



| COURSE INFORMATION | | | | |
|--------------------|----------------|---------------------|----------------------------|--------------------------------|
| Course Code | CE382 | Course Title | REINFORCED CONCRETE | |
| <i>Semester</i> | <i>Credits</i> | <i>ECTS</i> | <i>C + P + L Hour</i> | <i>Prerequisites</i> |
| 6 | 3 | 6 | 2+2+0 | CE 236: Mechanics of Materials |

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| Language of Instruction | Course Level | Course Type |
| English | Bachelor's Degree (First Cycle Programmes) | Core |
| Course Coordinator | Assistant Prof. Almıla Uzel | |
| Instructors | Assistant Prof. Almıla Uzel | |
| Assistants | | |
| Goals | The goal of this course is to teach the fundamentals of reinforced concrete design. | |
| Content | Mechanical properties of structural concrete and reinforcing steel. Behaviour of reinforced concrete members under different natural and physical conditions. Behaviour of reinforced concrete members under axial force, bending moment, shear force and combined action of axial force and bending moment. Ultimate strength and serviceability design of reinforced concrete beams according to Design Standards in Turkey. | |
| Contribution of the Course to the Professional Education | Concrete and reinforced concrete are widely used in the construction industry in every country. Hence, it is important that a civil engineer studies the fundamentals of reinforced concrete design. | |

| Course Learning Outcomes | Detailed Program Outcomes | Teaching Methods | Assessment Methods |
|--|----------------------------------|-------------------------|---------------------------|
| Be capable of calculating the response of reinforced concrete members under axial load. | 1a,1b,2a,2b,6c | 1,2 | A,B |
| Be capable of calculating the response and ultimate strength of reinforced concrete members under bending moment according to applicable design codes in effect. | 1a,1b,2a,2b,3b,6c,9b | 1,2 | A,B |
| Be capable of designing shear reinforcement of reinforced concrete beams according to applicable design codes in effect. | 1a,1b,2a,2b,3b,6c,9b | 1,2 | A,B |
| Be capable of calculating the response of reinforced concrete members under bending moment and axial load according to applicable design codes in effect. | 1a,1b,2a,2b,3b,6c,9b | 1,2 | A,B |



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| Teaching Methods: | 1: Lecture by instructor, 2: Problem solving by instructor |
| Assessment Methods: | A: Written exam, B: Homework |

| COURSE CONTENT | | |
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| Week | Topics | Study Materials |
| 1 | Introduction to Reinforced Concrete Design-Concrete Beam Example Vitruvius- De Architectura-Ten Books on Architecture, | Lecture Notes |
| 2 | Overview of material properties of concrete and reinforcing steel | Lecture Notes, TS500 |
| 3 | RC members under axial load, tension stiffening after cracking | Lecture Notes |
| 4 | Introduction to flexural response, cracking moment | Lecture Notes, TS500 |
| 5 | Flexural response after cracking | Lecture Notes, TS500 |
| 6 | Rectangular stress block, nominal and factored resistance, Balanced failure- balanced sections | Lecture Notes, TS500 |
| 7 | Tutorial, review - Midterm 1 | Lecture Notes, TS500 |
| 8 | Doubly reinforced sections, T-sections | Lecture Notes, TS500 |
| 9 | Shear Design | Lecture Notes, TS500 |
| 10 | Shear Design | Lecture Notes, TS500 |
| 11 | Bond and Anchorage- Beam Example | Lecture Notes, TS500 |
| 12 | Beam example-Deflections | Lecture Notes, TS500 |
| 13 | Columns: Moment and Axial Load Interaction diagrams-effect of confinement | Lecture Notes, TS500 |
| 14 | Columns: Slender Columns | Lecture Notes, TS500 |



| RECOMMENDED SOURCES | |
|-----------------------------|---|
| Textbook | Reinforced Concrete – Mechanics and Design (Canadian Edition) MacGregor, J.G. and Bartlett, F.M., Prentice Hall, 2000 ISBN-13: 978-0-13-101403-9 ISBN-10: 0-13-101403-X |
| Additional Resources | Lecture Notes |

| MATERIAL SHARING | |
|--------------------|--|
| Documents | A booklet which contains some of the lecture notes are handed out at the beginning of the term |
| Assignments | Solutions of each assignment are posted |
| Exams | Solutions of exam questions are posted |

| ASSESSMENT | | |
|---|--------|------------|
| IN-TERM STUDIES | NUMBER | PERCENTAGE |
| Midterm | 1 | 44 |
| Assignments | 6 | 56 |
| Total | | 100 |
| CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE | | 55 |
| CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE | | 45 |
| Total | | 100 |

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|------------------------|--------------|
| COURSE CATEGORY | Field Course |
|------------------------|--------------|

| COURSE'S CONTRIBUTION TO PROGRAM OUTCOMES | | |
|---|--|------------|
| No | Program Learning Outcomes | check √ |
| 1a | Adequate knowledge in mathematics, science and engineering subjects pertaining to the relevant discipline, | √ |
| 1b | Ability to use theoretical and applied knowledge in these areas in complex engineering problems. | √ |
| 2a | Ability to identify, formulate, and solve complex engineering problems, | √ |



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| 2b | Ability to select and apply proper analysis and modeling methods for this purpose. | √ |
| 3a | Ability to design a complex system, process, device or product under realistic constraints and conditions, in such a way as to meet the desired result, | |
| 3b | Ability to apply modern design methods for this purpose. | √ |
| 4a | Ability to select and use modern techniques and tools needed for analyzing and solving complex problems encountered in engineering practice. | |
| 4b | Ability to employ information technologies effectively. | |
| 5a | Ability to design experiments for investigating complex engineering problems or discipline specific research questions, | |
| 5b | Ability to conduct experiments, gather data, analyze and interpret results for investigating complex engineering problems or discipline specific research questions. | |
| 6a | Ability to work efficiently in intra-disciplinary teams, | |
| 6b | Ability to work efficiently in multi-disciplinary teams, | |
| 6c | Ability to work individually. | √ |
| 7a | Ability to communicate effectively in Turkish, both orally and in writing, | |
| 7b | Knowledge of a minimum of one foreign language, | |
| 7c | Ability to write effective reports and comprehend written reports, prepare design and production reports, | |
| 7d | Ability to make effective presentations, | |
| 7e | Ability to give and receive clear and intelligible instructions. | |
| 8a | Recognition of the need for lifelong learning, ability to access information, ability to follow developments in science and technology, | |
| 8b | Ability to continue to educate him/herself. | |
| 9a | Consciousness to behave according to ethical principles and professional and ethical responsibility. | |
| 9b | Knowledge on standards used in engineering practice. | √ |
| 10a | Knowledge about business life practices such as project management, risk management, change management. | |
| 10b | Awareness in entrepreneurship and innovation. | |
| 10c | Knowledge about sustainable development. | |
| 11a | Knowledge about the global and social effects of engineering practices on health, environment, and safety, | |
| 11b | Knowledge about contemporary issues of the century reflected into the field of engineering. | |
| 11c | Awareness of the legal consequences of engineering solutions. | |
| 12 | Knowledge about project award mechanisms and tendering procedures. | |
| 13 | Knowledge about the interaction of designers and constructors. | |



| ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION | | | |
|---|----------|-----------------|-----------------------|
| Activities | Quantity | Duration (Hour) | Total Workload (Hour) |
| Course Duration | 13 | 4 | 52 |
| Hours for off-the-classroom study (Pre-study, practice) | 12 | 3 | 36 |
| Midterm examination | 1 | 2 | 8 |
| Homework | 6 | 6 | 36 |
| Final examination | 1 | 2 | 8 |
| Total Work Load | | | 140 |
| Total Work Load / 25 (h) | | | 6 |
| ECTS Credit of the Course | | | 6 |

Prepared by: Asst. Prof. Almıla UZEL

Preparation date: