

1. Course Description

COURSE DESCRIPTION FORM	
Course Code and Title	CHE451 CHEMICAL ENGINEERING DESIGN I
Course Semester	7
Catalog Description (Content) of the Course	Design of equipment used in chemical industry and determination of optimum operating conditions. Various pipeline, storage tank, heat exchanger, separation process and reactor design project. Cost analysis. Computer-aided design applications.
Main Textbook	Peters M.S, Timmerhaus K.D., West, R.E. "Plant Design and Economics For Chemical Engineers", Fifth ed., McGraw-Hill, New York (2003).
Supporting Textbooks	<ul style="list-style-type: none"> • Turton, R., Bailie, R.C., Whiting, W.B., Shaeiwitz, J.A., Bhattacharyya D., "Analysis Synthesis and Design of Chemical Processes", 4thEdt., Prentice Hall, New Jersey, 2013. • Seider.W.D., Seader, J.D., Lewin, D.R., Widago, S., "Product and Process Design Principles", 3rd ed., Wiley, New York, 2010. • J.M. Coulson, J.F. Richardson and R.K. Sinnott, Chemical Engineering Volume & Design, 4th ed., Butterworth-Heinemann, Oxford, 2005. • D.F. Rudd and C.C. Watson, Strategy of Process Engineering, John Wiley and Sons. Inc., New York, 1968 • Douglas, J. M., "Conceptual Design for Chemical Processes", McGraw-Hill, New York, 1988. • J.R. Backhurst and J.H. Harker, Process Plant Design, Heinemann Educational Books Ltd., London, 1983. • Perry, R.H., Green,D.W., "Perry's Chemical Engineers' Handbook," Seventh ed., McGraw-Hill, New York, 1998. • Biegler, L.T., Grossmann, I.E., Westerbeg, A.W., "Systematic Methods of Chemical Process Design", Prentice Hall, New Jersey (1997). • Smith, R., "Chemical Process Design and Integration", Wiley (2005). • Sinnott, Rk.K., "An Introduction to Chemical Engineering Design", Pergamon Press, Oxford (1983). • Backhurst, C.R., Marker J.H., "Process Plant Design", Heinmann, London (1973). • Douglas, J.M., "Conceptual Design of Chemical Processes", McGraw-Hill, New York (1988). • Ulrich, G.D., "A Guide to Chemical Engineering Process Design and Economics", John Wiley, New York (1984). • Resnick, W., "Process Analysis and Design for Chemical Engineers", McGraw-Hill, New York (1981). • Rudd, D.F., Powers, G.J., Siirola, J.J., "Process Synthesis", PrenticeHall, New Jersey (1973). • Mecklenburgh, J.C., "Plant Layout", Leonard Hill Books, Guildford (1973). • Vilbrandt, F.C., Dryden, C.E., "Chemical Engineering Plant Design", 4th Ed., McGraw-Hill, New York (1959). • Wells, G.L., Rose, L.M., "The Art of the Chemical Process Design", Elsevier Science Pub., Amsterdam (1986). • Edgar, T.F., Himmelblau, D.M., "Optimization of Chemical Processes", McGraw-Hill, (2001). • Speight, J., " Chemical Process and Design Handbook", 1st Ed., McGraw-Hill, (2002).
Course Credit (ECTS)	7
Prerequisites of the Course (Compulsory attendance should be indicated here.)	KM 321 Heat Transfer, KM 302 Mass Transfer, KM 341 Chemical Reaction Engineering, KM 378 Engineering Economics

Type of the Course	Compulsory		
Instruction Language of the Course	English		
Object and Target of the Course	Understanding the general philosophy to be followed in the design of basic equipments of chemical processes, learning optimization techniques, making cost calculations for basic equipments, to make detailed design and to find optimum parameters of at least a pipe line, a heat exchanger, a distillation column and a reactor. To provide experience in team work.		
Learning Outcomes of the Course	<p>General philosophy and approach to be followed in the design of basic equipment of chemical processes.</p> <p>Making the synthesis of the learned professional concepts and applying to design studies.</p> <p>Formulation of design problems, determination of solution methods and application.</p> <p>Assessment of alternative options.</p> <p>Detailed design of main equipment, determination of optimum design parameters and making cost calculations.</p> <p>Raising awareness of environmental, safety and similar concepts in design.</p> <p>Engineering ethics concept and awareness.</p> <p>Creativity improvement. Development of professional self-confidence.</p> <p>Team work skills.</p> <p>Improvement of written and oral communication skills.</p>		
Mode of Delivery	Project studies		
Weekly Schedule of the Course	Week	Subject	
	1	Design philosophy and strategy.	
	2	System structure; Information flow structure; Design variable selection algorithm.	
	3	Cost calculations and economic design criteria.	
	4	Pipe line design	
	5	Pipe line design	
	6	Heat exchanger design	
	7	Heat exchanger design	
	8	Reactor design,	
	9	Reactor design	
	10	Reactor design	
	11	Separation unit design	
	12	Separation unit design	
	13	Separation unit design	
	14	Separation unit design	
Educative Activities (Credit will be determined based on the time given for these activities. Should be filled carefully.)	<p>Theoretical Study Hours of Course Per Week</p> <p>Practising Hours of Course Per Week</p> <p>Searching in Internet and Library</p> <p>Designing and Applying Materials</p> <p>Preparing Reports</p> <p>Preparing Presentation</p> <p>Presentation</p> <p>Mid-Term and Studying for Mid-Term</p> <p>Final and Studying for Final</p>		
Assessment Criteria		Quantity	Total Contribution (%)
	Midterm	3	30
	Homework	0	0
	Assignment	0	0

	Projects	4	40						
	Practice	0	0						
	Quiz	0	0						
	Contribution of In-term Studies to Overall Grade		70						
	Contribution of Final Examination to Overall Grade		30						
	Attendance								
Workload of the Course	Activity	Total Week Count	Weekly Duration (in hour)	Total Workload in Semester					
	Theoretical Study Hours of Course Per Week	14	3	42					
	Practicing Hours of Course Per Week	14	2	28					
	Reading	14	1	14					
	Searching in Internet and Library	14	1	14					
	Designing and Applying Materials	14	1	14					
	Preparing Reports	4	3	12					
	Preparing Presentation	4	3	12					
	Presentation	4	3	12					
	Mid-Term and Studying for Mid-Term	3	3	9					
	Final and Studying for Final	1	6	6					
	Other	0	0	0					
	Total work load			163					
	Total work load/25			6,52					
	ECTS of the course			7					
Course's Contribution To Program	No	Program Learning Outcomes			1	2	3	4	5
	1	Adequate knowledge in mathematics, science and engineering subjects pertaining to the relevant discipline; ability to use theoretical and applied information in these areas to model and solve engineering problems.						x	
	2	Ability to identify, formulate, and solve complex engineering problems; ability to select and apply proper analysis and modeling methods for this purpose.					x		
	3	Ability to design a complex system, process, device or product under realistic constraints and conditions, in such a way as to meet the desired result; ability to apply modern design methods for this purpose.							x
	4	Ability to devise, select, and use modern techniques and tools needed for engineering practice; ability to employ information technologies effectively.							x
	5	Ability to design and conduct			x				

		experiments, gather data, analyze and interpret results for investigating engineering problems.					
	6	Ability to work efficiently in intra-disciplinary teams.			x		
	7	Ability to work efficiently in multi-disciplinary teams;	x				
	8	Ability to work individually.			x		
	9	Ability to communicate effectively in Turkish/English, both orally and in writing; Ability to write effective reports and comprehend written reports, make effective presentations,					x
	10	prepare design and production reports, give and receive clear and intelligible instructions.					x
	11	Recognition of the need for lifelong learning; ability to access information, to follow developments in science and technology, and to continue to educate him/herself.			x		
	12	Awareness of professional and ethical responsibility.				x	
	13	Information about business life practices such as project management, risk management, and change management.					x
	14	Information about awareness of entrepreneurship, innovation, and sustainable development.			x		
	15	Knowledge about contemporary issues and the global and societal effects of engineering practices on health, environment, and safety.			x		
	16	Knowledge about awareness of the legal consequences of engineering solutions.				x	
	17	Knowledge on standards used in engineering practice.			x		
Name of Lecturer(s) and Contact Information		1. Prof.Dr. İrfan AR irfanar@gazi.edu.tr 2. Prof.Dr. Suna BALCI sbalci@gazi.edu.tr 3. Prof.Dr. N. Alper TAPAN atapan@gazi.edu.tr 4. Prof.Dr. Sena YAŞYERLİ syasyerli@gazi.edu.tr					