**TED UNIVERSITY**

# CE 311
# Structural Analysis

**SYLLABUS/SPRING 2021**

# Course Information

| Required or Elective | ☑Required<br>☐Elective | Date Prepared | February 2021 |
|---|---|---|---|
| Semester | Spring 2021 | Class Hours and Class-rooms | Mon 12:00-12:50<br>Thu 16:00-17:50<br>Lectures will be held on regular time through Zoom platform. |
| Course Credit Hours/ ECTS credits | (3+0+0) 3 / 6 | Pre-requisite/ Co-requisite | CE214 & MATH210 |
| Level of Course | Junior | Language of In-struction | ☑ English<br>☐ Turkish |
| Instructors and their office hours | Assoc. Prof. Dr. Rıza Secer Orkun Keskin<br>E-mail: secer.keskin@tedu.edu.tr; Room: D313<br>Office Hour: Tue 12:00-13:00 (via Zoom)<br>Please get an appointment by e-mail to visit me in the office. | | |
| Teaching Assistant(s) | Neslihan Pınar Gödek<br>e-mail: npinar.godek@tedu.edu.tr | | |
| Textbook | Structural Analysis by A. Kassimali, 4th Edition, Cencage Learning, 2011 | | |
| Recommended Readings | 1) Structural Analysis by R.C. Hibbeler, 8th Edition, Prentice Hall, 2011.<br>2) Fundamentals of Structural Analysis by K.Leet, C.M.Uang, A.M.Gilbert, 4th Edition, McGraw-Hill, 2011<br>3) Matrix Structural Analysis by W.McGuire, R.H.Gallagher, R.D.Ziemian, 2nd Edition, Wiley, 1999<br>4)Matrix Analysis of Structures by A. Kassimali, 2nd Edition, Cencage Learning, 2012 | | |
| Course Web Pages | I already added all of you to the course web page on Moodle http://moodle.tedu.edu.tr.Please follow this course web page regularly to have access to the posted course materials and announcements. | | |

# Course Description

Introduction to structural analysis. Displacement methods: Slope deflection, moment distribution, special topics. Stiffness method, derivation of element stiffness matrices, assembly procedures. Computerized implementation of the stiffness method and use of instructional programs. Large scale structural analysis. Influence lines and moving loads.

# Course Objective

This is an introductory level course to analysis of statically determinate and indeterminate structures. Main objective of this course is to introduce the students the displacement and stiffness methods.

## Course Learning Outcomes

On successful completion of this course, students will be able to:

1. Compute internal forces and support reactions in statically determinate trusses, beams and frames (B4)
2. Examine deformations, unknown member and support forces in structures by the application of work and energy methods (B4)
3. Analyze statically indeterminate frame and truss structures by application of the force method (B4)
4. Analyze 2D frame structures by application of the slope-deflection equations (B4)
5. Analyze 2D truss and frame structures by application of the stiffness method (B4)
6. Analyze 2D frame structures by application of the moment distribution method (B4)
7. Develop influence lines for statically determinate and indeterminate structures (B3)
8. Implement the stiffness method in a programming language (B5)

## Course Assignments

A. *Quizzes (20%):* A number of quizzes will be given.
B. *Short-time assignments (20%):* A number of short-time assignments will be given.
C. *Term Project (10%):* A term project about developing a code for matrix structural analysis of trusses/frames will be given.
D. *Midterm exam (20%):* A face-to-face (or online) mid-term exam will be given.
E. *Final Exam (30%):* A cumulative face-to-face (or online) final exam will be given.

## Course Assessments & Learning Outcomes Matrix

| Assessment Methods | Course Learning Outcomes |
|---|---|
| Quizzes | #1, #2, #3 ,#4, #5, #6, #7 |
| Short-time assignments | #1, #2, #3 ,#4, #5, #6, #7 |
| Term Project | #8 |
| Mid-term Exam | #1, #2, #3 ,#4, #5 |
| Final Exam | #1, #2, #3 ,#4, #5, #6, #7 |

## Relationship to Program Outcomes

This course contributes to fulfillment of the following program outcomes:

ii. Apply knowledge of mathematics, science, and engineering to design and implement original, innovative and sustainable civil engineering systems or processes to meet desired needs within a greater societal context.

vi. Identify, formulate, and solve engineering problems.

xi. Employ state-of-the-art engineering techniques and computing tools necessary for creative engineering solutions.

## Tentative Course Outline

A tentative course outline for the lectures is given below. Any changes and updates will be announced on the Moodle web page for the course.

| Week | Topics |
|------|--------|
| 1 | • Introduction and structural determinacy/indeterminacy |
| 2 | • Internal force diagrams: axial, shear and moment diagrams for beams and frames |
| 3 | • Principle of work and energy: Virtual work and unit dummy load method for structures |
| 4 | • Analysis of statically indeterminate structures by force method: derivation of force method |
| 5 | • Analysis of statically indeterminate structures by force method: application of force method |
| 6 | • Analysis of structures by displacement method: application of slope-deflection equations |
| 7 | • Analysis of structures by displacement method: application of slope-deflection equations |
| 8 | • General stiffness method: introduction to stiffness method |
| 9 | • General stiffness method: development of element stiffness matrix for truss, beam, frame elements |
| 10 | • General stiffness method: development of element stiffness matrix for truss, beam, frame elements |
| 11 | • General stiffness method: analysis of 2D structures – from element to system level |
| 12 | • Analysis of structures by displacement method: introduction to moment distribution method |
| 13 | • Analysis of structures by displacement method: application of moment distribution method |
| 14 | • Influence lines for statically determinate and indeterminate structures |

# Course Policies and Some Remarks

### Attendance

**In order to be admitted to the final examination, a student must submit the given assignments and the term project, attend at least 80% of the quizzes and take the mid-term exam.** Students not fulfilling these conditions will not be permitted to take the final examination. Students not given the permission to take the final examination will automatically receive the grade FX at the end of the semester.

### Calculator Policy

You may use a calculator during exams.

### Make Up Exams

Make-up exams for midterm exams will NOT be offered. The only exceptions are illness or emergency (e.g., death in family, a traffic accident, etc.). In case of an illness or emergency you need to supply a documentation that supports your claim.

Also please read the document given in the link http://www.tedu.edu.tr/tr/main/yonetmelikler-ve-yonergeler

### Late Homework

For each day after the announced deadline, 25% of the total earned mark will be deducted.

### Plagiarism

Collaboration on non-collected homework and in studying is strongly encouraged; however, the work you hand in must be solely your own. Sharing written work before it is turned in to be graded is academic dishonesty. For more information on TEDU policy on intellectual integrity see the TEDU student handbook (https://student.tedu.edu.tr/en/student/principles-of-academic-integrity).

### Specialized Support and Students with Disabilities

Students who may require specialized support due to a disability affecting mobility, vision, hearing, learning, mental or physical health should consult with Specialized Support and Disability Coordinator, Asst. Prof. Emrah Keser E-mail: emrah.keser@tedu.edu.tr, or visit the website at https://www.tedu.edu.tr/tr/main/engelsiz-tedu

### Student Counseling Centre

The Student Counseling Centre is a service mandated with providing crisis intervention and supportive listening services to the campus community. A major part of fulfilling that mandate is raising awareness of our service so that students know they are never alone in dealing with problems. For further information and/or questions, you can contact Sıla Deniz Beyarslan, sdeniz.beyarslan@tedu.edu.tr, Office 165, or visit SCC website at http://csc.tedu.edu.tr

TED University Coronavirus Psychosocial Support Team was established in order to facilitate coping with the psychological, social, familial, academic, and professional difficulties that may arise due to adverse conditions associated with COVID-19 pandemic for TEDU students and employees. TEDU COPeS aims to provide psychosocial support for TED University students and employees during the coronavirus outbreak. To this end, the team aims to provide support at the early stages of a possible crisis, activate and strengthen your coping strategies, and provide information on support resources. For further information and/or questions, visit their website at https://copes.tedu.edu.tr