ChE 462 – Chemical Plant Design and Economics
Spring 2019-2020

Course information:

Instructor: Dr. Ahmet K. Avcı, Professor of Chemical Engineering
Office hour: whenever available. avciahme@boun.edu.tr
Teaching assistants:
- Cihat Öztepe. Office: KB411, Office hours: T2 W1, e-mail: cihatoztepe@gmail.com
- Elif Esvap. Office: KB 440, Office hours: M3 W6, e-mail: elifesvap@gmail.com
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- Hasan Köybaşı. Office: KB404, Office hours: T1 F5 , e-mail: h.hasankoybasi@hotmail.com

Textbook:
- Peters, M. S., Timmerhaus, K. D., West, R. E., *Plant Design and Economics for Chemical Engineers*, 5th Ed., McGraw-Hill, 2003.

Supplementary reading & useful materials (*Later editions of the texts below can be used*):
- Sinnott, R.K., Towler, G., *Chemical Engineering Design*, 5th ed., Butterworth-Heinemann, 2009.
- Turton, R., Bailie, R.C., Whiting, W.B., Shaeiwitz, J.A., *Analysis, Synthesis and Design of Chemical Processes*, 3rd Ed., Prentice Hall, 2009.
- Kirk-Othmer Encyclopedia of Chemical Technology – Electronic version available online at Bogazici University Library Website (http://www.library.boun.edu.tr/referans_kaynaklar.php)
- Smith, R., *Chemical process design and integration*, Wiley, 2005.
- Green, D.W., Perry, R.H., *Perry's Chemical Engineers' Handbook*, 8th Ed., McGraw-Hill, 2008.

Lecture hours: TT 78 at KB 433, ThTh 34 at KB 433 (2h + 2h: 4h per week)
Number of credits: 3
Prerequisite courses: ChE 334, ChE 342
Course content: Engineering Design 100%
Computer use: 100% (ChemCad™ Process Simulator, other auxiliary software)

Course objectives:

- Introduce fundamentals of engineering investments and economics.
- Integrate flowsheet synthesis and process equipment design concepts with the principles of engineering and process economics.
- Introduce methods to quantify concepts such as fixed capital investment, cash-flow analysis, profitability analysis and decision making.
- Practice these in the context of a term-project that will cover design and economic evaluation of a process to produce that chemical.
- Strengthen the Computer Aided Process Design skills through ChemCad Process Simulator.

Prerequisites by Topic:

- Characterization, selection and design of chemical process units
- Chemical reaction kinetics and reactor design
- Fundamentals of fluid flow, heat and mass transfer operations

Course contents:

- Separation processes
- Introduction to economic evaluations
- Cost structures of chemical plants and fundamental concepts of engineering economics
- Determination of base-case conditions for design
- Prediction of fixed capital investment
- Design of pressure vessels
- Health, safety and environmental regulations in chemical process industries
- The concept of depreciation, its estimation and integration into the cash flows
- Prediction of working capital investment and total cost of manufacturing
- Concepts of investment, interest and time value of money
- Profitability analysis
- Analysis of alternative investments and replacements
- Effects of inflation and other uncertainties on the economics of a project
- Principles of site selection for chemical plants

Evaluation & grading policy:

Midterm Exam	**15%**	**April 28, 2020**. Room: KB 433 / Open book (on limited basis)
Project Quiz 1	**5%**	**March 17, 2020**. Room: KB 433 / Closed book
Project Quiz 2	**8%**	**May 14, 2020.** Room: KB 433 / Closed book
Final Exam	**25%**	**Date & room TBA** / Open book (on limited basis)
Project	**47%**	Build-up and design a process to meet the production goals that will be announced during the course.
		Detailed literature survey, computer-based calculations for technical execution and economic evaluation of the proposed process. Creative team (group) work to be demonstrated by progress reports and short presentations (see below). Groups will involve 5 students.
TOTAL	**100 %**	
Project Breakdown		
Progress report	**11%**	Submission date: **March 24, 2020, 12:00 sharp.**
Progress presentation	**6%**	**April 3, 2020**. Max. 9 min/group for presentation.
Final report	**21%**	Submission date: **May 18, 2020, 12:00 sharp.**
Final presentation	**9%**	**June 5, 2020**. Max. 11 min/group for presentation

Other information:

- Project submission is a definitive must for passing this course. No matter of the midterm and final exam grades, the student/group will get a direct F in case he/she/group does not submit the final project. No excuses will be accepted for a missing final project report. *Declaration of Independent Work* should be signed by all group members before submission; otherwise reports will not be accepted.
- Attendance to Project Quiz Exams is a must. No make-up will be given.
- The use of original copy of the textbook is a must. Original copies can be (1) purchased from the bookstore, (2) borrowed from the library or from previous classes. Partial or complete photocopies of the textbook are strictly prohibited, such copies will not be allowed for use in open-book exams.
- Course notes will not be allowed for use in open-book exams.
- Licensed and latest versions of ChemCad™ software will be available during the course. Using illegal copies of ChemCad™ will lead to a direct F, no matter what the grades are.
- Presentations will be done by all of the group members. At the end of the presentations, each member will be asked several questions about the project study. You can contact your TAs about licensing and installation of ChemCad™.
- Assistance about your projects will be given only during the office hours specified in this document. No assistance will be provided by e-mail, phone, etc. The purpose of such a regulation is to sharpen your time management skills and encourage the execution of your project in a well-organized style. This will be one of the most important contributions of this course to your future (industrial or academic) career.

- **Academic Honesty:**
  - *Students are bounded by academic honesty. Cheating is a violation of academic honesty. The result is failing.*
- **Attendance policy:**
  - A minimum of 50% attendance is required. If the attendance is less than 50%, the letter grade will be reduced by one level, for example from BA to BB, from CC to DC and from DD to F (no E!).
- **Eligibility for attending the final exam:** Final Exam will not be given to the students who fail meeting in any of the two criteria below:
  1. Attendance > 50%
  2. Midterm exam grade > 20/100
  3. Personal grade from the progress report > 25/100
  4. Personal grade from Presentation 1 > 25/100

  In case of missing the Final Exam, the letter grade will be assigned as F and no make-up exam will be given.
- **Reports:** Late submission policy (unless otherwise specified)
  - Target: Submission date before 12:00 sharp.
  - Same day, submission btw 12:01 – 13:59: 10 pts. OFF (out of 100)
  - Same day, submission btw 14:00 – 17:30: 15 pts. OFF (out of 100)
  - Same day Submission after 17:30 and following days: Reports will not be accepted.
- **Average grading periods:**
  - Exams: 2-3 weeks; Reports: 2-3 weeks; Presentations: 1 week
- **Other:**
  - Please be in the class on time! Do not disturb the class if you see the doors closed.
  - Do not play with laptops, smartphones, tablets, etc. during the lecture hours.
  - Cell phones MUST be switched off during the lectures and in the exams. Any opposing attempts will be penalized (lectures – will be asked to leave the class; exams – will be treated as an attempt to cheating)