Syllabus MAT305 – Fall 2023-2024

- Lecturer

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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;  
Tuesday;  
R 1h  
10:40 - 11.30  
Classroom: FENS L062

Thursday;  
F 2h  
12:40 - 14.30  
Classroom: FASS G050

- 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  
13:40 - 15.30  
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 Tg.
- 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  
Sezen Öztürk  
Amin Ranjbar Aghjehkohal
• Lecture, homework and exam calendar.

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

<table>
<thead>
<tr>
<th>Week #</th>
<th>R</th>
<th>F</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.Oct</td>
<td>6.Oct</td>
<td></td>
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<tr>
<td>4</td>
<td>26.Oct</td>
<td>27.Oct</td>
<td>Homework#1</td>
</tr>
<tr>
<td>5</td>
<td>2.Nov</td>
<td>3.Nov</td>
<td>Exam#1</td>
</tr>
<tr>
<td>7</td>
<td>16.Nov</td>
<td>17.Nov</td>
<td>Homework#2</td>
</tr>
<tr>
<td>9</td>
<td>30.Nov</td>
<td>1.Dec</td>
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</tr>
<tr>
<td>10</td>
<td>7.Dec</td>
<td>8.Dec</td>
<td>Homework#3</td>
</tr>
<tr>
<td>11</td>
<td>14.Dec</td>
<td>15.Dec</td>
<td>Exam#2</td>
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<tr>
<td>12</td>
<td>21.Dec</td>
<td>22.Dec</td>
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</tr>
<tr>
<td>13</td>
<td>28.Dec</td>
<td>29.Dec</td>
<td>Homework#4</td>
</tr>
<tr>
<td>14</td>
<td>4.Jan</td>
<td>5.Jan</td>
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• 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   Crazing
    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

• **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.

<table>
<thead>
<tr>
<th>Activities</th>
<th>Percentages</th>
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<tbody>
<tr>
<td>2- Midterm exams</td>
<td>50 %</td>
</tr>
<tr>
<td>1- Final exams</td>
<td>25 %</td>
</tr>
<tr>
<td>4- Homework</td>
<td>20 %</td>
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<tr>
<td>Attendance</td>
<td>5 %</td>
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</tbody>
</table>

• **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


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.