

Syllabus MAT305 – Fall 2024-2025

- **Lecturer**

Fevzi Ç. Cebeci

FENS 2069

Phone: 9877

fccebeci@sabanciuniv.edu

I prefer email communications!

- **Course Meeting Times.**

I will not record lectures or share specific lecture notes. I will only share lecture slides as pdf file.

2 Sessions/week;	Thursday;	R	1h	10:40 - 11.30	Classroom: FENS L062
	Friday;	F	2h	10:40 - 12.30	Classroom: FENS 2019

- **Office Hours**

I arranged four office hours per week. Office hours will be online over Zoom or physical in-office visits. I will set them on your demand, which will be appointment only.

Sessions 1;	Thursday; R	2h	11:40 - 13.30	Online or Physical
Sessions 2;	On demand	2h	Appointment only	Online or Physical

- **Course Objectives**

- To give an understanding of polymer chemistry, science and engineering; the relationship between monomer/polymer structure and properties; the rheology of polymers and their importance for processing.
- To provide the importance of molecular structure, molecular weight, crystallinity, molecular orientation, and crosslinking
- To describe polymers' elastic properties, obtain stress-strain characteristics from elasticity; to evaluate polymer behavior below and above T_g .
- Explain the importance of the viscoelastic behavior of polymers, temperature dependence, processing properties, and parameters to quantify viscoelasticity.
- To evaluate selection criteria of polymer properties in engineering use
- To estimate failure behaviors polymers; elastic/plastic yield and fracture, crazing.
- To develop strategies to reinforce plastics.

TAs Rokhsareh Bakhtiari
 Onur Zırhlı

- **Lecture, homework and exam calendar.**

Exam dates and homework due dates are marked with the matching color.

	R	F	Notes
Week #	1h Lecture	2h Lecture	
1	26.Sep	27.Sep	
2	3.Oct	4.Oct	
3	10.Oct	11.Oct	
4	17.Oct	18.Oct	Homework#1
5	24.Oct	25.Oct	Exam#1
6	31.Oct	1.Nov	
7	7.Nov	8.Nov	Homework#2
8	14.Nov	15.Nov	
9	21.Nov	22.Nov	
10	28.Nov	29.Nov	Homework#3
11	5.Dec	6.Dec	Exam#2
12	12.Dec	13.Dec	
13	19.Dec	20.Dec	Homework#4
14	26.Dec	27.Dec	
			Final Exam

- **Lectures;**

Week# Topics to be covered

- 1 Introduction, Overview of Polymeric Materials
- 2 Polymer Synthesis
- 3 Structure of the molecule
Tacticity, Molecular Weight
Crosslinking
- 4 Structure of the polymeric solids
Crystallinity, Glass Transition Temperature
Molecular Orientation
- 5 Chain Conformation
Gaussian Chain
- 6 Elastic properties of rubber
Mechanics of Elastomers
- 7 The elasticity of a network
Stress-Strain relationship, Engineering Rubbers
- 8 Viscoelasticity
Creep
- 9 Stress Relaxation
Dynamic Response/Properties
- 10 Theory of linear viscoelasticity
Maxwell Models
- 11 Zener Model
Relaxation and temperature dependence
- 12 Polymer Selection: Stiffness
Stress Analysis
- 13 Effect of Temperature
Yield and fracture
Yielding
- 14 Crazeing
Fracture mechanics
Fracture properties of polymers

- **Textbooks;**

- Principles of Polymer Engineering 2E, N. G. McCrum, C. P. Buckley, C. B. Bucknall
- Fundamentals of Polymer Engineering, Arie Ram
- G. Odian, Principles of Polymerization, Wiley-Interscience
- Ehrenstein, G.W., Theriault, R.P., Polymeric Materials: Structure, Properties, Applications, Hanser Publishing, Munich
- Sperling, L. H, New York, Introduction to Physical Polymer Science, John Wiley, New York
- Birley, A. W., Haworth, B. Batchelor, J., Munich, Physics of Plastics Processing, Properties and Materials Engineering, Hanser Publishing, Munich
- Billmeyer, F. W., New York, Textbook of Polymer Science, 3rd Edition, John Wiley, New York
- Mills, N. J, London, Plastics. Microstructure and Engineering Applications, Edward Arnold, London Crawford, R. J, Oxford, Plastics Engineering, Pergamon Press, Oxford

- **Grading**

There will be two midterm exams and one final exam. All your grades will come from the activities that I listed in the table below. I will include all your exams/assignments for your final grade. If you miss any assignments, there won't be an additional make-up assignment. If you have to take a make-up midterm exam, it will be on December 29. Attendance is essential and will contribute to your final grade.

Assignments will include two to four questions/tasks, and you will have one at least a week to return.

Activities	Percentages
2- Midterm exams	50 %
1- Final exams	25 %
4- Homework	20 %
Attendance	5 %

- **Attendance**

Students are expected to attend at least 36h (out of 42h) of the classes to get a grade of 5% for their final grade calculation. You will lose %1 for each missing two hours.

- **Appendix 1: Course Catalogue Information**

Polymer Engineering: Fundamentals Structure of macromolecules. Morphology and order in crystalline polymers. Rheology and the mechanical properties Melting, glass transition, properties involving large and small deformations. Elastic properties. Viscoelasticity. Yield and fracture.

Polimer Mühendisliği I: Makromoleküllerin yapısı. Kristal yapılı polimerlerin morfolojisi ve dizilimi. Polimerlerin mekanik özellikleri ve reolojisi. Polimerlerin erime ve camsı geçiş sıcaklıkları, büyük ve küçük yük altında değişimleri. Polimerlerin elastik özellikleri. Viskoelastik davranışları. Akma ve kırılma.

3.000 Credit hours

Levels: Undeclared, Doctorate, Masters, Exchange - Erasmus Mundus DR, Exchange - Erasmus Mundus MA, Exchange - Erasmus Mundus UG, Special, Scientific Preparatory, Undergraduate, Exchange - Socrates Erasmus DR, Exchange - Socrates Erasmus MA, Exchange - Socrates Erasmus UG

Faculty: Course Offered by FENS

Appendix 2: ACADEMIC INTEGRITY AT SABANCI UNIVERSITY

Investigation procedures for academic integrity violations:

Violations of academic integrity include cheating in classroom examinations, plagiarism in take-home examinations, homework assignments, essays, thesis and artistic work, fabrication and misrepresentation of facts and data, as well as assistance to others in commission of these acts, spontaneous or premeditated. These violations undermine values of fairness, honesty and trust in the academic environment and distort the process by which knowledge is shared and evaluated. The academic integrity investigation procedure is a fundamental component of our commitment to maintain a productive climate of learning and a vibrant academic life.

A student whose work or behavior is considered to have contravened the principles of academic integrity faces academic consequences. These are determined by the course instructor or the thesis supervisor in accordance with our academic norms. **The academic integrity policy for each course is appended to the syllabus and announced to the students at the beginning of the course.**

The disciplinary procedure outlined below is independent from the academic consequences of the violation.

1. The students, teaching assistants and proctors in a learning module or course must communicate any information and observation about academic integrity violations to the main instructor.
2. The main instructor personally reports all incidences with preponderance of evidence for violations of academic integrity, **without exceptions**, to the Dean or the Director's office. The report consists of a written statement of facts and evidence. The case is recorded. Please use the attached form.
3. If necessary, the Dean/Director interviews the parties involved and decides on whether to initiate further disciplinary investigation.
4. Further disciplinary investigation is carried out according to the regular procedures of the university.

The duty to report violations, highlighted in the above procedure, is inseparable from our responsibility to take action against wrongdoing, even in situations involving peer pressure, fear or compassion. The requirement that all cases be reported to the Dean/Director's office ensures fairness through a uniform application of rules across all cases. It also strongly signals our community's determination to defend the academic values of honesty and mutual trust.