**Course Contents**

**1ST Year**

1. **Term**

**MLC530 – Advanced Molecular Cell Biology 3 / ECTS: 6**
The structure of the cell, which is the building block of life, its parts, internal organization, organelle structure and functions, nucleic acid structure and metabolism, mutation and repair mechanisms are explained.

**ENS501 – Research Methods and Scientific Ethics 3 / ECTS: 6**

In this course, how to make a research and the ethical rules to be followed will be discussed.

1. **Term**

**MLC531 – Advanced Molecular Genetics 3 / ECTS: 6**

In this course, genetic materials and structures, thermodynamics of double helix, types of DNA conformation, viral chromosomes, bacterial chromosomes, DNA organization in eukaryotic chromosomes, DNA replication, origin of replication, replication enzymes, gene regulation, operons, introns and exons, mutations, DNA repair, Topics such as recombination, protein synthesis, transformation, transduction, plasmids will be covered.

**ENS502 – Applied Statistics 3 / ECTS: 6**

Basic concepts of statistical models, variation, statistical criteria, distributions, significance tests, variance analysis, basic experimental design, regression and correlation, covariance, multiple regression, curvilinear regression are among the topics to be covered in the course. The topics covered in the course will be supported by the use of a computer laboratory and statistical software for computational topics.

**MLC520 - Seminar 0 / ECTS: 2**
In this course, current applications of molecular biology will be discussed.

**2nd Year**

1. **Term**

**MLC512.01 - Master's Thesis-I 0/ ECTS: 30**

Master's thesis study.

1. **Term**

**MLC512.02 - Master's Thesis-II 0/ ECTS: 30**
Master's thesis study.

**Elective Courses**

**MLC501 - Recent Developments in Biotechnology 3 / ETCS: 6**

This course, which is necessary to update the knowledge of the students who have understood the basics of biotechnology in the undergraduate biotechnology course, will basically cover the latest developments in the field of biotechnology. Topics that are gaining importance nowadays: Biotechnological applications of extremophiles, biotechnology of metabolic products that are important in medical and environmental health, metabolism and evolution engineering, biotechnological studies on the mechanism of some diseases such as cancer, current technologies used in the biomedical field.

**MLC532 - Stem Cell Biology 3 / ECTS: 6**

In this course, stem cell biology, various stem cell forms and regenerative medicine applications will be explained. Molecular, epigenetic and genetic control of stem cell differentiation and specialization will be discussed. The current and potential clinical use of stem cells, their derivatives and induced pluripotent stem cells will also be discussed.

**MLC503 - Essential Topics in Biochemistry 3 / ECTS: 6**

In this course, the topics will be covered under the headings of classification of carbohydrates, carbohydrate metabolism, classification of lipids, metabolism, structures and classification of amino acids, structure-function relationships of proteins.

**MLC504 - Advanced Biochemistry 3 / ECTS: 6**

Enzymes, metabolism of amino acids, myoglobin and hemoglobin, porphyrins and bile pigments, hormones and their mechanisms of action, free radicals and antioxidants will be covered.

**MLC507 - Human Genetics 1 3 / ECTS: 6**

DNA, RNA Protein structure, function and metabolisms, human genome and human genome project DNA replication and transcription, genes, genome and universal code, mutation, polymorphism and mutation repair mechanisms, Mendelian genetics, inheritance patterns: autosomal inheritance, inheritance patterns: gonosomal and mitochondrial inheritance, pharmacogenetics, individual medicine and biotechnology, molecular medicine.

**MLC508 - Human Genetics 2 3 / ECTS: 6**

Examination of genetic structure and diversity in humans, information about hereditary and molecular basis of diseases. Composition of human DNA, classification, organization of DNA, cytogenetics, human genome project, pharmacogenomics, nutrigenomics, forensic diagnosis and ethical problems, gene therapy, antisense technology, cloning, mutations and inheritance of diseases, genetic diseases and their mechanisms, diagnosis in genetic diseases. and treatment strategies will be discussed.

**MLC505 - Enzymology 3 / ECTS: 6**

Chemical structure of enzymes, coenzyme and apoenzyme, Naming and classification of enzymes, Active center, Enzyme specificity and hypotheses, Activators, Inhibitors, Enzyme activity and the effects of various factors on this activity, Enzyme specificity and related hypotheses, Activators, Inhibitors, Enzyme inhibition, Chemical kinetics and enzyme kinetics, Enzyme classification and examples, Enzyme purification and applications of enzymes in various fields.

**MLC533 - Ultimate Techniques in Molecular Biology 3 / ECTS: 6**

In this course, polymerase chain reaction and its types, mutation detection systems, protein isolation, identification and bioinformatics, microarray analysis, karyotype and FISH applications, application areas of cytogenetics will be discussed.

**MLC511 - Specialization Field Course 3 / ECTS: 6**

Examination, research, presentation and discussion of current professional issues are within the scope of this course. Seminars; It is given by lecturers, invited speakers and students enrolled in the course. Student Presentations may also be within the scope of thesis studies.

**MLC516 - Molecular and Cellular Neurobiology 3 / ECTS: 6**

In this course, the molecular mechanisms of neural function will be explained. A foundation will be established on sub-fields of cellular neurophysiology such as action potential generation and transmission, ion channels and ion channel kinetics, receptors and receptor potential, postsynaptic and presynaptic potentials, synaptic transmission and quantal oscillation, membrane electrophysiology, passive and active transmission.

**MLC514 - Purification Techniques of Biomolecules 3 / ECTS: 6**

In this course, cell wall and membrane destruction methods, membrane filtration methods and their usage areas, membrane characterization, centrifugation methods, electrophoretic methods, chromatographic methods, chromatography principles and applications will be explained.

**MLC509 - Molecular Biology Diagnostic Methods 3 / ECTS: 6**

In this course, polymerase chain reaction and its types, mutation detection systems, protein isolation, identification and bioinformatics, microarray analysis, karyotype and FISH applications, application areas of cytogenetics will be discussed.

**MLC534 - Bioenergetics 3 / ECTS: 6**

Introduction to the Wireless Communication Channel, Properties of Electromagnetic Waves, Propagation Mechanisms, Fundamentals of Antenna, Basic Propagation Models, and Terrestrial Fixed Links Satellite Fixed links, Macrocells. microcells. Picocells, Antennas for Mobile Systems.

**MLC518 - Advanced Cell Culture Techniques 3 / ECTS: 6**

Preservation and survival of cells, freezing techniques: cryopreservation, haemocytometry; cell count and viability tests, contamination and cytotoxicity, kinetics of cell death in culture systems, cell-line and medical uses, monolayer cell cultures, passage techniques, other methods used in cell culture will be explained.

**MLC535 - Developmental Biology 3 / ECTS: 6**

Fundamentals of developmental biology such as fertilization, division, gastrulation, nurulation, induction, determination, differentiation, pattern formation, teratology and sex determination.

**MLC536 - Molecular Immunology 3 / ECTS: 6**

The course will give the student the opportunity to develop knowledge of scientific aspects in the field of immunology. Topics to be covered are; Immunological processes underlying homeostasis control, namely tolerance induction, immunity, antigen presentation, and processes that lead to the development of inflammatory diseases (infectious diseases through pathogens), auto-immunity (neuro-immunology) and cancer.

**MLC537 - Protein Chemistry and Proteomics 3 / ECTS: 6**

This course will cover the fundamentals of structural biology and biochemistry with a focus on protein chemistry, proteomics and biophysical methods. Fundamentals of thermodynamics, reaction kinetics and theoretical aspects of molecular interactions will be discussed.

**MLC538 - Cancer Biology 3 / ECTS: 6**

It focuses on the cellular biology of cancer, including basic biology such as tumor angiogenesis, metabolism and immunology, as well as clinical oncology and cancer therapeutics. Emphasis will be placed on important experiments in cancer biology and oncology.

**MLC539 - Functional Genomics 3 / ECTS: 6**

This course provides a comprehensive view of current methods that can be used to probe genomes and gene functions, from classical genetics to the latest high-throughput methods. It contains information on how to design an experiment and how to choose between existing methods. Topics include genomics, metagenomics, transcriptomics, proteomics, metabolomics, and systems biology, as well as the use of model organisms, gene disruption methods, and discussion of gene ethics.

**MLC540 - Genome Structure and Organization 3 / ECTS: 6**

This course provides comparative information about the size, structure and organization of genes and genomes. It emphasizes the functional importance of genome organization and chromatin structure.

**MLC541 - Gene Therapy 3 / ECTS: 6**

Current sources, voltage reference design, Operational Transconductance Amplifier and OP-AMP structures, switched capacitor circuits, basics of analog filtering and gain circuits, process variation, layout design techniques, introduction to analog to digital and digital to analog conversion systems.

**MLC542 - Advanced Studies in Cell Signalling 3 / ECTS: 6**

The course aims to provide the student with an overview of the cellular interactions with the cellular microenvironment and the signaling events resulting from these interactions. In addition, prospective studies in this area will be discussed.

**MLC543 - Special Topics in Molecular Biology and Genetics 3 / ECTS: 6**

A critical analysis of the selected literature, including current developments, related to the instructor's area of ​​expertise.

**MLC544 - Protein Engineering and Synthetic Vaccines 3 / ECTS: 6**

What is Protein Engineering? What are their fields? Chemical synthesis of peptides by solid state method (Merrifield method), Biosynthesis of peptides and proteins, DNA technology, Hybridoma technology, Fusion of myeloma and spleen cells, Monoclonal immunoglobulins (antibodies), Modifications of biomolecules, Immobilization of peptides and proteins: binding to synthetic micelles, latex and liposomes techniques, microencapsulation and binding to polymeric matrices (water-soluble bioconjugates, interpolymer-protein complexes; biohybrids and biomimics, Preparation methods of adjuvants, Regulation of immunology of antigens, Synthetic vaccines, Viral vaccines, Polymeric immunogens based on peptides and vaccine prototypes: alum (Foot-Mouth), synthetic vaccine development methods against hepatitis, tuberculosis, influenza, salmonellosis, AIDS, etc.

**MLC545 - Pharmacoeconomics 3 / ECTS: 6**

In this course, studies in the pharmaceutical sector in the world and in Turkey and the challenges that may be encountered in the future will be discussed. Within the scope of this course; Introduction to the health environment, Health policy regulations, Introduction to pricing, Introduction to reimbursement, Introduction to Pharmacoeconomics and modelling, Introduction to outcome research, Introduction to epidemiology, Introduction to Turkish databases will be covered.

**MLC546 - Basic Principles of Animal Experiments 3 / ECTS: 6**

Basic concepts about experimental animals, Use of animals in experiments and its justification, Importance of experimental animal studies, Information about experimental animal species, Ethical obligations in experimental animal studies, Handling and blood collection techniques.