**ECTS COURSE INFORMATION FORM**

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| **Faculty** | **Faculty of Engineering** | |
| **Program** | **B.Sc. in Civil Engineering** | **Required** |
| | **B.Sc. in Computer Engineering** | **Elective** |
| | **B.Sc. in Electrical-Electronics Engineering** | **Elective** |
| | **B.Sc. in Industrial Engineering** | **Elective** |
| | **B.Sc. in Mechanical Engineering** | **Elective** |

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| **Course Code** | CE 304 | | | |
| **Course Title in English** | Theory of Structures II | | | |
| **Course Title in Turkish** | Yapı Statiği II | | | |
| **Language of Instruction** | English | | | |
| **Type of Course** | Flipped Classroom / Lecture | | | |
| **Level of Course** | Undergraduate | | | |
| **Course Category (by % of Content)** | Basic Science | Basic Engineering | Engineering Design | General Education |
| | - | 80 | 20 | - |
| **Semester Offered** | Spring | | | |
| **Contact Hours per Week** | Lecture: 4 hours | Recitation: - | Lab: - | Other: - |
| **Estimated Student Workload** | 126 hours | | | |
| **Number of Credits** | 5 ECTS | | | |
| **Grading Mode** | Standard Letter Grade | | | |
| **Pre-requisites** | CE 303 Theory of Structures I | | | |
| **Expected Prior Knowledge** | Prior knowledge in analysis of statically determinate structures and trusses, internal loadings developed in structural members, influence lines and deflection diagrams. | | | |
| **Co-requisites** | None | | | |
| **Registration Restrictions** | Only Undergraduate Students | | | |
| **Overall Educational Objective** | To analyze statically indeterminate structures by force and displacement methods. | | | |
| **Course Description** | This course will provide the students with a thorough grounding in the analysis of statically indeterminate structures by force method under dead and live loads, temperature changes and support settlements, determination of displacements by virtual work theory, reduction theorem, systems with elastic supports and connections, analysis for moving loads, influence lines, analysis of systems by displacement methods: slope-deflection and moment distribution methods, introduction to non-linear analysis. | | | |
| **Course Description in Turkish** | Bu derste öğrenciler, hiperstatik sistemlerin dış yükler, sıcaklık değişimi ve mesnet çökmeleri etkisinde kuvvet yöntemiyle çözümü. hiperstatik sistemlerde yer değiştirme hesabı, kısaltma teoremi, elastik mesnetli ve elastik birleşimli sistemler, hareketli yüke göre hesap ve tesir çizgileri, yapısal sistemlerinin hesabında yer değiştirme yöntemleri: Açı ve Cross yöntemleri; doğrusal olmayan analize giriş konularında sağlam bir altyapı edineceklerdir. | | | |
| **Course Learning Outcomes and Competencies** | Upon successful completion of the course, the learner is expected to:<br><br>1. describe the structural design process;<br>2. analyze statically indeterminate structural systems under the effect of external loads, temperature changes and support settlements using force method of analysis;<br>3. compute displacements of statically indeterminate systems;<br>4. analyze statically indeterminate structures using the displacement method;<br>5. develop team work skills. | | | |

| Relationship of the Course with the Student Outcomes | Level | Learning Outcome(s) | Assessed by |
|---|---|---|---|
| **Student Outcomes** | N=None S=Supportive H=High | | Exam, Project, HW, Experiment, Presentation, etc. |
| (1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics | H | 2, 3, 4 | FCP, Midterms, Quizzes |
| (2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors | | | |
| (3) an ability to communicate effectively with a range of audiences | S | 1 | Presentation |
| (4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts | | | |
| (5) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives | S | 5 | Term project |
| (6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions | | | |
| (7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies | | | |

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| **Prepared by and Date** | Dr. Onur Şeker / January 2020 | |
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| **Semester** | Spring 2019-2020 | |
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| **Name of Instructor** | Dr. Onur Şeker | |
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| **Course Contents** | Week | Topic |
| | 1. | Basic definitions of statically indeterminate structures. Type of structures, structural elements, loads. Load path. Static determinacy. Overview of statically determinate systems. |
| | 2. | Deformations due to axial force, shear force and bending moment. Principles of energy methods. Internal and external work. Deflections using virtual work method. |
| | 3. | Principles of force method. Flexibility. Principle of superposition and compatibility equations. Analysis of statically indeterminate structures by force method: Beams, frames and trusses. |
| | 4. | Analysis of statically indeterminate structures by force method for support settlement and thermal effects. Computation of displacements using virtual work principle. |
| | 5. | Analysis of statically indeterminate structures with elastic supports and connections. Application examples using a structural analysis program. |
| | 6. | Analysis of statically indeterminate structures by force method under moving loads, drawing shape of the influence lines. |
| | 7. | Live load arrangements. |
| | 8. | Analysis of systems by displacement methods. |
| | 9. | Slope-deflection method, Superposition equations. |
| | 10. | Analysis of systems by slope-deflection method. |
| | 11. | Moment distribution method. |
| | 12. | Analysis of systems by moment distribution method. |
| | 13. | Analysis of frames using a structural analysis software. |
| | 14. | Introduction to non-linear analysis. |
| | 15. | Final Exam/Project/Presentation period |
| | 16. | Final Exam/Project/Presentation period |
| **Required/Recommended** | Required: None | |

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| **Readings** | Recommended:<br>• R.C. Hibbeler, Structural Analysis, Ninth Ed. In SI Units, Pearson, 2016<br>• K. Girgin, M. G Aksoylu, K. Darılmaz, Yapı Statiği Hiperstatik Sistemler, Birsen Yayınevi, 2015. |
| **Teaching Methods** | Lectures/contact hours using 'flipped classroom' as active learning technique. |
| **Homework and Projects** | Term Project |
| **Laboratory Work** | - |
| **Computer Use** | Students are encouraged to use a general purpose structural analysis software to verify their solutions to in-class assignments. |
| **Other Activities** | - |
| **Assessment Methods** | Flipped Classroom Practice/In-class activities: 5%<br>Quizzes: 20%<br>Midterm Exams: 60%<br>Term Project/Presentation: 15% |
| **Course Administration** | **Instructor's office**:<br>**Office hours:**<br>**E-mail address:** sekeron@mef.edu.tr<br>**Rules for attendance:** YÖK Regulations.<br>**Missing a midterm**: Provided that proper documents of excuse are presented, a make-up exam will be given in the end of semester for each missed midterm.<br>**Missing a final**: Faculty regulations.<br>**A reminder of proper classroom behavior, code of student conduct**: YÖK Regulations<br>**Statement on plagiarism**: YÖK Regulations. |

ECTS Student Workload Estimation

| Activity | No/Weeks | Hours | | | Calculation | Explanation |
|---|---|---|---|---|---|---|
| | No/Weeks per Semester (A) | Preparing for the Activity (B) | Spent in the Activity Itself (C) | Completing the Activity Requirements (D) | | |
| Lecture | 14 | 1 | 4 | 0 | 70 | A*(B+C+D) |
| Quizzes | 2 | 2 | 1 | 0 | 6 | |
| Midterms | 2 | 10 | 2 | 0 | 24 | A*(B+C+D) |
| Term Project | 1 | 5 | 10 | 0 | 15 | A*(B+C+D) |
| Presentation | 1 | 10 | 1 | 0 | 11 | A*(B+C+D) |
| Total Workload | | | | | 126 | |
| Total Workload/25 | | | | | 5.04 | |
| ECTS | | | | | **5** | |