

**ISTINYE UNIVERSITY**  
**INSTITUTE OF HEALTH SCIENCES**  
**DEPARTMENT OF CANCER BIOLOGY AND PHARMACOLOGY (THESIS)**  
**COURSE DESCRIPTIONS**

**1<sup>st</sup> SEMESTER**

**Basic Concepts Of Biology And Biochemistry | 6 ECTS**

Chemistry of life, macromolecules, Structure and function of organelles, Structure and function of cell membrane, Water metabolism, acid-base and buffer solutions, Structural characteristics of amino acids, Structure and function of proteins, Structural characteristics of enzyme, Regulation of enzyme activities, Enzyme inhibition and enzyme kinetics, Bioenergetics, Role of citric acid cycle in metabolism, Investigation of oxidative phosphorylation and ATP synthesis.

**Current Advancements In Cancer Research | 5 ECTS**

Brainstorming on current articles about basic, clinical and cancer prevention and control that are presented weekly by students.

**Cell Biology | 6 ECTS**

Eukaryotic and prokaryotic cell structure; Structure and function of the cell membrane; Organelles, DNA, Chromosomes, nucleus; Cell cycle, DNA replication, Communication between cells; Classical and new signaling pathways; Cell surface and intracellular receptors; Second messenger system.

**Seminar | 2 ECTS**

Oral presentation

**Scientific Research Techniques And Publication Ethics | 3 ECTS**

Types and importance of research techniques and understanding differences. Procedure. Determination of which technique suitable to aim. Points to consider for publication. Authors determination criteria. Confidentiality agreements. Ethical violation types.

**Master of Science Thesis Advisory-1 | 2 ECTS**

Having an interview with the advisor according to the interests of the students. Making the literature studies by taking into consideration the thesis topic. Planning the final thesis topic.

**Master of Science Specialized Field Course-1 | 6 ECTS**

The students who start the thesis study, first of all, they get basic information about their subjects. After that, the advisor makes sure that the students master the subjects, carry out their studies and the advisor provides financial follow-up, makes the students do their experiments, comments about their results, reports them and ensures that the studies become publication process. Also, the advisor provides the materials for thesis subjects.

## **ELECTIVE COURSES**

### **Scientific Article Preparation Techniques | 3 ECTS**

Preparation process of an article to be sent to a scientific journal. Raw data processing. Preparation of figures and captions, introduction, material & method, conclusion and discussion parts. Points to consider for finding literature and citation.

### **Molecular Biology Techniques | 5 ECTS**

Identification of nucleic acid and protein purification and quantification methods, Cloning of bacterial DNA, Basic molecular biology techniques used in DNA analysis and protein analysis, ELISA, DNA sequencing, cloning, DNA bank, RNA isolation and characterization, expression analysis, cDNA synthesis (RT-PCR), microarray and gene chip analysis, Real-Time PCR applications, agarose gel electrophoresis.

### **Cell Culture Techniques | 5 ECTS**

Equipment used in cell culture, Fundamentals of cell culture, Subculturing, Growth curve creation, Cell freezing and storage methods, Cell viability and toxicity tests, Drug discovery technologies against diseases in cell culture (antibiotic effect, anticancer effect, etc.), Biotechnology applications, Cell-based therapies, stem cell technology, cell banks, Current developments in cell and tissue culture technologies, Applications of cell and tissue culture technologies in our country.

### **Oncogenes And Carcinogenesis | 3 ECTS**

Definition and classification of oncogenes and effects on cell cycle, roles in the process of cancer, Oncoproteins and their effects, tumor suppressor genes and their effects on cancer formation, Carcinogenesis theories and clonality, The concept of multistep carcinogenesis, Clinical data supporting multistep carcinogenesis, Molecular biological approaches used in cancer diagnosis, treatment and follow-up.

### **Molecular Toxicology | 3 ECTS**

Fundamentals of toxicology and dose-effect relation, Mechanisms of uptake and excretion of toxic substances, Metabolic pathways for drugs and xenobiotics, Molecular toxicology techniques, Bioactivation of toxicants, CYP metabolism, Receptor-mediated cytotoxicity, Chemical and biological reactive intermediates, Molecular basis of diseases and drug toxicity reactions.

## **2<sup>nd</sup> SEMESTER**

### **Basic and Translational Cancer Biology | 5 ECTS**

Properties of the transformed cancer cell, Angiogenesis and metastasis, Oncogenes, Tumor suppressors, Microenvironment, Stem cell, Cancer imaging, Tumor heterogeneity, System biology, Cell cycle, Cell cycle treatment approaches, DNA damage and repair mechanisms, Epigenetics, Cell signal transduction, Targeted therapies, Immunobiology, Immunotherapy, Apoptosis, microRNAs, RNA interference, Cancer metabolism, Development of *in vitro*, *ex vivo*, *in vivo* cancer models.

### **Seminars | 2 ECTS**

Oral presentation

### **Pharmacological Approaches | 4 ECTS**

Introduction to pharmacology, Drug application methods, pass of drugs from biological membrane and absorption, Drug distribution, Drug biotransformation, Drug elimination, Receptors and drug-receptor 2 relation, Relation between dose and concentration, Factors that change the effect of drugs, Interaction between drugs, Toxic effects of drugs.

### **Anticancer Drug Discovery | 3 ECTS**

Detection of enzyme and receptor activities, Methods for modelling drug half-life, Discovery techniques to molecules that have intended biological activities, cancer vaccines, miRNAs, Antibody, Developing new drug and therapeutics with gene and stem cell therapies, Developing novel drugs against drug-resistant microorganisms, Personalized targeted therapeutics with using gene or protein technologies, Methods to reducing adverse effects of treatments, Tumor targeted-drugs, Determination of preclinical biosafety levels of drugs, Required optimization approaches for a molecule to be a safe and effective drug.

### **Scientific Research Techniques And Publication Ethics | 3 ECTS**

Types and importance of research techniques and understanding differences. Procedure. Determination of which technique suitable to aim. Points to consider for publication. Authors determination criteria. Confidentiality agreements. Ethical violation types.

### **Master Of Science Thesis Advisory-2 | 2 ECTS**

Having an interview with the advisor according to the interests of the students. Making the literature studies by taking into consideration the thesis topic. Planning the final thesis topic.

### **Master Of Science Specialized Field Course-2 | 6 ECTS**

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## **ELECTIVE COURSES**

### **Cancer Pharmacology And Drug Transporters | 3 ECTS**

Principles of cancer therapy, Pharmacological principles, Principles and history of therapeutics and place in drug development, Determination of biological targets, Metabolism of chemotherapeutic agents and mechanisms of action, Role of drug delivery mechanisms in pharmacology, Drug resistance mechanisms, High-throughput drug screening and toxicity of chemicals, Determination of drug dose, drug schedule and route of application, The role of biological markers, genomics and proteomics on therapeutics, Natural products, Different treatment strategies such as targeted therapies and immunotherapy, The process of moving a drug from the laboratory to the clinic.

### **Metastasis And Clinical Importance | 5 ECTS**

Biological mechanisms of tumor metastasis, Seed and soil hypothesis, Organ-specific metastasis, Cell cycle and metastasis, Molecules involved in the process of metastasis, Multiple therapies for metastatic cancers and Research from the basic sciences to the clinic (bench-to bedside) for three basic metastatic human cancer

### **Biology And Detection Of Cell Death | 5 ECTS**

Mechanism and regulation of apoptosis, necrosis, necroptosis, and autophagic cell death and the relation between carcinogenesis; Cell death receptors; Role of mitochondria in cell death; Detection methods of cell death with morphological, histochemical, biochemical, immunological; Current literature and methods on the subject.

### **Cellular Biochemistry | 5 ECTS**

Structure and function of proteins, nucleic acids, DNA as the genetic material, Central dogma, enzymes, Transport on cell membrane, Cell membrane channels and pumps, catabolism and formation of phosphate bond energy, glycolysis, Krebs cycle, Oxidative phosphorylation, Oxidation of fatty acids and Oxidative degradation of amino acids, Biosynthesis of carbohydrates, lipids, amino acids and nucleotides.

### **Cancer Stem Cell | 5 ECTS**

History of Cancer Stem Cell (CSC), Theory of CSC, Hypothesis on CSC origin, Characteristics of CSC, Propagation and isolation techniques, CSC microenvironment, Plasticity of CSC and epithelial-mesenchymal transition, Regulation of the apoptotic mechanism and activation of pro-survival signaling, Autophagy, DNA damage response and repair, Developmental signaling pathways in CSC biology (Notch, Wnt /  $\beta$ -catenin, Hedgehog signal transduction), Natural and synthetic compounds targeting CHD, The importance of CSC in oncology.

## **3<sup>rd</sup> SEMESTER**

### **Master Of Science Thesis Advisory-3 | 2 ECTS**

Having an interview with the advisor according to the interests of the students. Making the literature studies by taking into consideration the thesis topic. Planning the final thesis topic.

### **Master Of Science Specialized Field Course-3 | 8 ECTS**

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### **Thesis Project I | 20 ECTS**

## **4<sup>th</sup> SEMESTER**

### **Master Of Science Thesis Advisory-4 | 2 ECTS**

Having an interview with the advisor according to the interests of the students. Making the literature studies by taking into consideration the thesis topic. Planning the final thesis topic.

### **Master Of Science Specialized Field Course-4 | 8 ECTS**

The students who start the thesis study, first of all, they get basic information about their subjects. After that, the advisor makes sure that the students master the subjects, carry out their studies and the advisor provides financial follow-up, makes the students do their experiments, comments about their results, reports them and ensures that the studies become publication process. Also, the advisor provides the materials for thesis subjects.

### **Thesis Project II | 20 ECTS**