

# CIVL343: Introduction to Structural Mechanics

**Year and Semester** : 3, Fall  
**Credit Hour** : (4,1) 4  
**Pre/Co requisite(s)** : CIVL222 Strength of Materials  
**Course web page** : <http://civil.emu.edu.tr/civl343>

## Catalog Description:

Modeling of structures. Unsymmetrical bending. Shear center. Determinacy, indeterminacy and stability. Virtual work. Deformation and deflected shapes. Force method of analysis. Plastic behavior of structural members.

## Prerequisite by Topic:

This is the third course in a series of courses in Engineering Mechanics. Therefore the student is expected to have sound background of statics and strength of materials.

## Textbook:

1. A. Kassimali, Structural Analysis, 4<sup>th</sup> Edition, SI Edition, Cengage Learning, 2011.
2. R. C. Hibbeler, Mechanics of Materials, 7<sup>th</sup> Edition, Prentice Hall, 2008.

## References:

1. K. M. Leet and C. M. Uang, Fundamentals of Structural Analysis, 3<sup>rd</sup> Edition, McGraw Hill, 2008.
2. R. C. Hibbeler, Structural Analysis, 6<sup>th</sup> Edition, Prentice Hall, 2006.
3. H. H. West, Fundamentals of Structural Analysis, John Wiley & Sons, 1993.
4. F. Arbabi, Structural Analysis and Behavior, International Editions, McGraw Hill, 1991.
5. F. P. Beer and E. R. Johnston, Mechanics of Materials, 3<sup>rd</sup> Edition, McGraw Hill, 1992.

## Course Objectives:

- Knowledge about different structural elements and systems
- Determinacy, indeterminacy and stability of structures
- Drawing deflected shapes
- Calculation of deformations of continuous beams, frames and trusses using the virtual work method
- Analysis of indeterminate structures by using the force method
- Unsymmetric bending
- Locate shear center of thin-walled members
- Plastic behaviour

## Course Outcomes:

At the end of the course the students will be able to:

1. an ability to recognize structural systems
2. an ability to apply energy principles to analyze structures
3. an ability to analyze statically indeterminate structures
4. an ability to understand structural analysis softwares
5. an ability to recognize and analyze unsymmetrical bending problems
6. an ability to eliminate twist in thin walled members
7. knowledge about plastic deformation and behaviour

## Weekly Teaching Plan:

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|-----------------|--|
| <b>Week 1</b>   | <b>Modeling and classification of structures (5 Classes)</b><br>Course objectives, course description, structural elements and systems.  |
| <b>Week 2</b>   | <b>Determinacy, indeterminacy and stability of structures (5 Classes)</b><br>Stability and degree of indeterminacy will be investigated.   |
| <b>Week 3-5</b> | <b>Deflected shapes. Energy principles and the Virtual Work Method (15 Classes)</b><br>Deflected shapes and deformations of continuous beams, frames and trusses will be considered. |

- Week 6-7 Force method of analysis (10 Classes)**  
Indeterminate continuous beams, frames and trusses will be analyzed.
- Week 8 Mid-term Examination**
- Week 9 Force method of analysis (5 Classes)**  
Indeterminate continuous beams, frames and trusses will be analyzed.
- Week 10 Unsymmetric bending (5 Classes)**  
In some cases a member may be loaded such that the resultant internal moment does not act about one of the principal axes of the cross section.
- Week 11 Shear center (5 Classes)**  
Shear center for the thin-walled members will be considered.
- Week 12-13 Plastic behavior of structural members (10 Classes)**  
Collapse load of determinate and indeterminate structures, role in design.
- Week 14 Final Examination**

**Course Professional Component:**

Engineering Topics: 4 credits

**Computer Usage:**

Students are encouraged to use available analysis software and to check their hand calculations. Students can reach the teaching material such as homework, solved problems, past exam papers, exam results and etc. on the allocated web site.

**Teaching Techniques:**

Power point presentation and multimedia tools are used in classroom. After the discussion of the theory example problems from the real structures are solved using the outlined method in order to clarify its numerical application. Homework problems are given at the end of each chapter and arranged to cover the material. Tutorials are organized to answer the student's questions especially from the homework. Quizzes are also given. Therefore the students are expected to attend the class and study regularly. Students are also expected to make use of instructor's office hours.

**Laboratory/Studio Works:**

Not applicable in this course.

**Grading Policy:**

Quizzes	20%
Mid-term Exam	35%
Final Examination	45%

All examinations will be closed book/closed notes type based on lectures, assignments, tutorials, quizzes or other work.

**Midterm Exam:** The midterm exam will cover all of the material up to the date of examination.

**Quizzes:** There will be various quizzes held during the semester and some will be pop quizzes. **There will be no make-up for quizzes.**

**Final Exam:** The final exam will cover the whole course material.

**Make-up Exam:** A student who fails to sit for an examination (midterm or final) due to a valid reason is given a make-up exam. **Within three working days after the examination, students who wish to take a make-up must submit a written statement to the instructor that explains the reason(s) for his/her request.**

No separate (special) make-up exams are administered for mid-term or final exams. **Re-sit examination is administered as make-up examination,** instead only to those students missing only one exam (midterm or final).

The re-sit exam will cover the whole course material of the semester. **Students missing more than one exam will get NG grade.**

**Any objection to the grade should be made within a week following the announcement of the grade.**

**Attendance:** Students are required to attend at least 75% of all scheduled classes.

**NG Grade:** Students are required to attend at least 75% of all scheduled classes. Absence more than 25% of scheduled classes or failing to attend more than one exam or failing to attend quizzes may bring a **NG** grade. **This rule will be followed strictly.**

**Grading Criteria:**

Grade	Marks	Value
A	85-100	4.0
A-	80-84	3.7
B+	75-79	3.3
B	70-74	3.0
B-	66-69	2.7
C+	63-65	2.3
C	60-62	2.0
C-	57-59	1.7
D+	54-56	1.3
D	50-53	1.0
D-	45-49	0.7
F	0-44	0.0
NG		0.0

**Contribution of the course to program educational objectives and outcomes:**

The course helped achieve the following educational objectives:

- Produce graduates with contemporary engineering knowledge, environmental awareness, ethics and necessary technical and computer skills for a successful professional life,
- Produce graduates with advanced knowledge, skills and practical information that will equip them with the necessary tools either for work in industry or pursuing further studies in the areas of civil engineering.

**The course makes significant contributions to the following program outcomes:**

- an ability to identify, formulate, and solve engineering problems
- an ability to apply knowledge of mathematics, science, and engineering
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice