

ChE 352
MATHEMATICAL MODELING IN CHEMICAL ENGINEERING
Section 03
Spring 2014

Instructor & Assistant	Office	Phone	e-mail
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M 10.40 & 11.40 (Z-120) **Tr** 8.40 (Z-120)

Catalog Description

Mathematical model formulation of chemical and physical processes. Solutions of problems related to fluid flow, heat transfer, mass transfer and chemical reaction engineering.

Prerequisite: *MATH 219*.

Textbook

Rice, R.G. and Do, D.D. "*Applied Mathematics and Modeling for Chemical Engineers*", John Wiley & Sons Inc. 1995.

References

R.B. Bird, W.E. Stewart and E.N. Lightfoot, "*Transport Phenomena*" John Wiley, 2nd edition, 2002.

Ismail Tosun, "*Modelling in Transport Phenomena*", Elsevier, 2002.

Mickley, H.S., Sherwood, T.S. and Reed, C.E. "*Applied Mathematics in Chemical Engineering*", Mc Graw Hill, 1975.

Himmelblau, D.M. and Bischoff, K.B. "*Process Analysis and Simulation*" John Wiley & Sons, 1968.

Outline

- I. Introduction
 1. Modeling Philosophy
 2. Basic Concepts
 3. Fundamentals of Molecular Transport
- II. Mathematical Modeling of Physical Problems: Macroscopic Balances
- III. Mathematical Modeling of Physical Problems: Microscopic Balances
- IV. Solution Techniques of Chemical Engineering Problems Yielding ODEs
 1. First Order ODEs
 2. Second Order ODEs
 3. Series Solutions and Bessel Functions

- V. Solution Techniques of Chemical Engineering Problems Yielding PDEs
1. Separation of Variables
 2. Combination of Variables (Similarity Transformation)
 3. Functions of Definite Integrals, Error and Gamma Functions
 4. Numerical Solution of PDEs by Finite Difference Method

Policies and Procedures

- A web page has been constructed for this course. All course materials (syllabus, problem sets, exam solutions and grades, etc.) will be made available at

<http://www.metu.edu.tr/~yuludag/che352/>

You need to visit the site on a regular basis to get recent homework assignment and other relevant announcements.

- Attendance is mandatory. Below 80 % attendance will be considered as NA and waiving the final exam right regardless of other grades.
- Do not be late to the lectures.
- Time to time a problem set will be posted at the web page. You don't need to hand in their solutions. But you are strongly urged to solve the sets and get help from the instructor whenever you feel necessary as they will be instrumental in following and succeeding the course. Furthermore selected problem(s) from the sets will be asked in quizzes.

- Exams are scheduled as follows:

Midterm Exam # 1	March 24, 2014, Monday
Midterm Exam # 2	May 5, 2014, Monday
Final Exam	May 29, 2014, Thursday

- All tests will be open-book. It is your responsibility to understand the exam questions. If you have difficulty in English, you may use a dictionary during the exams.
- If you miss an exam with a certified medical excuse, you may take a makeup exam at a designated time near the end of the semester. Bear in mind that it will be **CHALLENGING!**
- A weighted average grade will be calculated as follows:

Midterm exams	50 % (25 % each)
Quiz	7 %
Term Project	8 %
Final exam	35 %

- To get an AA in this course, you must attempt and do satisfactory work on all homework problems and term project in addition to getting the necessary weighted average grade on tests.