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**FACULTY OF ENGINEERING**

**CIVIL ENGINEERING DEPARTMENT**

**COURSE OUTLINE**

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| **Course Unit Title** |  REINFORCED CONCRETE THEORY |
| **Course Unit Code** | CE 481 |
| **Type of Course Unit** |  Compulsory |
| **Level of Course Unit** |  1 |
| **National Credits** | 4 |
| **Number of ECTS Credits Allocated** | 5 |
| **Theoretical (hour/week)** |  4 |
| **Practice (hour/week)** |  - |
| **Laboratory (hour/week)** |  - |
| **Year of Study** |  4 |
| **Semester when the course unit is delivered** |  1 |
| **Course Coordinator** | Kabir Sadeghi |
| **Name of Lecturer (s)** | Kabir Sadeghi |
| **Name of Assistant (s)** | - |
| **Mode of Delivery** | Face to Face; Formal Lectures |
| **Language of Instruction** | English |
| **Prerequisites and co-requisites** | Strength of Materials (CE224) |
| **Recommended Optional Programme Components** | Background of statics and strength of materials |
| **Objectives of the Course:** The main objectives of this course are to engage students in the discovery of reinforced concrete elements design principles and to provide them with theory and applications in a clear, understandable presentation. |
| **Learning Outcomes** |
| **When this course has been completed the student should be able to** | **Assessment** |
| 1 | A Get familiar and understand conceptually topics of reinforced concrete elements design. | 1, 2, 5 |
| 2 | Apply the methods of solving reinforced concrete elements design problems that leads to the first insights into the rudiments of related fields in structural engineering sciences. | 1, 2, 3 |
| 3 | Analyze the reinforced concrete elements design problems in two dimensions and three dimensions according to acceptable rules, regulation and ACI structural codes. | 1, 2, 3 |
| 4 | Apply the different methods of reinforced concrete elements design due to applied loads. | 1, 2, 3 |
| 5 | Apply and integrate the basic reinforced concrete elements design including different types of beams, columns slabs, material properties and the principles of engineering sciences into working practical knowledge. | 1, 2, 3, 5 |
| Assessment Methods: 1. Written Exam 2. Assignment 3. Project/Report 4.Presentation 5. Lab. Work |
| **Course’s Contribution to Program** |
|  |  | **CL** |
| 1 |  Ability to relate and apply fundamental sciences to learning the essential civil engineering concepts and theories of different branches. | 4 |
| 2 | Ability to understand the derivation of these concepts and theories by relating them to the real-life engineering cases within the related civil engineering branch. | 4  |
| 3 | Ability to define clearly and analyze the engineering problems by applying the introduced civil engineering concepts and theories of the related branch.  | 4  |
| 4 | Ability to use decision-making skills and perform design calculations correctly for the solution of the defined problem/project by applying the introduced theories of the related civil engineering branch. |  4 |
| 5 | Ability to understand and carry out the practical applications of learned civil engineering concepts and theories on site and/or laboratory.  |  5  |
| 6 | Ability to use software packages for the analysis and/or the design of the defined civil engineering problems/projects. | 3  |
| 7 | Ability to manage time and resources effectively and efficiently while carrying out civil engineering projects. | 4 |
| 8 | Ability to participate in team-works in a harmonized manner for the solution of the targeted problem. |  4  |
| 9 | Ability to write technical reports and/or to carry out presentations on the studied engineering project using the modern techniques and facilities. |  4  |
|  10 | Ability to carry out and finalize a civil engineering study/project by showing professional ethics. |  5 |
| CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5:Very High) |

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| **Course Contents** |
| **Week** | **Chapter** |  | **Exams** |
| 1 | Chapter 1 | Introduction to Concrete and Reinforced Concrete  |  |
| 2 | Chapter 2  | Mechanical properties of concrete and reinforcements |  |
| 3 | Chapter 3  | Concept of Design of Structures: Working Stress Design (WSD), Ultimate Strength Design (USD) and Limit state Design (LSD), LRFD, concept of safety, definition of reinforced concrete elements |  |
| 4 | Chapter 4  | Flexure (Design of Rectangular Beams Reinforced in Tension by using WSD method) |  |
| 5 | Chapter 4 | Flexure (Design of Rectangular Beams Reinforced in Tension and compression by using WSD method) |  |
| 6 | Chapter 5 | Flexure (Design of Rectangular Beams Reinforced in Tension by using USD method) |  |
| 7 | Chapter 5 | Flexure (Design of Rectangular Beams Reinforced in Tension and Compression by using USD method) |  |
| 8 | Chapter 5 | Flexure (Design of T Beams by using USD method) | Midterm |
| 9 | Chapter 5 | Flexure (Design of L and other types of Flanged Beams by using USD method) |  |
| 10 | Chapter 6 | Shear (Design of Beams by using WSD and USD methods) |  |
| 11 | Chapter 7 | Flexure and Shear (Design of Rectangular, T, L and other types of Continuous Beams by using WSD and USD methods) |  |
| 12 | Chapter 8 | Flexure and Shear (Design of One-Way Slabs by using WSD and USD methods) |  |
| 13 | Chapter 9 | Bond, Development Length and Splices |  |
| 14 | Chapter 10 | Stairs, Hooks and Bends of Reinforcement  |  |
| 15 |  | Homework and assessment practices. | Final |
| **Recommended Sources****Textbook:**  1. Reinforced Concrete Structures Design, 2nd Edition, By; Kabir Sadeghi, Near East University Press Centre, 2015. **Supplementary Material (s**):  2. Design of Concrete Structures, George Winter, Arthur H. Nilson, Published by McGraw Hill Book Company, 13th Edition, 2008.  3. Reinforced Concrete Design, Noel J. Everard and John L. Tanner III, Schaum’s Outline Series, Published by McGraw Hill Book Company, Latest Edition.  4. Fundamentals of Reinforced Concrete Design, M.L. Gambhir, Published by PHI Learning Private Limited Book Company, 2011.  5. Design of Reinforced Concrete, Mc.Cormac and Brown, 8th edition,  6. ACI Building Code Requirements and Commentary for Reinforced Concrete (ACI 318-11).  |  | **Final Examination** |
| **Assessment** |
| Attendance& Assignment | 10% |  |
| Midterm Exam (Written) | 35% |  |
| Quiz (Written) | - |  |
| Final Exam (Written) | 55% |  |
| Total | 100% |  |
| **ECTS Allocated Based on the Student Workload** |
| **Activities** | **Number** | **Duration****(hour)** | **Total****Workload(hour)** |
| Course duration in class (including the Exam week) | 15 | 4 | 60 |
| Tutorials | 2 | 2 | 4 |
| Assignments | 2 | 3 | 6 |
| Project/Presentation/Report Writing | 2 | 12 | 24 |
| E-learning Activities | 2 | 1 | 2 |
| Quizzes | - | - | - |
| Midterm Examination | 1 | 20 | 20 |
| Final Examination | 1 | 25 | 25 |
| Self-Study | 14 | 2 | 28 |
| Total Workload | 165 |
| Total Workload/30 (h) | 5.5 |
| ECTS Credit of the Course | 5 |