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MUNZUR UNIVERSITY
INSTITUTE OF SCIENCE
COURSE INTRODUCTION FORM

Course Code and Name: BT5001- BASIC PRINCIPLES OF BIOTECHNOLOGICAL PROCESSES				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	3	0	3	3	10	Turkish	Elective

Prerequisites	-	
Instructor		**Email :** **Web :**
Course Assistant		**Email :** **Web :**
Groups Classes		
Purpose of the Course	The aim of this course is to enable students to understand biocatalysts, the properties of biochemical reactions, the kinetic basis of biotransformations, and to perform mass and heat transfer calculations by examining bioprocesses from an engineering perspective .	
Course Objectives	•	
Course Learning Outcomes and Competencies	• To understand the concept of biocatalysts and the importance of controlling cellular activities in biochemical reactions. • Ability to understand biotransformations and bioprocess kinetics. • To understand the basic features of operation modes. • Ability to make calculations regarding the concepts of efficiency and productivity in biotransformations. • To understand the properties of biological materials • Ability to understand bioprocess systems in all their stages. • Ability to select the appropriate mode of operation for a given biotransformation. • To understand transport events in bioprocesses.	
Basic and Auxiliary Resources of the Course	• Bailey, JE, Ollis, DF, "Biochemical Engineering Fundamentals", McGraw Hill, (1986). • Shuler, ML, Kargi, F., Bioprocess Engineering (Basic Concepts), Prebtice-Hall, Inc., 1992, 479 pages. • Atkinson, B. And Mavituna, F., 1983, Biochemical Engineering and Biotechnology Handbbok, • The Nature Press, North Yorkshire, England. Fogler, HS, 1999, "Elements of Chemical Reaction Engineering", • Prentice Hall International, Inc. Palmer,T., 2001, • "Enzymes Biochemistry, Biotechnology, Clinical Chemistry", Horwood Series in Chemical Science, Bodmin, England.	
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Method of Teaching the Course	

Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	1. Midterm Exam	X	**50**
	2. Midterm Exam		
	3. Midterm Exam		
	4. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	Subjects
1	Definition and historical development of bioprocesses, characteristics of biotechnological processes, applications in various sectors, advantages of biochemical processes over chemical processes.
2	Properties of biological materials Sugars and polysaccharides Lipids, fats and steroids Proteins and amino acids Nucleic acids, RNA and DNA
3	Microscopic Living Organisms General characteristics of microorganisms Chemical Structures Reproduction of microorganisms Effects of Environmental Changes
4	Control and direction of cellular activities Cell Metabolism Metabolic Control Mechanisms
5	Biotransformations and bioprocess kinetics Yield Enzymatic Transformations Microbial Transformations
6	Biotransformations and bioprocess kinetics Operation Types Batch Processes Continuous Processes Batch-Fed Processes Semi-Continuous Processes
7	Biotransformations and bioprocess kinetics Use of Plant and Animal Cells as Catalysts Immobilized Biocatalysts Enzyme Immobilization Immobilized Microorganisms
8	Midterm Exam
9	Transport phenomena in bioprocesses Oxygen demand Diffusion resistances Operating variables affecting mass transfer Gas bubbles Surfactants Oxygen solubility Oxygen partial pressure Liquid rheology

10	Transport phenomena in bioprocesses Rheology in bioprocesses Aeration and mixing of bioreactors Aeration Mixing Design variables affecting mass transfer Air diffuser Mixer
11	Transport phenomena in bioprocesses Power transferred to the liquid Effect of reactor geometry and liquid volume Relationship of oxygen transfer coefficient with design variables
12	Transport events in bioprocesses Experimental determination of oxygen transfer coefficient Measurement of dissolved oxygen concentration in liquid phase Use of measured CL value in kLa calculations
13	Experimental determination of kLa Indirect methods Direct methods Biological effects of mixing and aeration
14	Heat transfer and sterilization in bioreactors Heat transfer Sterilization of bioreactors Batch sterilization Continuous sterilization

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Course Code and Name: BT5002- SCIENTIFIC RESEARCH AND PUBLICATION ETHICS IN BIOTECHNOLOGY				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	2	0	2	2	6	Turkish	Elective

Prerequisites	-	
Instructor		**Email :** **Web :**
Course Assistant		**Email :** **Web :**
Groups Classes		
Purpose of the Course	The aim of the course is to introduce ethical and scientific research methods, to evaluate scientific ethical values with all their components, especially individual, social and legal aspects, and to discuss them in terms of bioethics and biotechnology.	
Course Objectives		
Course Learning Outcomes and Competencies	• To understand ethical rules in scientific research. • Ability to identify behaviors that violate scientific ethics • To be able to obtain information about the legislation related to scientific ethics • Ability to understand bioethical rules in biotechnology	
Basic and Auxiliary Resources of the Course	• Baskent University: Regulations concerning ethical committee on animal experiments, 2003, Baskent University Press. • This is Biology - The Science of the Living World. Ernst Mayr, TUBITAK, ISBN 978-975-403-481-3, 2008. • Engineering Ethics: An Industrial perspective (Hardcover) by Gail Dawn Baura, 2006, Elsevier Inc. • NanoEthics, Springer Netherlands, ISSN 1871-4757 (Print) 1871-4765 (Online). • Practical Ethics, Singer, P., Cambridge University Press, (1993).	
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Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	1. Midterm Exam	X	**50**
	2. Midterm Exam		
	3. Midterm Exam		
	4. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	Subjects
1	Introduction to ethics and scientific research methods in biotechnology,
2	Ethics and rules in scientific research,
3	Behaviors that violate scientific ethics,
4	Behaviors that violate scientific ethics,
5	Ethical education in raising scientists,
6	Ethical responsibilities of scientists,
7	Relationships between science, society and ethics,
8	Midterm Exam
9	Ethical principles in scientific publications, Ethics in the production of scientific knowledge, Plagiarism and ethics, Survey ethics in field research, Legal regulations regarding ethics of YÖK, TÜBİTAK, UNIVERSITIES.
10	Ethics in scientific knowledge production, Plagiarism and ethics, Survey ethics in field research, Legal regulations regarding ethics of YÖK, TÜBİTAK, UNIVERSITIES.
11	Plagiarism and ethics,
12	Survey ethics in field research,
13	Legal regulations regarding ethics of YÖK, TÜBİTAK, UNIVERSITIES.
14	Legal regulations regarding ethics of YÖK, TÜBİTAK, UNIVERSITIES.

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Course Code and Name: BT5003-INTRODUCTION TO BIOCHEMISTRY				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	2	0	2	2	8	Turkish	Elective

Prerequisites	-	
Instructor		**Email :** **Web :**
Course Assistant		**Email :** **Web :**
Groups Classes		
Purpose of the Course	The aim was to explain the structure, organization and function of the molecules that make up living things at the molecular level.	
Course Objectives		
Course Learning Outcomes and Competencies	• Understanding the basic language of biochemistry • Understanding the structure of important biological molecules • To establish the relationship between the structure and function of biological macromolecules. • To understand the chemical reactions in the synthesis and destruction of biological molecules.	
Basic and Auxiliary Resources of the Course	• CK Mathews, KE van Holde, KG Ahern, Biochemistry, Addison Westley Haugman Inc. (2000). DL Nelson, MM Cox, Lehninger, Principles of Biochemistry, Worth Publishing (2000).	
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		If yes, please mark (X)	Percentage (%) Contribution to the Overall Average
Evaluation Criteria	**1. Midterm Exam**	X	**50**
	2. Midterm Exam		
	3. Midterm Exam		
	4. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	Subjects
1	Biochemistry and the foundation of life.
2	Water and its properties, chemical bonds, covalent and non-covalent bonds.
3	Proteins 1: Amino acids, peptides and proteins, functions of proteins, naming and classification of amino acids and peptides.
4	Proteins 2: Three-dimensional structures of proteins, primary, secondary and tertiary structures, protein sequence analysis.
5	Enzymes 1: Structure, classification, nomenclature and general functions of enzymes.
6	Enzymes 2: Enzyme kinetics, enzyme activity units, Michaelis-Menten theory, Lineweaver-Burk diagram, kinetic constants.
7	Coenzymes; structure, classification and functions, relationship of coenzymes with vitamins.
8	Midterm Exam
9	Nucleic acids 1: Nucleosides, nucleotides and nucleic acids, structure, nomenclature and functions
10	Nucleic acids 2: Replication, transcription and translation.
11	Carbohydrates 1: Mono-, di-, oligo and poly saccharides, their structures, classification and nomenclature.
12	Carbohydrates 2: Stereochemistry, general reactions and functions of monosaccharides,
13	Lipids and fats 1: Lipids and their classification, fatty acids, structure, nomenclature and classification of fatty acids.
14	Comparison of structural and functional aspects of biologically important macromolecules (proteins, enzymes, coenzymes, nucleic acids, carbohydrates and lipids)

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Course Code and Name: BT5004-INTRODUCTION TO CELL BIOLOGY				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	2	0	2	2	8	Turkish	Elective

Prerequisites	-	
Instructor		**Email :** **Web :**
Course Assistant		**Email :** **Web :**
Groups Classes		
Purpose of the Course	The aim of this course is to enable biotechnology graduate students who have completed undergraduate education in different fields to acquire basic knowledge about the cell, which is the basis of living organisms, to learn the structure and function of the cell, and to evaluate this information for their own study subject.	
Course Objectives		
Course Learning Outcomes and Competencies	• To understand technical developments in cell biology, cell theory and cell organization. • Learning cell chemistry and biosynthesis, energy and enzyme properties • To learn the chemical structures and functions of cell organelles and to establish structure-function relationships. • Learning about energy production and use in the cell • Being able to learn how movement occurs in cells • To be able to compare the structure and function of the nucleus and to learn DNA-protein complexes. • Understanding the basics of cell cycle, cell death and cell division mechanisms • To learn how signal transmission occurs in the cell	
Basic and Auxiliary Resources of the Course	• Molecular Biology of the Cell, translation from the fourth edition, (translation editors: Buyru, N., Dalay, N., Özgüç, M., Öztürk, M., Sakızlı, M.). Sistem Ofset, Ankara. • Cooper, GM and Hausman, RE, 2006. The Cell Molecular Approach, third edition, (translation editors: Sakızlı, M. and Atabey, N.). İzmir Medical Bookstore, İzmir. •	
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Method of Teaching the Course	

Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	1. Midterm Exam	X	**50**
	2. Midterm Exam		
	3. Midterm Exam		
	4. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	Subjects
1	INTRODUCTION TO THE CELL • Technical developments, cell theory, prokaryotic and eukaryotic cell organization
2	CELL CHEMISTRY-I • Chemical Composition of the Cell: Nucleic acids, Proteins, Carbohydrates and Lipids
3	CELL CHEMISTRY-II • Energy and Enzymes
4	STRUCTURE AND FUNCTION OF CELL ORGANELLES PLASMA MEMBRANE • Desmosome Types • Transport Mechanisms in Cell Membranes -Passive transport -Active transport
5	CELL WALL • Chemical structure of bacterial cell wall • Chemical structure of plant cell wall RIBOSOMES • Molecular structure and function
6	ENDOPLASMIC RETICULUM • Molecular structure and function •Signal hypothesis •N-Glycosylation
7	GOLGI AND VESICULAR TRAFFIC • Molecular structure and function • O-Glycosylation • Vesicular traffic LYSOSOMES AND MICROBADIA • Molecular structure and function
8	Midterm Exam
9	MITOCHONDRIA AND ATP SYNTHESIS • Molecular structure of mitochondria •Electron

	transport chains and proton pumps
10	CHLOROPLAST AND PHOTOSYNTHESIS • Molecular structure of plastids • Photosynthesis mechanisms • Endosymbiont theory
11	CYTOSKELETON AND CELLULAR MOVEMENT • Formation of cytoskeleton molecules and fibril structures • Microtubule forming centers
12	NUCLEUS AND CHROMOSOMES • Structures Found in the Nucleus • Nucleus envelope • Nuclear matrix • Nucleolus • Synthesis of rRNA and formation of ribosome subunits in the nucleolus • General structure of chromosomes and chromatin • DNA-Protein complexes, nucleosomes
13	SIGNAL TRANSMISSION IN THE CELL • General principles of cell communication • Signal transmission via G protein-linked cell surface receptors • Signal transmission via enzyme-linked cell surface receptors • Regulated proteolysis-dependent signal transduction pathways • Signal transmission in plants
14	CELL CYCLE AND PROGRAMMED CELL DEATH • Cell cycle control • Programmed cell death (Apoptosis)

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Course Code and Name: BT5005-STOCHIOMETRY AND APPLIED MATHEMATICS				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	2	0	2	2	8	Turkish	Elective

Prerequisites	-	
Instructor		**Email :** **Web :**
Course Assistant		**Email :** **Web :**
Groups Classes		
Purpose of the Course	Addressing the mass and energy balances for bioprocesses with numerical solutions and forming the basis for advanced analyses.	
Course Objectives		
Course Learning Outcomes and Competencies	• Ability to perform simple process calculations and understand process variables • Gaining the ability to establish mass and energy balances for each unit in the process. • Recognizing the data required for calculations and finding deficiencies • Ability to apply mass and energy balances to any process • Ability to combine mass and energy balances for the entire process • Recognizing unit systems	
Basic and Auxiliary Resources of the Course	• 1.Felder, RM, Rousseau, RW, "Elementary Principles of Chemical Processes", John Wiley and Sons, 3rdEdition New York, (2000). • 2. Doran, P. M. “Bioprocess Engineering Principles”, Academic Press, 2007. • 3.Yalçın, H., Gürü, M. “Stoichiometry”, Palme Publishing, Ankara 2000. • 4. Himmelblau, DM, "Basic Principles And Calculations In Chemical Engineering", Prentice/Hall International, New Jersey, (1982)	
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		If yes, please mark (X)	Percentage (%) Contribution to the Overall Average
Evaluation Criteria	**1. Midterm Exam**	X	**50**
	2. Midterm Exam		
	3. Midterm Exam		
	4. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	Subjects
1	Introduction to engineering calculations: Units, unit conversions
2	Processes and process variables: Mass, volume, flow rates
3	Processes and process variables: Chemical composition, temperature, pressure
4	Fundamentals of mass balances: Law of conservation of mass, classification of processes, mass balances in single- and multi-unit processes.
5	Mass balances in recirculating processes, mass balances in bypass and purge flow systems
6	Microbial growth, elemental balances and product formation stoichiometry, stoichiometric coefficients
7	Energy Balances: Types of energy, the first law of thermodynamics, steady-state energy balances in open and closed systems, general procedure for energy balances.
8	Midterm Exam
9	Energy calculations in non-reactive systems, calculations on sample processes, temperature changes, phase changes
10	Energy balances in reactive processes, combustion reactions, reaction heats, heat of combustion
11	Microbial growth thermodynamics
12	Energy balances in fermentation processes
13	Mass and energy balances in unsteady states
14	Formulation of equations and solution of differential equations in unsteady processes.

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Course Code and Name: BT5006-MICROBIOLOGY AND MICROBIAL GENETICS				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	2	0	2	2	8	Turkish	Elective

Prerequisites	-	
Instructor		**Email :** **Web :**
Course Assistant		**Email :** **Web :**
Groups Classes		
Purpose of the Course	Microbiologists all over the world are working on activities related to the genetic structure of microorganisms, disease control, industrial processes and the ability to synthesize and degrade complex organic molecules. Microbiology is one of the most important branches of science because it provides the opportunity to interact with other natural sciences and therefore, is extremely important for human life in many ways.	
Course Objectives		
Course Learning Outcomes and Competencies	• Knowing microbial control mechanisms and establishing protection against them • Gaining the ability to design microorganisms used in industries such as food, industry, agriculture, textile and chemistry using recombinant DNA methods. • Gaining the ability to investigate the potential of microorganisms as hosts in heterologous protein production • The ability to understand the relationship between the beneficial and harmful activities of microorganisms for humanity and their life cycles and genetics. • Gaining the ability to protect against microorganisms by knowing the mechanisms of action of antibiotics used against them. • Understanding the attack mechanisms of pathogenic microorganisms and ways to protect against them • To establish the relationship between the structure, physiology and genetics of microorganisms and their identification. • Understanding the relationship between microbial diversity and the evolutionary process	
Basic and Auxiliary Resources of the Course	• Willey, JM, Sherwood, LM and Woolverton, CJ Prescott, Harley, and Klein's Microbiology, 7th Ed, Mc Graw Hill Higher Education, 2008. • Madigan, MT, Martinko, JM, Dunlap, PV and Clark, DP, Biology of Microorganisms 12th Ed, Pearson. USA. 2009.	
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Method of Teaching the Course	

Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	1. Midterm Exam	X	**50**
	2. Midterm Exam		
	3. Midterm Exam		
	4. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	Subjects
1	Prokaryotic cell structure and functions
2	Bacterial cell wall and cell membranes
3	Archaeal cell wall and cell membranes
4	Protein secretion in prokaryotes
5	Chemotaxis and flagellar structure
6	Prokaryotic DNA structure
7	Eukaryotic cell structure and functions
8	Midterm Exam
9	Microbial nutrition and growth
10	Control of microorganisms with physical and chemical agents
11	Antimicrobial agents and their mechanisms of action
12	Microbial genetics
13	Bacterial conjugation, transformation and transduction
14	Genome mapping and recombination in viruses

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Course Code and Name: BT5007-BIOTECHNOLOGY APPLICATIONS IN LIVESTOCK I				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	3	0	3	3	9	Turkish	Elective

Prerequisites	-	
Instructor		**Email :** **Web :**
Course Assistant		**Email :** **Web :**
Groups Classes		
Purpose of the Course	To learn biotechnological methods and their application possibilities in farm animals .	
Course Objectives		
Course Learning Outcomes and Competencies	• Understand the importance of biotechnology in animal husbandry • Be informed about the past and future of biotechnological studies in animal husbandry • Understands the application and place of biotechnological studies in farm animals • Learn molecular marker techniques • Evaluates the latest developments in biotechnology	
Basic and Auxiliary Resources of the Course	• 1. Engelhard, M., Hagen, K., Boysen, M. (edt) 2009. Genetic engineering in livestock: New applications and interdisciplinary perspectives. Springer-verlag Heidelberg. ISBN 978-3-540-85842-3 • 2.Guimaraes, E.P., Ruane, J., Scherf, B.D., Sonnino, A., Dargie, J. D. 2007. Marker assisted selection. Current status and future perspectives in crops, livestock, forestry and fish. Food and Agriculture Organization of the United Nations. ISBN 978-92-5-105717-9 • 3.Animal biotechnology (electronic resource): Science-based concern. 2002.Committee on defining science-based concerns associated with products of animal biotechnology, Committee on agricultural biotechnology, health and the environment board on life sciences, Division on earth on earth and life studies. Washington, D.C: National academies pres. • 4.Murray,JD, Anderson,GB, Oberbauer, AM, McGloughlin.MM 1999. Transgenic Animals in Agriculture. CABI Publishing, ISBN 0851992935	
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Method of Teaching the Course	

Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	1. Midterm Exam	X	**50**
	2. Midterm Exam		
	3. Midterm Exam		
	4. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	Subjects
1	History of biotechnological studies in animal husbandry
2	Recent developments in biotechnology in animal husbandry
3	Biotechnological studies for the purpose of defining the genetic structure
4	Recombinant DNA technique
5	Areas of use of recombinant DNA technique
6	Transgenic animals, production purposes of transgenic animals
7	Gene transfer techniques used in the production of transgenic animals
8	Midterm Exam
9	Cloning studies in animal husbandry
10	Molecular marker techniques
11	Purposes of using molecular marker techniques in animal husbandry
12	Quantitative trait loci
13	Marker assisted selection
14	Molecular techniques for parentage determination in animal husbandry

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Course Code and Name: BT5008- MICROBIAL BIOTECHNOLOGY				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	3	0	3	3	9	Turkish	Elective

Prerequisites	-	
Instructor		**Email :** **Web :**
Course Assistant		**Email :** **Web :**
Groups Classes		
Purpose of the Course	The aim of the course is to inform students about microbial biotechnology.	
Course Objectives		
Course Learning Outcomes and Competencies	• Learning advanced microbial biotechnology concepts. • Learning industrial strain development techniques. • To have knowledge about the production and use of biotechnologically important microbial products. • To have knowledge about the production of recombinant proteins.	
Basic and Auxiliary Resources of the Course	• Okafor, N. "Modern Industrial Microbiology and Biotechnology", Science Publishers, (2007). • Madigan, MT Martinko, JM, Parker, J., "Brock Biology of Microorganisms", Pearson Education, (2006). • Glick, BR and Pasternak, J.J., (2003). Molecular Biotechnology: Principles & Applications of Recombinant DNA, 3rd Ed. The Book Place. • Glazer, AN, and Nikaido, H., Microbial Biotechnology: Fundamentals of Applied Microbiology, WHFreeman and Company, New York, 662 p, 1995.	
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Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	1. Midterm Exam	X	**50**
	2. Midterm Exam		
	3. Midterm Exam		
	4. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	Subjects
1	Introduction to microbial biotechnology
2	Screening of productive strains and strain development in biotechnological microorganisms
3	Industrial strain development techniques
4	Industrial strain development techniques
5	The place of culture collections in biotechnology
6	Growth and product formation in industrial processes
7	Yeast biotechnology
8	Midterm Exam
9	Production of some commercial microbial products
10	Production of some commercial microbial products
11	Recombinant protein production
12	Production of mammalian proteins by genetically engineered microorganisms
13	Monitoring and reviewing new articles related to the course
14	Project presentation

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Course Code and Name: BT5009-ELECTROCHEMICAL DNA BIOSENSORS				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	3	0	3	3	9	Turkish	Elective

Prerequisites	-	
Instructor		**Email :** **Web :**
Course Assistant		**Email :** **Web :**
Groups Classes		
Purpose of the Course	Understand the basic principles of electrochemical methods and their applications to DNA biosensors.	
Course Objectives		
Course Learning Outcomes and Competencies	• Understanding of the basic principles of electrochemical methods. • Understanding the structure and properties of nucleic acids. • Understanding of the electrochemical determination of DNA sequences. • To understand electrochemical detection of diseases based on nucleic acids. • To learn the design of electrochemical biosensors based on nucleic acids for the determination of diseases.	
Basic and Auxiliary Resources of the Course	• Elizabeth, A., Hall, H., "Biosensors", Open University Press, (1990). • ELECTROCHEMICAL METHODS Fundamentals and Applications, Allen J. Bard and Larry R. Faulkner, JOHN WILEY & SONS, INC. second edition. • ARZUM ERDEM, Chapter 19: "Genosensor technology for electrochemical sensing of nucleic acids by using different transducers", Electrochemical Sensor Analysis-COMPREHENSIVE ANALYTICAL CHEMISTRY book, 2007, Volume 49 (ed. S. Alegret and A. Merkoci) pp. 403-411, Elsevier. • 4. J. Wang, 'Electrochemical Sensor Analysis', Vol. 49, Algeret and Merckoci (Eds.), Elsevier, 2007.	
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Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	1. Midterm Exam	X	**50**
	2. Midterm Exam		
	3. Midterm Exam		
	4. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	Subjects
1	Basic Concepts of Electrochemistry; General Information
2	Biosensor definition, transducer systems according to detection type.
3	Structure and functions of nucleic acids; PNA, RNA, mRNA, microRNA, SiRNA.
4	Polymer Chain Reaction (PZT) and its stages, materials used, where is PZT used?
5	Concepts used in biosensor design; Primer, Probe, Target, complementary (conjugate), mutation, point mutation, exact match.
6	Immobilization of DNA to the surface; electrostatic, adsorption, covalent bonding.
7	Modification of DNA probe to the electrode surface
8	Midterm Exam
9	Voltammetric Methods
10	Impedimetric Methods
11	Biosensor design based on hereditary and infectious disease detection
12	Biosensor design based on hereditary and infectious disease detection

13	Recent examples of applications of electrochemical DNA biosensors.
14	Recent examples of applications of electrochemical DNA biosensors.

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Course Code and Name: BT5010-BIOTECHNOLOGY OVERVIEW				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	3	0	3	3	9	Turkish	Elective

Prerequisites	-	
Instructor		**Email :** **Web :**
Course Assistant		**Email :** **Web :**
Groups Classes		
Purpose of the Course	Introduction to biotechnology will provide the student with the details of the different branches of biotechnology and key concepts, their working principles, historical development and applications. This course also includes the understanding and visualization of many ethical issues related to biotechnology.	
Course Objectives		
Course Learning Outcomes and Competencies	• Understanding the definition of modern biotechnology • Evaluation of techniques used in biotechnology • Explaining the content of biotechnology topics and reading scientific literature • Ability to work effectively as a team and improve oneself by following innovations in science • Ability to conduct research using a modern library and obtain information about the main issues related to the functioning and structure of biotechnology. • Problem solving skills in group discussion and classroom work • Ability to choose an effective career • Identify the different branches of biotechnology • Explaining genetic engineering and applications used in the production of transgenic plants and animals. • To provide the ability to conclude group discussions through oral presentation.	
Basic and Auxiliary Resources of the Course	• WJThieman and Michael A. Palladino "Introduction to Biotechnology", Pearson Education, San Francisco, CA (2004).	
Method of Teaching the Course	FACE TO FACE	

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		If yes, please mark (X)	Percentage (%) Contribution to the Overall Average
Evaluation Criteria	**1. Midterm Exam**	X	**50**
	2. Midterm Exam		
	3. Midterm Exam		
	4. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	Subjects
1	Introduction to Biotechnology: Definition and History
2	Gene and Genome
3	Genetic Applications: Recombinant DNA Technology
4	Microbial Biotechnology
5	Agricultural Biotechnology
6	Medical Biotechnology
7	Forensic medicine and DNA
8	Midterm Exam
9	Pharmacological Biotechnology
10	Plant and Animal Biotechnology
11	Bioremediation
12	Biotechnology Legislation
13	Ethics and Biotechnology
14	Project presentation

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Course Code and Name: BT5011- MOLECULAR BIOLOGY				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	3	0	3	3	9	Turkish	Elective

Prerequisites	-	
Instructor		**Email :** **Web :**
Course Assistant		**Email :** **Web :**
Groups Classes		
Purpose of the Course	DNA and RNA molecules are examined in detail and the regulation of gene expression is discussed. The aim is for students to understand the cell cycle, the control of gene expression, and the communication pathways between cells in relation to cancer. Students will be informed about DNA and RNA manipulation methods.	
Course Objectives		
Course Learning Outcomes and Competencies	• Ability to present and develop scientific innovations • Ability to produce and apply original solutions in the field of Molecular Biology • Ability to read and understand scientific publications • Ability to use modern techniques and calculations	
Basic and Auxiliary Resources of the Course	• “Molecular Cell Biology” Freeman Press, 2000 New York	
Method of Teaching the Course	FACE TO FACE	

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Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	5. Midterm Exam	X	**50**
	6. Midterm Exam		
	7. Midterm Exam		
	8. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	Subjects
1	The human genome project and the importance of molecular biology
2	Molecular Anatomy of Genes and Chromosomes: Geometry of nucleic acids, secondary structures of DNA and RNA.
3	Regulation of Gene Expression: Transcription mechanisms in prokaryotes and eukaryotes
4	Regulation of Gene Expression: Transcriptional and translational regulation, post-translational modifications.
5	DNA Repair and Recombination: DNA damage and repair, their role in carcinogenicity.
6	DNA Repair and Recombination: Recombination between homologous and non-homologous DNA segments.
7	Oncogenic Transformation: Proto-oncogenes and tumor suppressor genes.
8	Midterm Exam
9	Oncogenic Transformation: Oncogenic mutations that affect cell proliferation
10	Basic Experimental Techniques in Molecular Biology: DNA and RNA isolation, DNA amplification.
11	Basic Experimental Techniques in Molecular Biology: DNA nucleotide sequencing.
12	Basic Experimental Techniques in Molecular Biology: DNA nucleotide sequencing.
13	Restrictional analyses
14	Scientific article review

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Course Code and Name: BT5012- SIGNAL TRANSDUCTION MECHANISM OF RECEPTOR PROTEINS AND THEIR RELATIONSHIP WITH DISEASES				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	3	0	3	3	9	Turkish	Elective
Prerequisites	-						
Instructor				**Email :** **Web :**			
Course Assistant				**Email :** **Web :**			
Groups Classes							
Purpose of the Course	The aim of this course is to provide students with the following information: cell membrane structure, classification of membrane proteins, their biological functions, and how they perform receptor functions. In addition, the biological meaning of these pathways, their relationship with diseases, pharmacological modulation possibilities, and research opportunities are explained.						
Course Objectives							
Course Learning Outcomes and Competencies	• Cell membrane structure. • Cell membrane proteins. • Cell membrane lipids. • Receptor proteins. • Identification of signaling pathways. • Biological manipulation of signaling pathways. • The role of signaling pathways in diseases. • Secondary messengers of signaling pathways.						
Basic and Auxiliary Resources of the Course	• Molecular genetics of drug resistance,Hayes,John D,Wolf,C.Roland • The World of the Cell, 7th Edition Wayne M. Becker, Lewis J. Kleinsmith, Jeff Hardin, and Gregory Paul Bertoni • Human Molecular Genetics by Tom Strachan and Andrew Read • Molecular Biology of the Cell: Bruce Alberts, Alexander Johnson, Julian Lewis, and Martin Raff • Basic techniques in molecular biology:Surzycki,Stefan						
Method of Teaching the Course	FACE TO FACE						

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Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	1. Midterm Exam	X	**50**
	2. Midterm Exam		
	3. Midterm Exam		
	4. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	Subjects
1	Membrane proteins and their functions
2	Receptor type membrane proteins
3	Receptor protein and signal transduction pathway
4	Receptor protein and apoptosis
5	Receptor protein and cell life
6	TLR pathway and its biological significance
7	Insulin pathway
8	Midterm Exam
9	NOTCH3 pathway and its relationship with diseases
10	STAT pathway and its relationship with diseases
11	FAS pathway and its relationship with diseases
12	CILIA PATHWAY AND ITS RELATIONSHIP WITH DISEASES
13	TNF pathway and its relationship with diseases
14	Interleukin-1 receptor pathway and its relationship with diseases

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Course Code and Name: BT5013-IMMUNOBIOTHECHNOLOGY				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	2	2	4	3	10	Turkish	Elective
Prerequisites	-						
Instructor				**Email :** **Web :**			
Course Assistant				**Email :** **Web :**			
Groups Classes							
Purpose of the Course	This course aims to provide comprehensive information on the basic principles of immunobiotechnology and the development of immune system-based biotechnological products, thus emphasizing future study opportunities.						
Course Objectives							
Course Learning Outcomes and Competencies	• To be informed about concepts and generate ideas about immunobiotechnology • To be informed about the importance and application areas of immunobiotechnology related techniques. • Interested in new approaches to commercial applications of immunobiotechnology, ability to generate and implement ideas • Ability to follow, understand and evaluate scientific publications on immunobiotechnology • Gaining knowledge on subjects such as thesis preparation, research project preparation and being able to evaluate the analysis results of immunobiotechnological products. • To be able to develop knowledge and theories using data obtained about immunobiotechnology through scientific methods. • Ability to generate ideas for developing immunobiotechnological drugs in the future						
Basic and Auxiliary Resources of the Course	• Annadurai B 2008. A Textbook of Immunology and Immunotechnology. S.Chand & Company Ltd. New Delhi • Embryonic Stem Cells: A Practical Approach (Practical Approach Series) (Paperback) by Elena Notarianni (Editor), Martin J. Evans (Editor), 2006, Oxford University Press. Gomase V, Dwivedi S. 2010. • Immunobiotechnology, Targets of Life. VDM Verlag, Dr. Müller, Germany. Casarett and Doull's Toxicology, The Basic Science of Poisons.Klaassen CD (ed). 2001 International Edition. McGraw-Hill Health Professions Divisions. New York. Janeway CA, Travers P, Hunt S, Walport M 1997						

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Method of Teaching the Course	FACE TO FACE

Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	1. Midterm Exam	X	**50**
	2. Midterm Exam		
	3. Midterm Exam		
	4. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	Subjects
1	Introduction to immunobiotechnology, historical development and basic terms.
2	Immunological and immunochemical techniques
3	Immunotherapeutic drugs and their markets
4	Cancer immunotherapeutic agents
5	Cell and vaccine-based immunotherapeutics
6	Immunotherapeutics based on monoclonal antibodies
7	Stem cells in immunotherapy
8	Midterm Exam
9	Strategies for developing immunotherapeutic drugs
10	Animal models in immunotherapy
11	Clinical trials of immunotherapeutics
12	Production techniques of immunotherapeutic drugs
13	Large volume production of immunotherapeutics
14	The future of immunotherapeutics

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Course Code and Name: BT5014- IN VIVO EXPERIMENTAL ANIMAL MODELS				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	2	2	4	3	10	Turkish	Elective

Prerequisites	-	
Instructor		**Email :** **Web :**
Course Assistant		**Email :** **Web :**
Groups Classes		
Purpose of the Course	This course aims to provide comprehensive information on the general principles and specific applications of animal models (drug discovery/development, pre-clinical studies of various chemicals and biotechnological products, etc.) and to highlight future study opportunities.	
Course Objectives		
Course Learning Outcomes and Competencies	• To be informed about basic terminology and concepts related to in vivo experimental animal model development and to be able to generate ideas. • To be informed about the importance and application areas of techniques related to in vivo experimental animal models. • Interest in new approaches to commercial applications of experimental animal models, ability to generate ideas and implement them • Ability to follow, understand and evaluate scientific publications on experimental animal models • Gaining knowledge on subjects such as thesis preparation, research project preparation and being able to evaluate in vivo experimental animal model analysis results.	
Basic and Auxiliary Resources of the Course	• Conn PM, Parker JV 2008. The Animal Research War, Palgrave Macmillan. Embryonic Stem Cells: A Practical Approach (Practical Approach Series) (Paperback) by Elena Notarianni (Editor), Martin J. Evans (Editor), 2006, Oxford University Press. Handbook of Toxicology. Derelanko MJ. and Hollinger MA. 1995 CRC. CRC Press. Inc., NewYork, USA. • Casarett and Doull's Toxicology, The Basic Science of Poisons.Klaassen CD (ed). 2001 International Edition. McGraw-Hill Health Professions Divisions. New York. • Jakasa I, Kezic S 2008. Evaluation of in-vivo animal and in-vitro models for prediction of dermal absorption in Human Exp Toxicol 27: 281-288,	
	YÜZ YÜZE	

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Dersin İşleniş Yöntemi	

Değerlendirme Ölçütleri		Varsa (X) Olarak İşaretleyiniz	Genel Ortalamaya Yüzde (%) Katkı
	1. Ara Sınavı	X	50
	2. Midterm Exam		
	3. Midterm Exam		
	4. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	50

Semester Course Plan

Week	Subjects
1	The history of animal experiments, animal work principles and ethical rules. Animals used in experiments will be introduced.
2	Preclinical studies
3	Toxicity tests (general toxicity tests: acute, chronic toxicity tests)
4	Toxicity tests (special toxicity tests: skin irritation test, genotoxicity tests)
5	Collection of blood etc. samples from animals
6	Wound healing patterns
7	Inflammatory / anti-inflammatory models
8	Midterm Exam
9	Analgesic effect trial
10	Obesity models
11	Diabetes models
12	Angiogenesis/anti-angiogenesis models
13	Cancer models
14	Creation of various disease models

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Course Code and Name: BT5015- BASIC OPERATIONS IN BIOTECHNOLOGICAL PROCESSES				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	2	0	2	2	8	Turkish	Elective

Prerequisites	-	
Instructor		**Email :** **Web :**
Course Assistant		**Email :** **Web :**
Groups Classes		
Purpose of the Course	The aim of this course is to understand the characteristics of downstream processes after biotechnological production, to recognize the relevant tools and equipment, and to transfer the relevant engineering calculations.	
Course Objectives		
Course Learning Outcomes and Competencies	• To understand the properties of biological products. • To understand the importance of downstream processes in biotechnological processes. • To understand the characteristics of separation processes. • Ability to perform engineering calculations for separation processes. • Ability to select appropriate separation processes and equipment for a given process. • To understand the characteristics of purification processes. • Ability to perform engineering calculations for purification processes. • Ability to select the appropriate purification process and equipment for a given process.	
Basic and Auxiliary Resources of the Course	• Biochemical Engineering Fundamentals, JE Bailey, DF Ollis, McGraw Hill, 1986. • Fermentation and Enzyme Technology, DIC Wang, CL Cooney, AL Demain, P. Dunnill, AE Humphrey, MD, John Wiley & Sons, 1979. • Pharmaceutical Process Engineering, AJ Hickey, D. Ganderton, Marcel Dekker Inc, 2001. • Downstream Processing of Natural Products, M. Verrall, Wiley, 1996. Bioseparations, PA Belter, EL Cussler, WS. Hu, Wiley, 1988.	
Method of Teaching the Course	FACE TO FACE	

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Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	1. Midterm Exam	X	**50**
	2. Midterm Exam		
	3. Midterm Exam		
	4. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	Subjects
1	Introduction to Downstream Operations in Bioprocesses Properties of Biological Products
2	Pretreatments Heating / Cooling Sedimentation
3	Separation by Foam Formation Foam separation (Fractionation) Foam flotation
4	Flocculation and Coagulation Precipitation
5	Cell disruption methods Mechanical disruption Non-mechanical disruption
6	Solid-liquid separation processes Filtration Microfiltration
7	Solid-liquid separation processes Centrifugation Centrifugal filtration
8	Midterm Exam
9	Concentration processes Membrane separation methods
10	Concentration processes Extraction
11	Purification processes Chromatography
12	Purification processes Electrophoresis
13	Purification processes Ultracentrifugation
14	Final processes Drying Formulation Marketing

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Course Code and Name: BT5016- COMBINED METHODS IN FOOD PRESERVATION-BARRIER TECHNOLOGY				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	2	0	2	2	8	Turkish	Elective
Prerequisites	-						
Instructor				**Email :** **Web :**			
Course Assistant				**Email :** **Web :**			
Groups Classes							
Purpose of the Course	Giving the basic principles of food preservation, microbial inhibition and elimination						
Course Objectives							
Course Learning Outcomes and Competencies	• Learning the sources of microbial contamination, factors affecting microbial growth and basic issues • Learning about microbial risks in foods • Learning the preservation methods applied in the food industry • Understanding and learning the concept of hurdle technology in the food industry • Minimizing health risks in foods and associating the shelf life concept with barrier technology • Gaining the ability to present relevant topics by summarizing them from literature						
Basic and Auxiliary Resources of the Course	• L. And Gorris, LGM 2003. Food Preservation by Combined Processes. Final report of European Commission, Flair Concert Action, Subgroup B, Netherlands. • Ohlsson,T and Bengtsson, N. 2002. Minimal Processing Technologies in the Food Industry. CRC Woodhed Publishing, Baco Raton. • Bhat, R., Alias, A.K. and Paliyath, G. (Eds) 2012. Progress in Food Preservation. John Wiley and Science Ltd., Oxford, UK. • Forsythe, S.J. 2010. Downstream Processing of Natural Products, Wiley-Blackwell Publishing, UK. • Riley, A.P. (Ed). 2005. New Development in Food Policy, Control and Research, Nova Science Publisher, Inc. New York. • Boye,J.I. and Arcand, Y. 2012. Green Technologies in Food Production and Processing, Springer, London. • Ünlütürk, A. ve F. Turantaş. (Ed) 2015. Gıda Mikrobiyolojisi, 3. baskı. Meta Basım Matbaacılık Hizmetleri, İzmir.						

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Dersin İşleniş Yöntemi	YÜZ YÜZE

Değerlendirme Ölçütleri		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	1. Midterm Exam	X	**50**
	2. Midterm Exam		
	3. Midterm Exam		
	4. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	Subjects
1	Sources of microbial contamination
2	Microorganisms of importance in foods
3	Factors affecting microbial growth in foods
4	Basic food preservation principles and methods
5	Basic food preservation principles and methods
6	Basic food preservation principles and methods
7	Non-thermal and green preservation methods High pressure applications
8	Midterm Exam
9	Non-thermal and green preservation methods High pressure applications
10	Non-thermal and green preservation methods Ultrasonic applications
11	Non-thermal and green preservation methods Photodynamic inactivation methods
12	Non-thermal and green preservation methods Modified atmosphere applications
13	Non-thermal and green preservation methods Modified atmosphere applications
14	Applications of barrier technology in different foods

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Course Code and Name: BT5017- BIOCHEMICAL REACTIONS AND PRODUCTION				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	2	0	2	2	8	Turkish	Elective
Prerequisites	-						
Instructor				**Email :** **Web :**			
Course Assistant				**Email :** **Web :**			
Groups Classes							
Purpose of the Course	To inform about the biochemical reactions taking place in biological systems and the productions related to these reactions, especially those of industrial importance.						
Course Objectives							
Course Learning Outcomes and Competencies	• Examples of industrial productions • Reaction mechanisms • Fermentation processes • Types of biochemical reactions						
Basic and Auxiliary Resources of the Course	• Nduka Okafor, Modern Industrial Microbiology and Biotechnology, 2007, Science Publisher • PM, Doran, Bioprocess Engineering Principles, 2007, Academic Press						
Method of Teaching the Course	FACE TO FACE						

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Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	1. Midterm Exam	X	**50**
	2. Midterm Exam		
	3. Midterm Exam		
	4. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	Subjects
1	Biochemical reactions and their mechanisms
2	Production Methods
3	Products of industrial importance: Baker's yeast production
4	Ethanol Production
5	Acetic-Butyric Acid Production
6	Commercial enzymes and their production
7	Citric Acid Production
8	Midterm Exam
9	Antibiotic production: Clavulanic Acid
10	Monoclonal Antibody Production
11	Microalgal productions: Biodiesel
12	Astaxanthin Production
13	Biopolymers
14	Human Growth Hormone Production

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Course Code and Name: BT5018-INTRODUCTION TO METABOLISM				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	2	0	2	2	8	Turkish	Elective
Prerequisites	-						
Instructor				**Email :** **Web :**			
Course Assistant				**Email :** **Web :**			
Groups Classes							
Purpose of the Course	The aim was to understand the metabolic reactions in living cells and how these reactions are regulated.						
Course Objectives							
Course Learning Outcomes and Competencies	• Ability to describe basic catabolic and anabolic pathways for macromolecules (proteins, carbohydrates and fats) • To be able to explain the structure and mechanism of biochemical metabolic pathways. • Ability to specify key regulatory points, energetic values and chemical transformations in metabolic pathways • To understand how energy is created and used in biological systems.						
Basic and Auxiliary Resources of the Course	• CK Mathews, KE van Holde, KG Ahern, Biochemistry, Addison Westley Haugman Inc. (2000). DL Nelson, MM Cox, Lehninger, Principles of Biochemistry, Worth Publishing (2000).						
Method of Teaching the Course	FACE TO FACE						

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Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	1. Midterm Exam	X	**50**
	2. Midterm Exam		
	3. Midterm Exam		
	4. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	**Subjects**
1	Definition of metabolism and phases of metabolism, metabolic reactions and their classification.
2	Carbohydrates, introduction to carbohydrate metabolism.
3	Glycolysis and gluconeogenesis.
4	Glycogen metabolism
5	Citrate cycle, anaplethoric reactions, glyoxylate cycle, pentose phosphate pathway.
6	Biological oxidations, electron transport system, oxidative phosphorylation and ATP synthesis.
7	Fat digestion and transport, fatty acid oxidation, ketone bodies.
8	Midterm Exam
9	Fatty acid biosynthesis, phospholipids and cholesterol.
10	Pathways of amino acid metabolism.
11	Transamination, deamination, urea cycle.
12	Biosynthesis of amino acids and nitrogen balance
13	Hormones and metabolism
14	Metabolic integration

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Course Code and Name: BT5019- USE OF INFORMATION TECHNOLOGIES IN ARTICLE AND THESIS PREPARATION				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	1	2	3	2	6	Turkish	Elective

Prerequisites	-	
Instructor		**Email :** **Web :**
Course Assistant		**Email :** **Web :**
Groups Classes		
Purpose of the Course	The purpose of this course is; a) To show how to make text adjustments automatically and quickly using word processing software (e.g. Microsoft Word) according to Munzur University Institute of Science Thesis Writing Rules, b) To teach advanced features of word processing software, c) To apply advanced level spreadsheet software (e.g. Microsoft Excel) in academic studies, d) To use bibliographies quickly and effectively using reference management software (e.g. Mendeley, EndNote), e) To prepare digital images to be used in articles and theses for publication.	
Course Objectives		
Course Learning Outcomes and Competencies	• Ability to easily apply spelling rules when preparing a graduate thesis or scientific article • Ability to use spreadsheet software routinely • Managing and adding bibliographies to articles with reference management software • Preparing digital images in a format suitable for publication	
Basic and Auxiliary Resources of the Course		
Method of Teaching the Course	FACE TO FACE	

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Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	1. Midterm Exam	X	**50**
	2. Midterm Exam		
	3. Midterm Exam		
	4. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	**Subjects**
1	Entrance
2	Application of advanced techniques in dictionary processing software
3	Multi-partner article/thesis text writing with Google Drive
4	Applying styles, changing style settings, and automatically generating a table of contents in word processing software
5	Automatic numbering of figures and tables in word processing software,
6	Bibliography scanning techniques; effective use of Web of Science, Scopus and Google
7	Installation of reference management software (e.g. Mendeley and EndNote) and on-line/manual data entry into it
8	Midterm Exam
9	Transferring information stored in reference management software to word processing software
10	On-line digital image search techniques (e.g. Google, Scopus) and their attribution
11	Editing digital images according to articles/thesis, adjusting to the correct resolution and working with layers
12	Data management with spreadsheet software
13	Using formulas in spreadsheet software; changing settings on created charts
14	Examples of academic use of spreadsheet software - Part 1

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Course Code and Name: BT5020-BIOTECHNOLOGY APPLICATIONS IN LIVESTOCK II				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	2	0	2	2	8	Turkish	Elective

Prerequisites	-	
Instructor		**Email :** **Web :**
Course Assistant		**Email :** **Web :**
Groups Classes		
Purpose of the Course	The aim of this course is to provide students with an understanding of the basic concepts and topics in biotechnological methods applied in domestic mammals and poultry, and biotechnology studies in Türkiye, the EU and the Mediterranean countries.	
Course Objectives		
Course Learning Outcomes and Competencies	• Understand the importance of biotechnology in animal husbandry. • Knows the anatomy of the reproductive organs in farm animals. • Explains how to perform the embryo transfer technique. • Criticizes gender control in animal husbandry. • Critiques the benefits and drawbacks of artificial insemination. • Criticizes the biotechnology methods applied in Türkiye, the EU and the Mediterranean countries. • Knows in vitro fertilization and genetic cloning. • Know the reproductive physiology of farm animals.	
Basic and Auxiliary Resources of the Course	• Kaymakçı, M. 2006. Reproductive Biology (4th Edition). E.Ü.ZF No.503 Bornova, İzmir. • • Hafez, ESE, 1993. Reproduction in Farm Animals. 6th Edition, Lea and Febiger Philadelphia, ISBN 0-8121-1534-1.	
Method of Teaching the Course	FACE TO FACE	

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Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	1. Midterm Exam	X	**50**
	2. Midterm Exam		
	3. Midterm Exam		
	4. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	**Subjects**
1	Presentation of the course program, learning outcomes to be gained from the course and matching them with the program outcomes, the importance of biotechnology in animal husbandry
2	Anatomy of the reproductive organs in mammals
3	Anatomy of reproductive organs in poultry
4	Reproductive physiology in mammals
5	Reproductive physiology in poultry
6	Artificial insemination in animal husbandry
7	Embryo transfer in animal husbandry
8	Midterm Exam
9	Control of estrus cycle and ovulation in livestock farming
10	In vitro fertilization in animal husbandry
11	Genetic cloning in animal husbandry
12	Production of identical twins in animal husbandry
13	Biotechnology studies in animal husbandry in Türkiye
14	Biotechnology studies in EU and Mediterranean countries

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Course Code and Name: BT5021-FUNGAL BIOTECHNOLOGY				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	3	0	3	3	9	Turkish	Elective

Prerequisites	-	
Instructor		**Email :** **Web :**
Course Assistant		**Email :** **Web :**
Groups Classes		
Purpose of the Course	The aim of this course is to enable students to understand the biotechnological use of metabolites produced by fungi and to understand and apply the techniques related to the evaluation of the obtained fungus species and production conditions.	
Course Objectives		
Course Learning Outcomes and Competencies	• To understand the metabolic activities of fungi in nature • To learn the development and history of fungal biotechnology • To learn the characteristics of fungal species used in production • Understanding how the natural metabolic activities of fungi can be adapted to technology • To learn the biotechnological importance of fungal metabolites • To learn the production techniques of useful fungal metabolites • Ability to apply all knowledge for industrial production and transfer it verbally and in writing	
Basic and Auxiliary Resources of the Course	• T Anke, 1997. In Fungal Biotechnology.. Chapman & Hall, Weinheim, • Mahendra Rai, 2009. Advances in Fungal Biotechnology. IK International Pvt Ltd, New Delhi. Bangalore	
Method of Teaching the Course	FACE TO FACE	

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Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	9. Midterm Exam	X	**50**
	10. Midterm Exam		
	11. Midterm Exam		
	12. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	Subjects
1	Industrial fermented foods
2	Production of edible capped mushrooms
3	Fungi in biological control: Fungal insecticides
4	Nematophagous fungi
5	Biological Herbicides-Mycoparasites
6	Plant and insect pest fungi and their use in biotechnology
7	Production of vitamins from fungi, synthetic production
8	Midterm Exam
9	Production of amino acids by fungi
10	Antibiotic production
11	Fungal pharmacologically active products
12	Production of agrochemicals from fungi
13	Ligninolytic systems in fungi
14	Mycotoxins

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Course Code and Name: BT5022-RECOMBINANT DNA METHODS AND APPLICATION AREAS				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**ApplicationTime**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	3	2	5	4	9	Turkish	Elective

Prerequisites	-	
Instructor		**Email :** **Web :**
Course Assistant		**Email :** **Web :**
Groups Classes		
Purpose of the Course	Recombinant DNA methods have revolutionized biology. It includes extremely important techniques used in transgenic plants and animal production, in the production of GMO foods, and in the production of various drugs and vaccines. The aim of this course is to provide the ability to apply recombinant DNA methods to master's and doctoral studies.	
Course Objectives		
Course Learning Outcomes and Competencies	• Developing the ability to establish the relationship between the physiology, secretion mechanisms and genetic structures of host organisms used in heterologous protein production and to apply the obtained knowledge to biotechnology. • Gaining the ability to use molecular biological identification methods and to apply this information to daily life. • Understanding the methods of using gene transfer in GMO foods and various industrial products • Ability to establish a connection between the methods used in recombinant products in food, textile, agriculture and medical fields today and to have the ability to foresee what will happen in the future. • Having the ability to prepare projects using recombinant DNA methods and to make efforts to meet the country's needs. • Gaining the ability to understand the advantages and disadvantages of the production of transgenic plants and animals and to prevent possible damage. • Gaining the ability to apply recombinant DNA methods in the production of vaccines • Understanding the basics of recombinant DNA methods and developing the ability to use these methods in biotechnological studies.	
Basic and Auxiliary Resources of the Course	• • Watson, JD, Baker, TA, Gann, A. et al., Molecular Biology of the Gene, Pearson Ltd, 2008. • Glick, BR, Pasternak, JJ, Molecular Biotechnology (Principles and Applications of Recombinant DNA), ASM Press, 2003.	

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Method of Teaching the Course	FACE TO FACE

Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	13. Midterm Exam	X	**50**
	14. Midterm Exam		
	15. Midterm Exam		
	16. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	Subjects
1	Restriction endonucleases, plasmid cloning vectors, construction of gene libraries
2	Screening of gene libraries by DNA hybridization, immunological methods and protein activities
3	Cloning of DNA sequences encoding eukaryotic proteins; phal, cosmid and bacterial vector systems for cloning large pieces of DNA
4	Genetic transformations of prokaryotes, chemical synthesis, sequencing and amplification of DNA
5	Manipulation of gene expression in prokaryotes (gene expression from strong and regulatable promoters)
6	Fusion proteins
7	Translational expression vectors
8	Midterm Exam
9	Protein folding, DNA integration into the host chromosome
10	Heterologous protein production in eukaryotic cells: Saccharomyces cerevisiae
11	Heterologous protein production in eukaryotic cells: Baculavirus insect cell systems
12	In vitro mutagenesis
13	Protein engineering
14	Production of therapeutic agents, production of vaccines

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Course Code and Name: BT5023-BASIC ENZYMOLOGY				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**ApplicationTime**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	2	0	2	2	8	Turkish	Elective

Prerequisites	-	
Instructor		**Email :** **Web :**
Course Assistant		**Email :** **Web :**
Groups Classes		
Purpose of the Course	The aim is to explain the historical development of enzymes, to provide basic enzymological terms, structure and function of enzymes, enzyme activity and activity units, enzyme kinetics and theories and related enzymological information at a basic level and to introduce the application areas of enzymes.	
Course Objectives		
Course Learning Outcomes and Competencies	• To understand the basic principles of enzymology • To understand the structure, mechanism of action and catalytic properties of enzymes. • Be able to describe the regulation of enzyme activity • Describe the economic importance of enzymes and their uses in industry. • Comparing the methods used in enzyme isolation and purification. • To understand the history and development of enzymology • Comparing immobilized enzymes and enzyme immobilization methods • Ability to optimize and design enzymatic analyses • Ability to define enzyme sensors and their application areas • Ability to evaluate, compare and interpret research results	
Basic and Auxiliary Resources of the Course	• H. Bisswanger, Practical Enzymology, Wiley-VCH ISBN: 3527304444 (2004) AS Bommarius, BR Riebel, Biocatalysis-Fundamentals and Applications ISBN: 3527303448 (2004) • HA Kirst, WK Yeh, MJ Zmijewski, Enzyme Technologies for Pharmaceutical and Biotechnological Applications, Marcel Dekker, ISBN: 0824705491 (2001)	
Method of Teaching the Course	FACE TO FACE	

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Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	17. Midterm Exam	X	**50**
	18. Midterm Exam		
	19. Midterm Exam		
	20. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	Subjects
1	Introduction to enzymology; overview of the historical development of enzymology, importance of enzymology in biological sciences.
2	General properties of enzymes; structure, monomeric, oligomeric and multimeric enzymes.
3	Catalytic properties of enzymes; enzyme active site, catalytic and substrate binding sites, substrate binding models, transition state theory, enzyme specificity, enzyme activity units and measurement methods.
4	Nomenclature and classification of enzymes
5	Enzyme kinetics; enzyme catalysis mechanism, rate equation, activation barrier, Michaelis-Menten equation, Lineweaver-Burk diagram, determination of kinetic constants (Km and Vmax).
6	Factors affecting enzyme activity and their mechanisms of action, enzyme inhibition and reversible inhibition types.
7	Isolation and purification of enzymes; purification strategy, determination of enzyme sources, methods used in enzyme isolation and purification and selection of these methods, chromatographic methods used in purification.
8	Midterm Exam
9	Isolation and purification of enzymes; chromatographic methods used in purification
10	Enzyme immobilization; immobilized enzymes and their advantages, enzyme immobilization methods
11	Industrial use of immobilized enzymes, current technological applications.
12	Economic importance and industrial applications of enzymes; commercial enzyme producing companies and the enzymes produced, enzymes used for analytical, clinical and industrial purposes and their general properties, main industrial usage areas of enzymes.
13	Application examples of enzymes in food, feed, textile and detergent industries and clinics
14	Biosensors; definition of biosensors, types, enzyme sensors and applications

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Course Code and Name: BT5024-GENOME INFORMATION				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**ApplicationTime**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	3	2	5	4	10	Turkish	Elective

Prerequisites	-	
Instructor		**Email :** **Web :**
Course Assistant		**Email :** **Web :**
Groups Classes		
Purpose of the Course	The aim of this course is to follow the rapidly developing genome sequencing projects, while teaching basic genome structures and explaining new developments in detail to students.	
Course Objectives		
Course Learning Outcomes and Competencies	• Learning how to find QTLs Understanding the structure, mechanism of action and catalytic properties of enzymes • Understanding the relationship between genome data and bioinformatics • Learning about the genome and mutations • Learning the difference between prokaryotic and eukaryotic genomes • Learning the structure of the eukaryotic genome • Learning the genome structure of prokaryotic organisms • Understanding the Genome and Polymorphisms • Learning universal science and rules in the field of genomics • Learning how to use genome data banks • Understanding the evolution of genomes • Learning about Molecular Markers in detail	
Basic and Auxiliary Resources of the Course	• Genomes. Brown, T. A. New York and London: Garland Science ; c2002 ISBN: 0-471-25046-5 • Molecular Biology of the Cell Alberts, Bruce; Johnson, Alexander; Lewis, Julian; Raff, Martin; Roberts, Keith; Walter, Peter. New York and London: Garland Science; c2002	
Method of Teaching the Course	FACE TO FACE	

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Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	21. Midterm Exam	X	**50**
	22. Midterm Exam		
	23. Midterm Exam		
	24. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	**Subjects**
1	The genome
2	Anatomy of the prokaryotic genome
3	Anatomy of the Human Genome
4	Anatomy of plant genomes
5	Comparison of genomes
6	Genomes and mutations
7	Genomes and polymorphisms
8	Midterm Exam
9	Polymorphism, mutation and genome evolution
10	Drawing phylogenetic trees
11	DNA markers and their uses
12	Finding QTLs affecting genetic traits in genomes
13	Genome databases
14	Genome studies and bioinformatics.

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Course Code and Name: BT5025-RECENT DEVELOPMENTS IN PLANT CELL AND TISSUE CULTURES				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**ApplicationTime**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	3	0	3	3	9	Turkish	Elective

Prerequisites	-	
Instructor		**Email :** **Web :**
Course Assistant		**Email :** **Web :**
Groups Classes		
Purpose of the Course	To make students aware of the latest developments and innovations in plant cell and tissue cultures.	
Course Objectives		
Course Learning Outcomes and Competencies	• Learn about the latest developments and innovations in plant cell and tissue cultures. • To know the new potentials of plant cell and tissue cultures in plant breeding. • Gaining the latest information on variety development.	
Basic and Auxiliary Resources of the Course	• Jain, S., M., S.J. Ochatt, 2010. Protocols for In Vitro Propagation of Ornamental Plants. Humana Press. • Neumann, K., H., A.Kumar, J. Imani, 2009. Plant Cell and Tissue Culture – A Tool in Biotechnology; Basics and Application. Springer–Verlag, Berlin Heidelberg. • George, EF, MA Hall, G.-J.De Klerk, 2008. Plant Propagation by Tissue Culture. 3rd Edition Volume 1. Springer Publishing Company. Loyola-Vargas, • VM, F. Vázquez-Flota, 2006. Plant Cell Culture Protocols, Second Edition, Humana Press Inc.	
Method of Teaching the Course	FACE TO FACE	

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Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	25. Midterm Exam	X	**50**
	26. Midterm Exam		
	27. Midterm Exam		
	28. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	Subjects
1	Plant cell culture techniques.
2	Plant tissue culture techniques.
3	Application areas of plant cell and tissue cultures.
4	Callus cultures and recent developments.
5	Embryo cultures and recent developments.
6	Anther cultures and recent developments.
7	Isolated microspore cultures and recent developments.
8	Midterm Exam
9	Node cultures and recent developments.
10	Meristem cultures and recent developments.
11	Shoot tip cultures and recent developments.
12	Agrobacterium rhizogenes- mediated genetic transformation of hairy roots and recent developments.
13	Clonal propagation and recent developments.
14	Homework presentation

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Course Code and Name: BT5026-AUTOINFLAMMATORY PATHWAY AND ITS IMPORTANCE IN CELL LIFE				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**ApplicationTime**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	3	0	3	3	9	Turkish	Elective
Prerequisites	-						
Instructor				**Email :** **Web :**			
Course Assistant				**Email :** **Web :**			
Groups Classes							
Purpose of the Course	The aim of this course is to provide students with information about the place of the autoinflammatory pathway in life, to learn the biological and clinical meaning of the molecules that make up this pathway, its place in anti-viral and anti-bacterial defense, its importance in the formation and functioning of the innate and adaptive immune system, to obtain general information about mendelian genetic diseases caused by different molecules of the pathway, and to understand the targeted therapy developed against different molecules of this pathway.						
Course Objectives							
Course Learning Outcomes and Competencies	• Learning cell life pathways. • Interaction of proteins in the signal transduction pathway. • Genetic changes of OI molecules. • Understanding OIY diseases with Mendelian inheritance. • Genetic diagnosis methods of these diseases. • Understanding genetic target therapy methods.						
Basic and Auxiliary Resources of the Course	• Medical Cell Biology, Third Edition (Medical Cell Biology (Goodman)) by Steven R. Goodman • The World of the Cell, 7th Edition Wayne M. Becker, Lewis J. Kleinsmith, Jeff Hardin, and Gregory Paul Bertoni • Human Molecular Genetics by Tom Strachan and Andrew Read • Molecular Biology of the Cell: Bruce Alberts, Alexander Johnson, Julian Lewis, and Martin Raff						
Method of Teaching the Course	FACE TO FACE						

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Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	29. Midterm Exam	X	**50**
	30. Midterm Exam		
	31. Midterm Exam		
	32. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	**Subjects**
1	Introduction of the autoinflammatory pathway
2	Autoinflammatory pathway molecules
3	Autoinflammatory pathway and innate immunity
4	Autoinflammatory pathway and adaptive immune response
5	Autoinflammatory pathway antibacterial response
6	Autoinflammatory response and antiviral response
7	Biological and clinical significance of autoinflammatory pathway molecules
8	Midterm Exam
9	IL1 pathway and its biological significance.
10	CARD family proteins and clinical significance
11	Biological significance and diseases of the NLRP3 inflammasome
12	Pyrin Inflammasome and its relationship with diseases
13	Pyrin pathway diseases
14	Cryopyrin pathway and its pathogens

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Course Code and Name: BT5027-EVALUATION OF MICROBIOLOGICAL QUALITY IN FOODS				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**ApplicationTime**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	2	0	2	2	8	Turkish	Elective

Prerequisites	-	
Instructor		**Email :** **Web :**
Course Assistant		**Email :** **Web :**
Groups Classes		
Purpose of the Course	Giving the basic principles of microbiological quality control in the food industry, examining new approaches, examining the reliability of new methods.	
Course Objectives		
Course Learning Outcomes and Competencies	• Learning the sources of microbial contamination and the groups of microorganisms that are important in foods • Learning microbiological standards and specifications • Learning the conventional and rapid methods used to determine the numerical values of microorganism groups. • Gaining the ability to present relevant topics by summarizing them from literature, • Understanding the concept of minimizing health risks and extending shelf life in foods	
Basic and Auxiliary Resources of the Course	• ICMSF (International Commission on Microbiological Specifications for Foods Staff), 2002. • Microorganisms In Foods 7. Microbiological Testing in Food Safety Management, Kluwer Academic Plenum Publishers, USA. Clute, M. 2009. • Food Industry Quality Control Systems. Taylor and Francis Group, CRC Press, Boca Raton. Forsythe, S. J. 2010. • The Microbiology of Safe Food. Wiley-Blackwell Publishing, UK. Riley, A. P. (Ed). 2005. • New Development in Food Policy, Control and Research, Nova Science Publisher, Inc. New York. • Unluturk, A. and F. Turantas. (Ed) 2015. Food Microbiological Analysis, 3rd ed. Meta Basim Printing Services, Izmir.	
Method of Teaching the Course	FACE TO FACE	

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Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	33. Midterm Exam	X	**50**
	34. Midterm Exam		
	35. Midterm Exam		
	36. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	Subjects
1	The Importance of Microbiological Quality Control,
2	Microorganism groups that are important in foods,
3	Sample Collection and Sample Preparation in Microbiological Quality Control,
4	Standards and Specifications Used in Microbiological Quality Control,
5	Test Methods Used in Microbiological Quality Control,
6	Reliability of instrumental-rapid test methods, correlation with conventional methods,
7	Conventional method and instrumental analysis method,
8	Midterm Exam
9	Microbiological analysis of drinking water:
10	Microbiological analysis of milk and dairy products: Conventional method and instrumental analysis methods,
11	Microbiological analysis of meat and meat products: Conventional method and instrumental analysis methods
12	Microbiological analysis of fruits, vegetables and their products,
13	Conventional method and instrumental analysis methods,
14	Conventional method and instrumental analysis methods,

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Course Code and Name: BT5028-MOLECULAR MODELLING				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**ApplicationTime**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	3	0	3	3	8	Turkish	Elective

Prerequisites	-	
Instructor		**Email :** **Web :**
Course Assistant		**Email :** **Web :**
Groups Classes		
Purpose of the Course	The aim of the course is to introduce some of the techniques used in molecular modeling and to show how these techniques are used to explain physical, chemical and biological phenomena.	
Course Objectives		
Course Learning Outcomes and Competencies	• Upon completion of the course, students should be able to: Describe techniques used in molecular modeling and computational biology • Must be able to perform conformational research. • Must be able to perform MC and MD simulations, • Be able to make calculations for energy reduction, • Must be able to use quantum mechanics and molecular mechanics, • Be able to describe intermolecular and intramolecular interactions in a system, • Be able to choose the most appropriate modeling method to investigate a macromolecule,	
Basic and Auxiliary Resources of the Course	• Molecular Modeling. Principles and Applications, AR Leach, 1996. • Conformational Theory of Large Molecules, WL Mattice and UW Suter, Wiley-Interscience. • Lecture notes	
Method of Teaching the Course	FACE TO FACE	

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Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	37. Midterm Exam	X	**50**
	38. Midterm Exam		
	39. Midterm Exam		
	40. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	Subjects
1	Algorithms for alignment of biological sequences and structures.
2	Computing with arrays.
3	Constructing a phylogenetic tree.
4	Hidden Markov models.
5	Computing with gene networks.
6	Basic structural calculations on proteins.
7	Protein structure prediction.
8	Visa.
9	Protein threading techniques.
10	Homology modeling. / Molecular dynamics and energy minimization.
11	Statistical analysis of three-dimensional biological data.
12	Integration of data sources.
13	Graphical representation of biological data.
14	Clustering and classification.

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Course Code and Name: BT5029-BIOINFORMATICS				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**ApplicationTime**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	3	0	3	3	8	Turkish	Elective
Prerequisites	-						
Instructor				**Email :** **Web :**			
Course Assistant				**Email :** **Web :**			
Groups Classes							
Purpose of the Course	This course aims to investigate and discuss biological databases and some bioinformatics tools and approaches in order to better understand the flow of information between DNA-RNA and protein. In addition, comparison of sequences, construction of phylogenetic trees, calculation of distance between species, evaluation of microarray data, genomic and proteomic approaches are within the scope of this course.						
Course Objectives							
Course Learning Outcomes and Competencies	• Understanding the fundamentals of biological databases and their use in the context of molecular biology and genetics • Identify means of comparison for two or more sequences and discuss similarity/discrepancy • Be able to construct a phylogenetic tree for given sequences and discuss the distance between species. • Ability to understand the flow of information between protein-RNA and DNA and to analyze large-scale biological data using various bioinformatics-based tools • Discuss the genomic and proteomic approach using bioinformatics tools.						
Basic and Auxiliary Resources of the Course	• •Introduction to Bioinformatics, Arthur M. Lesk, Oxford University Press, New York, 2002. • •Bioinformatics: A Practical Approach, Shui Qing Ye, Chapman and Hall/CRC, London, 2007. • •Bioinformatics, ed. Jonathan M. Keith, Humana press, London, 2008.						
Method of Teaching the Course	FACE TO FACE						

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Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	41. Midterm Exam	X	**50**
	42. Midterm Exam		
	43. Midterm Exam		
	44. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	Subjects
1	Introduction to bioinformatics
2	Areas of use of bioinformatics
3	Collection and processing of information
4	Collection and processing of information
5	Sharing of information
6	Creating and using data banks
7	Nucleic acid and protein biochemistry
8	Midterm Exam
9	Nucleic acid and protein biochemistry
10	Examination of nucleic acid databases
11	Examination of nucleic acid databases
12	Primer design
13	Evaluation of nucleotide sequence analysis results
14	Evaluation of nucleotide sequence analysis results

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Course Code and Name: BT5030-APOPTOSIS AND CELL CYCLE				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**ApplicationTime**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	3	0	3	3	8	Turkish	Elective

Prerequisites	-	
Instructor		**Email :** **Web :**
Course Assistant		**Email :** **Web :**
Groups Classes		
Purpose of the Course	To learn the mechanisms of cell cycle initiation and cell death. to determine the importance of cell cycle checkpoints and programmed cell death in cancer and these changes	
Course Objectives		
Course Learning Outcomes and Competencies	• Identify the stages of cell division • Identification of factors that initiate the cell cycle • Defining apoptosis • It can express the cell types in which apoptosis is observed. • Describe the mechanisms of apoptosis induction.	
Basic and Auxiliary Resources of the Course	• Adams, J. M. And Cory, S. Life-or-death decisions by the Bcl-2 protein family. Trends in Biochemical Sciences 26, 61-6 (2001). • Hunot S and Flavell RA. Death of a monopoly?. Science 292: 865-866, 2001 • Kerr JF and Winterford CM. Apoptosis. its significance in cancer and cancer therapy. Cancer 73:2013-2026, 1994 • Karol S., Ayvalı C., Suludere Z. 1995. Hücre Biyolojisi. Ankara Üniv. Fen Fak., Ankara • Smith C.A., Wood E. J. 1992. Moleculer and Cell Biochemistry, Cell Biology. Chapman and Hall. London. Widnell C.C., Pfenninger K. H. 1990. • Essential Cell Biology. Int. Ed. Williams and Wilkins, Baltimore, USA Reed, JC (1998). • "Bcl-2 family proteins." Oncogene 17(25): 3225-36. Ameisen, JC (2002). • "On the origin, evolution, and nature of programmed cell death: a timeline of four billion years." Cell Death Differ 9(4): 367-93.	
Method of Teaching the Course	FACE TO FACE	

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Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	45. Midterm Exam	X	**50**
	46. Midterm Exam		
	47. Midterm Exam		
	48. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	**Subjects**
1	Cell division: Mitosis, meiosis
2	Cell cycle
3	Control of cell cycle
4	Cell differentiation
5	Cell signaling pathways and mechanisms
6	Definition and history of apoptosis
7	Mechanisms of induction of apoptosis
8	Midterm Exam
9	The role of mitochondria in apoptosis
10	Apoptosis in animal cells
11	Apoptotic mechanism, caspases and structure of caspases
12	Apoptosis pathways: extrinsic and intrinsic pathways.
13	Inhibitors of apoptosis
14	Differences between Apoptosis and Necrosis

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Course Code and Name: BT5031-STEM CELL TECHNOLOGY				**Department / Major** : INSTITUTE OF SCIENCE - BIOTECHNOLOGY - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**ApplicationTime**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Compulsory/Elective**
FALL/SPRING	3	0	3	3	8	Turkish	Elective
Prerequisites	-						
Instructor				**Email :** **Web :**			
Course Assistant				**Email :** **Web :**			
Groups Classes							
Purpose of the Course	In this course, stem cells and their types, isolation and clinical applications will be covered along with ethical discussions and legal regulations. In addition, information will be gained about molecular biology techniques and more comprehensive stem cell biology studies.						
Course Objectives							
Course Learning Outcomes and Competencies	• To be able to define stem cells and distinguish their types according to their pluropotency • To be able to analyze the characteristics of embryonic and adult stem cells by comparing them. • To be able to distinguish the sources of stem cells in the body • To gain insight into the isolation and characterization of stem cells with the help of advanced techniques. • To know and discuss ethical and legal regulations regarding the production and therapeutic use of stem cells.						
Basic and Auxiliary Resources of the Course	• Stem cell biology and clinical applications. TÜBA publications • http://www.tuba.gov.tr/tr/kok-hucre-yayinlar/1511-kok-hucre-bilimsi-ve-klinik-uygulamalar.html • Current concepts in stem cell research, TÜBA publications • http://www.tuba.gov.tr/tr/kok-hucre-yayinlar/1512-kok-hucre-aratirmalarinda-guncel-kavramlar.html • Essentials of stem cell biology, Robert Lanza et al. (2nd edition) Academic press • Cell, Academician Medical Bookstore, Alp Can • Essentials of Stem Cell Biology, 2nd Edition, by Robert Lanza						
Method of Teaching the Course	FACE TO FACE						

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Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	49. Midterm Exam	X	**50**
	50. Midterm Exam		
	51. Midterm Exam		
	52. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	X	**50**

Semester Course Plan

Week	Subjects
1	What is stem cell biology? Scope and goals, types of stem cells, classification of stem cells according to their pluripotent potential
2	What is an embryonic stem cell? Definition and usage areas of embryonic stem cells
3	What is an adult stem cell? Describe the similarities and differences between embryonic and adult stem cells
4	Regulation of stem cell function, What is a hematopoietic stem cell? Definitions and demonstration of their areas of use. Cord blood banking
5	What is a mesenchymal stem cell? Molecular targets used for its characterization. Areas of use
6	Stem cell isolation and clinical applications
7	Applications of stem cell biology in clinical tissue engineering
8	Midterm Exam
9	Discussion of articles on stem cells and gene therapy
10	Discussion of stem cell applications, ethical and legal practices in the world. Discussion of articles on the subject
11	Current issues in stem cell biology: Use of iPS cells
12	Discussion of articles on the use of connective tissue as a source of stem cells
13	Future goals and areas of study in stem cell biology
14	Future goals and areas of study in stem cell biology

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COURSE INTRODUCTION FORM

Course Code and Name: Genome analysis methods				**Department / Major Branch** : INSTITUTE OF SCIE - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type:** Elective
SPRING	3	0	3	3	5	Turkish	
Prerequisites							
Instructor				**Email :** **Web :**			
Course Assistant				**Email :** **Web :**			
Groups Classes							
Purpose of the Course	Analysis and characterization of nucleic acids and proteins, which form the basis of biotechnology, helps to understand the events occurring in the basic cell more easily at the molecular level. For this purpose, it is aimed to eliminate the deficiencies of students in advanced genome analysis methods and to provide more detailed information about the techniques.						
Course Objectives	• Based on undergraduate level qualifications, they develop and deepen their knowledge in the same or a different field to an expert level and analyze and interpret it using statistical methods. • Identify the interdisciplinary interactions that are related to the field of biotechnology. • Uses the theoretical and practical knowledge acquired at the expert level in the field of biotechnology. • Interpret and create new knowledge by integrating the knowledge acquired in the field of biotechnology with knowledge from different disciplines. • Solves problems encountered in the field of biotechnology using research methods. • Independently conducts a study requiring expertise in the field of biotechnology. • Develops new strategic approaches and takes responsibility to produce solutions for unforeseen and complex problems encountered in applications related to biotechnology. • Provides leadership in environments requiring solutions to problems related to the field of biotechnology. • It guides the learning and evaluation of the knowledge and skills acquired at the expert level in the field of biotechnology with a critical approach. • It systematically conveys current developments and own studies in the field of biotechnology to groups in and outside the field in written, verbal and visual form, supported by quantitative and qualitative data. • Ability to critically examine social relations and the norms that guide these relations, to develop them and, when necessary, to take action to						

	change them. • Uses advanced information and communication technologies along with computer software required by the biotechnology field. • It teaches the ability to monitor social, scientific, cultural and ethical values during the collection, interpretation, application and announcement of data related to the field of biotechnology and to teach these values. • Develop strategies, policies and implementation plans on issues related to the field of biotechnology and evaluate the results obtained within the framework of quality processes. • Use the knowledge, problem-solving and/or application skills they have acquired in the field of biotechnology in interdisciplinary studies. • Evaluates important people, events and phenomena involved in the development of the field of biotechnology in terms of their impact on the applications of the field.
Course Learning Outcomes and Competencies	• Explains the historical process of genome analysis • Explains physical mapping • Performs qualitative feature analysis • Enumerate and apply genome sequencing techniques • Conducts literature review on the field
Basic and Auxiliary Resources of the Course	1. Fundamental Molecular Biology, Lizabeth A. Allision, Palme Publishing. 2. Gene Cloning and DNA Analysis: An Introduction, TA Brown, Nobel Publishing Distribution
Method of Teaching the Course	Face to face

Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	53. Midterm Exam	(X)	**50%**
	54. Midterm Exam		
	55. Midterm Exam		
	56. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab,		

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	Project, etc.)		
	Final Exam	(X)	**50%**

Semester Course Plan

Week	Subjects
1	• General laboratory rules
2	• Concepts related to concentrations
3	• Preparing buffer solution
4	• pH measurements and calculations
5	• Basic types of sterilization
6	• Physical properties of proteins
7	• Function of proteins
8	• Use of spectrophotometer
9	• Agarose
10	• Literature review
11	• Purification processes of nucleic acids
12	• Silica gel matrix systems
13	• EtBr, Cyber and silver nitrate used in imaging
14	• Literature review

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COURSE INTRODUCTION FORM

Course Code and Name: Cancer Molecular Genetics I and II				**Department / Major** : INSTITUTE OF SCIENCE - B MASTER **'S DEGREE PROGRAM WITH THESIS**			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type:** Elective
FALL/SPRING	3	0	3	3	5	Turkish	
Prerequisites							
Instructor				**Email :** **Web :**			
Course Assistant				**Email :** **Web :**			
Groups Classes							
Purpose of the Course	To provide the ability to understand normal and cancerous cells at the molecular level, to evaluate the signaling pathways that play a role in cancer at the molecular level, and to discuss issues related to molecular cancer genetics.						
Course Objectives	• Identify and apply advanced Biology concepts. • Carefully review the literature in line with the research project and establish connections between one's own results and previous literature. • Describe the structure-function relationship in cells and organisms. • Know and apply techniques used in genetic and protein engineering, microbial identification, enzyme technologies, mammalian cell culture and plant tissue culture. • Ability to Work Independently and Take Responsibility • Accessing scientific knowledge and working independently • Finding methods to improve existing knowledge • Understanding the basic principles and applications of new tools and/or software required for thesis work. • Ability to express ideas and findings on the research topic effectively both verbally and in writing • Demonstrates professional and ethical behavior and uses advanced information and communication technologies.						
Course Learning Outcomes and Competencies	• Can comment on the nature of cancer. • Can identify oncogenes and tumor suppressor genes. • Ability to distinguish normal and cancerous cells at the molecular level. • Be able to define the cell cycle. • Kanser gelişimi, angiojeneziz, metastaz, tümör immünolojisi, kanser tedavisi konularında yorum yapabilir.						

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Dersin Temel ve Yardımcı Kaynakları	1-Gordon Peters and Karen H.Vousden: Oncogenes and Tumour Suppressors, Oxford University Press, (First edition), Oxford, 1997. 2-L.M.Franks and N. M. Teich:Introduction to the Cellular and Molecular Biology of Cancer, Oxford University Press, (Third edition), Newyork 1998. 3-RJB King: Cancer Biology, Pearson Education Limited, (Second addition), Essex, 2000. 4-John K.Heath: Principles of cell Proliferation, Blackwell Science ltd, (first edition), Oxford, 2001. 5-Lauren Pecorino:Molecular Biology of Cancer, Mechanisms, Targets and Therapeutics Oxford University Press, 2005 6.The Biology of Cancer by Robert A. Weinberg. Garland Science 2007
Method of Teaching the Course	Face to face

		If yes, please mark (X)	**Percentage (%) Contribution to the Overall Average**
Evaluation Criteria	**57. Midterm Exam**	(X)	**50%**
	58. Midterm Exam		
	59. Midterm Exam		
	60. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	(X)	**50%**

Semester Course Plan

Week	**Subjects**
1	• What is cancer, how does it occur and neoplasm and cancer nomenclature
2	• Introduction to Oncogenes

	• Origin of oncogenes • Viral carcinogenesis • DNA viruses • RNA viruses
3	• Publication discussion covering DNA and RNA viruses in cancer
4	• Specific examples of oncogene alterations • Increased normal product • Changed arrangement • Gene amplification • Changed product • Product with altered activity in normal size • Abnormally sized product
5	• Publication controversy involving oncogene alteration
6	• Oncogenic Growth Factors and discussion of publications covering oncogenic growth factors
7	• Oncogenic Growth Factor Receptors
8	• Publication discussion covering oncogenic growth factor receptors
9	• Signal transmitters
10	• Transcription factors and discussion of literature covering the topic
11	• Changes in cell adhesion molecules and hormone receptors
12	• Introduction to tumor suppressor genes • Identifying tumor suppressor genes, • Retinoblastoma • P53
13	• Other tumor suppressor genes
14	• General Summary

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Course Code and Name: Nucleic Acid and Protein Biochemistry				**Department / Major:** INSTITUTE OF SCIENCE - BI MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type:** Elective
SPRING		0	3	3	5	Turkish	
Prerequisites							
Instructor				**Email :** **Web :**			
Course Assistant				**Email :** **Web :**			
Groups Classes							
Purpose of the Course	1.The aim of this course is to acquire advanced knowledge on basic and important topics about nucleic acids and proteins, the four main molecules that constitute life. 2. Students will also learn about the physical, structural, functional properties of these biomolecules and the relationships between them.						
Course Objectives	• To be able to understand the interdisciplinary interaction related to the field Knowledge: Ability to understand the interdisciplinary interactions related to the field • Ability to develop and deepen knowledge in the relevant program field at an expert level, based on undergraduate level qualifications Sufficient knowledge (information): Ability to develop and deepen knowledge at an expert level in the relevant program field based on undergraduate level qualifications. • Ability to use theoretical and practical knowledge at the expert level in the field • Skill: Ability to use theoretical and practical knowledge at the expert level in the field • Ability to interpret and create new information by integrating the information acquired in the field with information from different disciplines. • Skill: Ability to interpret and create new information by integrating the information acquired in the field with information from different disciplines. • Ability to systematically convey current developments and own studies in the field to groups in the field and outside the field in written, verbal and visual formats, supported by quantitative and qualitative data. • Ability to use computer software and information and communication technologies at an advanced level as required by the field • Communication and Social Competence: Ability to use computer software and information and communication technologies at an advanced level as required by the field.						

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Course Learning Outcomes and Competencies	• Graduate students who successfully complete this course will know the basic terms and definitions used in nucleic acid and protein biochemistry. • II. Has knowledge about the structure, physical properties and functions of nucleic acids • III. Has knowledge about the structure, physical properties and functions of proteins. • IV. Know the synthesis and destruction mechanisms of nucleic acids. • V. Know the synthesis and destruction mechanisms of proteins. • VI. Has knowledge about protein folding. • VII. Has knowledge about purification processes of nucleic acids and proteins. • VIII. Has knowledge about the methods used in the elucidation of the structure and mechanism of nucleic acids and proteins. • IX. Has knowledge of current developments and applications in nucleic acid and protein biochemistry.
Basic and Auxiliary Resources of the Course	1 RH Wrap, MH Wrap. Structure and Function: Nucleic Acids, Proteins, 1992. Adenine Pr; ISBN: 0940030365. 2 Harald Tschesche. Modern Methods in Protein-And Nucleic Acid Research. 1991. Walter De Gruyter; ISBN: 3110122758. 3 David L. Nelson, Michael M. Cox. Lehninger: Principles of Biochemistry 1991.Worth Publishers; ISBN-13: 978-0-7167-7108-1. 4 Felicia YH Wu, Cheng-Wen Wu. Structure and Function of Nucleic Acids and Proteins. 1990. Amazon books. ASIN: 0881676780. 5 Joseph NM Mol, Alexander R. Van Der Krol. Antisense Nucleic Acids and Proteins. 1991. Marcel Dekker; ISBN: 0824785169.
Method of Teaching the Course	Face to face

		If yes, please mark (X)	**Percentage (%) Contribution to the Overall Average**
Evaluation Criteria	**61. Midterm Exam**	(X)	**50%**
	62. Midterm Exam		
	63. Midterm Exam		
	64. Midterm Exam		
	Oral Exam		

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	Practical Exam (Lab, Project, etc.)		
	Final Exam	(X)	**50%**

Semester Course Plan

Week	Subjects
1	• Introduction to nucleic acid and protein biochemistry, basic terms and definitions used
2	• Structure of nucleic acids
3	• Physical properties of nucleic acids
4	• Function of nucleic acids
5	• Structural properties of proteins
6	• Physical properties of proteins
7	• Function of proteins
8	• Synthesis and destruction mechanisms of nucleic acids
9	• Synthesis and degradation mechanisms of proteins
10	• Protein folding
11	• Purification processes of nucleic acids
12	• Purification processes of proteins
13	• Methods used in the elucidation of the structure and mechanism of nucleic acids and proteins
14	• Current issues and applications in nucleic acid and protein biochemistry

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Course Code and Name: Regenerative Biology and Biomedical Applications				**Department / Major Branch :** INSTITUTE OF SCIE - MASTER'S DEGREE PROGRAM WITH THESIS			
Semester	**Theoretical Hours**	**Application Time**	**Total Hours**	**Credit**	**ECTS**	**Language of Instruction**	**Type: Elective**
SPRING	3	0	3	3	5	Turkish	
Prerequisites							
Instructor				**Email :** **Web :**			
Course Assistant				**Email :** **Web :**			
Groups Classes							
Purpose of the Course	Understanding the mechanisms of tissue and organ regeneration and examining the importance of animal regeneration models in the implementation of regenerative medical applications.						
Course Objectives	• Students learn the basic principles of regeneration. • Students interpret the effects of age, tissue damage, tissue type and organismal differences on regeneration. • Students learn methods that analyze the level of regeneration and examine their ethical aspects. • Students identify, present, and discuss different animal models. • Using regeneration mechanisms to produce the tissues and organs we need or to stimulate damaged tissues to repair themselves, • New organ printing technologies are being developed. • To be able to understand the interdisciplinary interaction related to the field Knowledge: Ability to understand the interdisciplinary interactions related to the field • Ability to develop and deepen knowledge in the relevant program field at an expert level, based on undergraduate level qualifications Sufficient knowledge (information): Ability to develop and deepen knowledge at an expert level in the relevant program field based on undergraduate level qualifications. • Ability to use theoretical and practical knowledge at the expert level in the field • Skill: Ability to use theoretical and practical knowledge at the expert level in the field • Ability to interpret and create new information by integrating the information acquired in the field with information from different disciplines. • Skill: Ability to interpret and create new information by integrating the information acquired in the field with information from different							

	disciplines.
Course Learning Outcomes and Competencies	• Students learn the basic principles of regeneration. • Students interpret the effects of age, tissue damage, tissue type and organismal differences on regeneration. • Students learn methods that analyze the level of regeneration and examine their ethical aspects. • Students identify, present, and discuss different animal models.
Basic and Auxiliary Resources of the Course	1. Richard Twyman, Principles of Proteomics, Taylor & Francis 2. Edmond de Hoffmann, Vincent Stroobant, Mass Spectrometry: Principles and Application, Wiley-Interscience 3 ed.
Method of Teaching the Course	Face to face

Evaluation Criteria		**If yes, please mark (X)**	**Percentage (%) Contribution to the Overall Average**
	65. Midterm Exam	(X)	**50%**
	66. Midterm Exam		
	67. Midterm Exam		
	68. Midterm Exam		
	Oral Exam		
	Practical Exam (Lab, Project, etc.)		
	Final Exam	(X)	**50%**
Semester Course Plan			
Week	**Subjects**		

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1	• An Overview of Regenerative Biology and Medical Applications
2	• Skin Regeneration with Fibrosis
3	• Regeneration of Epidermal Structures
4	• Regeneration of Nerve Tissues
5	• Regeneration of Digestive, Respiratory and Urinary Tissues
6	• Regeneration of Musculoskeletal Tissues
7	• Regeneration of Cardiac Muscle and Hematopoietic Tissues
8	• Regeneration of Secondary Organs
9	• Regenerative Medicine Strategies
10	• Regenerative Medicine Applications in Epidermal Structures
11	• Regenerative Medicine Applications in Nerve Tissues
12	• Regenerative Therapies for Digestive, Respiratory and Urinary Tissues
13	• Regenerative Therapies for Musculoskeletal Tissues
14	• Regenerative Approaches for Hematopoietic and Cardiovascular Tissues