drawing (2weeks)
4. Analysis design and preparation of working drawings of steel and concrete structures(4weeks)
5. Introduction to basics of earthquake resistant design (4weeks)

### **Practical Part**

1. Analysis, design and drawing of a RC Retaining wall (2weeks)
2. Analysis, design and drawing of one way slab, beams, columns and footing(3weeks)
3. Analysis, design and drawing of two way slab, beams, columns and footing(2weeks)
4. Analysis, design and drawing of flat plat slab without beams(2weeks)
5. Analysis, design and drawing of flat plat slab without beams and column capitals(2weeks)
6. Analysis, design and drawing of steel structure(3weeks)
7. Analysis, design and drawing of a steel roof truss(2weeks)

### Grading policy

| <b>S.No.</b>                                | <b>Grading</b> | <b>% of Total Marks</b> |
|---|----------------|-------------------------|
| Theory Part (Design calculation and theory) |                |                         |
| i.  | Assignments    | 10                      |
| ii.   | Quizzes        | 10                      |
| iii.  | Mid-term Exam  | 30                      |
| iv.   | Final Exam     | 50                      |
| Practical Part (Drawing and Detailing)      |                |                         |
| i.  | Assignments    | 10                      |
| ii.   | Quizzes        | 10                      |
| iii.  | Mid-term Exam  | 30                      |
| iv.   | End Term Exam  | 50                      |
|   |                |                         |

### Students learning outcomes

1. Successful student will be able to analyze, design and draft a most suitable RC or steel structural system for given requirements.
2. Students will be able to decide the ideal specification for their design conforming to the prevailing code and guidelines of ACI committees and ASTM Specifications.

### Course Professional outcomes

Students will learn advance structural design techniques for RC and steel structures

| PLOs  |   | CLOs  |  |   |
|---|---|---|--|---|
|   | CLO-1<br>(fundamental concepts of Drawings and RC design) | CLO-1<br>(advance knowledge of structural analysis) | CLO-3<br>(skills to choose the best structural system) | CLO-4<br>(detailing of Miscellaneous Structural Elements) |
| <b>PLO 1</b><br>(Engineering Knowledge)           | ✓   |   |  |   |
| <b>PLO 2</b><br>(Problem Analysis)                | ✓   |   |  | ✓   |
| <b>PLO 3</b><br>(Design/Development of Solutions) | ✓   | ✓   |  | ✓   |
| <b>PLO 4</b><br>(Investigation)                   |   |   | ✓  |   |
| <b>PLO 5</b><br>(Modern Tool Usage)               | ✓   | ✓   | ✓  | ✓   |
| <b>PLO 6</b><br>(The Engineer and Society)        | ✓   | ✓   | ✓  | ✓   |
| <b>PLO 7</b><br>(Environment and Sustainability)  |   |   |  |   |
| <b>PLO 8</b><br>(Ethics)                          |   |   |  |   |
| <b>PLO 9</b><br>(Individual and Team work)        | ✓   | ✓   | ✓  | ✓   |
| <b>PLO 10</b><br>(Communication)                  |   |   |  |   |
| <b>PLO 11</b><br>(Project Management)             |   |   |  |   |
| <b>PLO 12</b><br>(Lifelong Learning)              | ✓   | ✓   | ✓  | ✓   |

| Assessment Modules | CLOs  |       |       |       |
|--------------------|-------|-------|-------|-------|
|                    | CLO 1 | CLO 2 | CLO 3 | CLO 4 |
| Assignments        | ✓     | ✓     | ✓     | ✓     |
| Quizzes            | ✓     | ✓     | ✓     | ✓     |
| Midterm Exam       | ✓     | ✓     | ✓     | ✓     |
| Final Exam         | ✓     | ✓     | ✓     | ✓     |

### Lab Practicals:

| Sr. | Lab Practicals No.  |
|-----|---|
| 1   | Detailing of Miscellaneous Structural Elements (Part-I)               |
| 2   | Detailing of Miscellaneous Structural Elements (Part-II)              |
| 3   | Detailing of Complex Structural Elements (Part-I)                     |
| 4   | Detailing of Complex Structural Elements (Part-II)                    |
| 5   | Study of damage pattern in existing concrete structures               |
| 6   | Evaluation and assessment of concrete of existing concrete structures |
| 7   | Evaluation and assessment of steel of existing concrete structures    |
| 8   | Seismic detailing for structural members                              |
| 9   | Study of tendons  |
| 10  | Introduction to ETABS & SAFE and revision of Auto Cad                 |
| 11  | ETABS and SAFE Models   |
| 12  | Analysis and Design in ETABS and SAFE                                 |
| 13  | Extracting design from ETABS and SAFE for Auto Cad drawing            |

### Grading Guideline:

| S.No. | Grading       | % of Total Marks |
|-------|---------------|------------------|
| i.    | Practice      | 40               |
| ii.   | Mid-term Exam | 20               |
| iii.  | Final Exam    | 40               |
|       | <b>Total</b>  | <b>100</b>       |

### Student Learning Outcome:

Students who pass the course will be able to design miscellaneous and complex structural elements manually and using softwares. Furthermore, they will have basic understanding of earthquake-resistant design and evaluation/assessment and retrofitting of concrete structures and pre-stressed concrete.

### Course Professional Outcome/Industrial Usage:

Students appreciate the need for becoming good structural engineers capable to design miscellaneous and complex structural elements manually and using softwares and for basic understanding of earthquake-resistant design and evaluation/assessment and retrofitting of concrete structures and prestressed concrete.



