

Course Description

Zoology

1- Diploma

2- Z501: Stem Cell Biology	501ح: بيولوجيا الخلايا الجذعية
The course covers a brief history of the field, cell potency and different cell lineages. It also describes research on animal models, tissue engineering, and the political and ethical issues related to stem cell technology.	
Z502: Ecological Diversity	502ح: التنوع البيئي
The course covers distribution of different animal phyla in different ecosystems, factors affecting speciation and range shift. Sympatric vs allopatric and parapatric speciation. Ecosystem dynamics and equilibrium. Ecosystem management and anthropogenic threats.	
Z503: Molecular Biology	503ح: بيولوجيا جزيئية
The course covers gene structure in prokaryotes and eukaryotes. Molecular mechanisms of DNA replication, repair, transcription, protein synthesis, gene regulation, and chromatin structure and function in different organisms. RNA polymerase dynamics and regulation of gene expression will be discussed. Basic molecular techniques and experiments will be practiced.	
Z504: Biological Vectors	504ح: ناقلات
The course covers the general concepts of biological vectors, vector classes and vector biology, developmental cycle of selected pathogens in their vectors, pathogen-vector interaction, final hostvector relationships, and vector control	
Z505: Invertebrates Physiology	505ح: فسيولوجيا اللافقاريات
The course covers osmoregulation, respiration, digestion, sensation, excretion, metabolism and energy production and expenditure in selected invertebrate phyla.	
Z506: Essentials in Microbiology	506ح: أساسيات الميكروبيولوجي
The course covers different methods of disinfection, sterilization, biosafety, culturing and culture media. Basic structure and taxonomy of bacteria, fungi and viruses. Serological, biochemical and molecular identification and typing of bacteria, fungi and viruses will be discussed.	
Z507: Radiobiology	507ح: بيولوجيا اشعاعية
The course covers the biological responses of animals as well as human beings to ionizing and nonionizing radiations. It describes different mechanisms and pathways involved in animal responses on cellular, subcellular and molecular levels. Also, role of radiation in induction of cancer, malformation and mutagenesis will be addressed. Relative risk and benefits of radiation usage are considered.	
Z508: Fundamentals of Electron Microscopy	508ح: أساسيات المجهر الإلكتروني

The course covers the different types of electron microscopes. Application of EM in life and basic sciences. Samples processing including fixation, sectioning, visualization and imaging. Quality control of electron microscopy preparations and outputs.

Z509: Pathology**509ح: علم أمراض الأنسجة**

The course covers general concepts on cell injury, disturbance in cell metabolism and growth as well as haemodynamics. Also, it describes the fundamentals of apoptosis, inflammation, necrosis, cirrhosis fibrosis and gangrene. Differentiation of benign tumors and neoplasia as well as different types of tissue reactions will be discussed. Also, immunopathology will be addressed.

Z510: Evolution**510ح: علم التطور**

The course covers various theories in evolution. Evolutionary evidences from comparative anatomy, embryology, physiology, taxonomy and molecular biology. Geological time chart and related issues will be described.

Z511: Cytogenetics (1)**511ح: وراثة خلوية (1)**

The course describes meiosis and mitosis, cell cycles, chromosome banding, chromosomal aberrations and the differences in number and structure of chromosomes in animal phyla. Various techniques and applications utilized in cell cycle detection will be covered.

Z512: Laboratory Investigations (1)**512ح: فحوص معملية (1)**

The course covers human samples preparation and analyses including urine and stool analyses, blood analyses, serological and molecular analyses, in both health and disease condition. Also, laboratory safety measures and dealing with harmful or genetically modified organisms will be mentioned.

Z513: Biostatistics**513ح: إحصاء حيوي تطبيقي**

The course covers the different types of experiments, methods of tabulation, manipulation and analysis of experimental data. Also, statistical concepts and models will be discussed. Application of statistical software including SPSS will be practiced.

Z514: Toxicology**514ح: علم السموم**

The course covers the fundamental concepts on the toxicosis, toxicant classes including corrosives, metallic poisons, heavy metals, pesticides, insecticides, molluscicides, animal poisoning, volatile gases poisoning, mycotoxicosis, poisonous plants, irradiation and their occurrence and mechanism of action. Also, it covers factors affecting xenobiotics, mode of action and defense responses.

Z515: Blood Physiology and Blood Diseases (1)**515ح: فسيولوجيا الدم وأمراض الدم (1)**

The course covers the basics of blood cells types and percentages in health and disease, hematopoiesis and hematopoietic tissues, hemoglobin carrying capacity, hemoglobin structure and functions and hematopoietic disorders.

Z516: Bioinformatics**516ح: معلوماتية حيوية**

The course covers gene and protein sequences analysis including detection of open reading frames, sequence alignments, protein structure prediction, helix-turn-helix, transmembrane prediction, and molecular modeling and analysis. In silico recombinant DNA formation, restriction enzyme analysis as well as primer design will be discussed.

Z517: Endocrinology**517ح: فسيولوجيا الغدد الصماء**

The course describes role and regulation of hormonal system associated with development, energy production and utilization, haemostasis, homostasis, growth and reproduction. Also, it covers hormonal coordination, and endocrine related diseases.

Z518: Enzymology**518ح: علم الإنزيمات**

The course covers organization, classification and nomenclature of enzymes. Enzymes, specificity, kinetics and regulation of enzymatic reactions.

Z519: Molecular Physiology**519ح: فسيولوجي جزيئي**

The course deals with the molecular characteristics of different types of muscle function, molecular mechanisms of conduction, action potential, neurotransmission at synapses and neurotransmitters. It covers molecular basis of hormonal regulation and transmembrane transportation and signal transduction.

Z520: Physiological Disorders**520ح: إختلالات وظيفية**

The course covers physiological homostasis and disorders. It emphasizes disorder patterns of diabetes, coronary heart disease, stroke, hypertension, Parkinson's disease, Alzheimer's disease, motor neuron disease, multiple sclerosis, rheumatoid arthritis, osteoporosis, inflammatory bowel diseases. It describes disorders related to nutrients deficiency. Molecular basis of above mentioned disorders will be addressed.

Z521: Genetic and Epistatic Interaction**521ح: وراثة ووراثة فوقية**

The course describes the Function of proteins, interaction of alleles and genes in phenotype production, epistasis: what's in a name, Differing perspectives on gene interactions, Epistatic Relationships Involving Two Genes complementation tests, Epistasis in human health and disease and Epistasis and the path of evolutionary change will be described.

Z522: Physiology of Toxicity (1)**522ح: فسيولوجيا التسمم (1)**

The course covers the majortypes of poisons in terms of potential exposure routs, mechanism of action, detection and quantitation as well as symptoms of toxicity in different animals. Enzymes level and gene expression in corresponding to toxicity will be described.

Z523: Genetic Engineering**523ح: هندسة وراثية**

The course covers fundamental concepts of gene technology, common biotechnology techniques, transgenic animal production, recombinant microorganisms and protein production. Also, biosafety of genetically modified organisms will be discussed.

Z524: Cancer Biology (1)**524ح: بيولوجيا الأورام (1)**

The course describes how cancer arises and develops at the molecular and cellular level. It explains genetic alterations implicated in tumor formation, distinguish alterations in oncogenes and tumor suppressor genes, compare and contrast cell cycle regulatory mechanisms as well as cell death in normal and tumor cells, describe how cancer grows and spreads. Also, distinguish between tumorigenesis, angiogenesis, and metastasis.

Z525: Genomics and Proteomics (1)**525ح: علم الجينوم و البروتيوم (1)**

The course introduces students to genomes, proteomes and databases that store various data about genes, proteins, genomes and proteomes. The main objective is to organize the large amount of information about genomics, proteomics and bioinformatics and offer basic knowledge of genome sequencing, major differences between prokaryotic and eukaryotic genomes, basic proteomics and its applications, basics in bioinformatics, comparative and evolutionary genomics and applications.

Z526: Biology of Genetic Diseases**526ح: بيولوجيا الأمراض الوراثية**

The course covers the chromosomal analysis, chromosomal aberrations, molecular cytogenetics mutations-mutagens and mutagenesis, autosomal recessive and x-linked disorders-twin studies family clusters as well as marker associations models (cancer- diabetes and infectious diseases).

Z527: Applied microbiology**527ح: ميكروبيولوجيا تطبيقية**

The course covers the common topics of microbial technology including fermentation and bioreactors. Also, it covers utilization and application of microbes in different products and processes in industry, environment, aquaculture and agriculture. Common application methods including production of beverage, antimicrobial, biofuel, biodegradation and wastewater treatment will be discussed.

Z528: Applied molecular biology**528ح: بيولوجيا جزيئية تطبيقية**

The course covers the different types of molecular vectors, transformation, transfection and detection of gene products. Also, it covers concepts of agarose gel electrophoresis, nucleic acid purification and quantification, DNA restriction digestion and analysis, Southern hybridization, library construction, and basics of computer-based DNA sequence analysis.

Z529: Microbial poisoning**529ح: التسمم****الميكروبي**

The course describes toxin producing microorganisms in food and food products. Risk of toxicosis in stored food, animal food, beverage, drinking water, and surface water. Description of standard methods of detecting and quantification of such microorganisms and their toxins.

Z530: Cellular and molecular immunology**530ح: مناعة خلوية و جزيئية**

The course covers the general concepts on cell mediated immunity, different types of hypersensitivity reactions, role of T cell subsets, cell receptors, histocompatibility molecules, as well as activation and regulation of immune-related gene superfamilies in case of health, disease and infection. Also, cellular and molecular basis of cell mediated abnormalities will be discussed.

Z531: Aquatic ecosystem**531ح: البيئة المائية**

The course covers fundamentals of different aquatic compartments including lakes, reservoirs, rivers and sea water. It describes food chains and food cycles, benthic life and population responses to various stressors and pollutants. Biomonitoring of ecosystem balance will be addressed.

Z532: Immunochemistry**532ح: كيمياء المناعة**

The course covers the chemical composition of antibodies and their classes, antibody domains and variability of antigen-antibody interaction sites. It describes the molecular basis of antibody variabilities and immune-related gene superfamilies. Factors affecting antigen-antibody interactions, nature of complement, integration between humoral and cellular immune responses and the role of cytokines, as well as immunological disorders will be mentioned. The course will detail the different immunological assays and their role in diagnosis.

Z533: Management of protected areas**533ح: ادارة المحميات الطبيعية**

The course covers concepts of protected areas, the role of protected areas in conserving global biodiversity and for global and regional sustainable development. Biodiversity concepts and the significance of "Hot Spots" will be mentioned. The course also describes categories and types of protected areas, and the different approaches towards management of protected areas. Distribution of protected areas in Egypt and the Egyptian law in the field will be illustrated. Important international organisations for the management of protected areas will be referred.

Z534: Histochemistry (1)**534ح: كيمياء الأنسجة (1)**

The course introduces basics of routine histochemical staining techniques in different tissue compartments. It also covers techniques such electron microscopy, immunohistochemistry, and tissue enzyme histochemistry.

Z535: Treatment of ecological pollution**535ح: معالجة التلوث البيئي**

The course covers different approaches for treatment of pollution and management of ecological crises in case of air, terrestrial and aquatic compartments. Also, it describes, treatment of industrial disposals including air-born particles, chemical and organic pollutants. Drinking water, waste water and solid waste treatments will be detailed. Bioremediation; and setting of emission and quality standards will be provided as well as awareness of modern environmental protection legislation and ethical considerations.

Z536: Assessment of freshwater animal diversity (1)**536ح: تقدير التنوع الاحيائي في المياه العذبة (1)**

This course covers description of aquatic animals' diversity from different animal phyla including examples from, sponges, cnidarians, free living flatworms, rotifers, Nematoda, Gastrotricha, Polychaeta, oligochaetous, Mollusca, Arthropoda, fish, Amphibia, Reptilia, birds and mammals.

Z537: Environmental pollution**537ح: التلوث البيئي**

The course covers the potential sources of pollution in different ecological compartments, including agricultural, industrial and anthropogenic activities. Also, it describes induced environmental problems (e.g. global warming and climate change), effect of pollution on biodiversity and speciation. Control measures will also be addressed. In addition, the course describes fundamentals of physical, biological and chemical treatments of drinking water, sea wage and industrial effluents. Monitoring and quantification of pollutants in the environment will be discussed.

Z538: Food Poisoning (1)**538ح: تسمم الأغذية (1)**

The course covers different examples of microorganisms that produce toxins in food. Toxicities in stored food, beverages and water will be addressed. Toxins detecting and quantification methods will be explained.

Z539: Basics of Environmental management & economics**539ح: أسس الإدارة البيئية والاقتصاد**

The course introduces students to the fields of environmental management. It defines basic concepts and main elements of environmental management, compare between different economic tools and models, with international standards, for environmental management, explain the role of costbenefit analysis in environmental management and benefits of adopting environmental management system.

Z540: Studies in forensic medicine**540ح: دراسات في الطب الشرعي**

The course deals with variousmedico-legal aspects of diseases, essential forensic pathology, recognition and interpretation of wounds and other injuries. It explains the ways of medical and scientific investigation of fires and explosions, non-natural deaths and child abuse. Forensic toxicology, pathology and DNA fingerprinting will be illustrated.

Z541: Parasitology**641ح: الطفيليات (متقدم)**

The course covers the concepts of parasitism, fitness and host-parasite interaction. Also it describes the life cycles of internal protozoa, trematodes and nematodes in human and animals, rumen parasites in animals, blood parasites and tissue dwelling parasites. Life cycles of ectoparasites in animals phyla including mites, fleas, bed bugs, lice and other parasites will be detailed. Control and prevention methods will be addressed.

Z542: Blood physiology and blood diseases**542ح: فسيولوجيا الدم وأمراض الدم**

The course describes the fundamentals of Hematopoiesis and hematopoietic tissues. Hemoglobin structure and functions. Leucocytes ontogeny and maturation. hematopoietic disorders (inherited and acquired). Hematopoiesis in health and disease.

2- Master**3- Z601: Ethics in biological experiments****601ح: أخلاقيات التجارب البيولوجية**

The course covers fundamentals of experimentation ethics including approvals from corresponding authorities, following the rules of preserving of protected areas, natural fauna and endangered species. It also, describes the ethics in experimental animals during specimen(s) collection, injury/killing manipulations, pain relief during the experiments. Following the respected measures of biosafety and biosecurity during biological experiments. Also, close watching and recording actual measurements and observations, appropriate data analyses and avoidance of generalization. Criminalizing experimentation on human beings. Having the required consents in case of patient samples or usage of individuals' data. Respecting the rules of privacy in all cases of biological studies.

Z602: Laboratory investigations**602ح: فحوص
معملية**

The course describes the safety measures in laboratories, biosafety and lab equipment. It covers samples preparation, stool and urine analyses. Also, blood analyses, serological and molecular analyses, using different molecular tools, in both health and disease conditions will be mentioned.

Z603: Cell biology and cell signaling**603ح: بيولوجيا الخلية و الإشارات الخلوية**

The course examines the principals of cellular biology including membrane and organelle structure and function; bioenergetics; and cellular communication. The course also focuses on inter- and intracellular communication, from the generation of signaling molecules till the cellular responses. It covers the major signaling pathways. Explanations of cellular and molecular approaches will be mentioned.

Z604: Molecular Biology**604ح: بيولوجيا جزيئية**

The course covers gene structure in prokaryotes and eukaryotes. Molecular mechanisms of DNA replication, repair, transcription, protein synthesis, gene regulation and chromatin structure and function in different organisms. RNA polymerase dynamics and regulation of gene expression will be discussed. Basic molecular techniques and experiments will be practiced.

Z605: Biotechnology**605ح: تقنية حيوية**

The course focuses on handling and manipulating DNA in different organisms, engineered genes and transgenic organisms. It also covers the bioprocess and biosensors technologies, genetic technology, hybridization based and immuno- based diagnostics, protein technology, bioremediation and quality standards.

Z606: Radiobiology**606ح: بيولوجيا إشعاعية**

The course covers the biological responses of animals as well as human beings to ionizing and nonionizing radiations. It describes different mechanisms and pathways involved in animal responses on cellular, subcellular and molecular levels. Also, role of radiation in induction of cancer, malformation and mutagenesis will be addressed. Relative risk and benefits of radiation usage are considered.

Z607: Blood physiology and blood diseases

607ح: فسيولوجيا الدم وأمراض الدم

The course describes the fundamentals of Hematopoiesis and hematopoietic tissues. Hemoglobin structure and functions. Leucocytes ontogeny and maturation. hematopoietic disorders (inherited and acquired). Hematopoiesis in health and disease.

Z608: Toxicology

608ح: علم السموم

The course covers the fundamental concepts on the toxicosis, toxicant classes including corrosives, metallic poisons, heavy metals, pesticides, insecticides, molluscicides, animal poisoning, volatile gases poisoning, mycotoxicosis, poisonous plants, irradiation and their occurrence and mechanism of action. Also, it covers factors affecting xenobiotics, mode of action and defense responses.

Z609: Endocrinology

609ح: فسيولوجيا الغدد الصماء

The course describes role and regulation of hormonal system associated with development, energy production and utilization, hemostasis, homeostasis, growth and reproduction. Also, it covers hormonal coordination, and endocrine related diseases

Z610: Immunochemistry

610ح: كيمياء المناعة

The course covers the chemical composition of antibodies and their classes, antibody domains and variability of antigen-antibody interaction sites. It describes the molecular basis of antibody variabilities and immune-related gene superfamilies. Factors affecting antigen-antibody interactions, nature of complement, integration between humoral and cellular immune responses and the role of cytokines, as well as immunological disorders will be mentioned. The course will detail the different immunological assays and their role in diagnosis.

Z611: Enzymology

611ح: علم الإنزيمات

The course deals with classification and nomenclature of enzymes, structural organization of enzymes, isolation of enzymes, enzyme specificity, kinetics of enzymatic reactions, molecular mechanisms of enzymatic reactions, regulation of enzyme activity, multicomponent forms of Enzymes, immobilized enzymes and enzyme applications.

Z612: Cytogenetics

612ح: وراثة خلوية

The course deals with cell cycles and cell cycle aberration. It describes chromosome banding, detection of chromosomal changes, variations in the number and structure of chromosomes in representative animal phyla. It illustrates chromosomal mapping, somatic cell hybridization, FISH technique and its applications, autosomal disorders, structure and number

Z613: Biology of Genetic Diseases

613ح: بيولوجيا الأمراض الوراثية

The course covers the chromosomal analysis, chromosomal aberrations, molecular cytogenetics mutations-mutagens and mutagenesis, autosomal recessive and x-linked disorders-twin studies family clusters as well as marker association's models (cancer- diabetes and infectious diseases).

Z614: Cancer Biologyح:614: بيولوجيا
الأورام

The course covers the fundamentals of conventional and molecular basis of cell cycle and hemostasis. Also, it describes the benign and malignant tumors as well as the characters of cancerous cells and ways of metastasis will be discussed. Disturbances in cell signals and the significance of tumor markers will be addressed. Also, it illustrates the oncogenic, physical and chemical origin of cancer. Role of biological responses in induction of cancer including hepatocarcinoma..etc.

Z615: Fundamentals of electron microscopy

ح:615: أساسيات المجهر الإلكتروني

The course covers the different types of electron microscopes. Application of EM in life and basic sciences. Samples processing including fixation, sectioning, visilisation and imageing. Quality control of electron microscopy preparations and outputs.

Z616: Invertebrates comparative anatomy

ح:616: تشريح مقارن لافقاريات

The course covers the comparative anatomy of muscular, circulatory, integumentary, skeletal, digestive, respiratory and nervous, endocrine and urinogenital systems as well as receptor organs in different taxa of invertebrates.

Z617: Histochemistry

ح:617: كيمياء الأنسجة

The course introduces theory and practice of routine histochemical staining techniques, including microorganisms, tissue pigments and minerals, proteins and lipids in different tissue compartments. It also covers specialized techniques such electron microscopy, immunohistochemistry, and tissue enzyme histochemistry.

Z618: Evolution

ح:618: علم التطور

The course covers the different concepts and theories related to evolution. It describes the evidences from comparative anatomy, embryology, physiology and geological time chart. Also, it addresses the effects of selective pressure, mutations and adaptation on the evolution and geographical distribution.

Z619: Vertebrates comparative anatomy

ح:619: تشريح مقارن فقاريات

The course covers the comparative anatomy of muscular, circulatory, integumentary, skeletal, digestive, respiratory and nervous, endocrine and urinogenital systems as well as receptor organs in different taxa of vertebrates.

Z622: Experimental embryology

ح:620: علم الأجنة التجريبي

The course describes the gametogenesis, induction of somatic cells to embryonic status, embryonic induction and control of differentiation. Also, it covers the molecular basis and biochemical changes of metamorphosis and organogenesis, control of embryonic development through stem cells. It illustrates the concepts of gene therapy in embryonic defects/malformation. Also, cell signaling and cell interactions through embryogenesis will be emphasized.

Z621: Vertebrate Paleontology

ح:621: حفريات فقارية

The course describes common definitions in vertebrate paleontology emphasizing vertebrates' subphyla and subclass, particularly Pisces and tetrapoda (Amphibia, Reptila, Aves and Mammalia). It also covers dinosaur paleobiology and the origin of birds. Major mammalian lineages and Primate origins. Importance of Fayoum province in Egypt as a famous locality for vertebrate fossils. Wadi EI-Hitan as a world heritage protectorate in Egypt. Also the study includes examples of each class in the laboratory.

Z622: Ecological Diversity**622ح: التنوع البيئي**

The course covers distribution of different animal phyla in different ecosystems, factors affecting speciation and range shift. Sympatric vs allopatric and parapatric speciation. Ecosystem dynamics and equilibrium. Ecosystem management and anthropogenic threats.

Z623: Advanced invertebrates' taxonomy**623ح: تصنيف لافقاريات (متقدم)**

This course describes the specific characteristics of the different invertebrate phyla including protista, porifera, cnidaria, platyhelminthes, nematoda, annelida, arthropoda, mollusca, echinodermata and their classes.

Z624: Population genetics and Evolution**624ح: وراثة الجماعة والتطور**

The course explains the general concepts of quantitative genetics, gene pools, genetic polymorphisms, transposable elements and genetic equilibrium. Also, it covers distribution and change in frequency of alleles within populations along with the convenient biostatistics models. The main processes of evolution including natural selection, genetic drift, gene flow, mutation, and genetic recombination as well as related phenomena of adaptation, speciation, population subdivision, and population structure will be discussed.

Z625: Invertebrate paleontology**625ح: حفريات لافقارية**

The course describes the invertebrate macro and micro paleontological course, includes; review on invertebrate macrofossil Phyla such as: porifera, cnidaria, bryozoa, brachiopoda, annelida, mollusca, echinodermata and arthropoda. Also it covers collection, preparation, preservation and identification of microfossils. An introductory survey of the major groups of microfossils, including calcareous, siliceous, phosphatic and organic-walled types. The skeletal anatomy, biology, mode of life, and geologic history of Foraminifera and some foraminiferal genera and their classification will be detailed.

Z626: Population genetics and Evolution**626ح: علم الوراثة الإنمائي**

The course describes the mechanisms that control embryonic and post-embryonic development, cell-cell signaling, transcriptional patterning, stem cells, cell differentiation, organogenesis, and morphogenesis. Morphogenesis gradients and gene regulatory mechanisms as well as programming and reprogramming genes in development. The course emphasizes the degree of conservation of the genes controlling development throughout evolution within animal taxa.

Z627: Environmental pollution**627ح: التلوث البيئي**

The course covers the general concepts of environmental pollution, potential sources of pollution in different ecological compartments, effect of pollution on biodiversity and control measures. Acid rains: causes, effects and counter measures. Ozon depletion and global warming: causes and remedies.

Z628: Aquatic ecology**628ح: بيئة مائية**

The course covers the concepts of lakes and rivers as well as seas as ecosystems. The ecological zonation in both freshwater and marine habitats. Trophic dynamics in aquatic ecosystems and eutrophication. Effects of climate change on aquatic habitats. Lentic and lotic habitat, and their communities. Major differences between lotic and lentic systems. Benthic macroinvertebrates as indicator organisms, variation in diversity of benthic macroinvertebrate species as well as aquatic pollution and pollutants. Selected indicators of stream water quality, What is biomonitoring? biotic index, benthic macroinvertebrate biotic index.

Z629: Fetal malformation**629ح: التشوهات الجنينية**

The course describes the concepts on the incidence, definitions and classification of birth defects, genetic cause of malformations, physical, chemical and biological agents as well as malformations of unknown cause.

Z630: Invertebrate physiology

630ح: فسيولوجيا اللافقاريات

The course describes the unique physiological processes of each invertebrates phylum including locomotion, feeding mechanisms and digestion, reproduction, osmoregulation, circulation, respiration, excretion and sensation.

Z631: Assessment of freshwater animal diversity

631ح: تقدير التنوع الإحيائي في المياه العذبة

Global diversity of aquatic macrophytes, sponges, cnidarians, free living flatworms (Platyhelminthes, "Turbellaria"), rotifers, Nemertea, Nematoda, hairworms (Nematomorpha: Gordiacea), Gastrotricha, bryozoans, Tardigrada, Polychaeta, oligochaetous, Hirudinea, Mollusca, Arthropoda, fish (Pisces), Amphibia, Reptilia, mammals, birds.

Z632: Biostatistics

632ح: إحصاء حيوي تطبيقي

The course covers the different types of experiments, methods of tabulation, manipulation and analysis of experimental data. Also, statistical concepts and models will be discussed. Application of statistical software including SPSS will be practiced.

Z633: Geography of Nile River basin

633ح: جغرافيا حوض نهر النيل

The course covers the concepts on the geography and climates of Nile River basin, plant and animal coverage. Also, the origin, development and passway of the Nile river. The impact of human activities on the water quantity and quality will be addressed. In addition, the effect of intervention of basin countries on the Egyptian water quota. The influence of political and ethnic conflicts on the water resources and the potential measures to face the water crises in Egypt will be discussed.

Z634: Geography of Nile River basin

634ح: بيولوجيا البحيرات والبرك

The abiotic frame and adaptations to cope with abiotic constraints. The organisms: the actors within the abiotic frame. Predation and herbivory, Parasitism, Symbiosis, Practical experiments and observations, Food web interactions in freshwater ecosystems. Biodiversity and environmental threats, biodiversity in lakes and ponds, paleolimnology as a tool to understand history, eutrophication, Acidification, contamination, global climate change

Z635: Cellular immunology

635ح: مناعة خلوية

The course illustrates the ontogeny of immune cells, cell communication, cytokines, complement system, development, structure and function of cell receptors of immune cells. Histocompatibility and histocompatibility receptors will be mentioned. Also, it covers cell mediated immunity and hypersensitivity reactions.

Z636: Advanced parasitology

636ح: الطفيليات (متقدم)

The course covers the concepts of parasitism, fitness and host-parasite interaction. Also it describes the life cycles of internal protozoa, trematodes and nematodes in human and animals, rumen parasites in animals, blood parasites and tissue dwelling parasites. Life cycles of ectoparasites in animals phyla including mites, fleas, bed bugs, lice and other parasites will be detailed. Control and prevention methods will be addressed.

Z637: Biology and farming of freshwater prawns

637ح: بيولوجيا واستزراع جمبري المياه العذبة

History and global status of freshwater prawn farming. Introduction to the origins of modern freshwater prawn culture. Global production status, summary of opportunities and constraints. Biology, broodstock management, hatchery systems and management, larval feeds and feeding, nursery systems and management, grow-out systems, site selection and pond construction, monoculture, culture in temperate zones, polyculture and integrated culture, nutrition, feeds and feeding, water quality and soil management, health management, genetics, the biology and

management of size variation. Commercial freshwater prawn farming and enhancement around the world, post-harvest handling and processing, marketing and preparation for consumption, economics and business management. Sustainability of freshwater prawn culture.

Z638: Pathology (علم أمراض الأنسجة) باثولوجي

The course covers general concepts on cell injury, disturbance in cell metabolism and growth as well as hemodynamics. Also, it describes the fundamentals of apoptosis, inflammation, necrosis, cirrhosis fibrosis and gangrene. Differentiation of benign tumors and neoplasia as well as different types of tissue reactions will be discussed. Also, immunopathology will be addressed.

Z639: Protozoa and their role in marine processes الأوليات ودورها في العمليات البحرية

An introduction to a taxonomic review of heterotrophic protists important in marine ecology. Methods for the study of marine microzooplankton Session, Quantitative sampling of field populations of protozooplankton. Protists and pollution - with an emphasis on planktonic ciliates and heavy metals. Endosymbiosis in the protozoa. Mixotrophy in marine planktonic ciliates: physiological and ecological aspects of plastid retention by oligotrichs. Brief perspective on the autecology of marine protozoa. Community grazing in heterotrophic marine protista. trophic behavior and related community feeding activities of heterotrophic marine protists. Protozoan global production of heterotrophic ciliates.

Z640: Medical and veterinary entomology حشرات طبية وبيطرية

The course includes morphology, life cycles, systematics of medically and veterinary important insects including members of order diptera such as members of Phlebotominae, Anophelen and Culicine. Also, the course covers their feeding habits and living habitat, effect of climatic condition on reproduction and distribution. Concepts of myiasis including introduction, morphology, life cycles, classification and control measures of flies involved in myiasis will be mentioned.

Z641: Mariculture الاستزراع البحري

Introduction to and purposes of mariculture- site selection- water quality and sources- Cage culture- Cage design: Floating flexible, floating rigid, semi-submersible and submersible- fish species suitable for aquaculture- induction of spawning and larval keeping.

Z642: Shrimp Diseases أمراض الجمبري

Shrimp Species and Anatomy, Obvious Manifestations of Shrimp Disease: (Damaged Shells, Inflammation and Melanization, Emaciation and Nutritional Deficiency, Muscle Necrosis, Tumors and Other Tissue Problems, Surface Fouling, Cramped Shrimp, Unusual Behavior, Developmental Problems, Growth Problems, Color Anomalies, Microbes, Viruses, Bacteria and Rickettsia, Fungus, Protozoa, Haplospora, Gregarina, Body Invaders, Surface Infestations, Worms, Trematodes, Cestodes, Nematodes, etc..).

Z643: Biological Control of Insects مكافحة البيولوجية للحشرات

The course covers fundamentals of biological control including biology of predators, parasitoids and pathogenic agents, interaction between herbivores and natural enemies, biotechnology in biological control, biological control in pest management.

Z644: Production and use of live food for aquaculture إنتاج واستخدام الغذاء الحي في المزارع السمكية

Major classes and genera of cultured algal species, algal production, growth dynamics, isolating/obtaining and maintaining of cultures, sources of contamination and water treatment, algal culture techniques, algal production in outdoor ponds, culture of sessile micro-algae, quantifying algal biomass, harvesting and preserving micro-algae, algal production cost, use of micro-algae in aquaculture, replacement diets for live algae, preserved algae, rotifers, artemia, cladocerans, nematodes and trochophora larvae morphology, biology and life history, strain differences, general culture conditions, marine rotifers, freshwater rotifers, culture procedures, harvesting/concentration of rotifers, nutritional values of the cultured rotifers. Production and use of resting eggs.

Z645: Insect behavior**645ح: سلوك الحشرات**

The course describes the mechanisms underlying the behavior of insects; emphasis on neuroelthological and evolutionary bases of insect orientation, mating and reproduction, feeding, oviposition, defense, learning, and sociality.

Z646: Principles of Aquaculture**646ح: أساسيات الاستزراع المائي**

The course covers an introduction to the types of aquaculture systems: Open, Semi-closed, closed systems. Common culture method for each fish category, culture types, hanging culture, bottom culture, semi-enclosed, and closed systems. Recirculating, raceways, and inland ponds- fish transport- fish care.

Z647: Medicinal and poisonous plants**647ح: نباتات طبية ونباتات سامة**

The course describes the general concepts on medicinal and toxic plants with reference to Egyptian flora. Systematic of medicinal and toxic plants, toxic materials in each plant, distribution of toxic/medicinal materials in different parts of the plant, extraction methods, and different assays of toxicity in the plants/plant extracts will be detailed.

Z648: Mycology**648ح: ميكولوجي**

The course covers different methods of disinfection, sterilization, biosafety, culturing and culture media of fungi and yeasts. Basic structure, morphology, metabolism, and taxonomy of fungi and yeasts. Serological, biochemical and molecular identification and typing will be illustrated. Role of immune responses and hypersensitivity in mycotic infections will be addressed.

Z649: Microbial poisoning**649ح: التسمم الميكروبي**

The course describes toxin producing microorganisms in food and food products. Risk of toxicosis in processed food, animal food, beverage, drinking water, and surface water. Description of standard methods of detection and quantification of such microorganisms and their toxins.

Z650: Fundamentals of virology**650ح: أساسيات الفيروسات**

The course covers structure and classification and phylogeny of RNA and DNA viruses as well as viroids and prions. It also describes host cell attachment and invasion, uncoating, replication strategies, assembly, incubation, transmission and viral evolution. Pathogenesis of the viruses will be addressed. Also, the common

techniques of virus isolation, culturing as well as sero-and molecular identification will be detailed.

Z651: Fundamentals of forensic medicine

651 ح: أساسيات الطب الشرعي

The course describes identification of death, wounds, thermal injuries, asphyxia, abortion, infanticides, medical rules and ethics. Basic concepts on toxicosis symptoms, detection and quantification of toxicants will be addressed. Fundamentals of crime scene investigations including fingerprints, biological as well as molecular evidences.

Z652: Medical virology

652 ح: علم الفيروسات الطبية

The course covers principles of animal and human molecular virology. Topics include replication, expression, pathogenesis, methods of diagnosis and detection, current uses of viruses in gene therapy and vaccine applications, viruses and cancer and other diseases, persistent infections, and emerging viruses. Comprehensive examples of different viral taxa.

Z653: Essentials in Microbiology

653 ح: أساسيات الميكروبيولوجيا

The course deals with basic structure and taxonomy of bacteria, fungi and viruses. It also covers disinfection and antiseptis procedures, microbial growth and death measurements, microbiological sampling and analysis of different environments, antimicrobial analysis. Also, it illustrates different approaches of selected pathogenic microorganisms.

Z654: Medical microbiology

654 ح: الميكروبيولوجيا الطبية

The course covers basic concepts of medical microbiology, explaining the fundamental information about the pathogenic microorganisms, studying the types of pathogenic microbes and the host infection, summarizing the essential conceptions of mechanism of action between microorganism and the host. It also discusses the most recent techniques in the field of microbial biotechnology.

Z655: Bacteriology

655 ح: بكتريولوجيا

The course covers different methods of disinfection, sterilization, biosafety, culturing and culture media. Basic structure and taxonomy of bacteria. Serological, biochemical and molecular identification and bacterial typing. Antigenic structure and virulence factors in bacteria as well as development of antimicrobial resistance and resistance genes will be discussed.

Z656: Introduction to epidemiology

656 ح: مقدمة في وبائيات انتشار الامراض

The course provides introduction to epidemiology, covers the principles and methods of epidemiologic investigation including describing the patterns of illness in populations and research designs for investigating the etiology of disease, introduces quantitative measures to determine risk, association and procedures for standardization of rates.

Z657: Zoonotic diseases

657 ح: الأمراض المشتركة

The course covers the general concepts of zoonosis, selected topics of zoonotic parasites, bacteria, fungi, viruses and prions. It describes routes of transmission, pathogenesis of the infection, control and prevention measures. Also, surveillance programs will be addressed.