

ANKARA UNIVERSITY
Department of Energy Engineering
ENE 205 – Material and Energy Balances

COURSE SYLLABUS

Instructor
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Assistant Professor of Energy Engineering
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Teaching Assistant
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Course Objectives

This course is an introductory stoichiometry course. The purpose of this course is to prepare you to formulate and solve material and energy balances on systems and thus, give you the principle problem solving strategies used in the courses: thermodynamics, fluid mechanics, heat and mass transfer. At the end of this course, you will be able to divide a process into its components, identify the unknown and known variables, do the degree of variables analysis and obtain the solution of the problem.

Classroom Hours

Mondays between 14.30-16:15 (BME-5)
Fridays between 08.40-10.30 (BME-5)

Office Hours

You are welcomed to come between 09:30-10:30 on Wednesdays. You can email me at any time.

Mrs. Ghobadi will held 1.5 hours tutorial on Wednesdays between 11:00-12:30 in Room Z-16.

Web site

You can follow the course content from the website: <https://acikders.ankara.edu.tr>. Your homeworks will be posted on this website as well.

Textbook

Richard M. Felder, Ronald W. Rousseau, Elementary Principles of Chemical Processes

Supplementary Reference

David M. Himmelblau, James B. Riggs, Basic Principles And Calculations In Chemical Engineering

Exams

Two midterm exams will be given on the following dates:

Midterm Exam # 1: November 6, 2017.

Midterm Exam # 2: December 18, 2017.

Please don't expect these dates to change. If you miss an exam with a certified medical excuse, you may take a make-up exam (after the exam but it will be CHALLENGING. All exams will be open-book. Bring your textbook, calculator, graph papers (both the cartesian and the logarithmic graph papers) and ruler to all exams. If you have difficulty with English, you may also bring a dictionary with you for the exam.

Grading

A weighted average grade will be calculated as follows:

Midterm exams: 40% (20% each)

Homeworks and Quizzes: 10%

Final exam: 50%

Classroom rules

Always bring your textbook and calculator to the class.

Be prepared for pop quizzes or scheduled quizzes.

Do not arrive late to the class.

Turn off your mobile phones, do not use it during the class even in case of finding a relevant information.

You are required to attend at least 70% of the total lecture hours.

Homeworks

You are encouraged to work on the homework assignments with your classmates but you should submit your homeworks independently. You should not copy solutions from a classmate. Presenting someone else's work as your own is plagiarism (or cheating) and will be dealt accordingly.

For your homeworks:

- Use an A4 size paper.
- Use a pencil. Do not use a pen.
- Use one side of each page.
- Add page number on the top of each page.
- Start each problem on a new page.
- Clearly indicate the your answer by drawing a box around it.
- Use the standard abbreviations.
- Do not forget to indicate the units of the values. You will lose points if your answer doesn't have a unit.
- Provide a neat sketching on the graphs, use a ruler if necessary.
- Provide a neat sketching for the flowcharts, use a ruler if necessary.
- HOMEWORKS should be submitted to Mrs. Ghobadi in the beginning of the course on Fridays. Late homework may be accepted up to ONE WEEK – You will lose 40% of the total points. You are granted this privilege only 3 times.

At the first page, please indicate your information as follows:

ENE 205	Name	HW1	29/9/2017
Problem 1			
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COURSE CONTENT

Introduction to Engineering Calculations

Units and Dimensions, Conversion of Units, Systems of Units

Force and Weight, Numerical Calculation (Scientific Notation, Significant Figures and Precision)

Dimensional Homogeneity and Dimensionless Quantities

Process Data Representation and Analysis (calibration, interpolation-two point linear interpolation, and extrapolation)

Processes and Process Variables

Mass and Volume, Flow rate

Chemical composition (atomic weight, molecular weight, mol, mass and mole fractions, average molecular weight)

Concentration, parts per million (ppm), parts per billion (ppb)

Pressure (fluid and hydrostatic pressure), Temperature

Fundamentals of Material Balances

Process Classification, Balances (The General Balance Equation, Balances on continuous steady-state processes, Integral balances on batch processes)

Material Balance Calculations (Flowcharts, Balancing a process)

Balances on Multiple-Unit Processes, Recycle and Bypass

Chemical Reaction Stoichiometry (Stoichiometry, Limiting and excess reactants, etc.)

Balances on Reactive Processes (Molecular and atomic species balances, product separation and recycle, purging),

Combustion Reactions

Energy and Energy Balances

Forms of energy, the first law of thermodynamics, Energy balances on closed systems,

Energy balance on open systems at steady state

Tables of thermodynamic data, Mechanical energy balances

Balances on Nonreactive Processes

Elements of energy balance calculations, Procedure for energy balance calculations

Balances on Reactive Processes

Heat of reaction (measurement and calculation: Hess's law), Formation reactions and heat of formation, Heat of combustion, Energy balances on reactive processes, Fuels and combustion.