

1. Course Description

COURSE DESCRIPTION FORM	
Course Code and Title	CHE484 BIOCHEMICAL REACTION ENGINEERING
Course Semester	8
Catalog Description (Content) of the Course	Definitions of Biotechnology and Biochemical engineering .Cell structure and components .Enzyme kinetics. Enzyme immobilization techniques and kinetics. Cellcultures. Growth kinetics and fermentor design. Mass transfer effects in bioprocess systems.
Main Textbook	• J.M.Lee"Biochemical Engineering ",Prentice Hall, New Jersey, 1992
Supporting Textbooks	• M.L. Shuler, F.Kargı ‘‘ Bioprocess Engineering , Basic Concepts 2nd’’Prentice Hall 2002 • J.E.Bailey, F.Ollis "Biochemical Engineering Fundamentals"McGraw Hill,1986 • A.H. Schragg , "Biotechnology for Engineers",John Wiley and Sons 1982. • Türker, M., Biyoreaksiyon Mühendisliği, Su yayınları, 2005
Course Credit (ECTS)	4
Prerequisites of the Course (Compulsory attendance should be indicated here.)	There is no prerequisite or co-requisite for this course.
Type of the Course	Elective
Instruction Language of the Course	English
Object and Target of the Course	To teach the basic principles of biotechnology and biochemical reaction engineering. To inform the students about bioprocesses. To introduce the studentst to the fundamentals of enzymatic reactions and microbial growth. To teach the important parameters and the used bioreactors for enzymatic and microbial production.
Learning Outcomes of the Course	1.To gain adequate knowledge in mathematics, science and engineering 2. To gain the ability in biochemical engineering field to identify, formulate, and solve complex engineering problems; and to select and to apply proper analysis and modeling methods for this purpose. 3. To gain ability in biochemical engineering field 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.
Mode of Delivery	Face to face
Weekly Schedule of the Course	Definition, content, development and importance of 1. Week biotechnology and biochemical engineering. 2. Week The cell structure , cell components, carbohydrates ,lipids,fats 3. Week Amino acids, proteins, nucleic acids 4. Week Models to define enzyme kinetics and estimation of Miche-Menten kinetics parameters 5. Week Enzyme inhibition

	6. Week Immobilization methods of enzyme and immobilized enzyme kinetics 7. Week Immobilization methods of enzyme and immobilized enzyme kinetics 8. Week Cell cultures and preparation of cell growth media 9. Week Cell growth kinetics 10. Week Batch fermentors 11. Week Continuous fermentors 12. Week Multiple fermentors and recycled fermentors 13. Week Multiple fermentors and recycled fermentors 14. Week Mass transfer effects in bioprocess systems			
Educative Activities <i>(Credit will be determined based on the time given for these activities. Should be filled carefully.)</i>	Theoretical Study Hours of Course Per Week Reading Searching in Internet and Library Preparing Reports Preparing Presentation Presentation Mid-Term and Studying for Mid-Term Final and Studying for Final			
Assessment Criteria		Quantity	Total Contribution (%)	
	Midterm	2	35	
	Homework	2	10	
	Assignment			
	Projects	1	15	
	Practice			
	Quiz			
	Contribution of In-term Studies to Overall Grade		60	
	Contribution of Final Examination to Overall Grade		40	
	Attendance		70	
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			
	Reading	4	1	4
	Searching in Internet and Library	1	4	4
	Designing and Applying Materials			
	Preparing Reports	2	4	8
	Preparing Presentation			

	Presentation							
	Mid-Term and Studying for Mid-Term		2	10	20			
	Final and Studying for Final		1	10	10			
	Other							
	Total work load				88			
	Total work load/25				3,52			
	ECTS of the course				4			
Course's Contribution To Program	Number	Program 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 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.	x				
Name of Lecturer(s) and Contact Information		1. Prof.Dr. Nurdan Saraçoğlu nsarac@gazi.edu.tr					