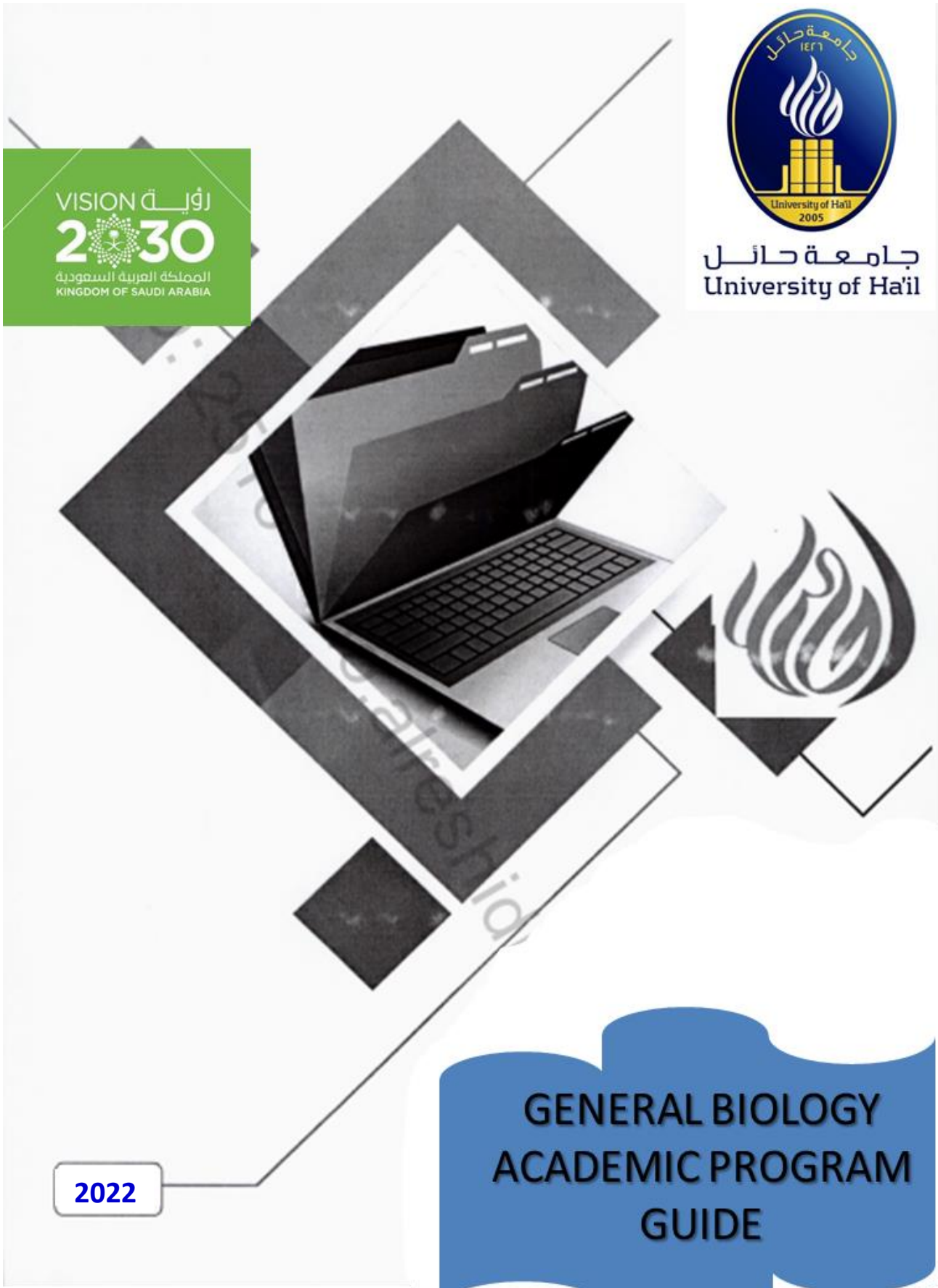


GENERAL BIOLOGY ACADEMIC PROGRAM GUIDE

2022

جامعة حائل
University of Ha'il

Contents

Introduction

Dean's Welcome:

(Dr. Khalaf Alanzi)

In the Name of Allah, the Merciful, the Compassionate Praise to be for Allah, the Almighty, and both peace and blessing to be upon the most venerable Prophet Muhammad Ibn Abdullah. On my own behalf and the behalf of the employees of the College of Science at the University of Hail (in KSA) of College members, administrators, technicians and students, it gives me great pleasure to welcome you. The College of Science was established in 1430 AH (2009 AD), after a brief period from the start of Hail University in 1426H. Currently it has four academic departments: mathematics, biology, chemistry, and physics. The College of Science offers bachelor's degree in these disciplines, and in shaa Allah, in the coming future, it will initiate the establishment of graduate programs in the four departments, in addition to the expansion in establishing other new programs at the bachelor's degree level. Since its establishment, the College of Science looks forward to be a leading institution in the fields of education and scientific research in both basic and applied sciences and to be a scientific center of excellence and community service locally, regionally and internationally.

The College of Science represents a scientifically vital active society with diverse knowledge and cultures, and can be considered also as a leading center for generations for scientific disseminations and application of knowledge in the natural sciences and technology since it has a group of distinguished professors, specialists, experts and prominent researchers, who are trying to achieve excellency, and who contribute significantly towards supporting the march of the University of Hail for the continuing evolution and enduring success.

In order to follow the updated international and new technology developments, the College of Science initiated the application of interactive style in education rather than the traditional method by using the latest technologies in order to keep pace with scientific and global developments through goals setup by the College of Science and which are consistent and compatible with:

-The requirements of local and international academic standards accreditation.
-The quality management system in the College of Science.
-The provision of training programs for College members, technicians and administrators
-A five-year development strategic plan and other long-term plans.
-Modern technologies in the educational process as the “smart lecture halls” -Achieving and providing a suitable environment for undergraduate students. -Paying attention to the quality of the outputs of the College of Science to be compatible with labor market needs.
The College of Science also strives to activate and develop scientific research projects for the graduate studies and distinguished scientific research according to the strategies and techniques of scientific research advertised and participation in the areas of international cooperation in order to achieve the mission and objectives of the University.

The College of Science realizes how scientific and cognitive challenges faced at the local, regional and international levels, so it is doing sincere efforts and working hard as a team in order to achieve the goal of the educational and research level highly decent to the college, in order to be so comparable to its counterparts from prestigious universities in advanced countries. Moreover, the College aspires to continued fruitful cooperation with local community institutions and its bodies for the benefit of the citizens and the progress and advancement of the nation.

Finally I may ask Allah, Almighty, to help all employees to service this scientific edifice and this beloved country. Wishing success for all of our students of the College of Science and reconcile be from Allah for everyone.

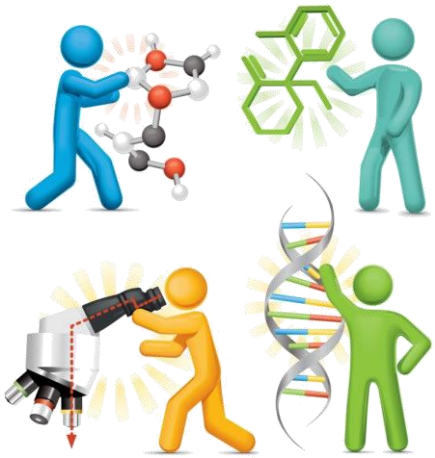
Department Chairman Welcome:

(Dr. Nawaf Ibrahim Alshammari)

Studying Biology is not restricted for researchers.
It is also a great venue for students to explore the mysteries of life. We pride ourselves on providing majors and non-majors students alike with an exposure to the basic and modern biological world.

Such exposure is valuable for students thinking over careers in biology, providing exciting opportunities for making new discoveries and the chance to learn some of the practical skills needed to find employment or to further their own education. We encourage any potential Biology students to learn more about our biology programs at University of Hail.

The Department of Biology offers a broad range of educational and research opportunities at the undergraduate and graduate levels. Undergraduate majors can choose from programs in general biology, environmental biology, Bioinformatics and Biotechnology.



Program Mission

The program is committed to prepare scientifically distinguished graduates in the field of Biology and its applications by acquiring scientific skills that keep pace with the needs of the labor market, producing applied research, and providing biological consultations to serve the community.

Program Objectives

The Biology Department, through its educational programs, strives to:

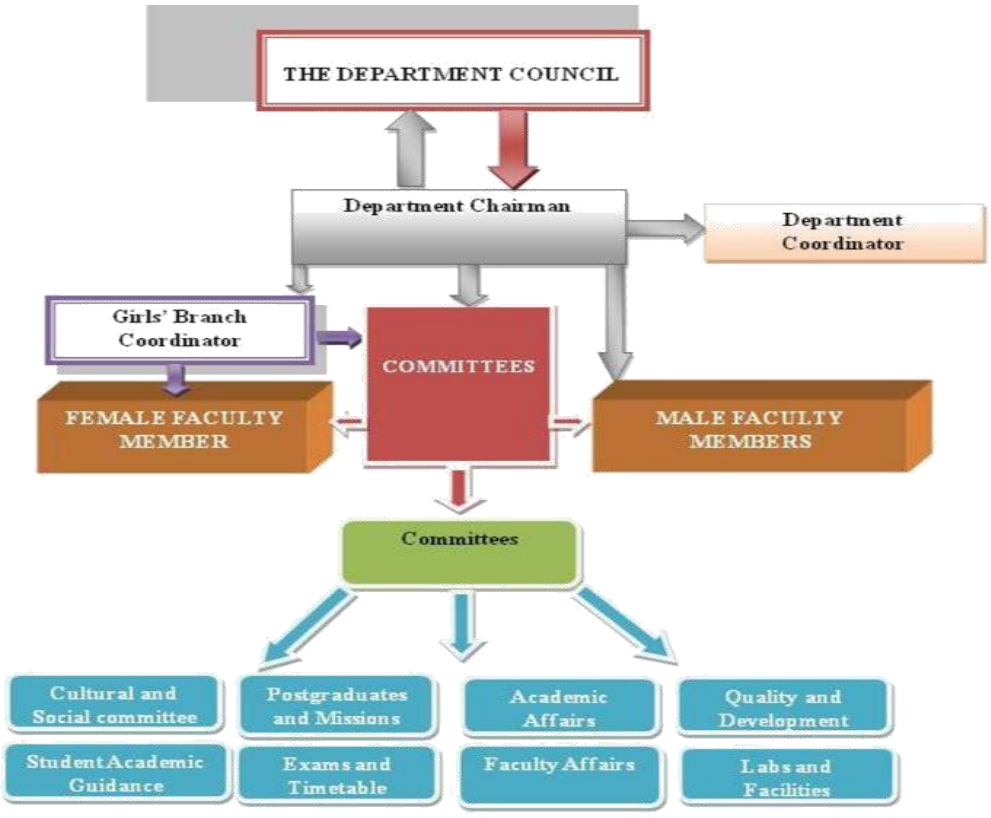
- Preparing a distinguished graduate with knowledge and skills in Biological Science.
- Qualifying the students to adapt to the developments and needs of the labor market in the field of Biology.
- Providing Biological consultations to the public and private sectors.
- Conducting biological research in line with national research priorities.

The major objectives of the program together with the measurable performance indicators and the major strategies taken to achieve these objectives:

Measurable Objectives	Measurable Performance Indicators	Major Strategies
Preparing a distinguished graduate with knowledge and skills in Biological Science.	Obtaining program accreditation by NCAAA and / or other agencies.	Develop the education methods to guarantee the quality performance and outcome.
	Percentage of employed graduates. Reaching the value of benchmarks or being closely related.	Follow an internationally recognized academic reference standard for programs offered by the department and keep up with the modern educational procedures implemented in such institutions. Taking internationally recognized academic programs nationally and internationally as benchmarks.
Qualifying the students to adapt to the developments and needs of the labor market in the field of Biology.	Proportion of students who passed the exams each year level. No. of student's projects or published articles.	-Equipping laboratories and classrooms with good technology for education. -Measuring the learning outcomes of the program eventually.
	Satisfaction percentage of beneficiaries.	Applying developed and relevant teaching strategies.
Providing Biological consultations to the public and private sectors.	-Number of consultation reports by staff members. - percentage of staff members involved in consultation.	Organizing workshops for public to introduce the capabilities of the program staff members in the field of consultation. Disseminating the information about the program's staff members quality by booklets and procures.
	Number of active partnerships agreements signed with national and international institutions.	Seeking partnership agreements with national and international institutions at both educational and research levels.
Conducting biological research in line with national research priorities.	The number of research papers published in scientific journals. - Number of staff members who participated in conferences.	Funding for the scientific projects that serve the community and environment Activate the research groups.

Organization Chart of the Program

The governing body of Biology Department is represented in the following chart. Its role is to formulate policies and manage implementations of the rules and regulations of the department. The department chairman is assisted by Girls branch supervisor, and the departmental committee's chairpersons. Several Committees are responsible for the running and supervision of different aspects of the academic life of the department and report directly to the department chairman.



Admission requirements

The eligibility criteria for candidates wishing to join the Biology program must fulfill the following requirements, which include both university and program requirements:

1- The applicant is a Saudi citizen.
2- Admission in the first year will be offered on the basis of 35% Secondary exam result plus 35% Kudarat and 30% Tahsili exams.
3- After successfully passing of the first preparatory year the students will be accepted at the College of Science according to their GPA in first year and must be not less than 1.0.

After successful completion of the first Science year, the student may contact the department and academic advisor for the mechanism approved by the college council to join the program.

Graduation requirements

To obtain a bachelor degree, all students must satisfy the following:

- Have a minimum Grade Point Average (GPA) of 2.0.
- Complete 132 credits according to the following:

- University Requirements: 15 credits (compulsory)
- Faculty Requirements: 27 credits (compulsory)
- Department Requirements: 90 credits (82 compulsory + 8 elective*)

Department electives: students choose courses from list of electives offered by the department.

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Academic reference Standards of the program

1. KNOWLEDGE & UNDERSTANDING

K1-Summarize the basic knowledge of genetics, molecular, biochemical and computational biology

K2-Mention microbial, cellular, tissue and organismal morphology and functioning

K3-Recognize the eco-physiological processes, conservation, biodiversity and environmental pollution and management concepts

K4-Describe the various complications and diseases due to ecological and environmental system disruptions

2. SKILLS

S1-Perform proper and safe laboratory practices without adverse effect on humans and environment

S2-Apply appropriate computational, mathematical and analytical approaches and techniques.

S3-Communicate biological ideas and data value effectively and accurately in both oral and written methods to various audiences.

S4-Implement the concepts and methodologies of biological science to produce economical products for human health and environment.

S5-Apply knowledge of plant and soil sciences and their used applications in pharmaceutics and environmental management.

3. VALUES

V1-Manages the biological data by using technologies and experiments independently and in team works

V2- Shows awareness of ethical, environmental and moral issues

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Program intended learning outcomes (PLO's)

Insert the program learning outcomes listed in the table above in the appropriate spaces under each of the NQF Learning Domains listed in the table below. Replace the codes and numbers under 'Course Offerings' with the codes and numbers of the courses offered by your program. Indicate the level of instruction for each course.

Knowledge & Understanding	
K1	Summarize the basic knowledge of genetics, molecular, biochemical and computational biology.
K2	Mention microbial, cellular, tissue and organismal morphology and functioning.
K3	Recognize the eco-physiological processes, conservation, biodiversity and environmental pollution and management concepts.
K4	Describe the various complications and diseases due to ecological and environmental system disruptions.
Skills	
S1	Perform proper and safe laboratory practices without adverse effect on humans and environment
S2	Apply appropriate computational, mathematical and analytical approaches and techniques.
S3	Communicate biological ideas and data value effectively and accurately in both oral and written methods to various audiences
S4	Implement the concepts and methodologies of biological science to produce economical products for human health and environment.
S5	Apply knowledge of plant and soil sciences and their used applications in pharmaceutics and environmental management.
Values	
V1	Manages the biological data by using technologies and experiments independently and in team works
V2	Shows awareness of ethical, environmental and moral issues

Study plan of the program

All students enrolled in the Biology Program are required to complete the following core coursework, totaling 132 credits. Students are prepared through a preparatory year in English Language, mathematics, and computer skills.

The goal of this program is to provide high school graduates with excellent foundation in all fields of life sciences and the basic practical skills of working as biologist. The program will prepare distinct cadres able to apply general principles of Biology in solving the problems of the surrounding environment, economy and industry.

Level	Course Code	Course Title	Required or Elective	*Pre-Requisite Courses	Credit Hours	University/ College or Department
Level 1	**ARAB 101**	Arabic language skills	Required	None	2	University
	ENGL 110	English language	Required	None	3	University
	IC 101	Introduction to Islamic culture	Required	None	2	University
	MATH 101	Calculus I	Required	None	4	College
	PHYS 100	Renewable Energy	Required	None	2	College
	PHYS 101	General Physics I	Required	CO- MATH 101	4	College
Level 2	**ARAB 102**	Arabic Composition	Required	None	2	University
	BIOL 101	General Biology	Required	None	4	College
	CHEM 101	General Chemistry I	Required	None	4	College
	ENGL 101	English Composition I	Required	None	3	College
	IC 102	Islamic and Society Building	Required	None	2	University
	ICS 103	Computer Programming	Required	MATH101	3	College
Level 3	**BIOL 211**	Cell Biology	Required	BIOL101	2	Department
	BIOL 221	Systematic Botany	Required	BIOL101	3	Department
	BIOL 231	Systematic Zoology	Required	BIOL101	3	Department
	ENGL 102	English Composition II	Required	ENGL101	3	College

	IC 103	Economic System in Islam	Required	None	2	University
	MATH 205	Biostatistics	Required	MATH101	2	Department
Level 4	**BIOL 212**	General Genetics	Required	BIOL101	3	Department
	BIOL 241	General Ecology	Required	BIOL101	3	Department
	CHEM 270	Organic Chemistry	Required	CHEM101	3	Department
	GEOL 201	Physical Geology	Required	CHEM101	3	Department
	IC 104	Basics of Political System	Required	None	2	University
Level 5	**BIOL 311**	Basic Biochemistry	Required	BIOL101	3	Department
	BIOL 324	General Microbiology	Required	OL101+BIOL221	3	Department
	BIOL 331	Invertebrates	Required	BIOL231	3	Department
	BIOL 332	Chordates	Required	BIOL231	3	Department
	BIOL 333	Animal Histology	Required	BIOL211	2	Department
	BIOL 353	Plant Morphology & Anatomy	Required	BIOL101	3	Department
	BIOL 355	ıtroduction to Remote Sensing & GIS	Elective		2	Department
	BIOL 357	Natural Resources Management	Elective		2	Department
	BIOL 359	Toxicology	Elective		2	Department
Level 6	**BIOL 312**	Molecular Biology	Required	BIOL211	3	Department
	BIOL 322	Plant Taxonomy	Required	BIOL 221	3	Department
	BIOL 327	esearch Design & Methodology	Required	MATH205	1	Department
	BIOL 367	Basic Plant Physiology	Required	BIOL311	3	Department
	BIOL 368	Basic Animal Physiology	Required	BIOL311	3	Department
	BIOL 383	Economic Zoology	Required	BIOL231	1	Department
	BIOL 372	Hydrobiology	Elective	OL231+BIOL221	2	Department
	BIOL 373	Biodiversity	Elective	BIOL241	2	Department
	BIOL 437	Fauna and Flora of KSA	Required	OL231+BIOL221	2	Department
Level 7	**BIOL 420**	Environmental Soil Science	Elective	HEM101+GEOL201	2	Department
	BIOL 493	Enzymology	Elective	BIOL311	2	Department
	BIOL 417	Principles of Biotechnology	Required	BIOL312	3	Department
	BIOL 418	Environmental Pollution	Required	BIOL241	2	Department
	BIOL 422	Plant Ecology	Required	BIOL241	3	Department
	BIOL 431	Animal Ecology and Behavior	Required	BIOL241	3	Department
	BIOL 433	Entomology	Required	BIOL231	3	Department

Level 8	**BIOL 476**	Applied Microbiology	Elective	BIOL324	2	Department
	BIOL 490	Advanced Plant Physiology	Elective	BIOL367	2	Department
	BIOL 496	Advanced Animal Physiology	Elective	BIOL368	2	Department
	BIOL 419	Archegoniates & Phycology	Required	BIOL221	2	Department
	BIOL 434	Immunology	Required	BIOL324	3	Department
	BIOL 435	Parasitology	Required	BIOL231	3	Department
	BIOL 436	Animal Embryology	Required	BIOL332	2	Department
	BIOL 497	Research Project	Required	100 Earned Credit Hours and Department Approval	3	Department
	Include additional levels if needed (i.e. summer courses).					

* **Prerequisite** – list course code numbers that are required prior to taking this course.

Courses description

Code	Course Title	Course overview
BIOL101	**General Biology**	Themes in the study of life, structures and functions of large molecules. A tour, in the cell, cell membrane, structure and function, the cell cycle, key roles of cell division. Mitosis, Meiosis and sexual life cycle. Plant structure, growth and development. Photosynthesis and cellular respiration. Animal and Plant Biodiversity. Biology 8th Ed. 2008, Campbell, N.A., Reece, J.B.
BIOL211	**Cell Biology**	Introduction to cells cells and cell theory, Membrane transport, Intracellular Compartments and Transport, Cell communication, Cytoskeleton, Eukaryotic DNA and chromosomes, Mitosis, meiosis and Cell-Cycle Control. Essential Cell Biology 3rd Ed. 2009, by Alberts, B. et al.
BIOL212	**General Genetics**	Introduction to Genetics, Mitosis and Meiosis, Mendelian Genetics and non Mendelian Inheritance, Sex determination and sex chromosomes, Karyotypes and chromosome mutations, Linkage and chromosome mapping in Eukaryotes, DNA structure and analysis, Recombinant DNA technology and Gene Cloning, Population and evolutionary genetics. Bio Instant Notes in Genetics. 3rd Ed. 2010, by Turner, P., McLennan, A., Bates, A and White, M.
BIOL221	**Systematic Botany**	Systems of classification of living organisms – 5 kingdoms classification. Viruses, Monera, Bacteria, Fungi and Protista (Algae). The plant kingdom – A study of the general characters of Plant kingdom – The characteristics of the different sections of the plant kingdom – The general reproduction and life cycle in the plant kingdom – study General characteristics and life cycle of : Bryophytes, Pteridophytes – Spermaphytes. Systematics 4th Ed. 2009, by Jones, S.B.Jr. and Luchsinger, A.E.
BOL231	**Systematic Zoology**	This course is intended to introduce the diversity and classification of the animal kingdom. To fulfill this, the course was designed to focus on 3 issues . Firstly, obtain knowledge about history, general principals and objectives of Systematics Zoology. Secondly, characteristics and brief overview on

		classification of different animal phyla. And finally, explain and provide examples of how animals adapt to specific environmental conditions. Modern Text Book of Zoology: Invertebrates 11th Ed. 2016, by Kotpal, R.L.
CHEM270	**Organic Chemistry**	The origin of organic chemistry and chemical bonding. Structure, nomenclature, synthesis and reactions of aliphatic hydrocarbons. Alkyl and aryl halides, nomenclature, synthesis and reactions. Also this course covers: Classification, nomenclature, physical properties, synthesis and reactions of alcohols, phenols, aldehydes, ketones, carboxylic (and their derivatives), amines and carbohydrates. Fundamentals of Organic Chemistry 7th Ed. 2011, by McMurry, J.E.
MATH205	**Biostatistics**	Descriptive statistics of grouped data, Types of variables, Sampling and distribution I, Sampling and distribution II, The bio-statistical theory – one sample t-test, The Student's t-test paired and two sample t-test, Analysis of variance, Correlation and Regression, Non-parametric statistics Chi square in Diagnosis.
BIOL241	**General Ecology**	Ecology (What, Why, How & Where), Constituents of the environment (Abiotic factors, Biotic factors), Distribution (Dispersal, Migration, Dispersion), Natural Biogechemical Cycles, Ecological Succession, Food chains, Food webs, Trophic pyramids, Types of ecosystems (Terrestrial ecosystems, Aquatic ecosystems, Adaptation to animal and plants to ecosystems), The Biomes. Elements of Ecology 9th Ed. 2015, by Smith, TM, Smith RL.
BIOL311	**Basic Biochemistry**	Macromolecules structure and function. Structure and function of Carbohydrates, Lipids, Proteins and Nucleic Acids. Enzymes: general properties, classification and action, Enzymes; Kinetics and effect of activators and inhibitors, Introduction to metabolism; Bioenergetics and the role of ATP. Carbohydrates and Lipid Metabolism. Principles of Biochemistry 4th Ed. 2016, by Horton, HR, Moran LA, Scrimgeour KG, Perry MD, Rawn, JD.
BIOL312	**Molecular Biology**	Introduction to molecular Biology-DNA structure and properties. Genome Structure, Chromatin and Nucleosome. Replication of DNA. RNA structure. Transcription & Translation. Mutations and DNA repair mechanisms. Regulation of gene expression. Molecular techniques. Molecular Biology of the Gene, 7th Ed. 2013 by Watson JD, Baker TA, Bell AP, Gann A, Levine M, Losick R.
BIOL322	**Plant Taxonomy**	History of plant classifications, Naming plants, International code of Botanical Nomenclature, Comparison of Major Classification systems, Phylogenic system. Principles of Plant Taxonomy, Different types of plant taxonomy, Structural and biochemical characters, Molecular methods, Origin and evolutionary history of the plants, Origin of flowering plants. Ferns and fern allies, Selected families of Gymnosperms, Angiosperms :Dicots, Selected families of Angiosperms: Dicots, Monocots. Taxonomy of Flowering Plants, 1st Ed. 2008, by Porter L.
BIOL324	**General Microbiology**	A general course emphasizing distribution, morphology and physiology of microorganisms in addition to skills in aseptic procedures, isolation and identification. It explains relationships and applies appropriate terminology relating to the structure, metabolism, genetics and ecology of prokaryotic microorganisms and viruses. It also investigates new exciting material about microbes in our world. Brock Biology of Microorganisms, 14 th Ed. 2014, by Madigan MT et al.

BIOL327	**Research Design & Methodology**	The course targets all students planning to be involved in scientific research projects in different disciplines of biological sciences, focuses on and aims at mastery of the culture and basic skills that are essential foe scientific research in biology, and aims to stimulate students to adopt and apply scientific approach to solve their daily life problems. Experimental Design for Biologists, 2ne Ed. 2014, by Glass DJ.
BIOL331	**Invertebrates**	Through this course the student will demonstrate an understanding of taxonomy, morphology, structure and function of various higher invertebrate animals. In addition to the characteristic features, the form and function of representatives from the phyla: Mollusca, Annelida, Arthropoda and Echinodermata and other minor phyla will be reviewed. The role of invertebrates in ecosystems will be also emphasized to prepare students for the broader examination of ecology and population biology. Biology of Invertebrates. 6th Ed. 2014, by Pechenik J.
BIOL332	**Chordates**	This course aims at giving students a plethora of knowledge and information on chordates in terms of taxonomy, anatomy and life style. This includes the main classes of chordates such as cephalochordates, urochordates, hemichordates and members of vertebrata that include chondrichytes, ostichytes, amphibians, reptiles, aves and mammals. Evolution of systems of these animals and their physiology are also considered. Vertebrate Life, 2002, by Pough FH, Janis CM and Heiser JB.
BIOL333	**Animal Histology**	Epithelial tissues and Epithelial glands. Connective tissues, Blood, Artery and vein, Cartilage and Bone. Nerve tissues, Muscles and Integumentary system, Digestive system, Liver, Gall bladder and Pancreas. Urinary system, Circulatory system, Female reproductive system, Male reproductive system. Adrenal, Thyroid and Pituitary glands. Functional Histology: A Text and Color Atlas, 6th Ed. 2013, by Young B, Stevens A, Heath JW, Deakin PJD.
BIOL353	**Plant Morphology & Anatomy**	Seed germination, buds and leaves, stem and roots, Flowers and Influorescences, fruits, Plant cell and tissues. Introduction to plant anatomy (simple, complexes and secretory tissues), Primary Plant Body (Growth), Protostele and Siphonostele, Secondary Growth: The Periderm, Types of Secondary growth. Plant Form: an Illustrated Guide to Flowering Plant Morphology Hardcover, 2008, by Bell AD and Bryan A.
BIOL367	**Basic Plant Physiology**	Introduction to plant Physiology, Plant Growth and development, Whole Plant Water Relations, Plant cells and Water – Enzymes – Plant Responses and Hormones, Cellular Respiration, Plant Physiology and Mineral nutrition, Photosynthesis, Energy. Introduction to Plant Physiology, 4th Ed. 2009, by Hopkins WG and Hüner NPA.
BIOL368	**Basic Animal Physiology**	A comparative Animal Physiology course covering regulatory and control mechanisms such as: homeostasis, metabolism and energetics, excretion and osmoregulation, feeding and digestion, muscles and locomotion, nervous systems. Animal Physiology, 3rd Ed. 2012, by Hill R, Wyse GA and Anderson M.
BIOL383	**Economic Zoology**	The course deals with application of zoological knowledge for the benefit of mankind. It includes culturing animals for mass production for human use and to control or eradicate animals that are injurious to man directly or indirectly. Economic Zoology, 4th Ed. 2008, by Shukla and Upadhyay.
BIOL417	**Principles of Biotechnology**	Introduction to Biotechnology, Branches of Biotechnology, Tools and Regulation for Biotechnological approach. Transgenic plant production,

		Genetically modified techniques and Food, Somatic organogenesis and Cloning, Cell and Tissue Culture/stem cells (plant & animal), Agrobacterium mediated plant (T-DNA) mechanism. Application in Agriculture (Plant & Animal), Application in Industry (Biomedical, Medical and Pharmaceutical). Plant Biotechnology, 1st Ed. 2003, by Adrian, Slater and Nigel.
BIOL418	**Environmental Pollution**	The course provides students with knowledge on environmental stressors and pollution, their sources in natural and workplace environments, their modes of transport and transformation, their ecological and public health effects, and existing methods for environmental disease prevention and remediation. The course also addresses the complex interactions of man, health and environment. Therefore, it exposes students to the multidisciplinary nature of Environmental Health Science. Understanding Environmental Pollution, 2nd Ed. 2010, by Hill MK.
BIOL419	**Archegoniates & Phycology**	This course is composed of 2 parts : Archegoniates and Phycology. The Archegoniates part includes the classification, morphology, anatomy, evolution, ecology and life cycles in various plant groups of Archegoniates as Bryophytes, Pteridophytes and Gymnosperms, while the Phycology part emphasizing the morphology, taxonomy, phylogeny, biology and Ecology of algae in all ecosystems. Algae, 2nd Ed. 2016 by Graham JE et al., Green Plants : Their origin and Diversity, 2000, by Bell PR & Hemsley AR.
GEOL201	**Physical Geology**	This course introduces the basic principles of physical geology. Earth's Interior – Plate tectonics – Matter & Materials – Melting magma and igneous rocks – Weathering & soil formation – Sediments and Sedimentary Rocks – Metamorphism & metamorphic rocks – Geologic time – Volcanoes & Earthquakes – Deserts & Aeolian Processes – Ground and Surface water – Costal processes and Glaciers – Earth resources. Earth, an Introduction to Physical Geology, 9th Ed. 2007, by Tarbuck & Lutgens.
BIOL422	**Plant Ecology**	General introduction to Ecology – Photosynthesis and Light – Water and Soil Relations – Population structure – Growth & Reproduction – Communities & Competition – Herbivory & Parasitism – Disturbance & Succession – Ecosystems & Landscapes – Biomes. The Ecology of Plants, 2nd Ed. 2006, by Gurevitch J, Scheiner SM, and Fox GA.
BIOL431	**Animal Ecology & Behavior**	An introduction of animal ecology, species distribution, Species Interactions, Animal Adaptations & Animal Defense, an introduction of Animal Behavior, Physiological basis of behavior, Types of behavior, Learned behaviors and Human behavior. Principle of Animal Behavior 2009, by Dugatkin LA.
BIOL433	**Entomology**	Importance of Arthropods & Insects, Insect Morphology :exoskeleton (Integument), Coloration in insects, The insect head (Mouthparts, Eyes, Antenna), The insect Thorax (Legs, Wings), The insect Abdomen, Insect development & Life histories (Growth, Life history Patters & Phases – Ametaboly, Metamorphosis, Hemimetaboly, Holometaboly, Voltinism); Insect Classification, Insect Anatomy (Digestion, Circulation, Excretion, Muscles & Locomotion, Respiration, Nervous System, Reproduction), Insect Ecology, Social Insects, Economical, Medical & Veterinary Insects. The insects: an Outline of Entomology. 5th Ed. 2014, by Gullan PJ and Cranston PS.
BIOL434	**Immunology**	Introduces the principles of Immunology including: development of immune system, Innate immunity, Antigen-Antibody Reaction, The Major

		Histocompatibility Complex Reactions and Antigen Presentation, B cells development, Immunoglobulin structure, T cells development & activation, Immune responses to infectious organisms, Autoimmune diseases, Autoimmunity, Allergies and immune deficiencies, Immune tolerance, Reproductive immunology, Tumor immunology. Janeway's Immunology, 9th Ed. 2016, Murphy KP and Weaver C.
BIOL435	**Parasitology**	The course aims at introducing the student to the general aspects of parasitology, such as biology, identification, route & mode of transmission, the fundamental mechanisms of host-parasite relationships, pathogenesis, epidemiology, treatment and control strategies of selected parasites of medical and veterinaty importance that belog to protozoa, helminthes, nematodes and arthropod's group. An Introduction to Parasitology, 2014, by Mattews BE.
BIOL436	**Animal Embryology**	Review of developmental concepts, Spermatogenesis, oogenesis, Amphioxus development: fertilization, Cleavage 7 Gastrulation. Amphibian development: fertilization, cleavage and Gastrulation, Amphibian's Neurulation, Germ layers and Derivatives, Differentiation & induction of embryo layers. Bird Development, Mammalian development & Organogenesis. Experimental embryology, Assistant reproduction Technology (IVF-ICSI-ET) and Teratology. Principles of Developmental Biology 2004, by Wilt FH and Hake SC.
BIOL437	**Fauna and Flora of KSA**	Concept of fauna & Flora, History of flora of the Arab Peninsula, Geomorphology & Climatology of plant regions in Saudi Arabia, Natural vegetational regions, Floristic composition and Zones – Types of habitat and their Vegatation – life forms in flora of Saudi Arabia- Plant Group in the Flora of Saudi Arabia, Endangered, rare, endemic economic, aromatic, poisonous, grazing, Woody and edible species. Flora of Eastern Saudi Arabia (Studies in the Flora of Saudi Arabia) ISBN-10: 0710303718 Flora of Saudi Arabia. 4th Edition, King Saud University, Riyadh, 1987 by Migahid, A. M. Flora of the Kingdom of Saudi Arabia illustrated, Volume 2, Part 3, 2000, by Shaukat Ali Chaudhary, Saudi Arabia. Ministry of Agriculture & Water.
BIOL497	**Research Project**	Students in this course will conduct a research project under the supervision of a faculty member in the Department of Biology. The course is open to 3rd and 4th year students. Students learn how to design, carry out and evaluate the results of a research project. Students are required to write and present a research proposal and present a seminar on the results of their research project. All students interested in a research project must approach potential faculty supervisors several months in advance of the beginning of the term. Students must obtain permission from the faculty member whom they would like to serve as their project supervisor. Students must meet the course coordinator periodically throughout the academic year.
BIOL355	**Introduction to Remote Sensing & GIS**	The course demonstrates the basis of electromagnetic radiation and its interaction with atmosphere and earth objects. It also describes the satellite sensors and the satellite images. It provides detailed information about image processing techniques and applications of remote sensing. Remote Sensing & Image Interpration, 4th Ed. 2000, by Lillesand T and Kiefer R.
BIOL357	**Natural Resources Management**	Forest, Land, Water and Food Resources, Fish and other Marine Resources. Mineral Resources. History of Management Approches, Approches in Resources Management, Resources Management in Developing countries, Causes and Link to resouces scarcity & poverty. Management of common

		International resources: Ocean, Climate, International Fisheries& Management Commissions, Antarctica: the evolution of an international resource management regime. Environmental and Natural Resource Economics: a Contemporary Approach, 2nd Ed. 2006, by Mifflin H and Harris JM.
BIOL359	**Toxicology**	The course covers and discusses general terms and principles related to toxicology, exposure to toxic substances, Biological Processes of toxic substance in the body (Biotransformation), Types of toxic chemical and natural (biological) substances, effects (harmfulness) of toxic substances to humans and animals. Also management, avoidance, prevention and legislations in the domain will be discussed. Essentials of Toxicology. 3rd Ed. 2015, by Klaassen C and Watkins JB.
BIOL372	**Hydrobiology**	Principles of aquatic biology reference to limnology and oceanography. Water as an environment for life, the marine brackish-water/estuarine and fresh water environments. Physical and chemical factors, Energy Flow, Influence on aquatic communities and pollution. Basic treatise on life of freshwater and marine communities with respect to their diversity, Production and Food chains and their functioning including nutrient recycling. Inquiry into Hydrobiology 2014, by Abdelmageed A.
BIOL373	**Biodiversity**	What is biodiversity (definitions of biodiversity), Biodiversity and the definition of species, Measuring biodiversity (Units of biodiversity, levels of biodiversity, biodiversity indices), Importance of Biodiversity (Values of Biodiversity), Threats to Biodiversity, Impacts of Biodiversty loss, Biodiversity hotspots, Conservation of Biodiversity. Biodiversity: an Introduction. 2nd Ed. 2013, by Gaston KJ and Spicer JI.
BIOL420	**Environmental Soil Science**	This course highlights the concept of soil formation, genesis and classification. It outlines the physical and chemical properties of soil and illustrates the phenomenon of soil degradation and its management. Elements of Nature and Properties of Soils, 2000, by Brady NC and Weil RR.
BIOL493	**Enzymology**	Definition of enzymes, How enzymes work, Properties and chemical composition of enzymes. Classification, Nomenclature and catalytic mechanisms od enzymes. Enzyme activity and factors affecting activity. Inhibition and Clinical Significance of Enzyme Inhibition. Regulation of enzyme activities. Isoenzymes. Applications of Enzymes. Enzymes in Clinical Diagnosis. Fundamentals of Enzymology: the Cell and Molecular Biology of Catalytic Proteins, 3rd Ed. 2001, by Price NC.
BIOL476	**Applied Microbiology**	The course is designed to develop the student's ability to apply the techniques used in the industrial microbiology: discovery, production (including fermentation and scale-up), bioprocessing and cell banking. It includes the principles and practices in the main applications of microorganisms to the industrial production of food, pure chemical proteins and other useful products. This course aims to enable graduates to enter industry with an appropriate level of understanding of the need for both the science and business aspects. Microbial Biotechnology: Fundamental and Applied Microbiology 2007, by Glazer AN and Nikaido H.
BIOL490	**Advanced Plant Physiology**	Introduction of plant water relation – Soil, water 7 plant relationship – Passive and active transport – Sources and Sinks – Introduction to the Plant Kingdom – Nitrogen compounds and Cycle of Nitrogen – Plant Nutrition – Nutrient Deficiency in Plants – Lipid metabolism of Plant.

		Introduction to Plant Physiology, 4th Ed. 2009, by Hopkins, WG and Hüner NPA
BIOL495	**Bioinformatics**	Introduces bioinformatics concepts and practice. Topics include: biological databases, sequence alignment, gene and protein structure prediction, molecular phylogenetics, genomics and proteomics. Students will gain practical experience with bioinformatics tools and develop basic skills in the collection and presentation of bioinformatics data, as well as the rudiments of programming in a scripting language.
BIOL496	**Advanced Animal Physiology**	Physiological regulation in vertebrates through the study of circulatory, endocrine and reproductive systems. Circulatory system: circulatory systems and heart types, Origin and conduction of heart beats, Regulation of heart beats, Blood components and its functions, Blood flow and blood pressure, Blood clotting, Blood groups, Blood and Hemostasis, Heart sounds, Hormonal and neural control of circulatory system, The lymphatic system. Endocrine system: Types of hormones, the hypothalamus and pituitary gland, The pineal gland, The thyroid gland, The parathyroid glands, The adrenal gland, The pancreas, The hormones of digestion, The hormones of the kidney. Reproductive system: Reproduction Strategies in animals, Sexual organs, Sexual cycles. Animal Physiology, 3rd Ed. 2012, by Hill RW, Wyse GA and Anderson M.

Program key performance indicators (KPI's)

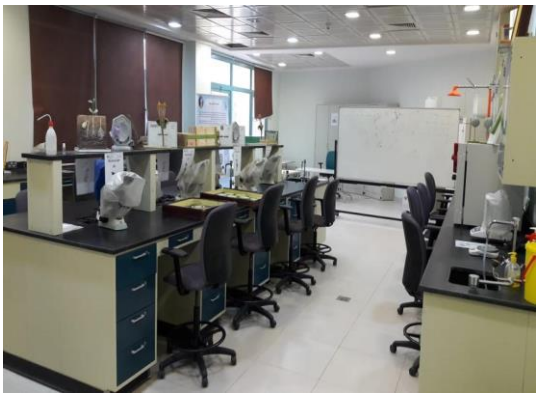
1. Percentage of achieved indicators of the program operational plan objectives.
   Proportion of courses in which student evaluations were conducted during the year.
2. The awareness and support of and administrators of the mission of the program/institution.
3. Students' Evaluation of quality of learning experience in the program.
4. Students' evaluation of the quality of the courses.
5. Completion rate.
6. First-year students' retention rate.
7. Students' performance in the professional and/or national examinations.
8. Graduates' employability and enrolment in postgraduate programs.

9. Average number of students in the class.
10. Employers' evaluation of the program graduates proficiency.
11. Percentage of achievement of program learning outcomes.
12. Students' satisfaction with the offered services.
13. Ratio of students to teaching staff.
14. Percentage of teaching staff distribution.
15. Proportion of teaching staff leaving the program.
16. Percentage of publications of faculty members.
17. Rate of published research per faculty member.
18. Citations rate in refereed journals per faculty member.
19. Relevance of the qualifications and experience of faculty members to the courses they teach.
20. The percentage of full time teaching staff members and others of administrative staff that participate in community service activities.
21. Satisfaction of beneficiaries with the learning resources.

Facilities

Biological sciences offer understanding of the biological process in the living organisms on molecular, cellular, tissues, systems and organismal level. Many processes are followed by faculty and teaching staff for planning and acquisition of several resources including laboratories, classrooms, library …etc.,



Characteristics of the Program Graduate

Biology Graduate will be

1- Having the ability to use skills for a variety of careers requiring knowledge of biological processes, such as teaching, research in governmental, industrial and academic laboratories.
2- Having the ability to understand ethical issues and the impact on society of advances in different biological disciplines.
3- Having the ability to develop basic strategies to update, maintain and enhance the acquired knowledge of biology.
4- Having the ability to carry out innovative approaches in the field of biology.
5- Having the ability to carry out state of the art research in various disciplines of biology.

جامعة حائل
University of Ha'il

Graduates employment opportunities

1. Research and Scientific Institutions.
2. Biology teachers.
3. Industry (in Research and Development).
4. Environmental observatory.
5. Wild life conservation.
6. Hospitals and Health centers. (clinical laboratory).
7. Water quality.
8. Forensic and control of food products.
9. Organization for Standardization and quality laboratories.
10. Pharmaceutical factories.
11. Document preservation and repair.
12. Livestock production.
13. Biological control of pests.
14. Forests managements.
15. Environmental quality managements.
16. Biotechnology production.

Program Coordinator **Head of the Department**