Botany Study Plan

Botany and Microbiology Department

2013 – 1434H

King Saud University
College of Science
Vice Dean Academic Affairs
Study Plans

Botany Study Plan

1st Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect.- Exre.-Pract.)**
CI 140	Learning, Thinking and Research Skills	-	-	3 (3+0+0)
CHS 150	Health and Fitness (2)	-	-	1 (1+0+0)
ENG 140	English Language (1) (E)	-	-	8 (8+0+0)
MATH 140	Introduction to Mathematics (E)	-	-	2 (1+1+0)
Total of Credit Hours				**14**

2nd Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect.- Exre.-Pract.)**
CT 140	Computer Skills (E)	-	-	3 (0+0+3)
MC 140	Communication Skills	-	-	2 (2+0+0)
ENG 150	English Language (2) (E)	ENG 140	-	8 (8+0+0)
MATH 150	Differential Calculus (E)	140 MATH	-	3 (2+1+0)
ENT 101	Entrepreunership	-	-	1 (1+0+0)
Total of Credit Hours				**17**

3rd Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect. Exre. –Pract.)**
BOT 102	Botany	-	BOT 222	3 (2+0+1)
ZOOL 103	Principals of Zoology	-	-	3 (2+0+1)
MBIO 140	General Microbiology	-	-	3 (2+0+1)
BOT 222	Principals of Flowering Plants Taxonomy	-	BOT 102	3 (2+0+1)
Elective course from University requirement			-	2 (2+0+0)
Elective course from the Specialization		Variable	-	2
Total of Credit Hours				**16**

4th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect. Exre. – Pract.)**
CHEM 101	General Chemistry (1)	-	-	4 (3+0+1)
BOT 212	Plant Anatomy	BOT 102	-	4 (2+0+2)
BOT 213	Microtechnique		-	2 (1+0+1)
BOT 241	Plant Ecological Factors	-	-	3 (2+0+1)
BOT 271	Plant physiology	BOT 102	-	4 (2+0+2)
Elective course from University requirement			-	2(2+0+0)
Total of Credit Hours				**19**

5th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect. Exre. –Pract.)**
BOT 251	Cell Biology & Cytogenetics	-	-	3 (2+0+1)
BOT 253	Genetics	-	BOT 251	4 (3+0+1)
BOT 345	Flora of saudi Arabia	BOT 241	-	2 (1+0+1)
BOT 346	Pollution and Environmental protection		-	2 (1+0+1)
BOT 349	Ecophysiology	BOT 241 BOT 271	-	2 (1+0+1)
Elective course from the Specialization		Variable	-	2
Elective course from University requirement			-	2(2+0+0)
Total of Credit Hours				**17**

6th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect. Exre. – Pract.)**
STAT 106	Biostatistics	-	-	2 (1+1+0)
BOT 373	Plant Growth and Its Regulators	BOT 271	-	2 (1+0+1)
BOT 384	Phycology	BOT 102	-	3 (2+0+1)
BOT 440	Plant Communities	BOT 241	-	2 (1+0+1)
BOT 442	Hot Desert Ecology		-	1 (1+0+0)
PHG 222	Pharmagonosy 1	-	-	3 (2+0+1)
Elective course from the Specialization		Variable	-	2
Elective course from University requirement			-	2(2+0+0)
Total of Credit Hours				**17**

Summer semester				
Course code	**Course title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect. - Exer. – Pract.)**
BOT 491	Training of monitoring of plants and algae	BOT 102	-	5 (0+0+5)
Total Units				**5**

7th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect. Exre. –Pract.)**
PHYS 209	General Biophysics (1)	-	-	3 (3+0+0)
GEOG 303	Principles of Remote Sensing in Geography	-	-	3 (2+1+0)
BOT 444	Ecological Resources	BOT 241	-	2 (1+0+1)
BOT 498	Research Project	BOT 102	-	3 (0+0+3)
Elective course from 1st or 2nd Group		Variable	-	2
Elective course from 1st or 2nd Group		Variable	-	2
Total of Credit Hours				**15**

8th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect. Exre. – Pract.)**
GEOG 302	Industry & Environment	-	-	2 (2+0+0)
BOT 358	Plant Molecular biology	-	-	3 (2+0+1)
BOT 359	Population Genetics	BOT 253	-	2 (1+0+1)
BOT 472	Plant Tissue Culture	BOT 251 BOT 271	-	2 (1+0+1)
BOT 473	Plant Chemistry	BOT 271	-	2 (1+0+1)
Elective course from 1st or 2nd Group		Variable	-	2
Elective course from 1st or 2nd Group		Variable	-	3
Total of Credit Hours				**16**

(Lect – Exer. – Pract.) = (Lecture – Exercise – Practical)

List of the Elective Courses of the University Requirements
(Student elects 8 credit hours)

Course Code	Course Title	Pre-requisite	Credits (Lect. – Exer. - Pract.)
IC 100	Studies in the Biography of the Prophet	-	2 (2+0+0)
IC 101	Introduction of Islamic Culture	-	2 (2+0+0)
IC 102	Islam and Building up the Society	-	2 (2+0+0)
IC 103	Economic System in Islam	-	2 (2+0+0)
IC 104	Political system in Islam	-	3 (2+0+1)
IC 105	Human Rights	-	3 (2+0+1)
IC 106	Islamic Jurisprudence	-	2 (2+0+0)
IC 107	Ethics of Occupation	-	2 (2+0+0)
IC 108	Contemporary Issues	-	2 (2+0+0)
IC 109	Woman and Her Developmental Role	-	2 (2+0+0)

List of the Elective Courses

Elective courses from the Specialization (Student elects 6 credit hours)		
Course code	**Course title**	**Credits (Lect. – Exer. - Pract.)**
BOT 263	Archegoniates	2 (1+0+1)
BOT 312	Plant Morphogenesis	2 (2+0+0)
BOT 322	Experimental Taxonomy	2 (1+0+1)
BOT 332	Seminar	1 (1+0+0)
BOT 341	Ecosystems	1 (1+0+0)
BOT 347	Plant Geography	2 (2+0+0)
BOT 379	Metabolism & Transport in Plants	2 (1+0+1)
BOT 380	Plant Water & soil Relations	2 (1+0+1)
BOT 446	Management of Botany natural resourses	2 (2+0+0)
BOT 447	Arid regions development	2 (1+0+1)
BOT 456	Gene Conservation	2 (1+0+1)
BOT 457	Genetic Engineering	2 (1+0+1)
BOT 458	Ecological Genetics	2 (1+0+1)
BOT 476	Date Palm Biology	2 (1+0+1)
BOT 487	Phytoplanktons	2 (1+0+1)

Elective courses from OUTSIDE the Specialization (Student elects 9 credit hours)		
(A)Microbiology Group:		
Course code	**Course title**	**Credits (Lect. – Exer. - Pract.)**
MBIO 240	Laboratory Skills	2 (0+0+2)
MBIO 250	General Virology	3 (2+0+1)
MBIO 251	Molecular Biology	2 (1+0+1)
MBIO 260	General Bacteriology	3 (2+0+1)
MBIO 270	General Mycology	3 (2+0+1)
MBIO 330	Microbial Physiology	3 (2+0+1)
MBIO 344	W. & S. Microbiology	2 (1+0+1)
MBIO 463	Antibiotics	3 (2+0+1)
MBIO 465	Industrial Microbiology	2 (1+0+1)

Elective courses from OUTSIDE the Specialization (Student elects 9 credit hours)		
(B)Biology Group:		
Course code	**Course title**	**Credits (Lect. – Exer. - Pract.)**
ZOOL 212	Parasitology	3 (2+0+1)
ZOOL 311	General Entomology	3 (2+0+1)
ZOOL 320	Ichthyology	2 (1+0+1)
ZOOL 327	Amphibians& Reptiles	3 (2+0+1)
ZOOL 325	Ornithology	2 (1+0+1)
ZOOL 326	Mammology	2 (1+0+1)
ZOOL 373	Land Ecology	2 (1+0+1)
ZOOL 374	Aquatic Ecology	2 (1+0+1)
ZOOL 432	Endocrinology	2 (1+0+1)
GEO 262	Geoecology	2 (1+0+1)

List of service courses to Other *Specialization* and collages.

Course Code	Course Title	Credits (Lect. – Exer.- Pract.)	Department / College of
BOT 102	Botany	4 (3+0+1)	GEO –MBIO – ZOOL - CHEM

Short Courses Description

I- Compulsory courses *from* the Specialization

Course number and code: BOT 102	Course title: Botany
Effective hours: 3 (2+0+1) (Lect. – Exer. – Pract.)	
Plant and their importance. Chemical and fine structures of the plant cell. Metabolism. Anatomy. Plant tissues, Plant water relations. Heredity and its applications. Levels of structural organization and evolution in plants (structure, taxonomy, economical and biological importance). Plant morphological and anatomical adaptation to environment Environmental pollution.	

Course number and code: BOT 212	Course title: Plant Anatomy
Effective hours: 4 (2+0+2) (Lect. – Exer. – Pract.)	
Types of plant cells and tissues. Primary plant body. Secondary plant body. Secretory structures. Ecological anatomy.	

Course number and code: BOT 213	Course title: Plant Microtechnique
Effective hours: 2 (1+0+1) (Lect. – Exer. – Pract.)	
Instruments, use and care of preservation and preservation of plant materials. Sectioning methods. Stains Histrochemistry Photomicrography. Drawing and Autoradiography.	

Course number and code: BOT 222	Course title: Principals of Flowering Plants Taxonomy
Effective hours: 3 (2+0+1) (Lect. – Exer. – Pract.)	
History of plant taxonomy (artificial, natural phylogenetical). Taxonomic units. Taxonomic sources. Methods of classification and nomenclatural rules.	

Course number and code: BOT 241	Course title: Plant Ecological Factors
Effective hours: 3 (2+0+1) (Lect. – Exer. – Pract.)	
Concept of ecology. Introduction of ecological factors. Climatic factors, biotic factors and soil factors & their effects on plants.	

Course number and code: BOT 251	Course title: Cell Biology & Cytogenetics
Effective hours: 3 (2+0+1) (Lect. – Exer. – Pract.)	
Concept of ecology. Introduction of ecological factors. Climatic factors, biotic factors and soil factors & their effects on plants. The subject matter of Cytogenetics, genetic material in protocell and eucells. The Eukaryotic Chromosomes, physical and chemical structure, heretochromatin and euchromatin, chromatin banding, special types of chromosomes, Karyotype and Ideogram. Cell division: mitosis, meiosis, Basic cytological techniques in Cytogenetics, Changes in chromosomes number and structure.	

Course number and code: BOT 253	Course title: Cytology
Effective hours: 4 (3+0+1) (Lect. – Exer. – Pract.)	
Basic genetic concepts. Heredity and environment, segregation and indepenassortment of genes and chromosomes, sex determination, linkage, crossingover and genetic maps. Transmission of genetic material in microorganisms. Cytoplasmic inheritance, Population genetics, genetic mutation, structure of genetic material. Genetic control of protein action. Genetic engineering in plants.	

Course number and code: BOT 271	Course title: General Plant Physiology
Effective hours: 4 (3+0+1) (Lect. – Exer. – Pract.)	
Functions of cells components, water relations, minerals nutrition, phloem transport. Amino acids, proteins and enzymes. Photosynthesis, transpiration, metabolism of N, S, lipids and aromatic compounds. Growth and differentiation. Phytohormones, Photomorphogenesis, biological clock, photoperiod, vernalization and physiological stress.	

Course number and code: BOT 345	Course title: Flora of Saudi Arabia
Effective hours: 2 (1+0+1) (Lect. – Exer. – Pract.)	
Concept of flora, history of flora of the Arab peninsula - Geomorphology and climatology of plant regions in Saudi Arabia - Natural vegetational regions, floristic composition and zones - Types of habitat and their vegetation - Life forms in the flora of Saudi Arabia - Plant groups in the flora of Saudi Arabia, endangered , rare, endemic ,economic, aromatic, poisonous, grazing, woody and edible species.	

Course number and code: BOT 346	Course title: Pollution and Environmental protection
Effective hours: 2 (1+0+1) (Lect. – Exer. – Pract.)	
Introduction to the Ecosystem plant cover, deterioration, forests. Natural ranges and means of protection. Biotic factors and their effects on vegetational conserves national parks, control of pollution. Concept, nature and sources pollution, air, water and soil. Effect of pollution on ecosystem. Biological method of controlling pollution.	

Course number and code: BOT 349	Course title: Ecophysiology
Effective hours: 2 (1+0+1) (Lect. – Exer. – Pract.)	
Concept of adaptation. Environmental stresses: its meaning and definition. Environmental changes and their effect on the vegetation. Strategies of plant adaptations to their environmental conditions.	

Course number and code: BOT 358	Course title: Plant Molecular biology
Effective hours: 3 (2+0+1) (Lect. – Exer. – Pract.)	
Gene chemistry (DNA & RNA). Gene expression (Transcription and translation) and genetic code. Gene organization. Control of gene expression. Recombination of Genetic material.	

Course number and code: BOT 359	Course title: Population Genetics
Effective hours: 3 (2+0+1) (Lect. – Exer. – Pract.)	
The subject matter of Population Genetics, Genetic Structure of apopulation, Allele and Genotype frequency, The sources of Genetic Variation in natural populations, Measuring Genetic Variation within and among natural populations and its molecular and non-molecular markers, Mating systems, Hardy-Wineberg Equilibrium, Sexual reproduction and Genetic variation, Factors affecting Evolution in Natural plant populations (Natural selection, Mutation, Migration, Genetic Drift, Founder effect, mating system etc. . .)	

Course number and code: BOT 373	Course title: Plant Growth and Its Regulators
Effective hours: 2 (1+0+1) (Lect. – Exer. – Pract.)	
Definition, measurements and patterns of growth and differntiation, controlling factors of developments. Phytohormones, Auxins, GAS, Cytokinins, Ethylene and ABA-effects and interactions.	

Course number and code: BOT 384	Course title: Phycology
Effective hours: 3 (2+0+1) (Lect. – Exer. – Pract.)	
Classification of algae, vegetative structure reproduction and life cycle. Biological and ecological importance. Ecology of algae.	

Course number and code: BOT 440	Course title: Plant Communities
Effective hours: 2 (1+0+1) (Lect. – Exer. – Pract.)	
Concept of plant community - Physiogronomy and structure of plant communities. Quantitative and qualitative characteristics, succession, competition amongst plant species and its effects – classification of vegetation.	

Course number and code: BOT 442	Course title: Hot Desert Ecology
Effective hours: 1 (1+0+0) (Lect. – Exer. – Pract.)	
The concept of desert from ecological point of view. Desert types of the world and their effects upon the wild plants. The reflection of desert climate on the vegetation. Desertization as an environmental problem.	

Course number and code: BOT 444	Course title: Ecological Resources
Effective hours: 2 (1+0+1) (Lect. – Exer. – Pract.)	
Concepts of the various ecological resources including: (a) renewal, (b) nonrenewal, (c) dynamic and (d) stable. Productivity of natural ecosystems. Dangers underlying ecosystems and ways of their prevention. Depletion of ecological resources, reasons and means of its prevention.	

Course number and code: BOT 472	Course title: Plant Tissue Culture
Effective hours: 2 (1+0+1) (Lect. – Exer. – Pract.)	
Principals of plant Organs cell cultures. , tissues cells embryos and protoplasm transfussion cultures. Haploid and diploids cell cultures.	

Course number and code: BOT 473	Course title: Plant Chemistry
Effective hours: 2 (1+0+1) (Lect. – Exer. – Pract.)	
Introduction to methods and instruments used in plant tissue analysis. Extraction and identification of various compounds (carbohydrates, lipids proteins, phenols, terpenes, clorides, pigments and toxins). Economic and biological values of these compounds.	

Course number and code: BOT 491	Course title: Training of monitoring of plants and algae
Effective hours: 5 (1+0+5) (Lect. – Exer. – Pract.)	
a. Ecology: Understanding the different plant habitats in Saudi Arabia and the ecological factors affecting the distribution of vegetation. Analytical and structural studies on plant communities and associations with special reference to their adaptations to these habitats. Effect of human activities on the destruction of the environment. b. Algal habitats and distribution. Factors affecting the growth of algae. Algal collection and preservation.	

Course number and code: BOT 498	Course title: Research Project
Effective hours: 3 (0+0+3) (Lect. – Exer. – Pract.)	
How to use scientific periodicals – How to search for scientific information in different scientific data banks – Experimental design and practical application – Data Analysis – Writing scientific reports	

II- Compulsory courses *from OUTSIDE* the Specialization

Course number and code: CHEM 101	Course title: General Chemistry (1)
Effective hours: 4 (3+0+1) (Lect. – Exer. – Pract.)	
Stoichiometry: SI units, chemical formulas, the mole, methods of expressing concentration, calculations based on chemical equations. **Gases**: Laws, kinetic theory, deviation and van der Waals equation. ***Thermo chemistry***: Types of enthalpy changes, Hess Law and its applications,, first law of thermodynamics. ***Solutions***: Type of solutions and laws related, colligative properties. ***Chemical Kinetics***: Law of reaction rate, reaction order, factors affecting the reaction. *Chemical* ***Equilibrium****:* Reaction between K_c & K_p, Le Chatelier's principle and factor affecting equilibrium. Ionic equilibrium: Acid and base concepts, pH calculations of acid, base and buffer solutions. ***Eleven experiments*** including: Physical properties of mater, Hess's law, chemical kinetics, volumetric analysis.	

Course number and code: ZOOL 103	Course title: Principals of Zoology
Effective hours: 3 (2+0+1) (Lect. – Exer. – Pract.)	
Study of structure of animal cell. Tissues, General characters of animal Kingdom. Classification of animal Kingdom. Study of Protozoa with selected examples. General characters and classification of different phyla of animal Kingdom with selected examples. Introduction of physiology : Nutrition, digestion and metabolism, blood (structure and function).	

Course number and code: STAT 106	Course title: General Biostatistics
Effective hours: 2 (1+1+0) (Lect. – Exer. – Pract.)	
Introduction to Bio-Statistics, types of data and graphical representation. Descriptive statistics: Measures of Central tendency- Mean, median, mode, Measures of dispersion-Range, Standard deviation, coefficient of variation. Calculating Measures from an Ungrouped Frequency Table Approximating Measures from Grouped Data. Basic probability, conditional probability, concept of independence, Sensitivity, Specificity etc, and Bayes Theorem for predictive probabilities. Some discrete probability distributions: cumulative probability distribution, Binomial, and Poisson –their mean and variance. Continuous probability distributions: Normal distribution, Standard normal and t distributions. Statistical inference: Point and interval estimation, Type of errors, Concept of P-value, testing hypothesis about one and two samples means and proportions including paired data – different cases under normality.	

Course number and code: MBIO 140	Course title: Microbiology
Effective hours: 3 (2+0+1) (Lect. – Exer. – Pract.)	
introduction –Principals of Microbiology-–Historical Review of the pioneer Microbiologist – Development of Microbiology – Methods of Studying Microorganisms – Classification of Microorganisms – Chemistry of Microbial Cell - Structure of Microbial Cell – Microbial Genetic – Nutrition and Microbial Metabolism –Survey Of microorganisms and their habitats – Growth and Reproduction – Relationships with other Organisms – Antimicrobial Agents-Immunity – Biotechnology - Microorganisms in medicine – Microorganisms in Industries- Microorganisms and Pollution	

Course number and code: PHYS 209	Course title: General Biophysics (1)
Effective hours: 3 (3+0+0) (Lect. – Exer. – Pract.)	
Animal mechanics, properties of fluids, heat and heat flow in biological systems, nature of sound and sound intensity, applications on sound hearing, echolocation, use of ultrasound in medicine, nature of light, applications on image formation, resolution of eye, mechanism of vision, color vision, biological effects of UV and visible radiation, radiation biophysics, radiation dose and its measurement, RBE multi target theory, laser in medicine.	

Course number and code: PHG 222	Course title: Pharmagonosy 1
Effective hours: 3 (2+0+1) (Lect. – Exer. – Pract.)	
The student must review the department concerned for decisions that taught outside the college (Compulsory and Elective).	

Course number and code: GEO 302	Course title: Industry & Environment
Effective hours: 2 (2+0+0) (Lect. – Exer. – Pract.)	
The student must review the department concerned for decisions that taught outside the college (Compulsory and Elective).	

Course number and code: GEOG 303	Course title: Principles of Remote Sensing in Geography
Effective hours: 3 (2+0+1) (Lect. – Exer. – Pract.)	
The student must review the department concerned for decisions that taught outside the college (Compulsory and Elective).	

III- Elective courses *from* the Specialization

Course number and code: BOT 263	Course title: Archegoniates
Effective hours: 2 (1+0+1) (Lect. – Exer. – Pract.)	
Concept of Archegoniatae, general characters, life cycles. Major divisions and dominant parts. Hepatophyta- classes - orders Exampls: genera - Bryophyte – classes – Orders - Examples: genera - Seedless vascular plants: developments, examples Seedless vascular plants : developments, characters Gymnosperms : Cycadophyta, Coniferophyta, Gnetophyta.	

Course number and code: BOT 312	Course title: Plant Morphogenesis
Effective hours: 2 (2+0+0) (Lect. – Exer. – Pract.)	
Discussion of experimental studies related to the morphogenesis, phenomena of morphogenesis, tissue mixtures, morphogenetic factors and organization.	

Course number and code: BOT 322	Course title: Experimental Taxonomy
Effective hours: 2 (1+0+1) (Lect. – Exer. – Pract.)	
The use of comparative experimental methods in taxonomy, units. Eco-geographical distribution and its taxonomic importance. Natural hybredization. Anatomical, cytological and chemical differences and their taxonomic value. Fertility and its significance.	

Course number and code: BOT 332	Course title: Seminar
Effective hours: 1 (1+0+0) (Lect. – Exer. – Pract.)	
Student select a scientific research paper in the field of Botany giving his opinion about: Title of the paper he selected – Abstract – introduction – methods – Results – Discussion and References.	

Course number and code: BOT 341	Course title: Ecosystems
Effective hours: 1 (1+0+0) (Lect. – Exer. – Pract.)	
Ecosystem and its components. Food chains, food web, biotic pyramids, biogeochemical cycles, World major ecosystems.	

Course number and code: BOT 347	Course title: Plant Geography
Effective hours: 2 (2+0+0) (Lect. – Exer. – Pract.)	
Introduction-concept of plant geography, history and relation with other sciences - Factors affecting the distribution of plants on the globe autochory and its types - Allochory: Anermochory, Hydatochory, zoochory, Humanchory and their types - Ecological factors affecting the plant dispersal - Area, Shape, structure and size. Types of area and development - Floristic realms. Vegetation zone in the world and theirs ecological characteristics.	

Course number and code: BOT 379	Course title: Metabolism & Transport in Plants
Effective hours: 2 (1+0+1) (Lect. – Exer. – Pract.)	
Introduction to Inzymology, Enzymes actions, reactions and classifications. Bioenergics. Metabolisms of carbohydrates amino acids and fatty acids. Translocation paths, source-sink relationship. Translocation directed control in Phloem. Theories of translocation. Osmotic forces in sieve plates, and translocation from ageing organs.	

Course number and code: BOT 380	Course title: Plant Water & soil Relations
Effective hours: 2 (1+0+1) (Lect. – Exer. – Pract.)	
Plant and water. Physiological and chemical importance, water and soil, cell water relation, water movement ot roots, absorption and translocation.	

Course number and code: BOT 446	Course title: Management of Botany natural resources
Effective hours: 2 (2+0+0) (Lect. – Exer. – Pract.)	
Natural resources - renewable and non-renewable - biodiversity - Conservation strategies: in-situ and ex-situ conservation, Genetic resources – Gene and Seed banks and other genetic resources banks - biosphere reserves (germplasm) etc. – Techniques used in Genetic resources conservation - Legislation on endangered species. Agencies involved in conservation activities.	

Course number and code: BOT 447	Course title: Arid regions development
Effective hours: 2 (1+0+1) (Lect. – Exer. – Pract.)	
Definition and classification of arid lands – Water and plant habitat – Dams and their role in water protection in arid regions – Wet and dry agriculture – Evaluation of arid regions and development methods – Arid lands uses – Production blockers in arid regions – Future energy and Arab arid lands use economics.	

Course number and code: BOT 456	Course title: Gene Conservation
Effective hours: 2 (1+0+1) (Lect. – Exer. – Pract.)	
Natural resources - renewable and non-renewable - biodiversity - Conservation strategies: in-situ and ex-situ conservation, Genetic resources – Gene and Seed banks and other genetic resources banks - biosphere reserves (germplasm) etc. – Techniques used in Genetic resources conservation - Legislation on endangered species. Agencies involved in conservation activities.	

Course number and code: BOT 457	Course title: Genetic Engineering
Effective hours: 2 (1+0+1) (Lect. – Exer. – Pract.)	
Extraction and purification of genetic material – Quantitative estimation and electrophoresis of genetic material – The enzymes used in genetic engineering and DNA manipulation – The vectors and hosts used in DNA cloning and genetic engineering techniques – Gene cloning – Construction, screening and purification of genomic and cDNA libraries.	

Course number and code: BOT 458	Course title: Ecological Genetics
Effective hours: 2 (1+0+1) (Lect. – Exer. – Pract.)	
Introduction to Ecological Genetics – Types of Genetic Variation – Origin of Genetic Variation – Quantitative Genetic Variation – Measuring of Genetic Variation – Gene Flow-plant Population Differentiation and F-Statistics – Gene Interaction with Environmental Variations.	

Course number and code: BOT 476	Course title: Date Palm Biology
Effective hours: 2 (1+0+1) (Lect. – Exer. – Pract.)	
Comparative forms and functions of Date palm as compared with other plants. Growth and distribution of Date palm and the related controlling factors. Effects of salinity and irrigation water. Date palm propagation: Conventional and new methods, pollination, fertilization, flowering, fruiting and fruit contents. Other Date palm products. Seed germination.	

Course number and code: BOT 487	Course title: Phytoplanktons
Effective hours: 2 (1+0+1) (Lect. – Exer. – Pract.)	
Fresh water and marine phytoplankton, mechanism of sinking and floating factors effecting their growth. Seasonal succession, interactions with other organisms, primary production.	

IV- Elective courses *from* OUTSIDE the Specialization

Group (A): Microbiology

Course number and code: MBIO 240	Course title Lab. Skills
Effective hours: 2(0+0+2) (Lect. – Exer. – Pract.)	
The basic techniques in Microbiology laboratories (Microbiology Lab. Organization and management The microcopy technique ,Kinds of microscopes , Sterilization techniques – Pure culture techniques –Morphology , growth and staining technique – Effect of physical and chemical factors on microorganisms physiological activities.-Antibiotic production- microbial Enzymatic activities- Medical microbiology	

Course number and code: MBIO 250	Course title: General Virology
Effective hours: 3(2+0+1) (Lect. – Exer. – Pract.)	
General characteristics of Viruses- cultivation and purification of viruses – Physical and chemical structure of human and animal viruses –Methods of classification — Families and replication cycle of human and animal viruses – Detection method of vaccine and antiviral drugs.	

Course number and code: MBIO 251	Course title: Molecular Biology
Effective hours: 2(1+0+1) (Lect. – Exer. – Pract.)	
Overview of genetic material DNA assembly and structure/function relationships. DNA replication , transcription and translation , regulation of gene expression – Gene cloning and chemical analysis of DNA restriction enzyme and sequencing methods – Recombinant DNA technology and genetic engineering concept and applications in field of microbiology.	

Course number and code: MBIO 260	Course title: General Bacteriology
Effective hours: 3(2+0+1) (Lect. – Exer. – Pract.)	
Isolation methods – Pure culture – Identification by using chemical and molecular methods – Bacterial groups , their characteristic taxonomy and biological significance	

Course number and code: MBIO 270	Course title: General Mycology
Effective hours: 3 (2+0+1) (Lect. – Exer. – Pract.)	
General characteristics of fungi – Growth – Classification – Reproduction – The Economics importance and commercial uses.	

Course number and code: MBIO 330	Course title: Microbial Physiology
Effective hours: 3 (2+0+1) (Lect. – Exer. – Pract.)	
Energy: its important, its compounds and sources stating the physical and chemical nature of the phenomena. The carbon sources and the spectrum of bacterial utilization of natural carbon sources maintaining the recycling of compounds in and out the biological system. The formation of the primary units for construction of the cell and its relation to nutrition and growth. The primary metabolism and secondary metabolism to explain growth, industrial and the pathogenic nature of microbes.	

Course number and code: MBIO 344	Course title: Water sanitation Microbiology
Effective hours: 2 (1+0+1) (Lect. – Exer. – Pract.)	
Introduction-Water as Biotopes for Microorganisms- Distribution of Microorganisms in the aquatic habitats –s – Microorganisms and Water pollution – Microbial flora of Sewage – Pathogenic Microorganisms in water and sewage- Sewage treatments –Role of Microorganisms in the Purification of Water –Preparation of water for drinking and other purposes –Chemical and Biological tests of water- the economic significance of Aquatic Microorganisms	

Course number and code: MBIO 463	Course title: Antibiotics
Effective hours: 3 (2+0+1) (Lect. – Exer. – Pract.)	
Introduction to antibiotics and their discovery – Antibiotic producing microbes and their isolation – Antibiotics groups – Synthesis pathways – Purification, action and release – Their peaceful use and their side effects – Antibiotic sensitivity tests – Antagonism and Synergy.	

Course number and code: MBIO 465	Course title: Industrial Microbiology
Effective hours: 2 (1+0+1) (Lect. – Exer. – Pract.)	
The courses outcome of the physiological activities so it does explain the resulting structures; The capsule - The filamentous structures -The cell envelope --The cell wall - The outer membrane - The cytoplasmic membrane - The genetic tools -The chromosomes - The plasmids - The spores - The ribosomes - The biological membranes .	

Group (B):Biology

[credit hours (Lect. – Exer. – Pract).]

ZOOL 212	Parasitology	3 (2+0+1)
Understanding and practicizing the different methods and techniques applied for identification of parasitic infections. Identification of the main characteristics of the different stages of the parasites. How to determine: the site of infection, diagnosis and diagnostic stages, pathogenecity & treatment. How to elucidate the life cycle of a parasite (host (s) and mode of transmission). Mastering photography, measurements and report writing.		

ZOOL 311	General Entomology	3 (2+0+1)
General considerations and introductory study of insects. General characters of insects. External structure: Integument structures and functions, Head thorax and abdomen. Internal structure (Anatomy): Alimentary canal, Excretory system, Respiratory system, Nervous system, Endocrine system and hormones, Reproductive system, Circulatory system. Insect growth and development (Metamorphosis) : Eggs and fertilization, Types of larvae, Types pupae. General Taxonomy of insect : Apterygota, Pterygota (Exopterygota, Endopterygota).		

ZOOL 320	Ichthyology	2 (1+0+1)
Introduction, Classification of fish. Fish Ecology. External feature. Skin structure. Internal structure : Muscular system, Digestive system, Circulatory system, Respiratory system, Urinogenital system, Nervous system and Endocrine glands, Skeletal system. Growth and age. Migration and Fish Zoolgeography.		

ZOOL 325	Ornithology	2 (1+0+1)
Historical introduction. Economic advantages of birds. Effects of birds in environmental balance. Bird's morphological structure. Energy for feather molting. Mechanisms of maintenance of body temperature in birds compared to mammals. Common diseases in birds. Bird's migration. Reproductive behavior in birds. Young care. Bird's classification. Development and conservation of birds.		

ZOOL 326	Mammology	2 (1+0+1)
Classification and historical view of mammals, Study some body organs, Characterized to mammals, anatomically and functionally, and their responses to different influences, these organs include hair, mammary gland, sweat glands, scent glands, mastication system, peripheral skeleton. Study some orders of mammals.		

ZOOL 327	Amphibians and Reptiles	3 (2+0+1)
Introduction. Structure of Amphibians and Reptiles. Origin of Amphibians & Reptiles. Reproduction and life history of Amphibians & Reptiles. Homeostasis. Relation to Biotic Environment. Amphibians & Reptiles of Saudi Arabia.		

ZOOL 373	Terrestrial Ecology	2 (1+0+1)
Introduction (Concept of Ecology). Components of Ecosystem. The cycles of elements. Terrestrial biomes. Zoolgeographical distribution of animals. Physical ecological factors (Temperature, Light, Humidity). Biological ecological factors (Symbiosis). Animal adaptation to desert environments.		

ZOOL 374	Aquatic Ecology	2 (1+0+1)
Introduction. Characters of aquatic ecology. Water characteristics: Physical charaters (Temperatyre, Salinity, Turbidity), Chemical characters (Dissolved Oxegen, Other dissolved gases, pH, Hardness). Aquatic ecosystem: Aquatic plants, Aquatic animals.		

ZOOL 432	Endocrinology	2 (1+0+1)
Brief study on hormones or chemical messages with examples. Chemical structure of hormones. Study of the endocrine gland system in some animals.		

GEO 262	Geoecology	2 (1+0+1)
Geologic factors influence the environment – air, water and soil pollution – radioactive waste disposal – geohazards including: earthquakes, volcanoes, floods, soil erosion and landslides – desertification – population expansion and depletion natural resources – pollution associated with the extractive industries.		

V- Service Courses to Another Departments and Colleges [credit hours (Lect. – Exer. – Pract).]

Course number and code: BOT 102	Course title: Botany
Effective hours: 3 (2+0+1) (Lect. – Exer. – Pract.)	
Plant and their importance. Chemical and fine structures of the plant cell. Metabolism. Anatomy. Plant tissues, Plant water relations. Heredity and its applications. Levels of structural organization and evolution in plants (structure, taxonomy, economical and biological importance). Plant morphological and anatomical adaptation to environment Environmental pollution.	

Important Note: The student must review the department concerned for decisions that taught outside the college (Compulsory and Elective).