**SULEYMAN DEMIREL UNIVERSITY**
**FACULTY OF ARTS AND SCIENCES**
**BIOLOGY DEPARTMENT COURSE CONTENTS**

## 1. SEMESTER COURSES

### BIO-101 General Biology I

**Credit (Theory-Practice-Lab.): 5 (4-0-2)** **ECTS: 8**

Improvement in history of cell science. Developmental studies in microscope and its mechanism. Features of plant biology. Chemical and physical structures of cytoplasm. Organelles in cells, special organelles and substances of plant cells. Nucleus, organelles and molecules, genome, chromosome and DNA concepts, cell cycle, genetical code mechanism. Cell division, mitosis and meiosis. Cell wall. Tissue, description and morphological developments. Dividing and non-dividing tissues. Structural features of tissues. Functions of tissues in high organization plants, structures of specific cells, stroma and higroma. Organs, their descriptions and improvements in the plant organisms. Root, leaf and flower. Their parts, features and functions. Positions of organs in high plant organizations (gymnosperm and angiosperm).

### BIO-103 Microbiology I

**Credit (Theory-Practice-Lab.): 3 (2-0-2)** **ECTS: 7**

The subject matter of microbiology, development of microbiology, characteristics of microbiology, the chemical basis of microbiology (energy, chemical bonds, carbohydrates, lipids, proteins and enzymes), microscopy and microscopes, prokaryotes and eukaryotes, microbial growth (cell duplication, growth curves, laboratory cultivation methods), metabolism of microorganisms (energy and ATP, glycolysis, fermentation, the Krebs cycle, electron transport, photosynthesis).

### BIO-105 Science and Ethics

**Credit (Theory-Practice-Lab.): 2 (2-0-0)** **ECTS: 4**

Scientific knowledge, meaning of the concept of ethics, rules of ethic, scientific thinking in the field of biology, the importance of doing research.

### KIM-602 General Chemistry

**Credit (Theory-Practice-Lab.): 3 (2-0-2)** **ECTS: 5**

Matter, energy, metric systems, meaningful numbers, structure of atom and the components of atom, electronic structure of the elements, periodic properties, chemical bonds, Lewis structures, resonance, molecule geometry and VSEPR theory, chemical reactions, mole concept, stoichiometry, thermochemistry, gases, gas laws, gas equations, liquids and solids, oxygen and hydrogen, acidic-basic oxides, ozone, redox reactions, solutions, physical properties and concentration units, chemical kinetics, chemical equilibrium, acids and bases, ionic equilibrium, electrochemistry.

**ATA-160 Principles of Ataturk and Recent Turkish History I**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 2**

The reasons of Ottoman Empire's collapsing, foundation of the Turkish Republic. Ideological movements during the late Ottoman era, disintegration of the Ottoman Empire, the armistice of Mudros, the situation of the country in the face of occupations and Mustafa Kemal Pasha's reaction. Organization through congresses, national forces and national pact. Inauguration of the Turkish grand national assembly, Turkish grand national assembly's taking charge of the independence war. The battle of Sakarya, the grand assault and victory.

**ING-101 English I**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 2**

Elementary level English.

**TUR-170 Turkish Language I**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 2**

What is language? Birth of languages. The relation of language-feeling-thought. Language-Culture relation. Language society relation. Languages all over the world and the place of Turkish among these languages. Punctuation marks and spelling rules. Phonology-Structure-word-verbs-phrases-sentence.

**2. SEMESTER COURSES**

**BIO-102 General Biology II**

**Credit (Theory-Practice-Lab.): 5 (4-0-2) ECTS: 7**

Introduction to zoology. What are the subdivisions of zoology? Chemical and physical compositions of animals cells, structure and function of animal tissues, organ systems and relationships with each other, the ecology of animals, the taxonomy of animals. Sub-structures and organelles of cell, measurement techniques for light microscope, cell membrane and membrane transport mechanisms, enzyme activity, animal tissues (epithelial, blood, bone, cartilage, muscle, nerve).

**BIO-104 Microbiology II**

**Credit (Theory-Practice-Lab.): 3 (2-0-2) ECTS: 5**

DNA and gene expression, microbial genetics (mutations, recombination and genetic engineering), control of microorganisms (physical and chemical agents, antibiotics), major groups of bacteria (spirochetes, gram(-), gram(+) bacteria, acid-fast bacteria), the fungi, the protozoa, the unicellular algae, the viruses, food and industrial microbiology, environmental microbiology.

**BIO-106 Microtechnique**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Eye. Light and light microscope. Numerical aperture. Code system using metrics in microscope. Measurement of things under microscope (micrometrical slide and micrometrical ocular). Explaining of observational methods (squash method, paraffine method etc.) in microscope, dyes, taking magnification in microphotography. Fixation of tissues. Advanced preparation technique in microtechnique (banding technique, FISH or GISH). Microscopes for specific purposes, electron microscope (theoretical). Basic equipments, glasses and chemicals in a Biology laboratory.

**BIO-108 Biostatistics**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

This module is concerned with the description of statistics, averages, regression and correlation tests.

**KIM-615 Organic Chemistry**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Organic compound concept and some important concepts of organic chemistry, structure of atom, chemical bonding, alkanes, alkenes, cyclic aliphatic compounds, dienes and polymerization, alkynes, stereochemistry, aromatic compounds, alcohols, phenols, ethers, aldehydes and ketones, carboxylic acids and its derivatives (acid halides, acid A-anhydrides).

**ATA-260 Principles of Ataturk and Recent Turkish History II**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 2**

National struggle in educational, cultural, social and economical areas. Ataturk's life, the strategy of the Turkish revolution, major revolutions in the political arena, in the social structure and health, in the internal and foreign policies of the Turkish Republic. Ataturk's principles and threats directed against these principles. Geopolitics and Turkey's geopolitical position. Psychological threat against the Turkish Youth.

**ING-102 English II**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 2**

Elementary level English.

**TUR-270 Turkish Language II**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 2**

The features of written and verbal narration. Reading and comprehension. Correct and good narration. Recognizing literary works. Listening and verbal narration.

## 3. SEMESTER COURSES

### BIO-201 Biochemistry I

**Credit (Theory-Practice-Lab.): 3 (2-0-2)** **ECTS: 6**

ATP and energy relations and carbohydrate, lipid, protein and (nucleic) acid metabolisms.

### BIO-203 Cytology

**Credit (Theory-Practice-Lab.): 2,5 (2-0-1)** **ECTS: 5**

Cell, protoplasm (composition and features of protoplasm), metabolism, organelles of cell (cytoplasm, cell membrane, granular endoplasmic reticulum, agranular endoplasmic reticulum, Golgi apparatus, lysosomes, mitochondria, microbodies, centrosome, microfilaments, cytoplasmic inclusions), nucleus (karyoplasm, nuclear chromatin, nucleolus), cell cycle, chromosome and its structure, sex chromatin, structure and synthesis of DNA, cell division (mitosis and meiosis), differentiation of cell, synthesis of protein.

### BIO-205 Systematics of Invertebrate Animals I

**Credit (Theory-Practice-Lab.): 2,5 (2-0-1)** **ECTS: 5**

Rules of classification, general characters and taxonomy of Porifera, Cnidaria, Platyhelminthes, Nemertae, Nematoda, Rotifera, Annelida and Mollusca.

### BIO-207 Plant Morphology and Anatomy I

**Credit (Theory-Practice-Lab.): 3 (2-0-2)** **ECTS: 5**

Cell and tissue analysis and presentation. Overall structure of plant cell, structure of cell wall, occur in cell wall structures, protoplast-cytoplasm, organelles in the cytoplasm, vacuole-ergastic substances, tissue-meristem tissue, permanent tissues, parenchyma, protective tissue, support tissue, conduction tissue, xylene, phyloem, vascular types.

### BIO-209 Cryptogamae Systematics

**Credit (Theory-Practice-Lab.): 3 (2-0-2)** **ECTS: 5**

Classification and Nomenclature of plants, types of reproduction in plants, general information about prokaryotes and eukaryotes, general characteristics of prokaryotes and eukaryotes algae, General characterics, reproduction, distribution, systematics and economically importance of Algae, general characterics, reproduction, distribution and systematics of Mycota, Lichenes, Bryophyta and Pteridophyta.

### BIO-211 Hydrobiology

**Credit (Theory-Practice-Lab.): 2 (2-0-0)** **ECTS: 4**

Some of the water features, freshwater classification, lakes, lake water, the physical and chemical properties, ecologically and lakes as limnologic classification, rivers, streams of the

physical and chemical properties, live freshwater classification of water environment of the food chain, water pollution and the effects of living.

## 4. SEMESTER COURSES

**BIO-202 Biochemistry II**

**Credit (Theory-Practice-Lab.): 3 (2-0-2) ECTS: 6**

ATP and energy relations and carbohydrate, lipid, protein and (nucleic) acid metabolisms.

**BIO-204 Histology**

**Credit (Theory-Practice-Lab.): 3 (2-0-2) ECTS: 6**

Epithelium tissue, cell adhesions, privatizations on cell surface (microvillus, cilium), connective tissue (tissue fluid, intercellular substance, basal lamina), bone and cartilage tissue, blood tissue, muscle tissue, heart muscle, smooth muscle and nervous tissue.

**BIO-206 Systematics of Invertebrate Animals II**

**Credit (Theory-Practice-Lab.): 3 (2-0-2) ECTS: 6**

General and taxonomic characters of Arthropoda, Phoronida, Bryozoa, Branchiopoda, Echinodermata, Chaetognatha and Hemichordata.

**BIO-208 Plant Morphology and Anatomy II**

**Credit (Theory-Practice-Lab.): 3 (2-0-2) ECTS: 6**

Morphology and anatomy of root, stem and leaf, metamorphosis. Flower structure, parts, investigation of fruit. Pollination, fertilization and seed.

**BIO-210 Systematic of Seed Plants**

**Credit (Theory-Practice-Lab.): 3 (2-0-2) ECTS: 6**

The aim, importance and history of classification. The necessary basic knowledge for classification, taxonomic categories, important plant groups and their diagnostic features.

## 5. SEMESTER COURSES

**BIO-301 Molecular Biology I**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 3**

Biomolecules and cell, nucleic acids, DNA replication and repair, gene and genome structure, viruses, transcription, protein synthesis, mutations and mutagenesis, recombinant DNA technology, Molecular Biology Techniques I: nucleic acid techniques. Molecular Biology Techniques II: protein analyses techniques.

**BIO-303 Genetics I**

**Credit (Theory-Practice-Lab.): 3 (3-0-0) ECTS: 5**

Introduction to genetics, genetics and heredity, short history of genetics, genetic terminology, the interactions between phenotype-genotype and environmental, cytological basis of heredity, the cell, chromosomes, the cell division, mitosis and its importance, meiosis and its importance, reproduction and the formation of reproductive cells, the mechanisms of monohybrid and dihybrid inheritance, genetic interactions, multiple allelism.

**BIO-305 Systematics of Vertebrate Animals I**

**Credit (Theory-Practice-Lab.): 3 (2-0-2) ECTS: 5**

Classification and naming of animals. The some main characters used in the classification of animal regnum. The general characters, origin and subgroups of Chordata. The general characters and classification of Procordata. The general characters, growing and classification of Hemichordata, Urochordata and Cephalochordata, the morphological characters, movement, skeleton structure, circulatory, respiratory system etc, reproductive organ and maturation of Amphioxus. General characteristic, morphological features, skin, color, skeleton, digestion, circulatory, respiration, urinary, nervous, reproduction system, habitat and feeding of Chondrichthyes, Osteichthyes and Amphibia relation with human and classification.

**BIO-307 Plant Physiology**

**Credit (Theory-Practice-Lab.): 4 (3-0-2) ECTS: 5**

General concepts of plant and cell, physiology, metabolism (anabolism and catabolism). Plant water relations, water potential mineral nutrient and membrane transport, chemical and electrochemical potential, cellular hemostatsis, photosynthesis and effects of external factors on photosynthesis rate, metabolite transport, respiration, growth and development in plants.

**BIO-309 Animal Embryology**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 3**

Reproduction organs of male and female; gametogenesis (spermatogenesis, oogenesis) and fertilization; blastulation, gastrulation, neurulation and formation of somites; embryonic membranes and placenta (placenta types).

**BIO-311 Vegetation Science**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 3**

Working issues of synecology and its main principles of synecology, communities and their general features, sampling methods for vegetation, types, shapes, magnitudes and putting of quadrates, explanations of density, frequents and prevailing terms and their using in vegetation works, Sociability, fidelity, loyalty, etc. and the meanings of terms using in vegetation studies, classification of vegetation (Classis, Ordo, Wedding Ring, Association etc.) and the creation of the tables, the methods of without sample areas and applying areas this method; world's major vegetation formations and their distributions.

**BIO-313 Plant Ecology**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 3**

Main concepts of ecology, compare ecology and environment, area of working on ecology. How do you do a working on autoecology, main principles of synecology, abiotic and biotic elements of composing environment, relation of plants and soil, variation of soils, drainage, ventilation, organic material, formation of soil, variation of water been located in soil, structure and texture of soil, relations of plants and climate, effects of light on plants, long day plants, short day plants and notr plants, photoperyodism, effect of wind, effects of rain on flora, relation of water and plants, important of water for lives, aquatic habitats and important plants of aquatic habitats, classifying plants for demanding water.

**UOS-801 University Common Elective I**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 3**

**BIO-803 Economic Plants**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 3**

Economic plants and historical development process, the importance of economic plants, Classification of economic plants, Production of economic plants, the factors effecting on the quality of economic plants.

**BIO-805 Human and Environment**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 3**

Concepts of Ecosystem, ecosystem diversity and factors effecting diversity, fundamental concepts of energy, energy flow and food web, Biogeochemical cycles, population ecology, communite and relationships among livings, concepts of biome and global biomes.

## 6. SEMESTER COURSES

**BIO-302 Molecular Biology II**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 2**

Biomolecules and cell, nucleic acids, DNA replication and repair, gene and genome structure, viruses, transcription, protein synthesis, mutations and mutagenesis, recombinant DNA technology, Molecular Biology Techniques I: Nucleic acid techniques. Molecular Biology Techniques II: Protein analyses techniques.

**BIO-304 Genetics II**

**Credit (Theory-Practice-Lab.): 3 (3-0-0) ECTS: 4**

The determination of sex, the sex chromosomes in monoploid and diploid organisms, primer and secondary nondisjunction, gynandromorfizm, the determination of sex in humans and sex abnormalities, gene linkage and recombination, the chromosome maps and factors affecting

crossing-over rate, mutations (gene mutations, mutations of chromosome structure and of chromosome numbers), polygenic and quantitative heredity.

**BIO-306 Systematics of Vertebrate Animals II**

**Credit (Theory-Practice-Lab.): 3 (2-0-2) ECTS: 4**

In Reptilia, Aves and Mammalia; general features, morphology, skin and color, skeleton, digestion, circulation, respiration, excretion, nerve, sense and breeding organs, habitats, relation with human beings, and systematics.

**BIO-308 Animal Physiology**

**Credit (Theory-Practice-Lab.): 4 (3-0-2) ECTS: 4**

Physiology comparison from simple life to develop life which investigation move, nervous, respiration, digestion, excretion, reproduction and endocrine systems.

**BIO-310 Evolution**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 3**

What is evolution? What are the misunderstandings of evolution? A view the history of evolutionary thought. Early world and changes. Origin of life on Earth. Mechanisms of evolution: mutations, natural selection, migration and genetic drift, population genetics, species concept and speciation mechanisms.

**BIO-312 Plant Embryology**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 3**

Introduction. Scientific development in history of Plant Embryology Life cycle (diplophase and haplophase). Structure of angiosperm flower. Microsporogenesis: Anther and its wall, function of tapetum, callose, archespor, sporogen tissue, pollen mother cells and importance of meiosis, microspore tetrads, pollen structure steps, pollen tube. Megasporogenesis: ovule and types, meiosis in megaspore and megagametophyte embryo sac. Chimera. Pollination and types of pollination in nature. Autogamy and allogamy. Fertilization: germination of pollen on stigma, development of pollen tube and way in stylus, double fertilization, self sterility, endosperma. Zygote, embryogeni, polyembryogeni, apomixes, vegetative fertilization. Seed: maturation, envelope of seeds, classification of seeds, types of dispersion in nature, dormancy of seed, importance of seed.

**BIO-314 Animal Ecology**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 3**

Terms, Zoo-biogeographic distribution, ethology, species protection.

**BIO-316 Biotechnology**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

What does biotechnology means? Structure and characteristics of DNA as genetic material, genes and their functions, gene transfer methods, gene cloning: enzymes used for cloning, vectors and hosts, gene resources, molecular hybridization methods, DNA isolation and visualization, DNA sequencing, PCR, biotechnological applications: genetic disorders, gene therapy, sex and paternity test, transgenic animals and plants, recombinant products in food industry.

**BIO-318 Recombinant DNA Techniques**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Stages of recombinant DNA technology, restriction enzymes, using of gene carrier vectors, plasmids, cosmid and bacteriophage vectors, usage of host cells in DNA cloning, genomic libraries, methods of recombinant DNA technology, polymerase chain reaction, agarose gel electrophoresis, southern blotting, DNA sequencing, current applications of recombinant DNA technology

**UOS-802 University Common Elective II**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 3**

**BIO-804 Bird Watching Methods**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 3**

General characteristics of birds, improving the ability to distinguish morphological features, the importance of bird watching, tools to be used in the observations, the properties of materials and supplies, observation techniques, the findings of evaluation, data conversion to scientific knowledge, health measures, species conservation awareness.

**BIO-806 Biology for Social Sciences**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 3**

Importance of Biology for Social Life, The reason of learning Life Sciences, Science and Technology, Scientific Research, Important Scientists in Life Science, Classification of Living Organisms, Taxonomy and Systematic, Basic features of living things (Morphology, Metabolism, Productivity, Irritability, Homeostasis, Adaptation, Mobility, Organization), Basic components of living things, Basic Chemical Terminology, Classification of food, Inorganic Components (General Properties of Water, Minerals), Organic Components (Carbohydrates, fats, proteins, vitamins, enzymes, nucleic acids), Basic unit of life: cell (shape and size of the cell, the cell structure and function of the cell membrane, cytoplasm and organelles).

## 7. SEMESTER COURSES

**FEF-403 Final Project-I**

**Credit (Theory-Practice-Lab.): 1 (0-0-2)** **ECTS: 2**

To investigate about one of special subject related with sub-branches of biology science and presentate and prepared to analysis the research/experiment results as graduate thesis.

**BIO-403 Hormones**

**Credit (Theory-Practice-Lab.): 2 (2-0-0)** **ECTS: 4**

Explain of the hormone and hormonal communications concepts, kinds of secretion, define of the internal and external secretion glands, histological structure of the internal secretion glands in animals, secretion of hormones and physiological effects of the hormone, investigation of the hormone secretion by control mechanisms.

**BIO-405 Environmental Biology**

**Credit (Theory-Practice-Lab.): 2 (2-0-0)** **ECTS: 4**

Ecologic terms and concepts, geological times and lives, material cycles, environmental problems, solving of environmental problems.

**BIO-407 Entomology**

**Credit (Theory-Practice-Lab.): 2 (2-0-0)** **ECTS: 4**

What is entomology? General informations about Arthropoda classes and determination of the differences between classes. General characteristics of insects. Superior features of the insect that is better than other living things. Insect morphology: head, thorax, abdomen and important structures on these parts. Organ systems, post-embryonic growth and breeding, ecology and taxonomy of insects.

**BIO-409 Specific Embryology**

**Credit (Theory-Practice-Lab.): 2 (2-0-0)** **ECTS: 4**

Embryologic periods, general embryology, developments after zygote in some animals, placentas, twinnings, ectopic pregnancy, systems forming from ectoderm, systems forming from endoderm, systems forming from mesoderm.

**BIO-411 Biodiversity (Fauna)**

**Credit (Theory-Practice-Lab.): 2 (2-0-0)** **ECTS: 4**

Species biology, ecosystem diversity, endangered species, conservation biology and management of biodiversity, population biology, our biodiversity.

**BIO-413 Biological Control Agents**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Biological control methods supply natural balance which use among live food beneficial.

**BIO-415 Fish Farming**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Fish farming's importance and development at agriculture, classification of fish production systems, water source and characteristics, trout farming, carp farming, mullet farming, eel farming, sea bass farming, gilt-head bream farming.

**BIO-417 Limnology**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

General properties of water, classification of inland waters, lakes, lake parameters, physical and chemical properties, classification of lakes as limnological. Streams types and physicochemical and biological properties of streams, organisms in inland waters, ecosystem in inland water, energy and productivity. Substance transfer in ecosystem, energy flow, nutrition and food pyramid steps, biomass, classification of pollution and effects on aquatic life, pollution control

**BIO-419 Water Chemistry**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

In this lesson, water features, different definitions and concepts will be emphasized.

**BIO-421 Professional English I**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Grammar, reading, speaking, understanding and translation.

**BIO-423 Turkey Land Cover**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Identification of flora and vegetation terms; the vegetational structures of Turkey, effective factors on vegetation, phytogeographic areas of Turkey and their plants. Forest vegetations (everygreen and not evergreen forests), macques, pseudomacques, steppe vegetation types, wetlands, alpinic vegetation.

**BIO-425 Useful Plants**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Cereal plants, oil plants, vegetables plants, fruit plants, space plants, stimulant plants, paint and tannin plants, plants used in industrial, sugar, wood and cellulose, rubber and glue plants, essential oil plants, plants used in the pharmaceutical industry, ornamental plants.

**BIO-427 Aquatic Ecosystems**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Importance of aquatic ecosystems, inland aquatic systems, water and food resources, biogeochemical processes, sources of dissolved organic matter (C,N,S,P), its bioassay and effecting factors, monomers effect in DOM flux, biofilms, bacterial effects in DOM cycle, importance of lights in aquatic ecosystems, using by phytoplankton and macrophytes and effected factors, photosynthetic activities of aquatic organisms, zooplanktons, characteristics of aquatic micro and macro fauna, pollution in the aquatic ecosystems and water quality management.

**BIO-429 Caryology**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Origin and significance of chromosome studies, chromosome and karyotype evolution, chromosome structure, number and size, the distribution and importance of B chromosomes, chromosome behaviors and taxonomic significance, types of chromosomal variation, chromosomal variation during mitotic cycle, control mechanisms in the transition from G1 to S phase, polyploidy complex as a unit of evolutionary.

**BIO-431 Plant Secondary Metabolites**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Evolution of secondary metabolites, the relationship between primary and secondary metabolism, characteristics of secondary metabolite production, regulator factors affecting secondary metabolism, roles of secondary metabolites.

**BIO-433 Medicinal Plants**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Medicinal plants and historical development process, the importance of medicinal and aromatic plants, classification of medicinal plants, production of medicinal plants, the factors effecting on the quality of medicinal plants.

**BIO-435 Plant Cell**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Scientific development of cell and microscope in the history, the relationships with other Biology disciplines. Cytoplasmic structure of plant cell. Chemical features of cytoplasm, determination of moisture and dry substance, effects of chemical features to synthetic nourishment media. Physical characters of cytoplasm (osmosis, plasmolysis, transpiration, ion antagonism, mycel structure etc.). Important organelles and their functions, ergastic substances. Nucleus (genome, chromosome and gene organizations), nucleolus. Structure of DNA, replication and translation, genetic code. Cell cycle and quantitative analysis of cycle (mitotic index). Functions of chromosome, caryotype analysis. Gene and gene mutations. Cell division; mitosis and meiosis. Cell wall and structural characters, callose and importance of callose.

Synchronization in living of cell. The use of radioisotopes in cell level. Description of special plant cells in respect of structure and functions.

**BIO-437 Genetic of Prokaryote**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Basics of genetics and molecular biology, prokaryotic gene structure, differences between prokaryotic and eukaryotic genes, gene expression, DNA replication, protein synthesis, genetic code, mutations and mutagenesis, bacterial transformation, conjugation, transduction, molecular biology techniques, polymerase chain reaction, current applications.

**BIO-439 Entrepreneurship**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

**BIO-441**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

**BIO-443**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

**8. SEMESTER COURSES**

**FEF-406 Final Project-II**

**Credit (Theory-Practice-Lab.): 1 (0-0-2) ECTS: 4**

To investigate about one of special subject related with sub-branches of biology science and presentate and prepared to analysis the research/experiment results as graduate thesis.

**REK-402 Scientific and Cultural Activities**

**Credit (Theory-Practice-Lab.): 0 (0-0-0) ECTS: 2**

**BIO-404 Cell Physiology**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Cell metabolism and cell organelles roles.

**BIO-406 Bird Science**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**
Ornithological history, species and species creating mechanisms, general features ordos, biological, systematical and ecological features of ordos, species biology, species distinguish, observation methods.

**BIO-408 Zoogeography**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Living and nonliving factors affecting about the animals, ecosystem concept, Biogeographical regions and their animals, the geologic and faunistic status of the zoogeography, dispersal types of the animals, the migrations of the animals in zoogeography, the relationship between human being and animals from past to present.

**BIO-410 Specific Histology**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Circulatory system (blood vessels system, lymph vessels system), lymphoid organs (lymph nodes, tonsils, thymus, spleen) skin and formations related to skin (skin, hair, nail, skin glands), digestive system (mouth cavity- lip, tongue, anatomic secretory glands; gastrointestinal tract- layers of gastrointestinal tract, esophagus, stomach, intestines; digestive glands- pancreas, liver, gallbladder), respiratory system (nose, nasopharynx, larynx, trachea, lungs), urinary system (kidneys and nephrons), endocrine system (pituitary, thyroid and parathyroid, chromaffin system, epiphysis), female reproduction system (ovary, uterus, vagina), male reproduction system (testis, male genital tract, penis), sense organs (sense receptors, eye, ear).

**BIO-412 Behavioral Biology**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Behavioral biology, components of behavior and its features and kind, examples of behavior, factors effecting on behavior.

**BIO-414 Host-Parasite Relations**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Ichneumonidae morphology and systematics of parasitoid-host interactions and disclosure of parasitoid lifestyle.

**BIO-418 Parasitology**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Parasite and parasitism, relationship between parasite and host, variety of parasitism (obligatory parasitism, temporary parasitism, permanent parasitism, endo parasitism, ecto parasitism), origin and contamination of parasites, pathogenesis and pathology, effects and damages of parasites to their hosts, systematic of parasites, protozoa and sub groups, The species of the helminthes (monogenetic trematoda, digenetic trematoda, cestoda, nematoda, acanthocephala), hirudinea and arthropoda.

**BIO-420 Marine Biology**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Description of the ocean and marine, general characteristics, geomorphological features, events and causes of sedimentation, marine organisms in the ecological classification of marine organisms to ecological factors and effects, living in the seas and biological properties.

**BIO-422 Professional English II**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Grammar, reading, speaking, understanding and translation.

**BIO-424 Plant Geography**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Introduction, areas and types of areal, historical plant geography, ecological plant geography, formations and plant communities, kingdoms of flora, general aspect of Turkey plant geography.

**BIO-426 Field Information**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

To give students theoretical information about field studies and application processes.

**BIO-428 Cytotaxonomy**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

History and relationship with evolution of cytotaxonomy, the methods used in plant cytotaxonomy, presentation of different stains and fixatives, karyotype analysis and detailed examination of chromosomes, chromosome counts and chromosome morphology, chromosome counts and drawings of various plants, effects of various environmental stress on cell division and chromosomes, the statistically calculations of chromosomal abnormalities and mitotic activity.

**BIO-430 Growth-Development Events in Plants**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Growth and development, hormones and growth regulators, plant movements, photomorphogenesis, biological clock, interactions of temperature-growth, photoperiodism.

**BIO-432 Enzymology**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Structure and particularities of enzymes, factors affecting enzyme activity, enzyme kinetics, activators, inhibitors, enzyme inhibition, allosteric enzymes, feedback control, isoenzymes, uses of enzymes, enzyme classification, determination methods of enzyme activity.

**BIO-434 Plant Tissue Culture**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Historical development of tissue culture studies, relationships with other Biology scientific disciplines. Cytoplasmic structure of plant cell. The effects of chemical characters of cytoplasm to the preparation of synthetic media components. Important rules in the preparation of syntethic tissue culture (cleaning, pure and freshening of substracts, importance of equipments). What is stock solution? Calculations and preparations for stock solutions. Sulfate stock, nitrate stock, compounds including iodide (I), flour (F) and chlor (Cl) (Halide stock), KBMo stock (Potassium, Bore and Molybdenum), NaFe-EDTA stock. Their importance and microsalts. Secondary metabolites which is produced by plant cell. Necessary technical details set up a tissue culture laboratory. Tools and their importance in a tissue culture laboratory. Growing sections of plants, plant tissues and organs. Some of important cell groups: meristem cells, gametes.

**BIO-438 Environmental Pollution**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

Environmental pollution of the principles and objectives of course, ecosystems, air pollution, air pollution causes and important air pollutants, the universe in the water cycle and the importance of water for living things, the major water pollutants and their effects. Water pollution against the might be taken based measures of soil and the importance of soil from polluting sources of air pollution, soil pollution on the effects heavy metals and solid wastes, soil pollution on the effects of erosion and energy production, soil pollution on the effects of agricultural activities, soil pollution on the effects, except for purposes of land use effects of soil pollution.

**BIO-440 Science and Technology Policy**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

**BIO-442 Technology and R & D Management**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

**BIO-444**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**

**BIO-446**

**Credit (Theory-Practice-Lab.): 2 (2-0-0) ECTS: 4**