

الدراسية لبرامج الدراسات العليا.

<b>E</b>		<b>E</b>		
Diploma		B500		<ul style="list-style-type: none"> <li>الميكروبيولوج</li> <li>البيئي والمعالجة الحيوية</li> <li>التقنية الحيوية النباتية</li> </ul>
M.Sc.	ماجستير	B600		<ul style="list-style-type: none"> <li>(خلية و - بيولوجيا</li> <li>جزئية - تكنولوجيا حيوية)</li> <li>البيئة النباتية</li> <li>التصنيف الزهري والفلورا المصرية</li> <li>الميكروبيولوجي (بكتريا - فطريات -</li> <li>فيروسات)</li> </ul>
Ph.D.		B700		<ul style="list-style-type: none"> <li>(خلية و - بيولوجيا</li> <li>جزئية - تكنولوجيا حيوية)</li> <li>البيئة النباتية</li> <li>التصنيف الزهري والفلورا المصري</li> <li>الميكروبيولوجي (بكتريا - فطريات -</li> <li>فيروسات)</li> </ul>

الخطة الدراسية :

			<b>E</b>	
			B500	
	اختياري			

جبارية: يدرس الطالب ساعات معتمدة موزعة على فصلين دراسيين بواقع

الساعات الاختيارية: يختار الطالب ساعات معتمدة موزعة على فصلين دراسيين بواقع

الميكروبيولوجية

اختياري					
-					أجهزه وتحليلات ميكروبية
-			-		ميكروبيولوجيا تطبيقية
-			-		وراثة ميكروبية

	-		-	أمراض نبات ومقاومة حيوية	
	-		-	كيمياء حيوية نباتية	
	-		-	بيولوجيا الطحالب	
	-		-	بيولوجيا المياه	
	-		-	ميكروبيولوجيا التخمر	
	-		-	طفيليات	
-			-	علم الفيروسات و المناعة	
-			-	فسبولوجيا كائنات دقيقة	
	-		-	البيئي بالميكروبات	
	-		-	بكتريا ممرضة ومضادات حيوية	
	-		-	التكسير الحيوي	
	-		-	ميكروبيولوجيا ذية	
	-		-	ندوة بحثية	
	-		-	فسبولوجيا الدم وأمراض الدم	

البيئي والمعالجة الحيوية:

ية

اختيا					
-			-		
-			-	تأهيل النظم البيئية	
-			-	وراثة ميكروبية	
	-		-	تشخيص التلوث البيئي وقانون البيئة	
	-		-	كيمياء حيوية نباتية	
	-		-	تقييم التلوث	
	-		-	بيولوجيا المياه	
	-		-	معالجة النفايات	
-			-	المعالجة النباتية	
-			-	الطفرة الجيني	
	-		-	التقنية الحيوية البيئية	
	-		-	بكتريا ممرضة و مضادات حيوية	
	-		-	التكسير الحيوي	
	-		-	ميكروبيولوجيا الاغذية	
	-		-	ندوة بحثية	

التقنية الحيوية النباتية:

ية

اختياري					
-			-	البيولوجيا الجزيئية	
-			-	تقنية حيوية ميكروبية	
-			-	وراثة ميكروبية	

	-		-		فسيولوجيا متقدم	
	-		-		تقنية حيوية الطحالب	
	-		-		هندسة وراثية	
-					بيولوجيا الخلية والو	
-			-		معلوماتية حيوية	
-					التقنية الحيوية	
	-				بكتريا ممرضة و مضادات حيوية	
	-		-		التكسير الحيوي	
	-				ميكروبيولوجيا الأغذية	
	-		-		ندوة بحثية	

### قرارات الدراسية

#### B501: Microbiological analysis and Instruments

#### : أجهزة أجهزه و تحليلات ميكروبية

Sterilization, Disinfection and Antisepsis. Growth and death measurements. Microbiological analysis of special environments. Antimicrobial analysis. Immunological analysis. Diagnosis of some pathogenic microorganisms.

#### B502: Virology and Immunology

#### : علم الفيروسات

Virus purification in relation to diagnosis. Virus systematics . Electron microscopy of In Vitro preparations. Serological methods of virus diagnosis. Serological tests. Immunoenzymatic Assays. Immunity to bacteria and fungi (avoidance of immune system), Tumor immunology (mechanisms of immunity, Tumor immunology (avoidance of immune system, Viral immunology (mechanisms of immunity, system), Plant immunology (introduction, different plant defenses, Round up discussion on the topics of the course, Plant immunology (uses of plant immunology in production of human vaccines, Vaccination (introduction ,traditional production of vaccines, Vaccination (new approach in vaccines production and uses, Immunological techniques (ELISA), Round up discussion on the topics of the course, Immunological techniques (PCR).

#### B503: Applied Microbiology

#### : ميكروبيولوجيا تطبيقية

Fermentation industry. Production of pharmaceuticals: Antibiotics, steroids, production of organic acids, vaccines, production of amino acids, production of enzymes, production of fuels. Microbiological production of food and beverages.

#### B504: Physiology of microorganisms

#### : فسيولوجيا كائنات دقيقة

Study cellular function, regulation, metabolism, basic energy yielding, morphogenesis, reproduction, metabolic properties of microorganisms, microbial activity and ecology. Spore germination of fungi, Dormancy (exogenous dormancy ), Constitutive dormancy, Breaking dormancy, Stimulatory substances ( maturation ), Heat shock proteins in fungi, Cellular effects of heat shock proteins, Heat

shock and development, Chitosan and fungi, Production of chitosan by fungi, Some applications of chitosan, Fungicides, Systemic fungicides, Selective Topic, Uptake and translocation and mechanism of systemic fungicides action.

**B505: Microbial genetics**

: وراثة ميكروبية

Genetic system of Bacteria, Microbial transformation, Microbial transduction, conjugation recombination in bacteria, fungi and viruses, Yeast genetics, plasmids , victors and DNA analysis in microorganisms, modern techniques in DNA analysis , bacterial genetic materials. Structure and organization of gene, Genetic elements, replication and repair of nuclear gene, molecular base of genetic change, DNA structure, recombination and evolution.

**B506: Environmental microbial contamination**

: البيئي بالميكروبات

Microbial dynamics, Microbial metabolism, Microbial interaction, Methods of Microbial pollutants. Microbial contamination of air, water, soil and food. Evaluation of risks related to microbiological contamination. Control and effectiveness of intervention to minimize the risks of microbiological contamination.

**B507:Plant pathology and biocontrol**

: أمراض نبات و مقاومة حيوية

Definition of diseases, How pathogen attacks plant, Mechanical forces exerted by pathogens on host tissues, Chemical weapons of pathogens, Microbial toxins in plant diseases, Growth regulators in plant diseases, Polysaccharides in plant disease, How plants defend themselves against pathogens, Structural defenses, Biochemical defenses, Study some plant diseases. Different types of control plant diseases, genetic control of plant diseases, biocontrol of diseases, definition and application. Practical isolation, identification and control of pathogens.

**B508:Pathogenic bacteria and antibiotics**

: بكتريا ممرضة و مضادات حيوية

Significance of disease. Parasitism and development. Measurement of plant disease. Environmental factors that affect plant disease. Resistance of plants against pathogens. Principles of disease control. History and discovery of antibiotics. Chemical nature of antibiotics. Mechanism of action of antibiotics. An ideal antibiotics for therapeutic purpose. Resistance to antibiotics. Application of antibiotics.

**B509: plant biochemistry**

: كيمياء حيوية نباتية

All topics of this course are taught in the context of plant biology. The course will consider the chemical constituents of plants, their synthesis, their contribution to key metabolic processes and the regulation of their biosynthesis. The biochemistry of amino acids and proteins, sugars and carbohydrates, and lipids. Protein structure. Carbohydrates, Lipid metabolism. Quantitative aspects of

biochemistry including enzyme kinetics, protein ligand binding, analytical techniques, and bioenergetics .Intermediary metabolism, discussed in the context of plant cell structure and function. Biochemical processes and metabolic pathways that are specific to plants, including photosynthesis, photorespiration, cell wall biosynthesis, nitrate and sulfate assimilation, and plant secondary metabolism. Structure and roles of fatty acids. Organic acids in c3 and in c4 plants.

**B510: Biodegradation of pollutants**

: التفسير الحيوي

Biodegradation and environment, natural microorganisms and environment changes, factors affect biodegradation, microbial degradation, organic pollution, treatments and nutrients.

**B511: Biology of Algae**

: بيولوجيا الطحالب

We will examine aquatic and terrestrial algal diversity, with a special emphasis on marine algae. We will consider the evolution, ecology, physiology, cell biology, and technological applications of algae.

**B512: Foods microbiology**

: ميكروبيولوجيا الأغذية

Food as substrate for microorganisms. Important microorganisms in foods microbiology. Food contamination. food spoilage. food preservation. Food born diseases. Fermented food and beverages . Fermented dairy products. Food sanitation, control and inspection.

**B513: Biological properties of water**

: بيولوجيا المياه

Water as a substance. Properties of water. Different aquatic ecosystems: Freshwater and marine ecosystems, shallow marine waters. Environmental factors affecting algal distribution in aquatic ecosystems. Ecosystems processes. Eutrophication and pollution. Red water or red tide phenomenon.

**B514: Research Seminars**

: ندوة بحثية

The course title and description are submitted by the department committee.

**B515: Fermentation Microbiology**

: ميكروبيولوجيا التخمر

Course focuses on the biochemistry, genetics, and behavior of microorganisms for the production of fermented beverages.

**B516: Phytoremediation**

: المعالجة النباتية

Phytoremediation, toxicity of heavy metals, organic and inorganic pollution, phytodegradation and stimulation phyto extraction , molecular and genetic basis of metal hyper accumulation by plants. Modern subjects in bioremediation.

**B517: Toxicology and pollution**

:

An introduction to the general principles of toxicology. Salient topics include: dose-response relationships, toxicokinetics, target toxicity, mechanisms of toxic action, general principles of toxicity testing, and mechanisms of action of antidotes. A discussion of major environmental pollutants, their sources, interactions with atmospheric, terrestrial and aquatic systems, exposure of people, animals and other biota, and their dose-response relationships. Some of the physical and chemical changes induced in the environment by pollutants, contaminant fate and transport, and bioremediation are also discussed.

**B518: Gene Mutation**

: الطفرة الجينية

Examination of toxic effects of environmental substances on living systems, effect of chemical agents on living organisms, genotoxic effects, Types of gene mutation, DNA damage and repair, chromosomal abnormalities and mutation.

**B519: Conservation and Rehabilitation of Ecosystems**

: تأهيل النظم البيئية

Reasons of conservation, value of wild life, ecosystem services, cause of wild life loss , impact of pollution growth and nature resources, establishment and maintains of protected area strategies of economic and conservation over entire region.

**B520: Ecological biotechnology**

: التقنية الحيوية البيئية

Introduction to legislation, economics and treatment technology. Waste characteristics, major degradative metabolic pathways, degradation of aliphatic, aromatic and halogenated compounds. Yeast fermentation applications. Reactor system and bioremediation technologies. microbiology of man-made environment. Waste water treatment technology.

**B521: Diagnosis of the environmental pollution and Environmental law**

: تشخيص التلوث البيئي و قانون البيئة

Methods for isolating pathogenic microorganisms and determining significant properties and immunological features. Testing the sum of all biological factors affecting plants and animals. Need for Environmental law, development of environmental law, public and private rights, regulation of pesticides and toxic materials, impact statements, professional as experts witnesses.

**B522: Cell Biology and Genetic**

: بيولوجيا الخلية و

Ultra-structure of cell components, membrane theory and transport cell molecules, structure and function Mitotic division. Meiotic division. Chromosomal changes, Karyotype, Chromosomal

abnormalities. Structural and numerical changes. Genetic material structure, function, sex determination and inheritance, diseases and cell function.

### **B523: Pollution evaluation**

: تقييم التلوث

Qualitative and quantitative analysis of environmental samples using UV visible spectrophotometry technique . Single and double beam spectrophotometers . Beer-Lambert's law . Calibration curve and standard addition methods . Chromatographic separation and detection of organic pollutants in environmental samples using different Chromatographic techniques. Paper Chromatography (PC) . Thin layer Chromatography (TLC) . Electrophoresis . Ion-exchange Chromatography. Gas Chromatography (GC) . High-Performance Liquid Chromatography (HPLC). Testing the sum of all radiation types affecting plants and animals. Methods for detecting radioactivity.

### **B524: Bioinformatics**

: معلوماتية حيوية

This course covers computational techniques for mining the large amount of information produced by recent advances in biology, such as genome sequencing and microarray technologies. Main topics of the course include: DNA and protein sequence alignment, sequence motifs/patterns, phylogenetic trees, protein structures: prediction, alignment, classification, microarray data analysis: normalization, clustering and biological networks.

### **B525: Waste management**

: معالجة النفايات

The aim of this course is to study different genetic engineering methods used in the treatment of various environmental pollution, whether in soil, water, food or air. The causes of environmental pollution will be reviewed. Moreover, the course will cover new trends to produce bio-products in order to replace chemical ones to maintain clean environment. Waste management, techniques, secondary biological treatment process, sewage sands filters, activated sludge plants, ponds, rotating biological contractors, aerobic and anaerobic nutrient removal.

### **B526: Biotechnology**

: التقنية الحيوية

This course is an introduction to the field of biotechnology. Topics include recombinant DNA, production of biological molecules, bioprocessing, and current events. Students also review employment and careers in the biotechnology and biopharmaceutical industries. Laboratories include aseptic technique, pipetting and measurement, DNA extraction and restriction digestion, gel electrophoresis, and PCR.

### **B527: Molecular biology**

: البيولوجيا الجزيئية

Information flow in the cell, Structure and organization of nuclear genes, Replication and repair of nuclear genes, Expression of nuclear genes, Chloroplast genome, Mitochondrial genome, Molecular basis of genetic changes, Molecular biology research methods.

**B529: Microbial Biotechnology**

: تقنية حيوية ميكروبية

This course covers how microbes are used to manufacture components of food and consumer products, biologics and biomaterials using recombinant DNA and is organized following the steps in discovery and development of biologics. An introduction to microbial growth kinetics is included as well as discussions on generating products from genetically modified microorganisms (GMOs,) . A minor portion of this class will also present schemes for choosing microbial hosts & vector expression systems for the production of heterologous peptides, proteins, or post translational-modified proteins and how this affects overall process strategy. Methods for production of industrial enzymes and selected applications of enzyme technology; for the pharmaceutical, chemical industries and for environmental remediation are presented.

**B531: Tissue culture**

:

Methods used in plant cell and tissue culture, Tissue culture nutrient media, Laboratory organization for tissue cultures, Culture of haploid cells, Isolation and fusion of protoplast, Propagation of plants from tissue cultures. Propagation of plants from fused protoplast, Cytology of cultured cells, Genetic variability through in vitro tissue and cell culture, Use of tissue cultures in gene transfer. Use of tissue cultures approaches for the production of plants adapted to environmental stress, and other desired traits.

**B533: Advanced Physiology**

: فسيولوجيا متقدم

Examines advances in plant physiology, with emphasis on carbon and nitrogen metabolism, mineral nutrition, solute transport and phloem translocation, plant growth regulators, and secondary compounds in relation to growth and development. Metabolism of carbohydrates, fats, and nitrogen compounds in higher plants; cell structures as related to metabolism; metabolic control mechanisms.

**B535: Algal biotechnology**

: تقنية حيوية الطحالب

This course will provide an overview of the growing field of algae biotechnology by introducing the basics of photosynthetic bio-manufacturing. The topics covered will include the biofuels, feeds and foods, nutraceuticals, industrial enzymes and therapeutic proteins. it will also cover the basics of algae biology and its importance as a feedstock, the biochemical, genetic and molecular approaches being developed to advance the next generation of bio-products, and the economical and global impacts of algal biomass production. Overall, the course will emphasize the importance of photosynthetic biomanufacturing development as a contributor to replacing the diminishing supplies of fossil fuels, reducing global warming, and creating a sustainable society.



**B537: Genetic engineering****: هندسة وراثية**

This course will focus on basics of genetic engineering, the methodology of gene manipulation, recombinant DNA technology, DNA manipulation, transgenic plants and the ethics of genetic engineering.

**ثانياً: الخطة الدراسية لبرامج الماجستير.**

		E	
	إختياري	B600	

. الساعات الإلجبارية: يدرس الطالب ساعات معتمدة موزعة على فصلين دراسيين بواقع

. الساعات الاختيارية: يختار الطالب ساعات معتمدة موزعة على فصلين دراسيين بواقع

. التسجيل لدرجة الماجستير. ( – B600 ) يبدأ بعد الانتهاء من إجراءات

. الدراسية الماجستير (خلية و – بيولوجيا جزيئية – تكنولوجيا حيوية).

إختياري					
-				وراثة خلوية	
-			-	هندسة وراثية	
-				بيولوجيا جزيئية متقدمه	
	-		-	وراثة ميكروبية	
	-		-	يمياء حيوية نباتية	
-			-	الخلية النباتية و زراعة انسجة	
-				معلوماتية حيوية	
	-		-	حيوية و تطبيقاتها	
	-			تقنية حيوية	
	-		-	التركيب الدقيق للخلية	

. الدراسية الماجستير البيئة النباتية.

اختياري						
-			-			
-			-		بيئة نباتية	
-			-		تأهيل النظم البيئية	
	-		-		بيئة صحراوية	
	-		-		بيئة النباتات الملحية	
	-		-		ميكروبيولوجيا التربة	
	-		-		علاقات مائية	
-			-			
-			-		التلوث البيئي	
	-		-		علم حبوب اللقاح و الفلورا المصرية	
	-		-		بيئة العشائر النباتية	
	-		-		حيوية و تطبيقاتها	
	-		-		تصنيف النباتات	
	-		-		المعالجة النباتية	

الدراسية الماجستير

اختياري						
-			-		فسيلوجيا النبات	
-			-		كيمياء حيوية نبات	
-			-		بيولوجيا جزئية متقدمة	
	-		-			
	-		-		فسيلوجيا النبات البيئية	
	-		-		فسيلوجيا الكائنات الدقيقة و الطحالب	
	-		-		أجهزة قياس و تحليلات فسيلوجية	
-			-		الإنزيمات	
-			-		بيولوجيا تطور النبات	
	-		-		فسيلوجيا جزئية	
	-		-		فسيلوجيا الإجهاد	
	-		-		الخلية النباتية و زراعة	
	-		-		حيوية و تطبيقاتها	
	-		-		المعالجة النباتية	

الدراسية الماجستير التصنيف الزهري و الفلورا المصرية.

اختياري						
-			-			

-					التصنيف الخلوي	
-					أحيائي	
	-		-		النباتات المائية	
	-				النباتية	
	-		-		تشريح متقدم	
	-		-		حيوية و تطبيقاتها	
-			-		التصنيف الجزيئي	
-			-		الجغرافيا النباتية	
	-		-		النباتات الطبية	
	-		-		علم حبوب اللقاح و الفلورا المصرية	
	-		-		تصنيف النباتات	
	-		-		التصنيف التطوري	

. الدراسة الماجستير الميكروبيولوجي (بكتريا - فطريات - فيروسات).

اختياري						
-			-		وراثة ميكروبية	
-			-		وفسيولوجيا	
-			-		ميكروبيولوجيا تطبيقية	
	-		-		كيمياء حيوية نبات	
	-		-		ميكروبيولوجيا التربة	
	-		-		أمراض نبات ومقاومة حيوية	
	-		-		حيوية وتطبيقاتها	
	-		-		تقنية حيوية الطحالب	
-			-		علم الفيروسات و المناعة	
-					علم البكتريا متقدم والسموم البكتيرية	
	-		-		ميكروبيولوجيا طبية	
	-				فسيولوجيا الكائنات الدقيقة	
	-				ميكروبيولوجيا الأغذية	
	-		-		تقنية حيوية ميكروبية	
	-		-		لم الفطريات متقدم والسموم الفطرية	
	-				طحالب المياه العذبة	

### المحتوى العلمي للمقررات الدراسية

#### B601: Cytogenetic

#### : وراثة خلوية

This course will focus on Cell division and cell cycle analysis, Chemical and architectural structure of chromosomes, Chromosomal changes, Karyotype analysis, Karyotype evolution, Methods of chromosomal studies, Molecular cytogenetics, Applications of cytogenetics in plant breeding and evolution, recent studies in cytogenetics.

**B602: Population genetics**

:

The genetic structure of populations, genetic variation and speciation, reproduction isolation, the statistical basis of population genetics, Gene and genotype frequencies, the Hardy-Weinberg principle and its uses, evolutionary processes, ecological and environmental genetics.

**B603: Genetic engineering**

: هندسة وراثية

This course will focus on basics of genetic engineering, the methodology of gene manipulation, recombinant DNA technology, DNA manipulation, transgenic plants and the ethics of genetic engineering, modern trends and recent studies in genetic engineering.

**B604: Plant cell and tissue culture**

: الخلية النباتية وزراعة

Methods used in plant cell and tissue culture, Tissue culture nutrient media, Laboratory organization for tissue cultures, Culture of haploid cells, Isolation and fusion of protoplast, Propagation of plants from tissue cultures. Propagation of plants from fused protoplast, Cytology of cultured cells, Genetic variability through in vitro tissue and cell culture, Use of tissue cultures in gene transfer. Use of tissue cultures approaches for the production of plants adapted to environmental stress, and other desired traits.

**B605: Advanced Molecular biology**

: بيولوجيا جزيئية متقدم

Molecular analysis of plant growth and development. Molecular techniques and their application to understanding control of gene expression in plants, recent studies in the field of molecular biology.

**B606: Bioinformatics**

: معلوماتية حيوية

This course covers computational techniques for mining the large amount of information produced by recent advances in biology, such as genome sequencing and microarray technologies. Main topics of the course include: DNA and protein sequence alignment, sequence motifs/patterns, phylogenetic trees, protein structures: prediction, alignment, classification, microarray data analysis: normalization, clustering and biological networks.

**B607: Microbial genetics**

: وراثية ميكروبية

Genetic system of Bacteria, Microbial transformation, Microbial transduction, conjugation recombination in bacteria, fungi and viruses, Yeast genetics, plasmids, vectors and DNA analysis in microorganisms, modern techniques in DNA analysis, bacterial genetic materials. Structure and organization of gene, Genetic elements, replication and repair of nuclear gene, molecular base of genetic change, DNA structure, recombination and evolution.

**B608: Biostatistics and Computer Applications****: حيوية و تطبيقاتها**

Frequency distribution, Standard errors and confidence limits, Significance tests, Correlation measurements, Regression analysis, Cluster analysis and principal component analysis, Probability and its application in genetic research, Introduction to basic computer programs used in genetics, systematic and evolution research.

**B609: Genetics and evolution****:**

Historical background – The fine structure of the gene – Processes of evolutionary changes – Natural selection – Mutation – Breeding systems – Genome evolution – Molecular basis of evolution – Factors promoting evolution – Biogeography and evolution – Biodiversity.

**B610: Biotechnology****: تقنية حيوية**

This course is an introduction to the field of biotechnology. Topics include recombinant DNA, production of biological molecules, bioprocessing, and current events. Students also review employment and careers in the biotechnology and biopharmaceutical industries. Laboratories include aseptic technique, pipetting and measurement, DNA extraction and restriction digestion, gel electrophoresis, and PCR.

**B611: Plant biochemistry****: يمياء حيوية نباتية**

All topics of this course are taught in the context of plant biology. The course will consider the chemical constituents of plants, their synthesis, their contribution to key metabolic processes and the regulation of their biosynthesis. The biochemistry of amino acids and proteins, sugars and carbohydrates, and lipids. Protein structure. Carbohydrates, Lipid metabolism. Quantitative aspects of biochemistry including enzyme kinetics, protein ligand binding, analytical techniques, and bioenergetics. Intermediary metabolism, discussed in the context of plant cell structure and function. Biochemical processes and metabolic pathways that are specific to plants, including photosynthesis, photorespiration, cell wall biosynthesis, nitrate and sulfate assimilation, and plant secondary metabolism. Structure and roles of fatty acids. Organic acids in c3 and in c4 plants

**B612: Genetic engineering****: التركيب الدقيق للخلية**

This course is an intensive examination of cell ultrastructure and function. Emphasis is placed on the role of specific organelles in cellular processes such as membrane structure, function, biogenesis and recycling; protein structure, assembly, modification and trafficking; energy transduction; intracellular transport; cellular locomotion; cell cycle control and programmed cell death; and, cell to cell communication. Techniques employed in the study of cellular components and processes, including microscopy, are integrated into the course content; as is the relationship of individual cells within the

environment of an integrated multicellular organism, cellular metabolism, genetics, and other related topics.

**B613: Vegetation cover in Egypt**

:

Community sampling, measuring species quantities, Count-plot method, Plotless sampling techniques, Mathematical treatment of vegetation data, Direct gradient analysis, Ecological diversity in Egypt, Production ecology, Introduction to Population Ecology, Life tables, Simple models, Regulation of plant populations, Demography of some plant populations, Colonial plants, Evolutionary ecology, Interactions in mixtures of species, Coexistence and the niche,

**B614: Phytosociology**

:

Introduction to Phytosociology, Life forms and Stratification, Horizontal distribution, Subjective, assessment of abundance frequency symbols, Quantitative assessment of abundance, Statistical and Sampling methods, Transect and isonomic studies, Vegetation change and Plant succession, Causal factors of inter-species associations, Examples to some communities in Egyptian deserts.

**B615: Plant Ecology**

: بيئة نباتية

This course will focus on the study of plants in relation to their environment. The course covers both autecology and synecology so that students learn about the spectrum of environmental factors and how these factors influence individual organisms as well as communities and ecosystems; Study of the local factors which limit plant growth, reproduction, and diversity. Particular emphasis on the mechanisms by which plants interact with their local environment and the effects of these interactions on diversity and community functioning. Specific topics include plant foraging, germination ecology, mechanisms of competition and facilitation, patterns of diversity, and community stability. The course includes local and global examples of subject matter studied.

**B616: Environmental pollution**

: التلوث البيئي

The course has been designed to improve the understanding of the students about different pollution control strategies and the skills of application of remediation techniques to combat pollution in three environmental compartments i.e. air, water and soil. The course will also be dealing about the sources of pollution in air, soil, water, solid-waste and noise and the impacts these sources on the environment and health. In addition, the students will be given the training to develop the particular skills required in pollution related structured research.

**B617: : Conservation and Rehabilitation of Ecosystems**

: تأهيل النظم البيئية

:

Reasons of conservation, value of wild life, ecosystem services, cause of wild life loss , impact of pollution growth and nature resources, establishment and maintains of protected area strategies of economic and conservation over entire region.

**B618: Palynology and Flora of Egypt**

: علم حبوب اللقاح والفلورا المصرية

Introduction, Pollination, Chemical Composition of Spores and Pollen – importance of pollen grains, Composition of pollen grains, Sporoderm (spore wall), Simple and Compound apertures – Spores of Pteridophyta, Pollen Morphology and Taxonomy of Angiosperms, Fossil Palynology, Pollen analysis, Distribution and Evolution of spores and pollens, Microfossils and Geology. Ecological characteristics of Egypt- Historical notes on the flora of Egypt- Western desert and its flora- The Sinai peninsula and its flora- The Nile region and its flora- Pharaonic plants- Drug plants- Ornamentals- Fodders and medicinal plants.

**B619: Desert Ecology engineering**

: بيئة صحراوية

Landforms, geomorphology and vegetation - Characterization of desert climates - wind and water processes - Adaptation - Primary production - Consumers, consumption and secondary production - Decomposition and nutrient cycling - desertification - Monitoring and assessment - Desert ecosystems in the future.

**B620: Plant population Ecology**

: بيئة العشائر النباتية

Density-independent growth- Density-dependent growth and intraspecific competition - Population regulation - Populations with age structures - Metapopulation ecology – Life history strategies - Interspecific competition – Mutualism - Host–parasite interactions - Plant–herbivore interactions.

**B621: Ecology of Halophytes**

: بيئة النباتات الملحية

Distribution and synecology of halophytes – classification of halophytes- Source of salinity – Ion transport and mineral nutrition- Regulation of Salt content of shoots – Water relations- Salt resistance- Salt secreting halophytes.

**B622: Advanced Plant systematics**

: تصنيف النباتات

Plant systematics will explore the origin and diversification of land plants while emphasizing flowering plants. student will become familiar with taxonomy (identification, nomenclature, classification emphasizing flowering plants), evolution (speciation, reproductive biology, adaptation, convergence, biogeography), and phylogenetics (phenetics, cladistics, morphology and molecules).

**B623: Soil microbiology**

: ميكروبيولوجيا التربة

Soil microorganisms . Ectomycorrhizae and Endomycorrhizae . Basic mechanisms in nutrient cycling, organic matter dynamics. mMicrobial ecology as they apply to agriculture and prairie ecosystems and environmental problems.

**B624: Phytoremediation**

: المعالجة النباتية

Phytoremediation, toxicity of heavy metals, organic and inorganic pollution, phytodegradation and stimulation phyto extraction , molecular and genetic basis of metal hyper accumulation by plants. Modern subjects in bioremediation.

**B625: Water relations**

: علاقات مائية

Water in plant life – The structure and properties of water – Water transport processes – Water in the soil – Water absorption by roots – Water transport through xylem – Water movement from the leaf to the atmosphere. Stomatal mechanisms – water balance and water stress.

**B626: Enzymology**

: الإنزيمات

structure and functions of proteins in general. Followed by general properties of enzymes ; enzyme classification and basic principles of enzymic reactions. Enzyme kinetics ; definition of enzymic assay, its constituents and their effect on the reaction rate ; derivitization of the rate equations for single substrate reaction ; inhibitors, types , their importance and there effects on enzymic reaction rates; specificity of enzymes and how they can be isolated and purifiedThe application of enzymes – Genetic engineering and protein engineering of enzymes – The technology of enzyme production – Immobilized enzymes.

**B627: Plant Physiology**

: فسيولوجيا النبات

Fundamental processes underlying water relations, metabolism, growth, and reproduction of plants. Overview of plant physiological and biochemical processes for plant science students. Basic information about plant processes integrated with agronomical and environmental considerations. Cellular mechanisms and regulatory features related to plant respiration, photosynthesis, sulfur metabolism, nitrogen fixation and metabolism, and signal transduction.

**B628: Plant Developmental Biology**

: بيولوجيا

Examines the succession of changes that occurs in plants as they progress from a simple embryo to a complex mature plant and through senescence. Plant growth, differentiation, organogenesis, morphogenesis, and environmental influences such as light, temperature, and gravity will be explored emphasizing the cellular and molecular events that control developmental processes. Gene expression and cell signaling pathways, and their roles in the control of embryogenesis, plant growth, flowering, and fruit maturation



**B629: Plant biochemistry**

: كيمياء حيوية نبات

All topics of this course are taught in the context of plant biology. The course will consider the chemical constituents of plants, their synthesis, their contribution to key metabolic processes and the regulation of their biosynthesis. The biochemistry of amino acids and proteins, sugars and carbohydrates, and lipids. Protein structure. Carbohydrates, Lipid metabolism. Quantitative aspects of biochemistry including enzyme kinetics, protein ligand binding, analytical techniques, and bioenergetics. Intermediary metabolism, discussed in the context of plant cell structure and function. Biochemical processes and metabolic pathways that are specific to plants, including photosynthesis, photorespiration, cell wall biosynthesis, nitrate and sulfate assimilation, and plant secondary metabolism. Structure and roles of fatty acids. Organic acids in c3 and in c4 plants

**B630: Molecular Physiology**

: فسيولوجيا جزيئية

This course will focus on understanding the nature of membrane transport process at cellular, biophysical and physiological levels. Students will learn about the different classes of molecular machines that mediate membrane transport and their mechanisms of action. Signal transduction molecules, molecular mechanisms of plant metal tolerance and homeostasis.

**B631: Advanced Molecular Biology**

: بيولوجيا جزيئية متقدمه

Molecular analysis of plant growth and development. Molecular techniques and their application to understanding control of gene expression in plants, recent studies in the field of molecular biology.

**B632: Stress Physiology**

: فسيولوجيا الإجهاد

Molecular, physiological, developmental and morphological characteristics enabling plants to avoid or tolerate environmental stresses; stress acclimation and adaptation processes; responses of wild and cultivated species to drought, flooding, nutrient deficiencies, salinity, toxic ions, extreme temperatures. Emphasis on the physical environment, photosynthesis, temperature and water relations, growth and allocation, and plant interactions.

**B633: Growth regulators**

:

Chemical and biophysical properties of plant hormones – classification and mode of action of hormones – Transport of hormones – metabolism of hormones – Functions of hormones at the cellular, tissue and organ level of organization. Molecular and genetic mechanisms underlying plant physiology will be a central theme of this course.

**B634: Molecular taxonomy**

: التصنيف الجزيئي

This course discusses about molecular approaches in the advance development of plant taxonomy. Isozyme, and DNA are use to describe the genetic variation among population and species, and to

know the evolution meaning to understand the relationships among taxa. The course includes the following topics: Isozyme, Method for generating the DNA data, Chloroplast genes, Mitochondria genes, Nucleus genes, PCR markers and Genetic mapping.

**B635: Plant Eco-physiology**

فسولوجيا النبات البيئية :

Analyzes adaptations and responses of plants to their environment, with emphasis on the physical environment, photosynthesis, temperature and water relations, growth and allocation, and plant interactions.

**B636: Phytogeography**

الجغرافيا النباتية :

The course contains: Geographic distribution of plants, dispersal of seeds, fruits, propagules, spores, Agents of dispersal, types of plant distribution endemism, center of origin relic areas and habitat types.

**B637: Physiology microorganisms and algae**

فسولوجيا الكائنات الدقيقة والطحالب :

Study cellular function, regulation, metabolism, basic energy yielding, morphogenesis, reproduction, metabolic properties of microorganisms, microbial activity and ecology. Spore germination of fungi, Dormancy (exogenous dormancy ), Constitutive dormancy, Breaking dormancy, Stimulatory substances ( maturation ), Heat shock proteins in fungi, Cellular effects of heat shock proteins, Heat shock and development, Chitosan and fungi, Production of chitosan by fungi, Some applications of chitosan, Fungicides, Systemic fungicides, Selective Topic, Uptake and translocation and mechanism of systemic fungicides action. Algal cultures, Characteristics of algal growth in limited, continuous and Synchronous cultures, metabolic patterns and growth, vitamins, hormones and growth factors, tropisms and endogenous rhythms.

**B638: Medicinal plants**

النباتات الطبية :

The course will familiarise students with key aromatic and pharmaceutical plants, their biologically active compounds and their main uses in industry and agriculture. The course also includes Identification/authentication of cultivated medicinal plants - Seeds and other propagation materials - Cultivation - Harvest - Permission to collect - Technical planning - Selection of medicinal plants for collection - Collection - Post-harvest processing - Bulk packaging and labeling - Storage and transportation - Equipment - Quality assurance - Documentation - Personnel (growers, collectors, producers, handlers, processors) - Ethical and legal considerations.

**B639: Equipments and physiological analysis**

أجهزة قياس وتحليلات فسيولوجية :

Concepts of instrumental analysis, Sample preparation and performing the measurement, IR Spectroscopy, Visible and ultraviolet molecular spectroscopy, UV instrumentation and analytical

application, Flame emission and atomic absorption spectroscopy, flames burner, Radiation sources and optical system, Quantitative analysis and Typical applications and Atomic absorption spectrometry. Introduction of chromatography, Theoretical concepts, Polarity and different solvent system of TLC, Adsorption thin-layer different adsorbant, developers and visualizing agents, Partition thin layer, TLC chromatography, Column chromatography and GLC chromatography.

#### **B640: Phylogenetic Taxonomy**

: التصنيف التطوري

This course covers the basic methods of phylogenetic analysis and their application in fields such as systematics, comparative biology, and molecular evolution. Lectures will emphasize the logical basis and computational details of various tree-building algorithms and associated methods of hypothesis testing, as well as novel applications of phylogenetic analysis in various fields of biology. Computer-based labs will give students the opportunity to implement these methods using a variety of phylogenetic software.

#### **B641: Cytotaxonomy**

: التصنيف الخلوي

This course discusses about cytological approaches in the advance development of plant taxonomy. Chromosome data are use to describe the genetic variation among population and species, and to know the evolution meaning to understand the relationships among taxa. The course includes : Polyploidy, Speciation by polyploidy, Polyploidy Data, Population Structure via polyploidy and its fate, Chromosome structure , Chromosome behavior, Plant speciation.

#### **B642: Virology and Immunology**

: علم الفيروسات والمناعة

Virus purification in relation to diagnosis. Virus systematics . Electron microscopy of In Vitro preparations. Serological methods of virus diagnosis. Serological tests. Immunoenzymatic Assays. Immunity to bacteria and fungi (avoidance of immune system), Tumor immunology (mechanisms of immunity, Tumor immunology (avoidance of immune system, Viral immunology (mechanisms of immunity, system), Plant immunology (introduction, different plant defenses, Round up discussion on the topics of the course, Plant immunology (uses of plant immunology in production of human vaccines, Vaccination (introduction ,traditional production of vaccines, Vaccination (new approach in vaccines production and uses, Immunological techniques (ELISA), Round up discussion on the topics of the course, Immunological techniques (PCR).

#### **B643: Biosystematics**

: إحيائي

The course will introduce the fundamental principles involved in biosystematics and phylogenetics. Students will learn about the three operations of systematics, namely description, classification, and identification, and acquire the skills required to analyze DNA sequences in a phylogenetic context. The course consists of formal lectures as well as student presentations based on library research assignments and computer-based projects.

**B644: Advanced bacteriology and bacteria toxins**

علم البكتيريا متقدم والسموم البكتيرية

A study of bacterial diversity, physiology, biochemistry and genetics as they relate to the environment and to human welfare. Laboratory methods for the identification of bacteria are introduced. Microbial toxins produced by the microorganisms bacteria (i.e. bacterial toxins) and fungi (i.e. mycotoxins). Bacterial endotoxins and exotoxins and their mechanism of action will be discussed.

**B645: Aquatic Botany**

النباتات المائية :

Taxonomy and ecology of aquatic vegetation, emphasizing freshwater and marine algae and the submergent vascular plants. Morphology, physiology, and classification of the algae; morphological and physiological adaptations of aquatic vascular plants; and primary production in aquatic ecosystems.

**B646: Medical microbiology**

ميكروبيولوجيا طبية :

A medical view of microorganisms, their morphology and physiology. Pathogenic microorganisms, including etiology and pathology are examined in detail as applicable to the hospital environment. The study of aseptic and antiseptic techniques involving patients, equipment and clinical areas enumerated. Obtaining pure cultures and identifying these cultures.

**B647: Botanical gardens and herbaria**

الحدائق النباتية والمعشبات :

This course deal with the source of plant identification (botanical gardens and herbaria)- Types of botanical gardens, role and function of botanical gardens, botanical gardens network. Historical development, importance of making good herbarium specimens. Collecting plant material of preparation of herbarium specimens and pressing, drying and mounting of plant specimens. Floras and checklists.

**B648: Physiology of microorganisms**

فسيولوجيا الكائنات الدقيقة :

Study cellular function, regulation, metabolism, basic energy yielding, morophogenesis, and reproduction, metabolic properties of microorganisms, microbial activity and ecology. Spore germination of fungi, Dormancy (exogenous dormancy ), Constitutive dormancy, Breaking dormancy, Stimulatory substances ( maturation ), Heat shock proteins in fungi, Cellular effects of heat shock proteins, Heat shock and development, Chitosan and fungi, Production of chitosan by fungi, Some applications of chitosan, Fungicides, Systemic fungicides, Selective Topic, Uptake and translocation and mechanism of systemic fungicides action.

**B649: Advanced plant anatomy**

تشريح :

Modern plant anatomy, cell and organ structure, special organs structure, use of plant anatomy in taxonomy relationships between anatomy and other branches, use of anatomy in molecular study. Cell structure and function, tissues and organs types.

**B650: Food microbiology**

: ميكروبيولوجيا الأغذية

Food as substrate for microorganisms. Important microorganisms in foods microbiology. Food contamination. Food spoilage. Food preservation. Food borne diseases. Fermented food and beverages. Fermented dairy products. Food sanitation, control and inspection.

**B651: Algae and algal physiology**

: وفسولوجيا

The structure of aquatic ecosystem and their algal composition. Factors affecting growth and distribution of algae: ecological factors, physiographic factors, chemical factors, biological factors. Organisms in streams. Algal assemblages in wetlands. Nuisance freshwater algae and their control. Algal cultures, Characteristics of algal growth in limited, continuous and Synchronous cultures, metabolic patterns and growth, vitamins, hormones and growth factors, tropisms and endogenous rhythms.

**B652: Microbial biotechnology**

: تقنية حيوية ميكروبية

This course covers how microbes are used to manufacture components of food and consumer products, biologics and biomaterials using recombinant DNA and is organized following the steps in discovery and development of biologics. An introduction to microbial growth kinetics is included as well as discussions on generating products from genetically modified microorganisms (GMOs). A minor portion of this class will also present schemes for choosing microbial hosts & vector expression systems for the production of heterologous peptides, proteins, or post translational-modified proteins and how this affects overall process strategy. Methods for production of industrial enzymes and selected applications of enzyme technology; for the pharmaceutical, chemical industries and for environmental remediation are presented.

**B653: Applied Microbiology**

: ميكروبيولوجيا تطبيقية

Fermentation industry. Production of pharmaceuticals: Antibiotics, steroids, production of organic acids, vaccines, production of amino acids, production of enzymes, production of fuels. Microbiological production of food and beverages.

**B654: Advanced mycology and mycotoxins**

: علم الفطريات متقدم والسموم الفطرية

Recent advances in our understanding of fungal ecology, evolution, genomics, genetics, cell biology, and physiology, driven largely by novel technological methods, large-scale research initiatives, and bioinformatics, are rapidly transforming the field of mycology. Structure and formation of microbial

toxins .Mycotoxins (Aflatoxins B1, B2,G1, G2, Zearalenone, Trichothecene, Ochratoxins,Patulin, Ergot toxins, Mushroom toxins). Implication of microbial toxins in human and animal diseases.

**B655: Plant pathology and biocontrol**

**: أمراض نبات ومقاومة حيوية**

Definition of diseases, How pathogen attacks plant, Mechanical forces exerted by pathogens on host tissues, Chemical weapons of pathogens, Microbial toxins in plant diseases, Growth regulators in plant diseases, Polysaccharides in plant disease, How plants defend themselves against pathogens, Structural defenses, Biochemical defenses, Study some plant diseases. Different types of control plant diseases, genetic control of plant diseases, biocontrol of diseases, definition and application. Practical isolation, identification and control of pathogens.

**B656: Fresh water Algae**

**: طحالب المياه العذبة**

The course takes full advantage of the excellent range of relatively unspoiled aquatic and terrestrial habitats in Nile delta of Egypt to provide a sound introduction to the recognition, identification and ecology of freshwater algae. Emphasis will be placed on the use of the microscope and taxonomic keys (print and electronic) for identification to generic and species level, but also broader aspects of algal morphology, structure, reproduction, and classification (morphological and molecular).

**B657: Algal biotechnology**

**: تقنية حيوية الطحالب**

This course will provide an overview of the growing field of algae biotechnology by introducing the basics of photosynthetic bio-manufacturing. The topics covered will include the biofuels, feeds and foods, nutraceuticals, industrial enzymes and therapeutic proteins. it will also cover the basics of algae biology and its importance as a feedstock, the biochemical, genetic and molecular approaches being developed to advance the next generation of bio-products, and the economical and global impacts of algal biomass production. Overall, the course will emphasize the importance of photosynthetic biomanufacturing development as a contributor to replacing the diminishing supplies of fossil fuels, reducing global warming, and creating a sustainable society.

**: الخطة الدراسية :**

			<b>E</b>	
	اختياري		B700	

الإجبارية.  
الاختيارية.

. الساعات الإجبارية: يدرس الطالب  
. الساعات الاختيارية: يختار الطالب

يبدأ بعد الانتهاء من إجراءات

(B700 – )

التسجيل لدرجة دكتوراه الفلسفة.

دراسية (خلية و - بيولوجيا جزئية - تكنولوجيا حيوية).

اختياري					
-			-		علم الجينوم
-			-		علم البروتينوم
-			-		معلوماتية حيوية
	-		-		الوراثة الكمية
	-		-		تربية النبات
	-		-		طرق المختبر في البيولوجيا الجزئية
	-		-		وراثة جزئية نباتية
	-		-		المفاهيم المتقدمة في علم الوراثة

الدراسية البيئة النباتية.

اختياري					
-			-		تحليل الكساء الخضري
-			-		تحليل الأنظمة البيئية
-			-		الخرائط النباتية
	-		-		وراثة بيئية
	-		-		علم البيئة الـ
	-		-		البيئة التطبيقية
	-		-		الصون الحيوي
	-		-		بيئة العشائر النباتية

الدراسية

اختياري					
-			-		الهرمونات النباتية و منظمات النمو الأخرى
-			-		الإنزيمات و الطاقة الحيوية
-			-		تنظيم أيض النبات
	-		-		معلوماتية حيوية متقدمة
	-		-		بيوتكنولوجيا النبات
	-		-		أيض النبات الثانوي
	-		-		تركيب البروتين
	-		-		

## التصنيف الزهري والفلورا المصرية.

## الدراسية

اختياري					
-			-		اتية
-			-		الفلورا المصرية
-			-		التصنيف العددي
	-		-		طرق المختبر في البيولوجيا الجزيئية
	-		-		الصون الحيوي
	-		-		التنوع الحيوي
	-		-		التصنيف الكيميائي
	-		-		التصنيف التطوري

## الميكروبي (بكتريا - فطريات -

## الدراسية

## فيروسات).

اختياري					
-			-		تقنية حيوية بكتيرية
-			-		تقنية حيوية الفطريات
-			-		تقنية حيوية الطحالب
	-		-		المركبات الثانوية للميكروبات
	-		-		الفيروسات النباتية
	-		-		الطحالب البحرية
	-		-		وراثة ميكروبية
	-		-		السموم الفطرية

## المحتوى العلمي للمقررات الدراسية

**B701: Genomics****: علم الجينوم**

Genomics classification, Structure and organization of prokaryotic genomes. Transcriptional regulators of bacterial genes. Transposable genetic elements in bacterial genomes. Evolution of bacterial operons and operonisation. Islands and segments of pathogenicity and resistance. Structure and organization of eukaryotic genomes. Repetitive and transposable elements and their effect on genome. Telomeric and subtelomeric regions in chromosomes. CpG methylation and gene silencing. Yeast-two-hybrid system. cDNA microarrays. Evolution and structure of mitochondrial genomes. Genome sequencing: whole shotgun genome sequencing. Sequencing technology: Sanger capillary sequencing, Roche 454 (pyrosequencing), Illumina/Solexa, SOLiD System. Pros and cons of sequencing techniques. Maxam-Gilbert sequencing. ORF and promoter predictions. Intron and exon predictions. Gene annotation. Major genome databases.



**B702: Proteomics**

: علم البروتيوم

Proteomics classification. 1D-SDS-PAGE and 2D-SDS PAGE. Detection and quantitation of proteins in gels. Pros and cons of various staining methods. Basics of mass spectrometry. Malditof and ESI, and their application in proteomics. Tandem MS/MS spectrometry. Peptide sequencing by tandem mass spectrometry. Affinity purification of protein.

**B703: Advanced Bioinformatics**

: معلوماتية حيوية متقدمه

Bioinformatics and its application. Major online databases. Practical use of databases. DNA, RNA, proteins in bioinformatics. Amino acid classification. Similarity, homology, local and global sequence alignment. Scoring matrices (PAM, BLOSUM). Pairwise alignment. Dot sequence alignment. BLAST. Types of BLAST. How to use BLAST. FASTA. ClustalW. BOXSHADE.

**B704: Quantitative Genetics**

: الوراثة الكمية

This course examines the nature of Mendelian inheritance when extended to quantitative traits that are jointly influenced by the environment and the simultaneous segregation of many genes. Prediction of response to natural and artificial selection in populations will also be studied.

**B705: Plant breeding**

: تربية النبات

This course examines the application of genetic principles to plant improvement. Topics include breeding objectives, mating systems, selection, testing and germplasm maintenance of horticultural and crop plants.

**B706: Laboratory Methods in Molecular Biology**

: طرق المختبر في البيولوجيا الجزيئية

This course involves laboratory based instruction in the basic methodologies of Molecular Biology. Students will have the opportunity to develop technical skills and practical knowledge sufficient to perform basic procedures independently, and to diagnose and analyze experimental results obtained with these techniques.

**B707: Plant Molecular Genetics**

: وراثة جزيئية نباتية

This course studies the molecular genetics of plants. The topics include: plant genome diversity and synteny; Arabidopsis thaliana genome, hormonal, environmental and developmental regulation of gene expression; chloroplast and mitochondrial genomes; and gene expression and silencing in transgenics. The course will be delivered using a lecture and paper discussion format. Students will learn and use a variety of computer techniques to search and analyze plant genome databases.

**B708: Advanced Concepts in Genetics**

: المفاهيم المتقدمة في علم

-----

This course presents classical non-Mendelian phenomena, including analysis of chromosome breakage, transposition, imprinting and paramutation. Modern advances in gene regulation via epigenetic phenomena will be a central theme, focusing on chromatic remodeling, gene silencing and RNA interference as they pertain to organism development, with an emphasis on plants.

### **B709: Vegetations Analysis**

**: تحليل الكساء الخضري**

Methods of vegetation science including field sampling, classification, gradient analysis, ordination. Computer analysis includes database construction (Turboveg), table analysis (JUICE), and ordination (PC-Ord).

### **B710: Ecosystems Analysis**

**: تحليل الأنظمة البيئية**

Nature of ecosystems - How ecosystems work - Energy flow and energetics - Material cycles in ecosystems - Ecosystems in high-stress environments: meeting environmental challenges - The role of disturbance and succession in ecosystem functioning - Biomes: world ecosystem types - Human impacts on ecosystems: humans as an ecological factor - Large-scale human impacts on ecosystems - Global environmental change: ecosystem response and biosphere impacts - The Role of Ecosystem Health Assessment in Environmental Management - Application of Indicators for the Assessment of Ecosystem Health.

### **B711: Botanical Maps**

**: الخرائط النباتية**

The course contains Introduction, study factors affecting on distribution of wild plants, distribution of wild plants. Using Geographical Information System (GIS) and Remote sensing (RS) to design the botanical maps. Using Global Position System (GPS) to certify the distribution of wild plants. Major types of concept mapping techniques including spider, hierarchy, flowchart, mind maps, logic trees, decision trees, fishbone diagrams, pictorial maps, multi-dimensional/3D maps and Mandela maps.

### **B712: Ecological genetics**

**: وراثة بيئية**

Ecological genetics is at the interface of three important subdisciplines of biology: ecology, evolution, and genetics. In this course, students will explore basic concepts in population and quantitative genetics focusing on techniques that reveal the genetic structure and adaptive value of ecologically relevant traits. This course will provide a conceptual link between courses focused on genetics and molecular biology and courses focused on whole organisms and their ecology.

### **B713: Evolutionary Ecology**

**: علم البيئة التطوري**

Empirical and theoretical approaches to key areas of research including natural selection, sexual selection, and life histories. Other topics may include phenotypic plasticity, speciation, co-evolution, and quantitative genetics.

**B714: Applied Ecology**

: البيئة التطبيقية

Integrating ecology and management - Interactions - Community structure - Succession - Closing the gap between science and management - Energy, Carbon Balance and Global Climate Change - Conservation and Management of Wild Species - Restoration of Communities.

**B715: Conservation Biology**

: الصون الحيوي

Introduction to the scientific discipline that deals with threatened species and habitats. Topics include: biodiversity, extinction, threats, demography, genetic diversity, protecting, managing and restoring ecosystems (e.g., nature reserves, captive breeding, conservation corridors), sustainable development, and global warming. Ties between the study of conservation biology and environmental law, economics, and policy will also be covered.

**B716: Population Ecology**

: بيئة العشائر

Abundance and distribution of populations; population growth and regulation; fluctuations, stochasticity and chaos; meta-population persistence and extinction; age and stage-structured populations; interactions within and between species; optimal harvesting; spread of infectious diseases. Labs include experiments and computer simulations.

**B717: Plant hormones and other growth regulators**

: الهرمونات النباتية ومنظمات النمو

Concept of hormones as chemical messengers, techniques for detection and quantitation of plant hormone, classical approaches and use of mutants in understanding hormone actions, hormones in defense against abiotic and biotic stresses, synthetic regulatory compounds and their uses.

**B718: Enzymes and bioenergetics**

: الإنزيمات والطاقة الحيوية

Application of principles of thermodynamics in biology; origin and evolution of biocatalytic reactions; significance of ribozymes; abzymes; artificial enzymes; enzyme technology; regulation of enzymatic activity; evolution of electron transport chain and its coupling to ATP synthesis; bioelectricity, photosynthesis and respiration.

**B719: Plant metabolism regulation**

: تنظيم أيض

The course aims to improve student competences in Plant Metabolism, therefore requiring basic knowledge in biochemistry. Unique plant biochemical features and how they relate dynamically to plant performance will be considered, i.e. metabolic regulation, primary and secondary metabolism, and integration of events at different levels of analysis (from biomolecules to plants). The course highlights the need and the relevance of integrating metabolic events within the plant and its environment. Students will acquire the necessary skills to assess in a critical way the complexity of the

plant system and its ability to adapt. Students will also develop the ability to critically analyse and present a research paper related to plant metabolism.

**B720: Advanced mycology and mycotoxins**

: بيوتكنولوجيا النبات

Introduction to gene cloning, plant tissue culture and transformation, and the development of agriculturally important transgenic traits. Critical thinking, case studies, and discussions are used to examine global approaches to the regulation and risks of genetically-modified organisms, plant and gene patents, and the consequences of these factors on food sovereignty and trade.

**B721: Plant Secondary Metabolism**

: أيض النبات الثانوي

A study of the role and biosynthesis of the diverse array of secondary natural products produced by plants. Secondary metabolites are divided into three main classes: alkaloids, isoprenoids/poly acetates and phenolics. For each class, the biosynthesis, physiology, ecology and biological activity of representative compounds will be discussed.

**B722: Protein structure**

: تركيب البروتين

Hierarchical structure of proteins; folding; ticketing; degradation; purification, detection and functional characterization; sequence alignments; molecular motors and pumps.

**B723: Fruit development and ripening**

:

Stages of fruit development and their regulation, biochemical and related events during fruit ripening in climacteric and non-climacteric fruits, physiology and biochemistry of fruit abscission, post-harvest changes, production of transgenic fruits.

**B724: Egyptian flora**

: الفلورا المصرية

Historical notes on the flora of Egypt- Flora of Nile region and Oasis, Flora desert and semi-desert- Flora of Sinai peninsula and Gable Elba.

**B725: Numerical taxonomy**

: التصنيف العددي

Introduction to the numerical approach to taxonomy. Aims and principles of numerical taxonomy. Selection of taxonomic characters. Application of numerical taxonomy for biological disciplines. Advantages and problems with numerical taxonomy.

**B726: Biodiversity**

: التنوع الحيوي

This course examines the biology, ecology, and evolutionary relationships among living organisms. All forms of life will be considered, from single celled prokaryotes to multicellular eukaryotic plants.

**B727: Chemotaxonomy**

: التصنيف الكيميائي

Introduction, historical review, Chemotaxonomic investigation. Characters of taxonomic molecules. Classification of molecules, macromolecules, micro molecules. Allozymes, Semantides, Serology and Electrophoresis. Evidence from phenolic and betalains. Evidence from alkaloids. Evidence from carbohydrates.

**B728: Phylogeny**

: التصنيف التطوري

This course covers the basic methods of phylogenetic analysis and their application in fields such as systematics, comparative biology, and molecular evolution. Lectures will emphasize the logical basis and computational details of various tree-building algorithms and associated methods of hypothesis testing, as well as novel applications of phylogenetic analysis in various fields of biology. Computer-based labs will give students the opportunity to implement these methods using a variety of phylogenetic software.

**B729: Bacterial biotechnology**

: تقنية حيوية بكتيرية

Introduction to biotechnology, genetic recombinant bacteria, genetic approaches for improving bacterial strains, selective isolation of mutants, kinetics of bacterial cell growth. role of biotechnology in production of antibiotics, vitamins, enzymes and food additives. Production of insulin, interferon and growth hormones in bacterial cells using genetically microbial biocatalysts. Bacterial bioremediation and bio-fertilizers.

**B730: Fungal biotechnology**

: نية حيوية الفطريات

Introduction of Mycology, Production techniques used in fungal Biotechnology, Production of Biochemicals by fungi, Fungi in Medical Biotechnology, Industrial uses of Fungi, Fungal Biodeterioration & biodegradation, Fungi in food industry, Fungi in Agricultural biotechnology, Biotechnology and the control of pathogenic fungi, Postscripts: Recent application of Fungal Biotechnology, Screening of fungal metabolites.

**B731: Algal biotechnology**

: تقنية حيوية الطحالب

This course will provide an overview of the growing field of algae biotechnology by introducing the basics of photosynthetic bio-manufacturing. The topics covered will include the biofuels, feeds and foods, nutraceuticals, industrial enzymes and therapeutic proteins. It will also cover the basics of algae biology and its importance as a feedstock, the biochemical, genetic and molecular approaches being developed to advance the next generation of bio-products, and the economical and global impacts of algal biomass production. Overall, the course will emphasize the importance of photosynthetic biomanufacturing development as a contributor to replacing the diminishing supplies of fossil fuels, reducing global warming, and creating a sustainable society.

**B732: Industrial Microbiology**

: ميكروبيولوجيا صناعية

Physiology, nutrition and growth of microorganisms important to various industries. Control of microbial growth in industrial production process. Application of microorganisms in production of cells, primary and secondary metabolites.

**B733: Plant viruses**

: الفيروسات النباتية

Plant virus structures, Nomenclature and classification, genome organizations and replication strategies. Symptoms and diagnosis of virus diseases of plants. Host factors involved in virus multiplication, Host defense. Plant viruses as useful tools.

**B734: Marine Algae**

: الطحالب البحرية

The course presents an overview of algal systematics and phylogeny based on morphology, ultra-structure, reproduction and molecular data. It also includes plankton and benthic algal ecology and biogeography with emphasis on Egyptian conditions.

**B735: Microbial Genetics**

: وراثة ميكروبية

Genetic system of Bacteria, Microbial transformation, Microbial transduction, conjugation. recombination in bacteria, fungi and viruses, Yeast genetics, plasmids , victors and DNA analysis in microorganisms, modern techniques in DNA analysis , bacterial genetic materials. Structure and organization of gene, Genetic elements, replication and repair of nuclear gene, molecular base of genetic change, DNA structure, recombination and evolution.

**B736: Microbial toxins**

: السموم الميكروبية

Toxigenic microorganisms. Structure and formation of microbial toxins .Mycotoxins (Aflatoxins B1, B2,G1, G2, Zearalenone, Trichothecene, Ochratoxins,Patulin, Ergot toxins, Mushroom toxins). Implication of microbial toxins in human and animal diseases. Natural occurrence of microbial toxins. Control of microbial toxins.