1. Course Description

COURSE DESCRIPTION FORM	
Course Code and Title	CHE452 CHEMICAL ENGINEERING DESIGN II
Course Semester	7
Catalog Description (Content) of the Course	Complete design of a selected chemical process. Flow chart selection, examination and preparation. Investigation of the process from flexibility, safety, operatibility, controlibility and environmental effects points of views. Mass and energy balances. Selection and design of equipments. Detailed economical analyses of processes.
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	• Turton, R., Bailie, R.C., Whiting, W.B., Shaeiwitz, J.A., Bhattacharyya D., "Analysis Synthesis and Design of Chemical Processes", 4th Edt., 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., Grosmann, I.E., Westerbeg, A.W., "Systematic Methods of Chemical Process Design", Prentice Hall, NewJersey (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, NewYork (1981). • Rudd, D.F., Powers, G.J., Siirola, J.J., "Process Synthesis", PrenticeHall, NewJersey (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, NewYork (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

<table>
<tr><td>Prerequisites of the Course (Compulsory attendance should be indicated here.)</td><td>KM 451 Chemical Engineering Design I</td></tr>
<tr><td>Type of the Course</td><td>Compulsory</td></tr>
<tr><td>Instruction Language of the Course</td><td>English</td></tr>
<tr><td>Object and Target of the Course</td><td>To learn and to investigate the philosophy of constructing flow diagrams of chemical processes, to make the preliminary design of a complete process, to realize the importance of ethic and environmental values, to make cost analysis and pricing of products.</td></tr>
<tr><td>Learning Outcomes of the Course</td><td>Making the synthesis of the professional basic concepts and application to design studies.
General philosophy and approach to be followed in the process design.
Formulation of design problems, determination of solution methods and application.
Flowsheet development of chemical processes, extensive examination of flowsheets and implemention, assessment of alternative options.
Detailed design of a process and the detailed economic analysis of the process designed.
Raising awareness of environmental, safety, flexibility, controllability, sustainability and similar concepts in design.
Engineering ethics concept and awareness.
Creativity improvement. Development of professional self-confidence.
Team work skills.
Speculative design vision for open-ended problems.</td></tr>
<tr><td>Mode of Delivery</td><td>Project studies</td></tr>
<tr><td>Weekly Schedule of the Course</td><td>
<table>
<tr><th>Week</th><th>Subject</th></tr>
<tr><td>1</td><td>Feasibility survey and the search for physicochemical properties.</td></tr>
<tr><td>2</td><td>Capacity and cite location identification, search of flow diagrams.</td></tr>
<tr><td>3</td><td>Evaluation of production alternatives, development of the flowsheet.</td></tr>
<tr><td>4</td><td>Mass and energy balance calculations.</td></tr>
<tr><td>5-10</td><td>Optimum design of process equipments</td></tr>
<tr><td>11</td><td>Updating mass and energy balances.</td></tr>
<tr><td>12</td><td>Plant layout.</td></tr>
<tr><td>13</td><td>Evaluation of process with respect to flexibility, safety, operability, controllability, optimal energy usege and environmental impact assessment.</td></tr>
<tr><td>14</td><td>Cost analysis. Profitability analysis.</td></tr>
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<tr><td>Educative Activities
(Credit will be determined based on the time given for these activities. Should be filled carefully.)</td><td>Theoretical Study Hours of Course Per Week
Practising Hours of Course Per Week
Reading
Searching in Internet and Library
Designing and Applying Materials
Preparing Reports
Preparing Presentation
Presentation
Mid-Term and Studying for Mid-Term
Final and Studying for Final</td></tr>
<tr><td>Assessment Criteria</td><td>
<table>
<tr><th></th><th>Quantity</th><th>Total Contribution (%)</th></tr>
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Midterm	2	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	2	28
Searching in Internet and Library	14	2	28
Designing and Applying Materials	14	2	28
Preparing Reports	4	2	8
Preparing Presentation	4	2	8
Presentation	4	2	8
Mid-Term and Studying for Mid-Term	5	1	5
Final and Studying for Final	1	2	2
Other	0	0	0
Total work load			185
Total work load/25			7,4
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					x

		engineering practice; ability to employ information technologies effectively.					
	5	Ability to design and conduct experiments, gather data, analyze and interpret results for investigating engineering problems.	x				
	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.			xs		
Name of Lecturer(s) and Contact Inıformation		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					