Biology Program
Curriculum Overview and Study Plan

January 2024

College of Science
Jazan University

Contents

1. About the program

The Biology program offers interested students a liberal education in biological sciences. It provides graduates with a broad background necessary in today's job market and prepares them for graduate and professional schools.

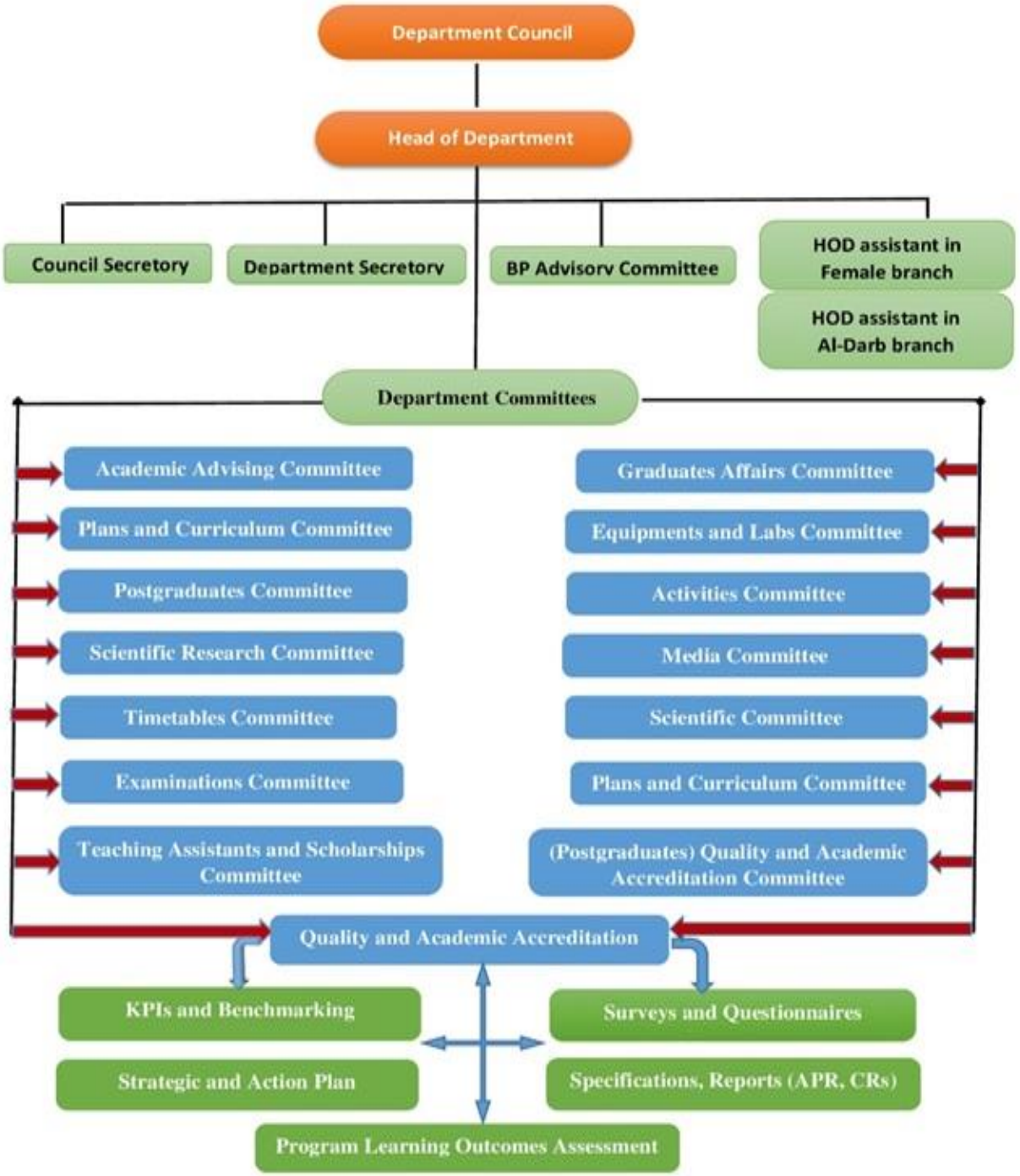
Students with a degree in biology are securing positions in the growing fields in industry, environment, medicine and academia. The recent advances in biology have created important new industries in genetic engineering, biomedicine, biotechnology, and pharmacology. Students with ambitions beyond the bachelor level enroll in graduate schools and professional schools worldwide like medicine, dentistry and veterinary medicine.

The Biology department offers Bachelor degree of Science in Biology. The program provides many opportunities for careers in teaching, health, agricultural, industrial and environmental research centers. This program, also, enable students to continue their higher studies and research in different fields of life sciences. In tailoring the curriculum, the department was guided by the academic accreditation requirements, the standards of the National Commission for Academic Accreditation and Assessment (NCAAA) and according to the national qualifications framework for higher education in the Kingdom of Saudi Arabia. With the possibility of continuous improvement of curricula and study plans so as to respond to the expected changes that may occur in the world.

1.1. Establishment

College of Science was established in 1426H (2005) with the two departments, Mathematics and Physics. The other two departments Biology and Chemistry were then opened during the academic year 1429/1430H (2008) The duration of study is four years and lead to the degree of Bachelor of Science in mathematics, chemistry, physics, and biology. It also offers master's degree in biology.

The Biology department which awards bachelor's and master's degrees Includes boards, councils, units, committees, etc. according to the following organizational structure.



1.2. Biology Department Vision

Excellence, leadership, and innovation in education, scientific research and community service in biological sciences locally and regionally.

1.3. Biology Department Mission

Providing distinguished academic programs to qualify students, and innovative scientific research to contribute in the requirements of development and community service.

1.4.1. Biology Program Goals

1) Create an environment of quality education in biological sciences.
2) Offer students the opportunity to gain knowledge and skills needed to engage into various Biology professions in industry, scientific inquiry, and foster life-long learning.
3) Build a culture for research and strengthen relationship with the community.

1.4.2. Biology Department Objectives

- Providing a high quality program in biological sciences based on high quality educational strategies and develops it to become one of the main sources of biological science education in the Kingdom.
- Provide students with sufficient basic academic, technical and vocational skills through which they can practice biology to meet the requirements of the labor market.
- Provide graduates with modern theories, and develop new skills and techniques in biology and enhance their personal skills that enable them to enter the job market according to current and future needs in the Kingdom.
- Refining the personal skills of the department's students to improve their scientific and cognitive level.
- Graduating qualified students in the field of biology according to the national values and standards.
- Responds to the educational needs required by the community, and contributing to the community service activities through consultation and professional services in the field of biological sciences and environmental risk assessment.
- To conduct research in the field of biology that have a broad economic and social benefits that contributes directly to the Department's role in providing research experience to our

students, encourages the intellectual development of faculty and meets the development requirements.

1.5. Program Values

Citizenship and Loyalty

Cherishing national identity and sensing social responsibility and a sense of commitment and initiative towards the goals and objectives of the department.

Excellence

We continually strive to be among the best in all we do in teaching, research, creative expression, service to our communities and service to each other in our daily interactions.

Diversity

We seek to treat all individuals with dignity and fairness and to promote understanding and respect for a diversity of perspectives, traditions and experiences.

Social Responsibility

We are committed to exploring the challenges that confront our region and country, by using our intellectual and creative capabilities to address these challenges, serve our communities, and have a positive and sustainable impact on development, business, the environment and society.

Capacity building

Investing in Human Capital.

Integrity

We believe that individuals are accountable for their actions, and as members of a community, our individual actions have an impact on others. We are stronger as a community when we reflect on the consequences of our decisions and actions, and we uphold the principles of academic integrity, including fairness, accountability and honesty.

Teamwork

Devoting the principle of cooperation and work in the spirit of one team.

Lifelong Learning

We believe that the pursuit of knowledge, understanding and personal and professional development should continue throughout one's lifetime.

1.6. Final degree of the Biology Program

The Statue of the Council of Higher Education and Universities (Saudi Universities Act) governs the education in Jazan University. The Biology Degree Program at the College of Science, Jazan University was established in 2011 based on the approval from the Ministry of Higher Education on 1437H (2016AD). The awarded degree is Bachelor of Science (B.Sc.) in Biology / College of Science / Jazan University. We also award a master degree (M.Sc.) of Biology three specialization (Zoology, Botany and Microbiology)

2. Program General Information

2.1. Branches and Locations

Biology department of Science College are located in three locations;

- Main campus for male section
  Location: https://goo.gl/maps/cxXMXpQ6GtHdxiTJ9
- Main campus for female section (Mahlia)
  Location: https://goo.gl/maps/sYRNk5MXiBkGn7HN6
- University College at Al Darb
  Location: https://goo.gl/maps/U7zdBUcPE6JQBG6J6

2.2. Teaching Facilities

2.2.1. Classes

Each classroom at the Department is equipped with smart board, projector, including ordinary white board in case the smart board is malfunctions. All of the staff offices contain

an office chair, two guest chairs, office table, computer table, a small coffee table, and a set of cabinet to ensure required comfort.

A full-time study is conducted over five days/week (Sunday-Thursday). Courses conduct for two or three semesters per year, including the summer semester. The summer courses are offered only for special cases. The mandatory attendance for students is 75% at least, for each course in the program. Variable teaching methodologies are applicable as using traditional classes, smart classes as well as e-learning which help in self-study and also distance education.

The duration of each lecture is 50 minutes and scheduled two to three lectures per week. An instructor is responsible to conduct the classes and all teaching activities in a group of 10-40 students. All the outlines and details belong to the courses in programs are displayed in Section 6 Study plan and Course Description.

2.2.2. Laboratories

The Biology Department has well equipped laboratories to meet the academic and research requirements of students and staff. The labs equipped with modern computers and required software that is important in teaching many of the subjects. The laboratories are allocated according to specialization Zoology, Botany and Microbiology labs. Performing laboratory activities or similar (practices with assignment, research, workshops, etc.) by the student, under the direct supervision of the teaching staff. Biology Department provides labs with all necessary equipment, tools, safety aids for undergraduate study.

Table 1. Biology Department Laboratories

Botany lab. (1) (G 601) Science College Capacity: 30 Student	
Instruments and equipment's	Spectrophotometer, Growth chamber, Oven, pH-meter, Muffle, Water bath, Heater, Microscopes, Balance, Magnetic stirrer.
Practical courses	General Biology, Plant water relationship, Plant physiology, Plant Hormones, Economic Botany, Biodiversity.
Botany lab. (1) (G 611) Science College Capacity: 30 Student	
Instruments and equipment's	Spectrophotometer, Growth chamber, Oven, pH-meter, Water bath, Heater, Microscopes, Balance, Magnetic stirrer.

Practical courses	General biology, Plant taxonomy, plant hormones, Plant morphology and anatomy, Economic botany, Biodiversity.
Microbiology lab. (1) (G 608) Science College Capacity: 20 Student	
Instruments and equipment's	Colony counters, Oven, pH-meter, shaker Water bath, Heater, Microscopes, Balance, Magnetic stirrer, Autoclave, Centrifuge
Practical courses	Molecular biology, General biology, Microbial physiology, Micro-techniques, Medical biology, Virology, bacteriology
Microbiology lab. (2) (G 604) Science College Capacity: 25 Student	
Instruments and equipment's	Colony counters, Oven, pH-meter, Shaker Water bath, Water bath, Heater, Microscopes with camera, Microscopes, Balance, Magnetic stirrer, Autoclave, Spectrophotometer, Distillatory, Incubator
Practical courses	General biology, Medical biology, Mycology, Plant pathology, Fundamentals of ecology, Medical biology
Biotechnology Lab. Science College Capacity: 20 Student	
Instruments and equipment's	Colony counters, Oven, pH-meter, Shaker Water bath, Water bath, Heater, Microscopes with camera, Microscopes, Balance, Magnetic stirrer, Autoclave, Incubator
Practical courses	Molecular biology, Industrial microbiology, Medical microbiology, Micro-technique
Zoology Lab 1. (G 705) Science College Capacity: 25 Student	
Instruments and equipment's	Microtome, Oven, pH-meter, Spectrophotometer, Water bath, Heater, Microscopes, Balances
Practical courses	Animal physiology, invertebrates, Parasitology, Economic and medical entomology, Miro-technique
Zoology Lab 2. (G 707) Science College Capacity: 25 Student	
Instruments and equipment's	Oven, pH-meter, Spectrophotometer, Water bath, Heater, Microscopes, Balances

Practical courses	Animal physiology, invertebrates, Parasitology, Economic and medical entomology.
Genetics Lab. (G 706) Science College Capacity: 20 Student	
Instruments and equipment's	Slides staining device, Deep freezer, oven, Water bath, Heater, Microscopes, Balances
Practical courses	Animal physiology, invertebrates, cytology, Genetics.
Herbarium (G 708) Science College Capacity: 10 Student	
Instruments and equipment's	Oven, Water bath, Heater, Microscope
Practical courses	Plant taxonomy, Biodiversity
PY Lab 1. (G 708) Faculty of Arts Capacity: 30 Student	
Instruments and equipment's	Microscope
Practical courses	General biology, Medical biology
PY Lab 2. (G 707) Faculty of Arts Capacity: 30 Student	
Instruments and equipment's	Microscope
Practical courses	General biology, Medical biology

2.2.3. Herbarium

Jazan University Herbarium was established at Biology Department in 1435H. It was awarded His Royal Highness Prince Mohammad Bin Nasser Excellence and Innovation Award for Environmental Protection in 1437H. The Herbarium also achieved international recognition of International Herbarium Union (USA) and gained Herbarium Code of (JAZUH) in 1438H. The Herbarium is the only one of its kind in the Southern Region and one of five internationally recognized herbaria in the Kingdom. It contains accessions of more than 5000 specimens representing flora of Jazan Region and the Kingdom. It also possesses the most comprehensive collection of succulent plant species in Saudi Arabia.

Research carried out by herbarium team resulted in several scholarly articles describing flora of Jazan and Wadi Lagab. Research endeavors also resulted in discovery new plant species as additions to Saudi Flora and as species new to science.
<http://sweetgum.nybg.org/science/ih/herbarium-details/?irn=244821>

Figure 1. *Excellence and Innovation Award from His Royal Highness Prince Mohammad Bin Nasser (Prince of Jazan region) for environmental protection in 1437H (2016).*

2.2.4. Library

The Library facilities provided by the Deanship of Library affairs at Jazan University can be seen in three different parts. First is the library facility available in the College of sciences, second is the main central library of the university and third is Saudi digital library. We will give small details for all of them.

The *library of College* of science is inside the College of science building and therefore provides the easiest access for the teaching staff and students to the available books and related materials. There are two different College of Science libraries, one in male and the other in female campus. The library at College of science contains mostly targeted set of books which covers the list of recommended books offered in various discipline of sciences including Biology.

The Central Library at Jazan University was established in year 2006 to support for science and culture, and to provide required academic services to the students and staffs of Jazan University. The new central library is located after moving to its new building on the north side of the university administration headquarters and it consists of three floors consisting of its estimated area about 1218 square meters, distributed over the sections of the library and the headquarters of the library affairs. The central library is divided in five different administrative sections. Namely, the department of Arabic books, the department of foreign books, the university theses department, the periodicals department and the manuscripts center.

The Saudi digital Library (SDL) is an integrated digital library source managed by the Ministry of Higher Education of Saudi Arabia. The SDL is the largest academic cluster of updated information sources in the Arab world, with more than (310,000) scientific sources that covers all academic areas or disciplines. The SDL has contracts with more than 300 best global publishers. The library won the award for the Arab Federation for Libraries and Information (know) for outstanding projects in the Arab world in 2010. The library provides one set of information to all the universities and research organizations in the Kingdom of Saudi Arabia through digital environment to ensure standard facilities. Any further relevant detail can be found on SDL official website. In Jazan University, any staff member or student can access SDL by using their secure ID and password on the dedicated website link (https://sdl.jazanu.edu.sa).

2.3. Teaching Strategies

Teaching and learning strategies to achieve program learning outcomes

Biology program learning outcomes (PLOs) are designed according to the National Qualification Framework (NQF) provides three learning domains; Knowledge and Understanding, Skills and Values (SAQF-2020).

To achieve the program learning outcomes of BP in our department we follow the following table 2.

Table (2): Teaching strategies and assessment methods for BP PLOs

Program learning outcomes*		Teaching strategies	Assessment Methods
1. Knowledge and Understanding			
K1	Display a broad knowledge and understanding of the principal, theories and concepts of Biology, in addition to the basic principles of chemistry, physics, and mathematics that form the foundation on which all of biology rests.	Interactive lectures. Classroom discussions Tutorials. Individual assignments. Group discussion. Lab-work. Self-learning activities. E-Videos.	MCQs. Short answer questions. Written exam. True/False. Quizzes. (Theory and Practical) Midterm (Theory and Practical) Final (Theory and Practical)
K2	Demonstrate significant knowledge and understanding of the processes, techniques, mechanisms, functions, practices, conventions and terminology of Biology.	Interactive lectures. Classroom discussions Tutorials. Individual assignments. Group discussion. Lab-work. Self-learning activities. E-Videos.	MCQs. Short answer questions. Written exam. True/False. Quizzes. (Theory and Practical). Midterm (Theory and Practical). Final (Theory and Practical).
K3	Express in-depth knowledge and understanding of research methodology and inquiry techniques in the field of Biology	Interactive lectures. Classroom discussions Tutorials. Individual assignments. Group discussion. Lab-work. Self-learning activities. E-Videos.	MCQs. Short answer questions. Written exam. True/False. Quizzes. (Theory and Practical). Midterm (Theory and Practical). Final (Theory and Practical).
2.Skills			
S1	Apply broad integrated underlying theories, principles, and concepts in various contexts in Biology.	Interactive lectures. Classroom discussions Tutorials. Individual assignments. Group discussion. Lab-work. Self-learning activities. E-Videos. Field trips.	MCQs. Short answer questions. Written exam. True/False. Quizzes. (Theory and Practical). Midterm (Theory and Practical). Final (Theory and Practical).
S2	Practice methods of inquiry, investigation and research for complex issues and problems in Biology	Interactive lectures. Classroom discussions Tutorials. Individual assignments. Group discussion. Lab-work. Self-learning activities. E-Videos. Field trips.	MCQs. Short answer questions. Written exam. True/False. Quizzes. (Theory and Practical). Midterm (Theory and Practical). Final (Theory and Practical). Research project.

			Individual and group project report.
S3	Carry out various complex practical tasks and procedures related to Biology.	Interactive lectures. Classroom discussions Tutorials. Individual assignments. Group discussion. Lab-work. Self-learning activities. E-Videos. Field trips.	MCQs. Short answer questions. Written exam. True/False. Quizzes. (Theory and Practical). Midterm (Theory and Practical). Final (Theory and Practical). Research project. Individual and group project report. Assignments (Theory and Practical) Oral exam
S4	Communicate in main forms and use of specialized digital technology and ICT tools to demonstrate an understanding of theoretical knowledge and transfer specialized knowledge, skills and complex ideas to a variety of audiences.	Interactive lectures. Classroom discussions Tutorials. Individual assignments. Group discussion. Lab-work. Self-learning activities. E-Videos. Field trips.	Research project. Individual and group project report. Assignments (Theory and Practical) Oral exam
3.Values, Autonomy and Responsibility			
V1	Show confidence and potential for leadership, long life learning and entrepreneurship.	Individual assignments. Group discussion. Lab-work. Self-learning activities. E-Videos. Field trips. Micro-Project Presentation (individual and teamwork)	Group Assignment. Observation. Group Discussion. Oral exam. Laboratory work.
V2	Consider risk assessment, and lab safety as a personal responsibility toward individuals and society.	Individual assignments. Group discussion. Lab-work. Self-learning activities. E-Videos. Field trips. Micro-Project Presentation (individual and teamwork)	Group Assignment. Observation. Group Discussion. Oral exam. Laboratory exams.
V3	Work collaboratively and constructively, and lead diverse teams to perform a wide range of tasks with responsibility, and play a major role in joint work planning and evaluation	Individual assignments. Group discussion. Lab-work. Self-learning activities. E-Videos. Field trips. Micro-Project	Group Assignment. Observation. Group Discussion. Oral exam. Laboratory work.

		Presentation (individual and teamwork)	

Biology program learning outcomes (PLOs) are designed according to the National Qualification Framework (NQF) provides three learning domains; Knowledge and Understanding, Skills and Values (SAQF-2020).

The program learning outcomes were established by a process that involved extension discussions with faculty members, students, Alumni, advisory committee and the quality assurance and accreditation committee. The program learning outcomes support program educational objectives. The overall learning outcome is measured by the continual student's assessment, quizzes, tutorial participation, and presentations delivery, active participation during classes, small group discussions midterm exams and final exams. Although all courses have goals and objectives included in course descriptions, the achievement of these goals is assessed through a vigorous evaluation process. This evolution process is done through surveys and normally carried out at the end of each semester.

2.4. Other Facilities

2.4.1. Information Technology

The Deanship of e-learning and distance education in the Jazan University is responsible to provide integrated administrative and educational e-services for all stakeholders at the university. These customized services are provided for the teaching Staff, Students and employees of the university through the University website and mobile applications that can be accessed with a dedicated ID and password.

Following is a brief summary of some important e-services provided by Jazan University:

- E-learning: Each teaching staff and each student has access to the world-renowned distance learning management system “Blackboard Learn”, where teaching staff can manage complete online teaching process irrespective of on-campus or distance learning courses. The learning management system is kept integrated and updated with respect to students, teachers, and courses in the respective program. It is worth mentioning that the pre-existence of this service was the reason for the smooth distance learning transition for all courses during the COVID-19 crises.

- Email: The Jazan University provides an email system for all stake-holders that is powered by Microsoft with the domain "username@jazanu.edu.sa".
- The Edugate Portal: A secured and advanced integrated online environment to manage attendance, marks, surveys, class and faculty schedules, and several other necessary services required for educational processes.
- Employee Affairs services: These services provide detailed information of employee, his/ her job status, salaries, and other financial affairs. It is also a gateway to provide administrative letters and financial statements to all employees.

The other key services are free access to Microsoft office 365, Saudi digital library, all application forms, and a strong application management system.

2.4.2. Students Campus Facilities

The Department ensures all necessary and sufficient Equipment for all stakeholders in the department. In male and female campus, each classroom at the department is equipped with smart board, projector, including ordinary white board in case the smart board is malfunctions. All of the staff offices contain an office chair, two guest chairs, office table, computer table, a small coffee table, and a set of cabinet to ensure required comfort. There is a general cafeteria area for the faculty and students to spend some refreshing time with each other and discuss problems. Also, two designated praying areas are assigned for teachers and students. Each faculty member is provided with a personal laptop and/ or office desktops, a printing facility and a photocopy machine for academic purposes. The Department has also provided 4 computer labs facility for students and teachers; it contains all necessary software for scientific learning and research.

2.5. Student Advising Policy

The Biology Department has Academic Advising Committee which belongs to the academic advising unit in CoS aims to:

- Provide consultations and information for students.
- Clarify the requirements, policies and procedures of the biology courses being offered.

- Approve students' programs of study and assist them in identifying appropriate resources.
- Facilitate relationships between the student and advisor; also, be able to provide relevant assistance.
- Advise on and help in realizing educational and career options.
- Support the standards of the University.

The Student Counseling and Support Committee have given several advising to the new and previous students such as:

- Orientation for new student's first & second Semester guidelines & instructions for the new students about biology program.
- Keep advising for previous students.
- Encourage the student to visit the central library, environmental center and Herbarium.
- Participating in Jazan university sport competition eg. Soccer training, soccer tournament. The consultation also gives to graduation students to search for job and improve their skills.
- Participating in Saudi Universities Sports Federation – activities and competition
- Students open meeting with the Head of BD.
- The importance of volunteering seminar especially on environmental day and cleaning beaches in Jazan.
- Future skills workshop, the workshop introduces the important skills for the future and the importance of gaining these skills
- Gathering for graduating students in alumni network

The cooperation between the Deanship of Admission & Registration, Deanship of Student Affairs and Faculty of CoS to provide a good service such as:

- Issuing student IDs
- Accommodation
- Student's fund
- Restaurant
- Sport halls
- Grants

Guidance and orientation programs for new students

Student orientation programs

Student orientation programs for new students are Introduction to the university life to become familiar with the new environment, starting in the college can cause much anxiety in the new college student. New student orientation programs are designed to guide students prior to the beginning of classes; students are given an overview of the complete realm of university life, from academics to social activities, through a period of days referred to as orientation. The academic advising team in the BD and CoS mange the orientation programs within the college.

The orientation program is designed to help students get acquainted with the following

- Vision, mission and objectives of the department, college and university.
- University and college regulations and code of conduct.
- Tips on leading a successful college life in line with their potential career goals.
- Department and college facilities and places.
- Plan of the study review course.
- Methods of evaluation.
- Wellness, self-care.
- Faculty expectations.
- Certification and licensure information.

College Orientation: Dean Meeting with newcomers.

Department Orientation: Head of Department Meeting with newcomers and staff.

Student Counseling Orientation: Student Counseling Committee Coordinator Meeting students

Student Counseling Services: (Academic, career, psychological and social)

Academic counseling

The academic advising unit offers courses designed to develop skills to help students succeed in college and make effective career and life choices. Special topics courses related to various areas of an academic career and personal development are also offered. Each student in the biology program has an academic advisor whose job is to provide students with Consultation and academic support mainly during registration time but also any time

during the semester. Students may consult their advisor, as well as the Department Chair and the Dean of the College, for any issues or concerns concerning their academic life. Given the number of biology students, the students are divided among the college for advising. The process is as follow:

- Student Academic Counseling Committee is in charge of student counseling.
- Each Faculty is assigned a group of students for counseling.
- Faculty will be available for student counseling at specific office hours on daily basis.
- Faculty should make a file for each student in his counseling group where student contact information, a copy of student timetable, a copy of student academic record is kept and updated every semester.

Career counseling

The alumni unit and academic advising provide opportunities for career exploration and evaluation of interests, aptitudes, skills and other characteristics related to vocational and pre-professional planning and job success.

This includes:

- Career Assessments and Interpretations.
- Career Workshops such as writing CV., interviewing assistance, researching occupations, labor market information, and career planning.
- College of science is going to plan to invite the stakeholders from the different authorities and ministries in program advisory committee as speakers in Alumni celebration and workshops.

Social counseling

Social programs in Jazan University focus on preparing students for a leadership role which can help in the developmental process and community services and problem solving of most ecological and biological difficulties.

Psychological counseling

There is no psychologist in college of science, but cases requiring psychological guidance are referred to the Academic Guidance Unit of the Deanship of Student Affairs at Jazan University.

Support for special need students

(Low achievers, disabled, gifted and talented)

Talented students

Talented students are those whose skills are distinctly above average in one or more areas of human performance. He is who performs at or shows the potential for performing at a remarkably high level of accomplishment when compared to others of the same age, experience, or environment. Gifted' learners are those with abilities in one or more academic subjects. Talented' learners are those who have practical skills in areas such as creative and performing in nursing Skills and attributes such as leadership, decision-making and organization may also be taken into account.

Instructional strategies and activities used with gifted students

1. *Design lessons with Bloom's Taxonomy*

   For gifted students, construct activities from the two upper levels: creating and evaluating. For example, activities could include conducting an experiment or writing an editorial about a current events topic.

2 *Assign independent projects*

   When gifted students finish class assignments early, allow them to work on special projects. Assign topics that are of special interest to our students and have them explore the topic in depth.

3. *Ask intellectually stimulating questions*

   When constructing our lesson plan, we write questions that are open-ended and require more thoughtful responses.

4. *Find mentors*

   Gifted students need guides just like other students. We Find an adult who can help our student explore a subject of interest more deeply. This mentor can serve as an advisor, counselor and role model to the student.

5. *Organize cluster groups*

   Research shows gifted students of the same grade benefit from being grouped together. As a way to combine resources, teachers can shift gifted students from different classrooms into one group to learn about a specific topic in more depth. This method works best with teachers who are specially trained to work with gifted students and have minimal distractions from other students in the class.

Low achievers

Slow learner is one whose performance is very dismal in the examination. They are on the lower rungs of intelligence scale. Slow learners – are low-achievers.

On the other hand, the only problem with them is that they learn concepts and achieve developmental milestones at a pace slower than their peers.

To help slow learners, the teacher will able to:

1. Combine a variety of tasks to the learning even if it is not assigned such as painting a picture.
2. Ask questions of the student while they are working about the assignment
3. Applying "Three Transfer" forms of learning in which the student must take information and do three things with it besides reading. For example, read it, explain it to someone else, draw a picture of it, and take notes on it.
4. Reward complete task.

Disabled students

Admission is not accepted for Disabled Students in the Biology program but in emergency situations; the college of science has wheelchairs or mobility devices as well as special corridors for these wheelchairs.

2.6 Attendance and Exam Policies

- A regular student is required to attend lectures and laboratory sessions. If her/his attendance is less than the limit determined by the University Council (75 percent of the lectures and laboratory sessions assigned for each course), the student will be barred from continuing the course and will be denied entrance to the respective final examination, and is considered to have failed that course and is given the grade (DN) in the course.
- The College Council or whatever bodies it delegates its authority to, may exempt a denied student from the provisions of attendance and allow him/her to take the examination, provided that the student presents an acceptable excuse to the council. The University Council determines the percentage of attendance, which must not be less than 50 percent of the lectures and laboratory sessions specified for the course.

- Students, who are absent from the final exam, will be given a zero grade for that examination. Her/his grade in the course will be calculated on the basis of the class work score he/she obtained over the semester.
- If a student fails to attend a final examination in any course but offers a compelling excuse, the College Council may choose to accept her/his excuse and allow him/her to take a make-up examination. The make-up examination must be taken prior to the end of the following semester. In such cases, the course grade will be given to the student after the make-up examination.
- A student may withdraw from continuing study for a semester, without being considered failed, if he/she presents an acceptable excuse to the authorized body specified by the University Council within a time period specified by the University Council executive regulations. The student is given a (W) grade and his semester will be included in the period required for completion of the graduation requirements.
- It is permissible to withdraw from one or more courses in a semester according to the executive regulations approved by the University Council.

❖ **Postponement and Interruption of Studies**

- A student may submit a request to postpone the study for reason(s) acceptable to a university body determined by the University Council. The postponement duration cannot be more than two consecutive regular semesters or three non- consecutive regular semesters as maximum during her/his study at the University; otherwise, s/he will be dismissed from the University. The University Council may make exceptions when it deems necessary. The postponed period is not included in the period required for completion of the graduation program.
- If a regular student interrupts her/his studies for a semester without submitting a postponement application, s/he will be dismissed from the University. The University Council also may dismiss a student if s/he interrupts her/his studies for a period less than one semester. An affiliated student is dismissed if s/he does not to attend all the final examinations of this semester without acceptable excuse.
- A student is not considered to have interrupted her/his studies during those semesters when s/he is a visiting student at another university.

❖ Re-Enrollment

- A student whose enrollment is cancelled may apply for re-enrollment using the same university ID number and academic record s/ he had before cancellation of her/his enrollment, according to the following regulations:

a) S/he must apply for re-enrollment within four regular semesters from the date of dismissal.

b) The concerned College Council and related bodies must approve the reenrollment.

c) If four or more semesters have lapsed since her/his dismissal, the student can apply to the University for admission as a new student without consideration of her/his old academic record if s/he fulfills all the admission requirements announced at the time of application. The University Council may make exceptions according to regulations set by the Council

d) A student cannot be re-enrolled more than once; unless the University Council exempts when it deems necessary.

e) A student cannot be re-enrolled if s/he has been academically dismissed before.

- A student who has been dismissed from the University for academic or disciplinary reasons, or who has been dismissed from another university for similar reasons, will not be granted readmission. If it becomes evident after admission that s/he was dismissed for such reasons, her/his readmission is considered canceled from the date of readmission.

❖ Examinations and Grades

- Based on the recommendation of the department council shall decide the class work scores, which must not be less than 30 percent of the final course

  The class work score is evaluated in one of the following ways:

  a. Oral and practical examinations, research papers, other class activities, some or all, in addition to at least one written examination.

  b. At least two written examinations grade.

- Council that offers the course may allow a student to complete the requirements of any course in the following semester. In such a case, an IC grade is recorded in the student's academic record. The student's grade in the course will not be included in the calculation of the semester or cumulative GPA until he/she completes the course requirements and earns a grade. If the IC grade is not changed in the academic record after the lapse of one semester because the student does not complete the course, the IC status will be

automatically changed to an F grade and will be included in the calculation of the semester and cumulative GPAs.

- If courses of a research nature require more than one semester to complete, the grade of IP is assigned to the student. After the completion of the course, the student will be given the grade s/he has earned. If s/he fails to complete the course within the specified time, the department council that offers the course may approve assigning an IC grade to the student's record for this course.

Table (3): The grades earned by students in each course are calculated as follows:

Percentage Grade	Significance Grade	Code	GPA (out of 5.0)	GPA (out of 4.0)
95 – 100	Exceptional	A+	5.00	4.00
90 – 94	Excellent	A	4.75	3.75
85 – 89	Superior	B+	4.50	3.50
80 – 84	Very Good	B	4.00	3.00
75 – 79	Above Average	C+	3.50	2.50
70 – 74	Good	C	3.00	2.00
65 – 69	High Pass	D+	2.50	1.50
60 – 64	Pass	D	2.00	1.00
Less than 60	Fail	F	1.00	0

- The exams in the undergraduate program in the biology department are based on learning outcomes planned on the syllabus and also on midterm exam, quizzes, home works, and assignments, along with practical and final exam at the end of the semester. Mentioned methods are utilized to ascertain that the desired program outcomes are fully achieved. The grades achieved by students are direct reflection of the course outcomes. Each course of biology department carries a total of 100 points. Final Grade Breakdown of the course shown below

Table (4): Final grade breakdown of the course

Assessment task	Proportion of total assessment
1- Assignments & Quizzes	10%
2- Mid-Term Exam	10%
3- Practical Assignments & Quizzes	10%
4- Practical Final Exam	20%

5- Theory Final Exam	50%
Total	100%

- Academic load refers to the total credit hours for the courses the student registers for in the semester. It is determined in accordance to the following regulations:

1. The minimum academic load is 12 credit hours for a semester, and the maximum academic load is 20 credit hours per semester and 10 credit hours for the summer semester at the following link <https://edugate.jazanu.edu.sa/jazan/ui/guest/application_online/index/typeApplicationOnlineIndex.faces>
2. The student who has an academic probation shall not be allowed to increase his academic load to more than 14 credit hours.
3. The student who has a Pass Grade shall not be allowed to increase his academic load to more than16 credit hours.

   The student on the threshold of graduation is allowed to exceed the maximum, the increase being not more than three credit hours.

Academic Probation

According to the regulations of Jazan University all students are required to maintain a grade point average (GPA) of at least 2.0 out of 5.0.

1. A student failing to maintain the GPA of 2.0 will be placed on “academic probation” and is given two semesters to improve his GPA. After this period the student may be removed from the program and it’s the student’s responsibility to be aware of his academic status, including the status of probation. The ACC Chair will contact the student regarding the probationary status and requirements for the student to be removed from probation.
2. A student will normally have one probationary semester to raise his term or cumulative grade point averages to 2.0 or above, or to remediate a failed course.
3. If the student’s semester or cumulative GPAs are between 2.0-2.74 at the end of the probationary semester, or if a course is not remediated by the end of the next term, the ACC will decide whether to place the student on probation for a second semester or to dismiss the student from the program see (Appendix Bio 3.2).

Student Assessment

Biology department under College of Science, Jazan University evaluates all student activities in programs and courses. A clear picture of what students have learned; avoid this wide variety of techniques potential weaknesses and give the opportunity for further improvement. The program has two types from the evaluation of students.

Direct assessment (direct & indirect)

Direct assessments are most effective embedded in a course, assignments or exams that are part of the course and counts towards the grade. Course evaluation is based on many tasks given to them e.g. Home works/assignments, quizzes, mid exams, their participation during lecture time and random question answers with them etc. Exam involves different CLOs of the questions. Like Knowledge, Skills and competencies. Evaluation method is described in each course description. Homework/ assignments, midterm exams, final exam and quizzes all are arranged according to the curriculum (Appendix Bio 3.3).

Indirect assessment

Indirect Assessment is the evidence that students are "probably" Learning. They are also useful in assessment, especially when used to complement or extend direct assessments of learning. They can help explain results obtained from a direct assessment, as well as give insights on how students perceive aspects of the programs.

Organization of Exam

Deanship of admission and registration issues a detailed schedule to all heads of departments at Jazan University to commence the preparation for examinations within the academic semester right after starting of the semester.

Procedures in examination

1. Invigilators are present in the examination room, at least 20 minutes before, to ensure the proper conduct of the examination and to deal with problems which may arise.
2. Student will not have allowed entering the exam if a student arrives after thirty minutes of the start of the exam.
3. Mobile phones for students must be switched off.
4. If a student feels unwell during examination, he/she must inform to invigilator and then can go to the Student Health Service and will be accompanied by an invigilator.

5. Fire Alarm: If a fire alarm is activated, invigilators will instruct students to leave the examination room and to leave examination papers and answer on their desks. When it is safe to do so, students will be allowed back into the classroom to complete their examinations. Additional time will be allowed for the disruption. An incident report is completed. A copy of this report issues to the relevant Heads of Departments.
6. When the use of calculators/or materials are permitted, it is the responsibility of the relevant Department to check these items in the Examination room.
7. Records for absentees are written on a separate paper and cheating cases are recorded on a separate paper.

Processes of exam

The process has the following steps:

1. Formulating a statement of outcomes and objectives as derived from Program and College of Science mission.
2. Establishing the tools and methods of measurement of extent of achievement.
3. Determining the criteria for successful achievement as KPI's.
4. Observe, document and analyze the results against the predefined KPI's.
5. If the criteria are met/objectives achieved, the results are documented.
6. If the criteria are not met/objectives not achieved, results are referred to the appropriate entity (committee, department or administrator) for action plan development and implementation.
7. The action plan for improvement and action taken is provided to the assessment committee for future assessment.
8. All action taken and results are documented to stakeholders through an annual report.
9. All the data regarding a particular area (program, administration, research, community engagement etc.) are gathered and reported to the appropriate.

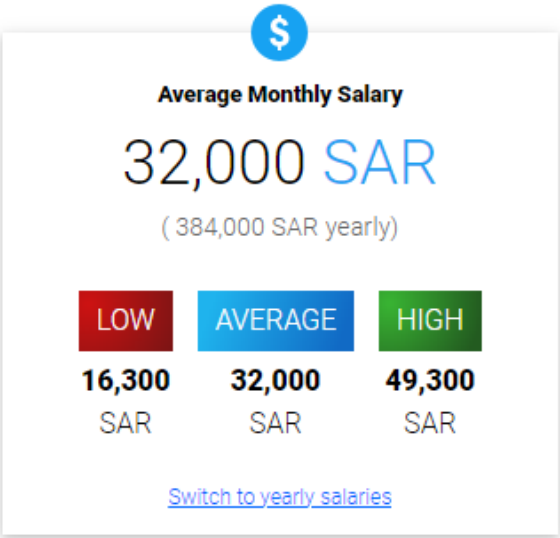
3. Employment Outlook

How much money does a Biologist make in Saudi Arabia?

A person working as a **Biologist** in **Saudi Arabia** typically earns around **32,000 SAR** per month. Salaries range from **16,300 SAR** (lowest) to **49,300 SAR** (highest).

This is the average monthly salary including housing, transport, and other benefits. Biologist salaries vary drastically based on experience, skills, gender, or location. Below you will find a detailed breakdown based on many different criteria.

http://www.salaryexplorer.com/salarysurvey.php?loc=191&loctype=1&job=677&jobtype=3



Career Opportunities for Biologists in Saudi Arabia

- Education Sector (Ministry of Education: Teacher, Technician, and Instructor).
- Health Sector (Laboratory Technician).
- Microbiologists.
- Pharmaceutical sales representative.
- Genetic counselor.
- Biochemist.
- Environment, Water and Agriculture Sector (Laboratory Technician, Researcher).
- Industrial Sector (Food & Dairy Laboratories and Quality Control: Technician, Researcher).
- Wildlife Protection Authority (Researcher).
- Quality Laboratories (Technician).
- National Center for Disease Prevention and Control (NCDC), Technician, Researcher).
- Saudi Food and Drug Authority (SFDA), Technician, Researcher).
- Ministry of Interior (General Department of Criminal Evidence).

- The Saudi Grains Organization.
- King Abdul-Aziz City Science & Technology (KACST): Laboratories: Technician, Researcher.

Examples of some Biologists job duties

Microbiologist

Primary duties: A microbiologist's primary duties involve the study of some of the smallest lifeforms on the planet, such as bacteria and fungi. Duties will include both lab and fieldwork, collecting samples and performing research. A microbiologist may also have the responsibility of drafting studies to present findings.

Pharmaceutical sales representative

Primary duties: Duties will include promoting new pharmaceutical drugs to doctors, health care professional buildings, hospitals and other medical centers. Regular visits, phone calls, attending sales meetings and delivering sales reports will be other parts of the position's duties.

Environmental scientist

Primary duties: Environmental scientists will perform experiments and create and participate in ion studies on how to protect the environment and environmental resources. They may also perform research used for the betterment of both the health of animals and the health of humans. Other duties include grant writing and solicitation of funds for research studies.

Genetic counselor

Primary duties: Genetic counselors will work with clients and patients to make assessments about the makeup of their genetics and provide them with the statistical risk of passing genetic illnesses or disabilities to future children. They often counsel families who are expecting children or are in the process of family planning. Duties may also include counseling adults who have concerns about developing genetic disorders later in life.

Biochemist

Primary duties: A biochemist will aid in labs in biotechnology companies and biomedical research firms. Job functions can include research and testing used for studies as well as

developing new products. A biochemist may also be responsible for proposal and grant writing to secure necessary funds for development and research projects.

3.1. Program Graduates Attributes

Graduates of Biology Program with leadership qualities that support their professional career path will have a positive impact on the future of professional graduates in all biological fields in Saudi Arabia.

According the attributes & Characteristics of graduates at Jazan University, Biology department put suitable learning outcomes to fit these attributes which are;

1. Broad knowledge of Biology.
2. Innovative solutions based on environment, culture and society.
3. Firm commitment to professional practice and ethical values.
4. Lifelong learning values and pursues continuous learning.
5. Applying Professional development, such as the ability to work collectively and awareness relating to the importance of building professional relationships.
6. Displaying the confidence and the potential for leadership.
7. Being respectful, team oriented and approachable in social and professional contexts.

3.2. Program Graduates and University Graduates Attributes

Table (5) Alignment between Biology Program Graduate Attributes and Jazan University Graduate Attributes

Biology Department Graduate Attributes	Jazan University Graduate Attributes
Broad knowledge of Biology	Passion of knowledge, continuous research and practical application of knowledge
Innovative solutions based on environment, culture and society	The ability to solve problems and make decisions

Firm commitment to professional practice and ethical values.	Commitment to values, ethics and responsibility
Lifelong learning values and pursue continuous learning	Digital communication
Applying Professional development, such as the ability to work collectively and awareness relating to the importance of building professional relationships.	Effective communication and negotiation
Displaying the confidence and the potential for leadership.	Leadership and team work
Being respectful, team oriented and approachable in social and professional contexts	Professional scientific ethics

4. Learning Outcomes

4.1 Program Learning Outcomes (PLO's).

Biology program learning outcomes (PLOs) are designed according to the National Qualification Framework (NQF) provides three learning domains; Knowledge and Understanding, Skills and Values (SAQF-2020).

A learning outcome is a concise statement that explains what students should do or do after a certain amount of time has passed. Knowledge, skills, abilities, or values should be used to assess learning outcomes. The learning objectives place a greater emphasis on student performance than on traditional methodologies or courses.

Table (6). Biology Program Learning Outcomes

Knowledge and Understanding: At the end of the program the graduates will be able to:	
K1	Display a broad knowledge and understanding of the principal, theories and concepts of Biology, In addition to the basic principles of chemistry, physics, and mathematics that form the foundation on which all of biology rests.
K2	Demonstrate significant knowledge and understanding of the processes, techniques, mechanisms, functions, practices, conventions and terminology of Biology.

K3	Express in depth knowledge and understanding of research methodology an d inquiry techniques in the field of Biology
Skills: At the end of the program the graduates will be able to:	
S1	Apply broad integrated underlying theories, principles, and concepts in various contexts in Biology.
S2	Practice methods of inquiry, investigation and research for complex issues and problems in Biology
S3	Carry out various complex practical tasks and procedures related to Biology.
S4	Communicate in main forms and use of specialized digital technology and ICT tools to demonstrate an understanding of theoretical knowledge and transfer specialized knowledge, skills and complex ideas to a variety of audiences.
Values, Autonomy and Responsibility: At the end of the program the graduates will be able to:	
V1	Show confidence and potential for leadership, long life learning and entrepreneurship.
V2	Consider risk assessment, and lab safety as a personal responsibility toward individuals and society.
V3	Work collaboratively and constructively, and lead diverse teams to perform a wide range of tasks with responsibility, and play a major role in joint work planning and evaluation

4.2. Consistency of Biology Program PLO's with the JU PLOs.

Table (7).

Biology Program Learning Outcomes	Jazan University Learning Outcomes
Display a broad knowledge and understanding of the principal, theories and concepts of Biology, In addition to the basic principles of chemistry, physics, and mathematics that form the foundation on which all of biology rests.	Assessment of sufficient information to analyze and clarify theories, concepts, principles, skills, and practices in various disciplines.
Demonstrate significant knowledge and understanding of the processes, techniques, mechanisms, functions, practices, conventions and terminology of Biology.	Demonstrate the leadership qualities and skills necessary in effective communication and negotiation with others orally and in writing.
Express in depth knowledge and understanding of research methodology an d inquiry techniques in the field of Biology	Skillfully applying independent and critical thinking to solve serious problems.

Apply broad integrated underlying theories, principles, and concepts in various contexts in Biology.	Effectively applying the skills and ethics of scientific research, innovation and creativity
Practice methods of inquiry, investigation and research for complex issues and problems in Biology	Applying knowledge by mastering practical skills.
Carry out various complex practical tasks and procedures related to Biology.	Commitment to professional and ethical behaviors and demonstrating team spirit.
Communicate in main forms and use of specialized digital technology and ICT tools to demonstrate an understanding of theoretical knowledge and transfer specialized knowledge, skills and complex ideas to a variety of audiences.	Applying sustainable learning skills in all scientific and social aspects relevant to environmental, economic and social issues.
Show confidence and potential for leadership, long life learning and entrepreneurship.	Demonstrate the leadership qualities and skills necessary in effective communication and negotiation with others, orally and in writing.
Consider risk assessment, and lab safety as a personal responsibility toward individuals and society.	
Work collaboratively and constructively, and lead diverse teams to perform a wide range of tasks with responsibility, and play a major role in joint work planning and evaluation	

4.2.1. Consistency of Biology Program PLO's with NQF PLOs

Biology Program Learning Outcomes	NQF (NCAAA)
1. Knowledge and Understanding	
Display a broad knowledge and understanding of the principal, theories and concepts of Biology, In addition to the basic principles of chemistry, physics, and	Broad in depth integrated body of knowledge and understanding of the underlying theories, principles, and concepts in one or more disciplines or field of work;

mathematics that form the foundation on which all of biology rests.	
Demonstrate significant knowledge and understanding of the processes, techniques, mechanisms, functions, practices, conventions and terminology of Biology.	In depth knowledge and understanding of processes, material, techniques, practices, conventions and/or terminology;
Express in depth knowledge and understanding of research methodology an d inquiry techniques in the field of Biology	Knowledge and understanding of research methodology and inquiry techniques.
2. Skills	
2.1. Cognitive Skills	
Apply broad integrated underlying theories, principles, and concepts in various contexts in Biology.	Apply broad integrated underlying theories, principles, and concepts in various contexts, in a discipline, profession or field of work.
Practice methods of inquiry, investigation and research for complex issues and problems in Biology	Practice methods of inquiry, investigation and research for complex issues and problems.
2.2. Practical and Physical Skills	
Carry out various complex practical tasks and procedures related to Biology.	Carry out various complex practical tasks and procedures related to a discipline, professional practice, or field of work.
2.3 Communication and ICT Skills	
Communicate in main forms and use of specialized digital technology and ICT tools to demonstrate an understanding of theoretical knowledge and transfer specialized knowledge, skills and complex ideas to a variety of audiences.	Communicate in main forms to demonstrate an understanding of theoretical knowledge and transfer specialized knowledge, skills and complex ideas to a variety of audiences.
3. Values, Autonomy and Responsibility	

3.2. Autonomy and Responsibility	
Show confidence and potential for leadership, long life learning and entrepreneurship.	Develop plans for academic and / or professional self-development, and work to achieve them effectively, assess own learning and performance, and take decisions regarding self-development and /or tasks based on convincing evidence, with autonomy.
Consider risk assessment, and lab safety as a personal responsibility toward individuals and society.	Participate actively in development of the discipline and society.
Work collaboratively and constructively, and lead diverse teams to perform a wide range of tasks with responsibility, and play a major role in joint work planning and evaluation	Work collaboratively and constructively, and lead diverse teams to perform a wide range of tasks with responsibility, and play a major role in joint work planning and evaluation.

5. Program Structural

The Biology department runs undergraduate and postgraduate programs. The undergraduate students in Biology department spend four years spread over eight semesters and they earn a degree of Bachelor of Science in Biology after completing 130 credit hours of studies (=217 ECTS; "European Credit Transfer System). The study program begins with general studies which include, for example, Mathematics, Physics, Biology, Basic Computer Science, English language and Islamic culture. The BP is one of the most important programs in the faculty of science. It includes theoretical courses, research project and laboratory work. The study program includes the core courses (the requirement of the university, the requirement of the college of science and the requirement of the department and specialization).

5.1. General View

The biology program has a demanding curriculum that students must cope with challenging workloads as part of their education. In Jazan University, the undergraduate Biology program has 130 credit hours and is designed to provide high quality biological education

to produce competent Biology graduates. It corresponds to the specific learning outcomes for Biology program outlined in the NCAAA Guidelines for Program Development and Review. The program also matches and in alignment with the vision and mission of the college of science and Jazan University.

The structure of the curriculum is given in Table (8) as follows:

5.2 European Credit Transfer and Accumulation System (ECTS) Credits

ECTS is a standard for comparing the study attainment and performance of students across the European Higher Education Area (EHEA) and making studies and courses more transparent. It helps students to move between countries and to have their academic qualifications and study periods abroad recognized.

ECTS credits express the volume of learning based on the defined learning outcomes and their associated workload. 60 ECTS credits are allocated to the learning outcomes and associated workload of a full-time academic year or its equivalent, which normally comprises several educational components to which credits (based on the learning outcomes and workload) are allocated. ECTS credits are generally expressed in whole numbers.

The workload is an estimation of the time the individual typically needs to complete all learning activities such as lectures, seminars, projects, practical work, work placements, and individual study required to achieve the defined learning outcomes in formal learning environments. The correspondence of the full-time workload of an academic year to 60 credits is often formalized by national legal provisions. In most cases, the workload ranges from 1,500 to 1,800 hours for an academic year, which means that one credit corresponds to 25 to 30 hours of work. It should be recognized that this represents the typical workload and that for individual students the actual time to achieve the learning outcomes will vary.

Awarding credits in ECTS is the act of formally granting students and other learners the credits that are assigned to the qualification and/or its components if they achieve the defined learning outcomes. National authorities should indicate which institutions have the right to award ECTS

Accumulation of credits in ECTS is the process of collecting credits awarded for achieving the learning outcomes of educational components in formal contexts and for other learning activities carried out in informal and non-formal contexts. A student can accumulate credits to:

- Obtain qualifications, as required by the degree-awarding institution;
- Document personal achievements for lifelong learning purposes.

Approach to Allocating Credit in Science Programs

1. The teaching staff outlines the learning activities and calculates the expected workload required for a student to complete these tasks based on the learning outcomes of each program component. A work estimate is stated in credits, and proposals are gathered, Examined, and combined.
2. Faculty may decide from the start to standardize the size of educational components, giving each one the same credit value.
3. Taking into account that each ECTS credit is equivalent to 28 study hours on average.

Self-Learning Calculation

For University Requirements

ECTS for all university requirement courses were calculated **based on the opinion of students through survey** and found to be consistent with standard ECTS calculation equations as

$$No.of\ ECTS\ points = \frac{\text{credit unit} \times 60\ (\text{ECTS for 2 Semesters}) \times 4\ \text{years}}{130\ (\text{total credit of the program}}$$

For Program Requirements

1.Each CH will be multiplied by 15 (the official week number of a semester) to get the contact Hours

2.Every contact Hour is considered 50 Min as per the University rule

3.For all program courses, it has been found through surveying students' opinions that each Contact Hour requires a minimum of two Learning Hours.

4.Add all together the contact hours with preparation times for Exam, HWs, lab reporting and case studies, etc. to get the total Hours of Learning that the student spend for the course

5. Divide the learning hours by 28 to get the ECTS points:

$$\text{Equivalent ECTS points} = \frac{\text{Total LH}}{28}$$

Table (8) Curriculum structure of Biology Program

Program structure	Required/ elective	No. of courses	Credit Hours	workload	ECTS	Percentage
Institution requirements	Required	7	15	775.6	27.7	11.5
College requirements	Required	6	24	1174.04	44.3	18.5
Program requirements	Required	38	89	5283.6	182.53	68.5
Capstone course/project	Required	1	2	172.76	6.17	1.5
Field experience/ Internship	NA	-	-	0	0	-
Total		52	130	7406	260.7	100

5.2. University Requirements

University requirements is studied by all students of the University and involved 15 credit unitsto contribute and prepare students academically and provide them with multiple skills such as Islamic culture, Arabic Writing and Language skills and principles for dealing with the computer needed for further study in coming years

Table (9). University Requirements

Course code	Course Name	Credit Hours	Contact Hours		workload	ECTS	Pre-requisite
			Lec.	Prac.			
101ARB-2	Arabic Language skills	2	2	--	103.6	3.7	--
102ARB-2	Arabic Writing	2	2	--	103.6	3.7	--
101SLM-2	Islamic culture I	2	2	--	103.6	3.7	--
102SLM-2	Islamic culture II	2	2	--	103.6	3.7	--
103SLM-2	Islamic culture III	2	2	--	103.6	3.7	--
104SLM-2	Islamic culture IV	2	2	--	103.6	3.7	--
101CSC-3	Introduction to Computer	3	2	2	154	5.5	--
Total		15	14	2	775.6	27.7	

5.3. Faculty Requirements

The College requirements is studied by all college students in the first year of preparation and goes to 24 credit hours to contribute and prepare students academically and providing them with basic skills of natural sciences (Mathematics, Physics, Chemistry, English

language and Biology).

Table: (10). Faculty Requirements

Course Code	Course Name	Credit Hours	Contact Hours		workload	ECTS	Pre-requisite
			Lec.	Prac.			
101Math-3	General Mathematics	3	3	--	154	5.5	--
101BIO-4	General Biology	4	3	2	207.2	7.4	--
101CHEM-4	General Chemistry	4	3	2	207.2	7.4	--
101PHYS-4	General Physics	4	3	2	207.2	7.4	--
105ENGL-6	Intensive Course In English Language	6	12	3	310.8	11.1	--
106ENGL-3	English for Science	3	3	--	154	5.5	--
Total		24	27	9	1240.4	44.3	

5.4. Program Requirements

The Section requirement is studied all compulsory courses by students during the years of study and involved 91credit hours to contribute and prepare student scientifically and academically.

Table (11). Program Requirements

Course code	Course Name	Credit Hours	Contact Hours		workload	ECTS	Pre-requisite
			Lec.	Prac.			
211BIO-3	Cell Biology	3	2	2	140.84	5.03	
231MIC-2	Bacteriology	2	1	2	127.96	4.57	
241BOT-3	Plant Morphology& Anatomy	3	2	2	168.84	6.03	
251ZOO-3	Invertebrates	3	2	2	168.84	6.03	
222BIO-2	General Genetics	2	1	2	119.84	4.28	
232MIC-2	Virology	2	1	2	112.84	4.03	
242BOT-2	Archegoniates	2	1	2	112.84	4.03	241BOT
252ZOO-2	Histology	2	1	2	107.8	3.85	
254ZOO-3	Chordates	3	2	2	169.96	6.07	
301BIO-2	Fundamental of Ecology	2	1	2	105	3.75	
311BIO-2	Specimen Technique	2	1	2	112.84	4.03	211BIO
331MIC-2	Phycology	2	1	2	109.76	3.92	
333MIC-3	Mycology & Plant Pathology	3	2	2	161	5.75	
341BOT-2	Plant Water Relationships	2	1	2	122.92	4.39	
351ZOO-3	Animal Physiology	3	2	2	165.76	5.92	
353ZOO-3	Marine Biology	3	2	2	172.76	6.17	
334MIC-3	Microbial Physiology	3	2	2	169.96	6.07	231MIC
342BOT-2	Taxonomy Flowering Plants	2	1	2	103.88	3.71	241BOT
334BOT-2	Plant Hormones	2	1	2	120.96	4.32	341BOT
352ZOO-2	Parasitology	2	1	2	112.84	4.03	251ZOO
354ZOO-2	Immunology & Serology	2	1	2	116.76	4.17	
356ZOO-3	General Entomology	3	2	2	163.8	5.85	251ZOO

411BIO-2	Molecular Biology	2	1	2	151.76	5.42	211BIO, 222BIO
431MIC-2	Industrial Microbiology	2	1	2	120.96	4.32	334BOT
433MIC-2	Medical Microbiology	2	1	2	112.84	4.03	334BOT
441BOT-3	Plant Physiology	3	2	2	172.76	6.17	
443BOT-2	Plant Ecology	2	1	2	112.84	4.03	301BIO
451ZOO-2	Endocrinology	2	1	2	123.76	4.42	351ZOO
491BIO-4	Graduation Project	4	1	3	238	8.5	Dept. App.
402BIO-2	Biodiversity	2	1	2	119	4.25	301BIO
412BIO-2	Biotechnology	2	1	2	126.84	4.53	411BIO
432MIC-2	Environmental Microbiology	2	1	2	115.92	4.14	334BOT
442BOT-2	Economic Botany	2	1	2	122.92	4.39	
452ZOO-2	Embryology	2	1	2	112.84	4.03	
454ZOO-2	Animal Ecology & Behavior	2	1	2	122.92	4.39	
456ZOO-3	Medical & Economic Entomology	3	2	2	164.92	5.89	356ZOO
203CHEM-3	Organic Chemistry	3	2	2	164.92	5.89	
204CHEM-3	Biochemistry	3	2	2	172.76	6.17	203CHEM
205MATH-2	Biostatistics	2	2	-	124.88	4.46	
Total		91	53	76	5283.6	188.7	

. Courses and Program Learning Outcomes Mapping

Program learning Outcomes Mapping Matrix Align the program learning outcomes with program courses, according to the following desired levels of performance (I = Introduced P = Practiced M = Mastered)

Table (12). Courses and Program Learning Outcomes Mapping

Course Code	Course Name	Program Learning Outcomes									
		Knowledge			Skills				Values		
		K1	K2	K3	S1	S2	S3	S4	V1	V2	V3
101SLM-2	Islamic Culture I										
105ENGL-6	Intensive course in English Language										
101BIO-4	General Biology	I	I	I	I						
101MATH-3	General Mathematics										
101CSC-3	Introduction to Computer										
102SLM-2	Islamic Culture II										
101ARB-2	Arabic Language Skills										
101PHYS-4	General Physics										
101CHEM-4	General Chemistry										
106ENGL-3	English for Science										
102ARB-2	Arabic Writing										
211BIO-3	Cell Biology	I	A		I	P			P		
231MIC-2	Bacteriology	A	A		A		P			I	

Course Code	Course Name	Program Learning Outcomes									
		Knowledge			Skills				Values		
		K1	K2	K3	S1	S2	S3	S4	V1	V2	V3
241BOT-3	Plant Morphology& Anatomy	I	I	I	I			I			I
251ZOO-3	Invertebrates	A	A		P		P			I	
203CHEM-3	Organic Chemistry										
205MATH-2	Biostatistics										
103SLM-2	Islamic Culture III										
222BIO-2	General Genetics	A	A	I	A		A		P		
232MIC-2	Virology	A	P		P	P	P		I		
242BOT-2	Archegoniates	A	P	P	P					I	
252ZOO-2	Histology	A	A	A	P			P	I		
254ZOO-3	Chordates	A	A	A	P						I
204CHEM-3	Biochemistry										
301BIO-2	Fundamental of Ecology	I	I	P	I	I	P		I		
311BIO-2	Specimen Technique	P	P	I	P	P	P			I	
331MIC-2	Phycology	I	P		A		I			P	
333MIC-3	Mycology & Plant Pathology	P	P	P	A	P			I	I	
341BOT-2	Plant Water Relationships	P	I	I	I		P		I		
351ZOO-3	Animal Physiology		A	A	P		P	P	I		
353ZOO-3	Marine Biology	A	P		P		A		P		I
334MIC-3	Microbial Physiology	A	I	A	I	I	P			I	
342BOT-2	Taxonomy Flowering Plants	P		P	A	P		P			I
334BOT-2	Plant Hormones	P	P		A	P	A			P	
352ZOO-2	Parasitology	A	P	A	A	A	P		P		P
354ZOO-2	Immunology & Serology	I	P	A	A	A	P		P	P	
356ZOO-3	General Entomology	A	A		A	P	P		P	P	
411BIO-2	Molecular Biology	A	A	A	A					A	
431MIC-2	Industrial Microbiology	A	I	P	A	P	P			P	
433MIC-2	Medical Microbiology	P	A		A		A		I		
441BOT-3	Plant Physiology	P	A			P	P	P	P		
443BOT-2	Plant Ecology	P	P	P	A		P	I	I		
451ZOO-2	Endocrinology	A	A	I	A		A		P		
491BIO-4	Graduation Project	I	I	A	P	P	A	A	A	A	A
104SLM-2	Islamic Culture IV										
402BIO-2	Biodiversity	A		A	A	P		P			P
412BIO-2	Biotechnology	A	A	A	A		A			A	
432MIC-2	Environmental Microbiology	P	P	P	A	P		P		P	P
442BOT-2	Economic Botany	P	I	P	P		A	P	P		
452ZOO-2	Embryology	A	A	A	A	A	A	A			I

Course Code	Course Name	Program Learning Outcomes									
		Knowledge			Skills				Values		
		K1	K2	K3	S1	S2	S3	S4	V1	V2	V3
454ZOO-2	Animal Ecology & Behavior	P	A	P	P	A	A			A	
456ZOO-3	Medical & Economic Entomology	P	P	A		P	P	P	P	P	

5.6. Assessments of LO's.

The intended learning outcomes of Biology program are put into practice within the individual courses of the program. The intended learning outcomes for individual courses are defined in the Program Handbook, which is available on the department web pages in course specifications. The descriptions of learning outcomes of the courses are written by teachers of the courses. The Teacher's Quality was used as help to describe knowledge, skills and values acquired in the courses.

The contribution of the individual course in intended learning outcomes of the program indicated in the Biology Program Matrix.

The course contribution within the intended learning outcomes of the program were classified in Levels Introductory (I), Proficient (P), and Advanced (A).

(I-P-A matrix) Teachers of the courses participated in the description and classification work.

The following points are considered in defining CLOs:

- CLOs are all aligned with PLOs.
- CLOs are based on the learning achievements of an average student.
- CLOs are described from the perspective of the student.
- CLOS are all achievable, assessable, and reflect the Level of Learning (LoL).
- CLOS are formulated to enable the students judge the results have actually been achieved.
- CLOs are ranged from 4 to 8 outcomes.

Assessment plan of CLOs and PLOs of BP

In Biology dept. We assess the CLOs each semester and the PLOs every academic year to help us in improvement process.

The mechanism by which BD in CS assesses its LOs and evaluates their development against courses and academic programs are accurate and powerful since it is carried out automatically by means of Excel spreadsheet. It is worth to note that assessment of CLOs is conducted every semester; however, assessment of PLOs is conducted annually.

The following is a brief description of the process used in assessing and evaluating Mathematics Program PLOs:

- Direct assessment

Assessment Tools: The actual attainment levels of students in a course through exams, quizzes and assignments.

Evaluation method:

- Define Levels of attainment of PLOs for evaluating student's direct assessment results.
- Tabulate and Display PLOs Achievement based on student's direct assessment results
- Comment on PLOs assessment

- Indirect assessment

Assessment Tools: Course Evaluation Survey

Evaluation method:

- Define Levels of Attainment of PLOs for evaluating indirect assessment survey.
- Tabulate and Display PLOs Achievement based on Indirect Surveys
- Comment on PLOs assessment.

6. Program Study Plan

BP has a demanding curriculum that students must cope with challenging workloads as part of their education. In Jazan University, the undergraduate BP has 130 credit hours and is designed to provide high quality Biology education to produce competent Biology graduates. It corresponds to the specific learning outcomes for Biology program outlined in the NCAAA Guidelines for Program Development and Review. The program also matches and in alignment with the vision and mission of the college of science and Jazan University.

6.1. Complete Study Plan

The BP has been prepared according to the institutional policies, standards and procedures. Subsequently, the program adapted these descriptions to the forms of NCAAA in which teaching and assessment strategies and methods are specified in detail. All courses have been specified in terms of CLOs, teaching and assessment methods using NCAAA forms and guidelines. CLOs have been mapped and linked to their respective program. Curriculum committee evaluates new proposal for program establishment or modification based on selected criteria. The curriculum shown in Table below is reviewed periodically to fulfill the program goals and learning outcomes, and the educational, scientific, technical and professional development in the field of specialization. The objectives of degree programs and courses are defined as learning outcomes. The learning outcomes of courses are based on the mission of Biology program.

Table (13): Complete Study Plan

Level	Course Code	Course Name	Required or elective	Pre-requisite courses	workload	ECTS	Credit hours	Type of requirements (inst., col. or de.)
Level 1	101SLM-2	Islamic Culture I	R	-	103.6	3.7	2	Institution
	105ENGL-6	Intensive course in English Language	R	-	310.8	11.1	6	College
	101BIO-4	General Biology	R	-	207.2	7.4	4	College
	101MATH-3	General Mathematics	R	-	154	5.5	3	College
	101CSC-3	Introduction to Computer	R	-	154	5.5	3	Institution
Total credit hours of Level 1					929.6	33.2	18	
Level 2	102SLM-2	Islamic Culture II	R	-	103.6	3.7	2	Institution
	101ARB-2	Arabic Language Skills	R	-	103.6	3.7	2	Institution
	101PHYS-4	General Physics	R	-	207.2	7.4	4	College
	101CHEM-4	General Chemistry	R	-	207.4	7.4	4	College
	106ENGL-3	English for Science	R	-	154	5.5	3	College
Total credit hours of Level 2					775.8	27.7	15	
Level 3	102ARB-2	Arabic Writing	R	-	103.6	3.7	2	Institution
	211BIO-3	Cell Biology	R	-	140.84	5.03	3	Department
	231MIC-2	Bacteriology	R	-	127.96	4.57	2	Department
	241BOT-3	Plant Morphology& Anatomy	R	101BIO-4	168.84	6.03	3	Department
	251ZOO-3	Invertebrates	R	-	168.84	6.03	3	Department
	203CHEM-3	Organic Chemistry	R	-	164.92	5.89	3	Department
	205MATH-2	Biostatistics	R	-	124.88	4.46	2	Department
Total credit hours of Level 3					999.88	35.71	18	
Level 4	103SLM-2	Islamic Culture III	R	-	103.6	3.7	2	Institution
	222BIO-2	General Genetics	R	-	119.84	4.28	2	Department
	232MIC-2	Virology	R	-	112.84	4.03	2	Department
	242BOT-2	Archegoniates	R	241BOT	112.84	4.03	2	Department

	252ZOO-2	Histology	R	-	107.8	3.85	2	Department
	254ZOO-3	Chordates	R	-	169.96	6.07	3	Department
	204CHEM-3	Biochemistry	R		172.76	6.17	3	Department
Total credit hours of Level 4					**899.64**	**32.13**	**16**	
Level 5	301BIO-2	Fundamental of Ecology	R	-	105	3.75	2	Department
	311BIO-2	Specimen Technique	R	211BIO	112.84	4.03	2	Department
	331MIC-2	Phycology	R	-	109.76	3.92	2	Department
	333MIC-3	Mycology & Plant Pathology	R	-	161	5.75	2	Department
	341BOT-2	Plant Water Relationships	R	241BOT	122.92	4.39	2	Department
	351ZOO-3	Animal Physiology	R	-	165.76	5.92	3	Department
	353ZOO-3	Marine Biology	R	251ZOO	172.76	6.17	3	Department
Total credit hours of Level 5					**950.04**	**34.2**	**16**	
Level 6	334MIC-3	Microbial Physiology	R	231MIC	169.96	6.07	3	Department
	342BOT-2	Taxonomy Flowering Plants	R	241BOT	103.88	3.71	2	Department
	344BOT-2	Plant Hormones	R	241BOT	120.96	4.32	2	Department
	352ZOO-2	Parasitology	R	251ZOO	112.84	4.03	2	Department
	354ZOO-2	Immunology & Serology	R	-	116.76	4.17	2	Department
	356ZOO-3	General Entomology	R	251ZOO	163.8	5.85	3	Department
Total credit hours of Level 6					**788.2**	**28.15**	**14**	
Level 7	411BIO-2	Molecular Biology	R	211Bio/222 Bio	151.76	5.42	2	Department
	431MIC-2	Industrial Microbiology	R	334MIC	120.96	4.32	2	Department
	433MIC-2	Medical Microbiology	R	334MIC	112.84	4.03	2	Department
	441BOT-3	Plant Physiology	R	331BOT	172.76	6.17	3	Department
	443BOT-2	Plant Ecology	R	301BIO	112.84	4.03	3	Department
	451ZOO-2	Endocrinology	R	351ZOO	123.76	4.42	2	Department
	491BIO-4	Graduation Project	R	Pass Level 6	238	8.5	4	Department
Total credit hours of Level 7					**1032.92**	**36.89**	**18**	
Level 8	104SLM-2	Islamic Culture IV	R	-	103.6	3.7	2	Institution
	402BIO-2	Biodiversity	R	301BIO	119	4.25	2	Department
	412BIO-2	Biotechnology	R	411BIO	126.84	4.53	2	Department
	432MIC-2	Environmental Microbiology	R	334MIC	115.92	4.14	2	Department
	442BOT-2	Economic Botany	R	-	122.92	4.39	2	Department
	452ZOO-2	Embryology	R	-	112.84	4.03	2	Department
	454ZOO-2	Animal Ecology & Behavior	R	-	122.92	4.39	2	Department
	456ZOO-3	Medical & Economic Entomology	R	356ZOO	164.92	5.89	3	Department
Total credit hours of level 8					**988.96**	**35.32**	**17**	

6.2. Courses Descriptions

6.2.1. Courses Descriptions for Biology Program

Course Title	General Biology			Course Code		101BIO-4
Number of Study Hours				Year	Level	Prerequisites
Theo.	Tut	Lab.	Credit			
3	-	2	4	1st	1st	

In-class activities		Self-learning/study	
	Contact Hours		Hours
Lectures	60	HW/Assignments	17
Laboratory	30	Case studies	
Exams and quizzes	10	Study for Exam	20.00
Lab demo		Working on lab experiment	10
		Preparation for classes	10.50
Total	83.30	Total	**57.50**
Total Learning Hours	140.84	Equivalent **ECTS points** = (Total LH/28)	5.03

Brief Course Description	• The general biology course deals with the description of Biology, its different branches, its terminology both in Arabic and English. • This course describes some of the special topics in biology like diversity among living organisms, applications of biological sciences in our life, cell division, tissue, nutrition and fertilization and development.	
Course Objectives	**This course is designed to provide students with the following concepts to:** • Emphasize the information relevant to the life sciences. • Examine the different structures and features related to the biology. • Study the difference between animal and plant cell. • Understand the concept of mitosis division, taxonomy, features of many organs in animals and plants. • Study the theoretically and practically the slides and diagrams related to the biology course.	
Course Contents	**Theory**	1- Introduction: Characteristics of Living Organisms, branches of biology, Scientific Method, and Application of Biological science. 2- Chemical Structure of Living Organisms: organic molecules, inorganic molecules and Biological Reactions and Enzymes.

		3- The Cell: Structure and Function: Prokaryotic cells, Eukaryotic cells, Cell membrane, Mitochondria, Endoplasmic Reticulum, Ribosomes, Golgi Bodies, Lysosomes, Peroxisomes, Plastids structure, Cytoskeleton, Centrioles and Nucleolus. 4- Tissues: Animal Tissues, Epithelia tissues, muscular tissues, nervous tissues, Connective tissues and plant tissues. 5- Systematics: Classification, of Eubacteria, Plant Kingdom, Protista Kingdom and Animal Kingdom. 6- Nutrition: Autotrophs, Photoautotrophs, Chemoautotrophs, Osmosis, Diffusion and active transport, digestion in human and liver functions. 7- Metabolism: Anabolism, photosynthesis, catabolism, cellular respiration. 8- Cell division: mitosis division and meiosis division. 9- Reproduction: sexual reproduction, asexual reproduction human male genital system and human female genital system 10- Excretion: Excretion in invertebrates, Excretion in human and Excretion in plants 11-Fertilization and Development: Fertilization & Development, External fertilization, internal fertilization. 12- Genetics: Monohybrid, Law of Segregation, Dihybrid crosses, Law of Independent Assortment and Genetics of Sex.
	Practical	This course is designed to reinforce the principles of biology. Branches of biology, chemical of living organisms , cell structure, digestion in different animals ,excretory organs in different animals, male and female reproductive system in human, blood groups and cell division.

Assessment Criteria	**Periodic Exams and Quizzes**	**Assignments, and Classroom Activities**	**Final Exam**
	30%	**20%**	**50%**

Course Teaching Strategies	Interactive lectures, Classroom discussions, Tutorials, Individual assignments, Group iscussion, Lab-work, Self-learning activities, E-Videos, Field trips, Micro-Project, Presentation (individual and teamwork).
Text Book	Introduction of biology (organization, reproduction and genetics) Nabih A Ba Zarrg I, Al fifi and Mohammed N. Baeshen fifth edition (2011). Jeddah 2158 80056 K.S.A
Reference Books	• Campbell, N. A. (2007) Biology. Benjamin Cummings Publishing Company, USA. • Introduction practical biology Introduction Solomon et al., (2002) Biology. John Wiley & Sons, New York) • practical biology of biology (organization, reproduction and genetics) Nabih A Baeshen; Zarrg I, Al fifi and Mohammed N. Baeshen first edition (2012) Jeddah 21589 box 80056 K.S.A

Course Title	General Genetics			Course Code		222BIO-2
Number of Study Hours				Year	Level	Prerequisites
Theo.	Tut	Lab.	Credit			
1	--	2	2	2nd	4th	211BIO-3

In-class activities		Self-learning/study	
	Contact Hours		Hours
Lectures	30	HW/Assignments	20
Laboratory	30	Case studies	
Exams and quizzes	6	Study for Exam	24
Lab demo		Working on lab experiment	10
		Preparation for classes	10.84
Total	55	Total	**64.84**
Total Learning Hours	119.84	Equivalent **ECTS points** = (Total LH/28)	4.28

Brief Course Description	• The general genetics course deals with the general principles in generics. • This course describes some of the special topics in genetics like nucleic acids, chromosomes, mutations, Mendelian genetics and non-Mendelian genetics, multiple alleles, and genetic engineering.	
Course Objectives	**This course is designed to provide students with the following concepts to:** 1- relate the structure and function of the DNA molecule. 2- describe normal chromosome number, structure, and behavior in biological cells. 3- understand the cause and effect of alterations in chromosome number and/or structure. 4- study how to identify and classify mutations in DNA. 5- understand the principles and mechanisms of the inheritance of traits from one generation to the next. 6- know the basics of genetic engineering.	
Course Contents	**Theory**	1. Introduction: what is genetics? Development of Genetics 2. Chromosomes: Definition, Number, Size and Shape, Structure, Classification, General Properties. 3. Chromosomal Aberrations: i- Structural Chromosomal Aberrations (Chromosome Type Aberrations- Chromatid Type Aberrations – Translocation- Deletion- Duplication- Inversion- Reciprocal

		translocation) and ii- Numerical Chromosomal Aberrations (Aneuploidy – Euploidy). 4. Nucleic acids: Deoxyribonucleic acid (DNA) – Ribonucleic acid (RNA) - Nucleotide structure – DNA structure – Types and Function of RNA- Comparison between DNA and RNA 5. Genetic Code and Protein Synthesis: Definition of genetic code – Start code – Stop Code- Steps of protein synthesis. 6. Mutations: Definition of mutation – Site of mutations – Mutation types (Spontaneous mutations- Induced mutations – Lethal mutations – sublethal mutations – point or genetic mutations – chromosomal mutations- forward mutations – backward mutations) – mutations Characteristics – chemical mutants – physical mutants. 7. Mendelian Genetics: Mendel first law (law of segregation) – Complete dominance - Cross test – Mendel second law (law of independent assortment). 8. Non-Mendelian Genetics: Incomplete dominance – Codominance – Epistasis – Multiple alleles – Polymorphism. Ex, inheritance of skin color in short horn sheep. 9. Inheritance Related to Sex Linked: Sex chromosomes – Sex linked genes – Sex inheritance in Humans (Hemophilia – Color Blindness)- Sex limited inheritance – Sex influenced inheritance 10. Inheritance of Blood Groups.: ABO system – Rh factor – Variation of Rh Factor – Genetics of Rh factor 11. Genetic Engineering: Development of genetic engineering – Tools used in genetic engineering (restriction enzymes – Plasmids – Gel Electrophoresis – DNA Sequencing – Taq polymerase – PCR) – Applications of Genetic Engineering in (Medical Field – Animal Production Field – Agricultural Production Field – Industrial Field – Environmental Field – Security Field) – Genomic Modified Organisms – Hazards of Genetic Engineering.
	Practical	This course is designed to reinforce the principles of general genetics. It includes the study of Cell Cycle - Cell Division (Mitosis and Meiosis) - Mendelian Genetics, Mendel's First Experiments, and First Law, Mendel's Second Experiments, and Second Law - Non Mendelian Genetics, Incomplete dominance, Codominance, Blood groups - Preparation of mitotic (metaphase) chromosomes – karyotype, Arm ratio, centromeric index - Chromosomal abnormalities.
Assessment Criteria	**Periodic Exams and Quizzes**	**Assignments, and Classroom Activities** / **Final Exam**

	30%	20%	50%
Course Teaching Strategies	Interactive lectures, Classroom discussions, Tutorials, Individual assignments, Group iscussion, Lab-work, Self-learning activities, E-Videos, Field trips, Micro-Project, Presentation (individual and teamwork).		
Text Book	علم الخلية والوراثة (2013 م). تأليف د. سعد بن حسين القحطاني. النشر العلمي والمطابع- جامعة الملك سعود- الرياض –المملكة العربية السعودية Cell Biology and Genetics (2013) by Saad H. Al-Qahtani, King Saud University- Riyadh- KSA (in Arabic)		
Reference Books	-Genetics: Analysis and Principles (6th ed.) (2017) by R. J. Brooker. McGraw-Hill Education, USA. -Genetics: A Conceptual Approach (4rd Ed) (2016) by B. A. Pierce. W. H. Freeman and Company. NY, USA. -Campbell, N., Reece, J.,Urry, L., Cain, M., Wasserman, S., Minorsky, P. and Jackson, R. (2008). Biology, 8th ed. Toronto: Benjamin Cummings. 1267 p عبدالهادى , عائدة وصفى . (٢٠٠٥). مقدمة فى علم الوراثة . ط٢ , عمان (الأردن): دار الشروق للنشر والتوزيع		

Course Title	**Bacteriology**			**Course Code**		**231MIC-2**
Number of Study Hours				**Year**	**Level**	**Prerequisites**
Theo.	**Tut**	**Lab.**	**Credit**			
1	**--**	**2**	**2**	**2nd**	**3rd**	

In-class activities		**Self-learning/study**	
	Contact Hours		**Hours**
Lectures	30	HW/Assignments	20
Laboratory	30	Case studies	
Exams and quizzes	6	Study for Exam	22.96
Lab demo		Working on lab experiment	10
		Preparation for classes	20.84
Total	**55**	Total	**72.96**
Total Learning Hours	127.96	Equivalent **ECTS points** = (Total LH/28)	4.57

Brief Course Description	This course deals with basic knowledge of *Bacteria* and their characterization, inclu morphological, phenotypical, and genotypical characterizations, organelles, applicat and associated theories.
Course Objectives	**This course is designed to provide students with the following concepts to:** 1- highlight the primary characterization of prokaryotic cells and the differences compared to Eukaryotes 2- comprehend the main concepts of Bacteriology theories, applications, taxonomy, metabolic properties, and cellular structure 3- give an opportunity of hands-on training in the Bacteriology laboratory

	4- give an appreciation to *Bacteria* and their roles in our body and daily life (food, Industry, and the environment)	
Course Contents	**Theory**	1. Introduction; Branches of microbiology, the importance of bacteria, the discovery of microorganisms, theory of spontaneous generation, Koch's postulates, and the germ theory of disease. 2. Applied bacteriology; microbiological media, bacterial scientific and economic importance, and products of bacteria. 3. Techniques and methods used in the study of microorganisms; microscopes, staining techniques, nutrients of microorganisms, cultivation of microorganisms, maintenance of bacterial culture. 4. Control of Microbial Growth; sterilization, disinfection, factors affecting the process of controlling microbes, mechanism of controlling microbes, and physical and chemical methods. 5. Bacterial cellular structure; morphology of bacterial cells, internal cellular structure, and external cellular structure. 6. Identification of bacteria; macroscopic morphology, microscopic morphology, biochemical and physiological characterizations, chemical analyses, serological analyses, and DNA and RNA sequencing. 7. Classification of bacteria; Bergey's manual, classification based on RNA and 16s rRNA gene sequencing. 8. Nutritional requirements for bacteria; autotrophs, heterotrophs, mixotrophs, and uptake of nutrients by the cell. 9. Growth and reproduction of bacteria; binary fission, budding, fragmentation, generation time, bacterial growth curve, and growth factors. 10. Genetics of bacteria; nucleoid, plasmid, transduction, transformation, and conjugation. 11. Bacterial metabolism; catabolism, anabolism, and bacterial enzymes. 12. *Mycoplasma* and *Rickettsia*; introduction to the genera and associated diseases
	Practical	This course is designed to reinforce the principles of working with bacteria, including safety, aseptic techniques, sterilization, microscopes, culture media, isolation of bacteria, quantitative determination of bacterial populations, staining techniques, morphological characteristics of bacteria, and biochemical characterizations.

Assessment Criteria	**Periodic Exams and Quizzes**	**Assignments, and Classroom Activities**	**Final Exam**
	30%	**20%**	**50%**

Course Teaching Strategies	Interactive lectures, Classroom discussions, Tutorials, Individual assignments, Group iscussion, Lab-work, Self-learning activities, E-Videos, Field trips, Micro-Project, Presentation (individual and teamwork).
Text Book	• Ibrahim Youssef Trabelsi (2007): Agricultural Microbiology, King Saud Universi Arabic).
Reference Books	• Brock Biology of Microorganisms, 15th Edition, M. T. Madigan, J. M. Martinko, P. V. Dunlap, and D. P. Clark, Pearson Benjamin Cummings, Publisher, 2018 (In English). • Benson's Microbiological Applications, 14th Edition, (complete version), A. Brown., McGraw Hill Publisher, 2017 (In English).

Course Title	Course Code	Number of Study Hours				Year	Level	Prerequisites
		Theo.	Tut.	Lab.	Credit			
Virology	**232MIC-2**	**1**	**-**	**1**	**2**	**2ND**	**4TH**	**231MIC-2**

In-class activities		Self-learning/study	
	Contact Hours		**Hours**
Lectures	30	HW/Assignments	20
Laboratory	30	Case studies	
Exams and quizzes	6	Study for Exam	17
Lab demo		Working on lab experiment	10
		Preparation for classes	10.84
Total	**55**	Total	**57.84**
Total Learning Hours	112.84	Equivalent **ECTS points** = (Total LH/28)	4.03

(1) <u>Brief Course Description</u>:

- Virology course deals with the nature of viruses and their relationships with the other living organisms.
- The course helps to study the characteristics and their medical and economical importance.

(2) Course Objectives

This course is designed to provide students with the following concepts:

1- To study the general characteristics of viruses, their structures and shapes cell transformation by viruses, interferon, antiviral agents, immunization and vaccination.

2- To understand the concept of Viroids, Prions, satellites.

3- To understand the multiplication of Viruses.

4- To study taxonomy and cultivation of viruses, viral pathogenesis.

5- To examine the patterns of some viral diseases.

(3) Course Contents

1- Introduction: Viruses, Viroids and Prions, General properties Viruses. Classification / Cultivation / Diseases.

2- Reproduction: Life cycle of Viruses.

3- Clinical types, Properties, epidemiology, structure and classification: Influenza Viruses / Enteroviruses / Rabies / Herpes/ Hepatitis. immunization and vaccination.

4- Clinical types, Properties, epidemiology, structure and classification: Rotavirus, adenovirus, calciviruses and astroviruses, Cytomegalovirus and congenital and postnatal problems, immunization and vaccination.

5- Clinical types, Properties, epidemiology, structure and classification: Childhood fevers, Warts, Retroviruses – HIV/AIDS, Virus and Cancer - Sarcoma and Leukemia.

6- Antiviral Therapy: Benefits of using antiviral therapy for treatment the viral disease.

B) Practical:

This course is designed to identify different diseases caused by viruses, their symptoms. Understand different types of viruses, their shapes. Virus isolation (tissue culture, chick embryo and laboratory animals), Isolation and characteristics of bacteriophage. Enumeration of viruses: Hemagglutination. Hospital Visits: to know the laboratory diagnosis methods of virus infection.

(4) Assessment Criteria

- Periodic Exams and Quizzes: 40 %
- Assignments, and Classroom Activities: 10 %
- Final exam: 50%

(5) Course Teaching Strategies

- Lectures, Photographs, slides, Reports and Essay Assignments, Homework, and Web-based Assignments.

(6) Text Book

- Notes on Medical Virology by Mirage C Timbury. (In English).
- Carter J., Venetia (2005) Virology. John and John Wiley & Sons, London.

(7) Reference Books

- W. A. Volk (1994) Essentials of Medical Microbiology. Lippincott, Philadelphia. - Levine, A.J. (1992) Viruses. Scientific American Library.
- Belshe, R.B . (1984) Human Virology. PSG. Publishing Com. INC.
- Alan, J. C. (2005) Principles of Molecular Virology. Elsevier, Amsterdam.
- Pleczar, M.J., Cang E.C.S., Krieg N.R. (1993) Microbiology. McGraw Hill, New York.

Course Title	Course Code	Number of Study Hours				Year	Level	Prerequisites
		Theo.	Tut	Lab.	Credit			
Plant Morphology & Anatomy	241BOT-3	2	-	2	3	2rd	3rd	None

In-class activities		Self-learning/study	
	Contact Hours		Hours
Lectures	45	HW/Assignments	30
Laboratory	30	Case studies	
Exams and quizzes	10	Study for Exam	28
Lab demo		Working on lab experiment	20
		Preparation for classes	20
Total	70.84	Total	**98.00**
Total Learning Hours	168.84	Equivalent **ECTS points** = (Total LH/28)	6.03

(1) Brief Course Description:

(1) Study of the germination of seeds, Morphology of root, stem and leaf.

(2) Plant cell structures, tissues, anatomy of root, stem and leaf.

(2) Course Objectives

This course is designed to provide students with the following concepts:

1- Describe importance of acclimation of root, stem, and leaf morphology to habitat.
2- List principal and operation of light and electron microscopes.
3- Describe plant cell ultrastructure characteristics in SEM micrographs.
4- Explain aspects, theories, and processes relevant to plant Morphology and Anatomy.
5- Compare different structures and features related to plant Morphology and Anatomy.

(3) Course Contents

1) Introduction and description of Light and electron microscope.

2) Morphology of the Seed and germination stages and types.
3) Morphology of the Root, types and their modifications.
4) Morphology of the shoot system (Buds, Stems and leaves) and their modifications.
5) Morphology and description of Leaf lamina shape, apex and leaf margin and Leaf venation.
6) Plant cell structure and organelles (Light microscope, SEM).
7) Plant tissues structure (Dermal, Ground and Vascular) and functions.
8) Anatomy of young root in mono and dicots plants.
9) Anatomy of young stem, leaf in mono and dicots plants.
10) Normal secondary thickening of root, stem.
11) Anomalous secondary thickening of root, stem.
12) Anatomy in relation to habitat (Aquatic, halophytes plants).

(B) Practical:

This course is designed to reinforce the principles of Light and electron microscope and Morphology of the Seed and their germination stages and types and Morphology of the Root, types and their modifications. Also Morphology of the shoot system (Buds, Stems and leaves) and their modifications and description of Leaf lamina shape, apex and leaf margin and Leaf venation. Plant cell structure and organelles and Plant tissues structure (Dermal, Ground and Vascular) and functions. Anatomy of young root, stem and leaf in mono and dicots plants. Normal and Anomalous secondary thickening of root and stem. Anatomy in relation to habitat (Aquatic, halophytes plants).

(4) Assessment Criteria

- Periodic Exams and Quizzes: 30 %
- Assignments, and Classroom Activities: 20 %
- Final exam: 50%

(5) Course Teaching Strategies

- Lectures, laboratory work, Reports and Essay Assignments, Homework, and Web-based Assignments.

(6) Text Book

- **Al-Bayomi A., Saleh Y., Sayed O. (2000). Fundamentals of Botany. Arab Publishing and Distribution House, Cairo.Pp541. ISBN 977-258-143-5**

(7) Reference Books

- **Bell A., Bryan A. (2008) An Illustrated Guide to Flowering Plant Morphology. Oxford University Press. Oxford.**
- **Evert R., Eichhon S. (2010) Esau's Plant Anatomy. John Wiley. New York.**

Course Title	Course Code	Number of Study Hours				Year	Level	Prerequisites
		Theo.	Tut.	Lab.	Credit			
Archegoniates	242BOT-2	1	-	1	2	2nd	4th	241BOT-3

In-class activities		Self-learning/study	
	Contact Hours		Hours
Lectures	30	HW/Assignments	20
Laboratory	30	Case studies	
Exams and quizzes	6	Study for Exam	17
Lab demo		Working on lab experiment	10
		Preparation for classes	10.84
Total	55	Total	**57.84**
Total Learning Hours	112.84	Equivalent **ECTS points** = (Total LH/28)	4.03

(1) Brief Course Description:

- The course Archegoniates deals with study of non-flowering plants which possess Archegonium as female sex organs. Archegoniates are classified into three groups of plants such as Bryophytes (non-vascular plants), Pteridophytes(vascular plants) and Gymnosperms(vascular seed plants).
- The course illustrates the morphological development of non-flowering plants from simple to complex, their classification, evolution and economic importance.

(2) Course Objectives

This course is designed to provide students with the following concepts:

1- To understand the morphology and anatomy of primitive (non- flowering) land plants such as Bryophytes, Pteridophytes and Gymnosperms.

2- To study about the structure, function and development of various organs of non-flowering plants.

3- To understand the development of simple to complex organs and vascular tissue.

4- To understand the process of plant evolution from spore bearing plants to naked seeded plants.

5- To study the economic importance various non-flowering plants.

(3) Course Contents

1- General classification of living organisms, Plant Kingdom, general classification of plants, classification of non-flowering plants and non-vascular and vascular plants

2- Introduction to Bryophytes, classification, general characters, reproduction, alternation of generation, lifecycle and economic importance.

3- Liverworts: Diversity, habitat, gametophyte, sporophyte, life cycle of Riccia and Marchantia.

4- Hornworts: Diversity, habitat, gametophyte, sporophyte, life cycle of Anthoceros

5- Mosses: Diversity, habitat, gametophyte, sporophyte, life cycle of Funaria

6- Introduction to Pteridophytes, classifications, general characters, reproduction, alternation of generation, lifecycle and economic importance.

7- Division Psilophyta(the Psilophytes) : Morphology and anatomy of Rhynia. Diversity, habitat, sporophyte, gametophyte, life cycle of Psilotum

8- Division Lycophyta(the Lycopods): Diversity, habitat, sporophyte, gametophyte and life cycle of Lycopodium and Selaginella.

9- Division Sphenophyta (the Horse tails): Diversity, habitat, sporophyte, gametophyte, life cycle of Equisetum.

10- Division Filicophyta(the Ferns): diversity, habitat, sporophyte, gametophyte, life cycle of Marsilea and Pteridium. Tree ferns diversity and morphology.

11- Steles in Pteridophytes: Protostele, Siphonostele, Dictyostele Eustele

12- Introduction to Gymnosperms, classification, general characters, reproduction, lifecycle and economic importance.

13- Cycadopsida: Diversity, General morphology, reproduction and life cycle of Cycas.

14- Coniferopsida: : Diversity, General morphology, reproduction and life cycle of Pinus.

15- Gnetopsida: Diversity, General morphology, reproduction and life cycle of Gnetum.

(B) Practical:

This course is designed to reinforce the principles of the structure, function and developments of various non-flowering plants such as Riccia, Marchantia, Anthoceros, Funaria, Psilotum, Lycopodium, Selaginella, Equisetum, Marsilea, Pteridium, Pteris, Adiantum, Cycas, Pinus and Gnetum. Microscopic examination of original/ preserved specimens and slides of structures of examples representing each group. The students should draw the diagrams of the different non-flowering plants and maintain a record book of laboratory work and submit for evaluation.

(4) Assessment Criteria

- Periodic Exams and Quizzes: 30 %
- Assignments, and Classroom Activities: 20 %
- Final exam: 50%

(5) Course Teaching Strategies

- Lectures, laboratory work, Reports and Essay Assignments, Homework, and Web-based Assignments.

(6) Text Book

- **(In Arabic).**
  None.

- **(In English).**

  Pandey, S. N., Shital, P., Misra, P. and S. Trivedi. (2013). A Textbook of Botany: Bryophyta, Pteridophyta, Gymnosperms and paleobotany. Vikas Publishing House. New Delhi.

  Pandey, B.P. (2010). Modern Practical Botany, Vol.1. S. Chand & Company Pvt. Ltd. New Delhi.

(7) Reference Books

- Vashista B.R. (2009) Botany Degree Classes. Bryophyta. Indian Bookstore, New Delhi.
- Vashista B.R. (2009) Botany Degree Classes. Pteridophyta. Indian Bookstore, New Delhi.
- Vasishta, B.R., A. K. Sinha and Adarsh Kumar (2016). Botany for degree students part III. Bryophyte. S. Chand & Company Pvt. Ltd. New Delhi.
- Vasishta, P. C., Sinha, A. K. and Anil Kumar (2009). Botany for degree students: Gymnosperms. S. Chand & Company Pvt. Ltd. New Delhi.
- Vasishta, P. C., Sinha, A. K. and Anil Kumar (2015). Botany for degree students: Pteridiphyta . S. Chand & Company Pvt. Ltd. New Delhi.
- Rashid, A. 1998. An introduction to Bryophyta (Diversity, Development and Differentiation), Vikas Publishing House, Pvt. Ltd., New Delhi.
- Rasheed A. 1999. An Introduction to Pteridophyta, Vikas Publishing House, New Delhi.
- Vanderpoorten, A. & Goffinet, B. 2009. Introduction to Bryophytes. Cambridge University Press.
- Watson, E.V. 1967. The structure and life of Bryophytes. Hutchinson & Co. London.
- James, W. B. 2015. The Gymnosperm Hand Book. Plant Gateway Ltd, United Kingdom.
- Hallingbäck T.(Ed.). 2000. Mosses, liverworts, and hornworts: status survey andconservation action plan for bryophytes (Vol. 53). World Conservation Union.
- Crum H. A. 2001. Structural diversity of bryophytes. University of Michigan Herbarium.
- Vanderpoorten A. & Goffinet B. (Eds.). (2009). Introduction to bryophytes (Vol.1). Cambridge: Cambridge University Press.
- Bhatnagar S.P. & Moitra A. 2000. Gymnosperms. New Age International Ltd.

- Biswas C. & John B.M. 2004 Gymnosperms. Narosa Publishing House, New Delhi.
- Sharma O.P. 2002 Gymnosperms. Pragathi Prakashan, New Delhi.
- Bhatnager, S.P. and Moitra, A. 1996 Gymnospersm. New Age International (P) Ltd. Publishers, New Delhi

Course Title	Course Code	Number of Study Hours				Year	Level	Prerequisites
		Theo.	Tut.	Lab.	Credit			
Invertebrates	**251ZOO-3**	**2**	**-**	**1**	**3**	**1st**	**3rd**	

In-class activities		Self-learning/study	
	Contact Hours		**Hours**
Lectures	45	HW/Assignments	30
Laboratory	30	Case studies	
Exams and quizzes	10	Study for Exam	28
Lab demo		Working on lab experiment	20
		Preparation for classes	20
Total	**70.84**	Total	**98.00**
Total Learning Hours	168.84	Equivalent **ECTS points** = (Total LH/28)	6.03

(1) Brief Course Description:

- Invertebrate's course is dealing with taxonomy of invertebrate phyla, characteristics of phyla, classes and species.
- It gives the general and specific characters of different phyla; also morphology, anatomy and biology of selected species that representing those phyla.

(2) Course Objectives

This course is designed to provide students with the following concepts:

1. To emphasize the general characters of the main phyla (protozoa, Porifera, Cnidaria, Platyhelminthes, Nematoda, Annelida, Arthropoda, Mollusca and Echinodermata.
2. To identify the main types of invertebrates upon their morphological variations.
3. To illustrate the biology and life cycles of selected examples of invertebrates.

4. To define the phylogenetic relations among the different invertebrates.
5. To understand the economic and medical importance of all invertebrates' phyla.
6. To recognizing taxonomic status of the living organism to distinguish it and Recognize differentiate, illustrate and compare between anatomical structures in invertebrate phyla.

(3) Course Contents

1- Introduction: classification of Invertebrates and phylogeny animals

2- Classification: of lower invertebrates: give general characteristics, their evaluation, metabolism, symmetry, cleavage and gastrulation, respiration, execration, reproduction and biological colony.

3- The Protozoan Phyla

4- Phylum Sarcomastigophora

5- Phylum Ciliphora

6- Phylum Proifera: Songes

7- Phylum Cnidaria

8- Classification of higher invertebrates: give general features, coelomic cavity, segmentation, movement, extraction organs, receptors and sensor organs.

9- Phylum Plathelminthes

10- Phylum Nematoda: Roundworms

11- Phylum Molluscs

12- Phylum Anthropoda

13- Sub Phylum Crustacean

14- Phylum Echinodermata

(B) Practical:

This course is designed to reinforce the principles of apply microscopic examination for microscopic invertebrate specimens. In addition, learn taxonomy of large species and identify

their morphology. Key classifications of higher and lower invertebrates. Field trip to local habitats for collecting samples.

(4) Assessment Criteria

Exams: Essay/Objective, oral, class work, research work and collecting samples.

Practical: Identifying samples and slides, drawings.

- Periodic Exams and Quizzes: 30 %
- Assignments, and Classroom Activities: 20 %
- Final exam: 50%

(5) Course Teaching Strategies

- Lectures, photographs, slides, multimedia, Field trips, web-based learning. Samples, Light microscopes, glassware, chemicals.

(6) Text Book

- (In Arabic). كيفلاند هيكمان واخرون (1993): "الأساسيات المتكاملة لعلم الحيوان؛ اللافقاريات"

(7) Reference Books

- Hickman, C.P., C.P., Larson, A., Helen I'Anson, H., Keen, S.L., Roberts, L.S. (2011) Integrated Principles of Zoology. 15th edition, McGraw Hill. London, New York.
- Wallace, R.L., Beck, D.E. and Braithwai Water, K.T. (1996). Invertebrate Zoology: A Laboratory Manual. Prentice Hall, USA.
- -Ruppert, E.E, and Barnes, R.D. (1994). Invertebrate Zoology. Saunders College Pu
- -Paul, A Meglitsch and Schram, F.R. (1991). Invertebrate Zoology. Oxford University Press, Oxford.

Course Title	Course Code	Number of Study Hours				Year	Level	Prerequisites
		Theo.	Tut.	Lab.	Credit			
Histology	252ZOO-2	1	-	1	2	2nd	4th	

In-class activities		Self-learning/study	
	Contact Hours		Hours
Lectures	30	HW/Assignments	20
Laboratory	30	Case studies	
Exams and quizzes	6	Study for Exam	12
Lab demo		Working on lab experiment	10
		Preparation for classes	10.80
Total	55	Total	**52.80**
Total Learning Hours	107.8	Equivalent **ECTS points** = (Total LH/28)	3.85

(1) Brief Course Description:

- The histology course deals with the microscopic structure and function of major tissue types and their cellular components as well as systems that constitute animal bodies
- This course describes some topics in histology which include epithelium, connective, muscular, nervous tissue, respiratory and reproductive systems

(2) Course Objectives

This course is designed to provide students with the following concepts:

1- To recognize, identify and draw epithelial, connective, muscular and nervous tissues
2- To describe the microscopic anatomy of the respiratory system
3- To study the microscopic anatomy of the urinary, male and female reproductive systems
4- To study the components of blood and hemopoiesis

5- To identify and recognize the histology of the digestive system and associated glands

(3) Course Contents

1- Introduction: Histology studies the microscopic structure of the tissues and organs of the body. It provides the basic knowledge which make the students able to understand the microanatomy of cells, tissues and organ systems and correlate the structure with function.

2- Types of epithelial tissues: define epithelium, structure function of basement membrane, origin of epithelium, classification of epithelium simple, stratified epithelium and glandular epithelium (simple &compound), mechanism (mode) of secretion and types of exocrine secretion (mucous, serous and mixed secretory acini). Histological structure of compound multicellular gland. Intracellular junction (function of tight junction), Adherens J. gap J. Desmosome, Hemidesmosomes. Cell surface specializations, structure function of (microvilli, stereocilia, cilia, and flagella. Functions of epithelial tissues.

3- Connective tissue: definition connective tissue proper, characters, origin, general structure, connective tissue cells (fixed &transient) and fibers, intracellular substance (ground substance) hydrated amorphous material, formed of glycosaminoglycans, proteoglycans and adhesive glycoproteins like Lamnin and fibronectin.

4- Specialized connective tissue: cartilages (structure and types), bones (characteristics, structure and function), cellular components of bone (osteoblast, osteocyte, osteoclast), compact bone features, Haversian system, structure of long bone, bone matrix (organic &inorganic components), cancellous/spongy bones and bony trabeculae and function of bone tissue.

5- Muscular tissue: Myofibrils, overlapping thick (myosin filament) and thin (actin filaments), sarcomere, accessory proteins of muscle, Triad (3 tubules terminal cisternae of S.R.) muscle cells (skeletal, cardiac, smooth muscle), skeletal muscle, development, structure of muscle fiber, contractile proteins (troponin and tropomyosin) cardiac muscle fiber, striation, intercalated disks, smooth muscle, functions of muscles.

6- Nervous tissue: introduction, neuron, functional unit, neuron composition, basic neuron types (unipolar, bipolar, pseudounipolar and multipolar), types of neurons (sensory, motor and

interneuron), types of synapses, neuromuscular junction (motor endplate), function of nervous tissue.

7- Respiratory system: overview, composition (conducting zone & respiratory zone), functions of conducting zone-portion-, conducting portion composition (nostrils, nasal cavity, paranasal sinuses, larynx, nasopharynx, trachea, bronchi, bronchioles, respiratory zone (portion), alveoli, alveolar ducts, lung alveoli, features of alveolar cells (I&II), fibroblasts, macrophages, contractile cells.

8- Urinary system: structure of urinary system, function, anatomy of kidney, cortex, medulla, collecting tubules, nephrons (functional unit), proximal convoluted tubule, distal convoluted tubule, description of renal corpuscle, Henel's loop, collecting tubules and ducts, ureter, histological examination of tissue section in the urinary bladder, transitional epithelium and pear shaped cells, mucosa, muscularis and adventitia.

9- Male reproductive system: male structures od reproduction include the testes, a system of ducts: ducts of epididymis, vas deferens, ejaculatory duct, urethra, histology of seminiferous tubules (germinal/seminiferous epithelium, wall of seminiferous tubule, Sertoli cells (structure and function), interstitial tissue, seminal vesicle layers (mucosa, muscularis and adventitia), accessory male sex glands [(prostate: mucosa submucosa, main, bulbourethral glands Cowper's gland consists of simple cuboidal epithelium, dense connective tissue).

Female reproductive system: Describe and characterizes the histological features of the paired ovaries, oviduct, uterus and vagina and cervix with emphasis on the epithelial linings of these structures and their functions. Ovary histology, germinal epithelium simple sq.-cuboidal Epith, Tunica Albuginea dense connective, cortex stroma houses ovarian follicles, medulla loose C. tissue. Ovarian follicles (4 types: primordial, primary, secondary and mature follicles). Corpus luteum definition and description of the corpus luteum cell types.

(B) Practical:

This course is designed to reinforce the principles of histology. It includes; the classification of epithelial tissues (simple &stratified), types of glands and their histological structural features, types of proper connective tissues, bones and cartilages, types of blood cells, types of muscles (skeletal, cardiac, smooth), nervous system,

transverse section of mammalian spinal cord, peripheral nerve cross section, transverse sections of sciatic nerve selected tissue sections of digestive, respiratory, urogenital male and female) systems.

(4) Assessment Criteria

- Periodic Exams and Quizzes: 30 %
- Assignments, and Classroom Activities: 20 %
- Final exam: 50%

(5) Course Teaching Strategies

- Lectures, laboratory work, Reports and Essay Assignments, Homework, and Web-based Assignments.

(6) Text Book

- (In Arabic)
- Alhaj, Hamid Ahmed (2011). Principles of histology. Knowledge publication Co
- Altayeb Nory bin Taher and Jarar, Bashir Mahmoud (2013). Descriptive histology. King Saud university scientific publications
- Albakri Nadia Abdel-Mohsen, Iqteis Ismail Ayad (2017). Histology Atlas. Arab publication store
- (In English).
- Leslie, P. Gartner and James, L. Hiatt (2007) Colour Textbook of Histology. Saunders, New York

(7) Reference Books

- **Castro Peter., Michael Huber (2015) Marine Biology, McGraw-Hill Professional 978-0-07-802306-4 (ISBN)**
- **Histology: A Text and Atlas: With Correlated Cell and Molecular Biology 7th Edition by, Michael H. Ross (2019).**
- **Histology: An essential text book D.J. Lowrie. (2020)**

Course Title	Course Code	Number of Study Hours				Year	Level	Prerequisites
		Theo.	Tut.	Lab.	Credit			
Chordates	254ZOO-3	2	-	2	3	2nd	4th	

In-class activities		Self-learning/study	
	Contact Hours		Hours
Lectures	30	HW/Assignments	30
Laboratory	30	Case studies	
Exams and quizzes	6	Study for Exam	20
Lab demo		Working on lab experiment	30
		Preparation for classes	24.96
Total	55	Total	**114.96**
Total Learning Hours	169.96	Equivalent **ECTS points** = (Total LH/28)	6.07

(1) Brief Course Description:

- The course deals with the basic characters of chordates, origin, and Ancestry of chordates.
- This course describes the general characters and classification of chordates up to order level.
- This course also describes the different types of modifications that occur in the skeletal body or in various other parts of the body to adapt the animal to the environment in which it lives
- The study samples were taken for each type as a model for the study

(2) Course Objectives

This course is designed to provide students with the following concepts:

1. Classification of Phylum Chordata and its different Subclasses.
2. Reorganization of the anatomy of the body plan in vertebrates, at the level of organs and systems.
3. Identification of the morphological and anatomical structure for the major groups of vertebrates from an evolutionary point of view.

4. By the end of the course, the student should:
   - Learn the importance of recognizing the taxonomic status of the living organism to distinguish it and facilitate their study.
   - Comparison between the specific features of chordates and invertebrates

(3) Course Contents

1) **Introduction of phylum Chordata:** characteristics that distinguish chordates from other animals, characteristics that chordates share with other animals, general characters, classification. Hemichordae, general characters, the morphology of Balanoglossus. General characters of Urochordata. Digestive, circulatory genital, and nervous systems of Ascidia. General characters of Cephalochordate. Amphioxus. Digestive, circulatory, excretory, genital, and nervous systems of Amphioxus.

2) **Subphylum Craniata:** Agnatha. Class Cyclostomata. General characters, classification. Digestive, respiratory, circulatory genital, and nervous systems of Petromyzon

3) **Infraphylum Gnathostomata**: **General characters of fishes, classification of** Pisces. Class Chondrichthyes. External morphology, digestive, circulatory, excretory, genital, skeletal, and nervous systems of dogfish

4) **Class Osteichthyes:** General characters of fishes, classification of bony fishes, external feature, digestive, circulatory, excretory, genital, skeletal, and nervous systems of Tilapia.

5) **Tetrapoda: Class Amphibians:** characters, classification. Dissection of the toad, skin and coloration, digestive, circulatory, excretory, genital, respiratory, and nervous systems of the toad.

6) **Class Reptilia:** General characteristics, classification of reptilian orders, General characteristics, digestive, circulatory, respiratory, urinogenital, and nervous systems of Scincus

7) **Class Aves:** General characteristics, Adaptation of birds for living in the air, classification. Skeletal, digestive, circulatory, respiratory, excretory, genital, and nervous systems of pigeon.

8) Class Mammalia: general characteristics, classification, external form, skeletal, digestive, circulatory, excretory, genital, and nervous systems of rabbit

(B) Practical:

This course is designed to reinforce the principles of the Describe and classification of chordates, and Vertebrates. Studying the Morphological and Anatomical characteristics of all examples for every class

1. Amphioxus: general shape, the transfer section of the pharynx, trunk, and tail.
2. Hemichordata Balanoglossus. Classification, **external features,** and the general viscera

   Urochordata Ascidia. Classification, **external features,** and the general viscera digestive, urogenital, circulatory, nervous systems, and the larva
3. Petromyzon: general shape, V.S. of skin, the transfer section of the pharynx, trunk, and tail.
4. Fish dog: the general, shape of male and female, anatomy, heart and respiratory system, and some types of cartilaginous fish.
5. Tilapia: general shape, anatomy, the structure of cycloid scales, heart, and a holobranch
6. Class of amphibians: frog .The general shape, life cycle, anatomy of the digestive, urogenital, circulatory, and respiratory systems.
7. Class of Reptiles: the lizard's general shape, the general viscera, the male and female urinogenital, circulatory, and respiratory system.
8. Class of Aves: the domestic pigeon. General shape and anatomy of the digestive, urogenital, circulatory, and respiratory systems.
9. Class of Mammals: Rabbit general shape, the general viscera, the digestive, urogenital and respiratory systems.

4) <u>Assessment Criteria</u>

- Periodic Exams and Quizzes: 30 %

- Assignments, and Classroom Activities: 20 %
- Final exam: 50%

(5) Course Teaching Strategies

- Lectures, laboratory work, Reports, and Essay Assignments, Homework, and Web-based Assignments.

(6) Text Book

Mohamed Ismail Mohamed and others (2010): Basics of zoology, second edition, Dar Al-Arab Thought, Cairo

(7) Reference Books

- Cleveland P. Hickman, Jr., Larry S. Roberts, Allan Larson, Helen I'Anson, David J. Eisenhour (2006) Integrated Principles of Zoology. McGraw-Hill Higher, New York
- Mahmoud Albanhawi, and others (2006). Textbook of Zoology, tenth edition, Dar -Almaref, Egypt.
- Mohammad Hassan Hamoud Biology of vertebrates (2005), first Arabic edition, to be eligible for publication and distribution, Jordan.
- Abdel Raouf Gamal and Hassan Shehata (2003). Chordata, first edition, Publishing House, Riyadh.
- Mohamed Ismail Mohamed and others (2002). Fundamentals of Zoology, First Edition, Dar Al-Arab Thought, Cairo.

1. Course Description

Course Title	Course Code	Number of Study Hours				Year	Level	Prerequisites
		Theo.	Tut.	Lab.	Credit			
Fundamentals Of Ecology	301BIO-2	1		2	2	3rd	5th	

In-class activities		Self-learning/study	
	Contact Hours		Hours
Lectures	30	HW/Assignments	10
Laboratory	30	Case studies	
Exams and quizzes	6	Study for Exam	20
Lab demo		Working on lab experiment	10
		Preparation for classes	10
Total	55	Total	**50**
Total Learning Hours	105	Equivalent **ECTS points** = (Total LH/28)	3.75

Brief Course Description

Introduction to ecological concepts, and the applications of this science in reducing environmental pollution.

(2) Course Objectives

This course is designed to provide students with the following concepts:

1. Identify environmental factors.
2. Study the impact of environmental factors on the ecosystem.
3. Explain the human role in the environment positively and negatively.
4. Awareness of the importance of the environmental protection from pollution.

(3) Course Contents

a. Theoretical part:

1. Introduction to Ecology: Concept of ecology and its fields and its relation to other sciences.
2. The ecosystem: The components of the natural ecosystem and the types of ecosystems, Living and non-living environmental factors and their impact on living organisms.
3. Effect Environment on the physical, anatomical and physiological aspects of organisms. Energy conservation in the natural ecosystem.

4. Living organisms and levels of nutrition, food chains and food webs - ecological pyramids.
5. Ecosystem Balance - natural ecosystems - conservation of natural resources, tolerance of organisms to chemical and physical agents, Natural environment.
6. Biogeochemical elements cycle: water, carbon, oxygen, nitrogen, phosphorus cycles.
7. Environmental pollution: Water pollution, food contamination, air Pollution soil pollution, desertification, radiation pollution, noise pollution, thermal pollution, electromagnetic pollution, climate change, global warming and Ozone layer depletion.

b. Practical part:

1. Methods of measuring environmental factors (temperature, wind, atmospheric pressure, rain, relative humidity, Soil analysis, scientific field trip to the meteorological station at the Center of Environmental Studies and Research.

(4) Assessment Criteria

- Quizzes, Midterm Exam and Assignments: 20 %
- Practical Section: 30 %
- Final exam: 50%

(5) Course Teaching Strategies

- Lectures, Reports and Essay Assignments, Homework, and Web-based Assignments.

(6) Text Book

- **Hayati, A. A.** (**2007**). *Fundamentals of Ecology (in arabic)*, First Ed., Dammam, Saudi Arabia.

(7) Reference Books

- Al-Oudat, Mohamed Abdo and Abdullah Yahya Basahey (2001), Pollution and Environmental Protection, Deanship of Library Affairs, King Saud University, Riyadh - Saudi Arabia.
- Alyaa Atokh Boran and M. Abo Deyah (2014) Ecology 4th Eddition, Amman, Jordan.
- Molles M.C (2015) Ecology: Concepts and Applications 7th Edition, McGraw Hill, New York.
- General Authority for Meteorology and Environmental Protection Saudi Arabia http://www.pme.gov.sa
- Saudi Wildlife Authority Website http://www.swa.gov.sa/index.php/en

Course Title	Course Code	Number of Study Hours				Year	Level	Prerequisites
		Theo.	Tut.	Lab.	Credit			
Specimen Technique	311BIO-2	1	-	1	2	3rd	5th	211BIO-3

In-class activities		Self-learning/study	
	Contact Hours		Hours
Lectures	30	HW/Assignments	15
Laboratory	30	Case studies	
Exams and quizzes	6	Study for Exam	20.84
Lab demo		Working on lab experiment	10
		Preparation for classes	12
Total	55	Total	57.84
Total Learning Hours	112.84	Equivalent **ECTS points** = (Total LH/28)	4.03

(1) Brief Course Description:

- The specimen techniques course deals with the steps and procedures of samples preparation.
- This course is an introduction to the collection and processing of animal and plant specimens for laboratory experiment. Other topics include skills, quality assurance, safety procedures.

(2) Course Objectives

This course is designed to provide students with the following concepts:

1- This course aims giving students the basic theoretical and practical techniques of histological samples and specimen preservation and related information.

2- Be able to identify supplies required for sample collection.

3- Be able to describe the pre-examination factors that affect specimen integrity.

4- Describe professional skills that would ensure student safety and comfort.

5- To study various tissue, different types of dyes, and its role in study histochemistry.

6- Define technical terminology related to laboratory techniques or sample collection.

7- Collect plant and animal specimen successfully and preserve same.

8- Prepare both temporary and permanent slides using histological techniques.

9- Be able to know the basic principles guiding the use of each instrument.

(3) Course Contents

1. Introduction: overview of Light and Electron Microscopy, Methods of Specimen Preparation - Plant & Animal Samples.
2. Fixation: fixation benefits, Specifications of a good fixative, principles and methods of fixation process. Fixative types.
3. Tissue Processing (1): Washing, Dehydration, clearing (clearing agent proprieties; types of Clearing agents)
4. Tissue Processing (2): Infiltration and Embedding definition, Infiltration and Embedding agents
5. Preparation of sectioning and Microtomy: Trimming, affixation, types of sections, sectioning problems and treatment, types of microtomes and uses.
6. Staining: classification of dyes, Mordants, Methods of Staining, differentiation definition.
7. Mounting medium for microscopy: Permanent Mount, Semipermanent Mount, Slide Mounting Media

B) Practical:

This course is designed to reinforce student skills of samples fixation process, microtome and paraffin sections, frozen sections and staining techniques, types of microscopically preparations, introductory histochemistry, and demonstration techniques. preparation and staining of plant sections (Roots, stems and leaves). Preparation, processing and staining of some organelles and contents of the cell. Preparation and staining of the different stages and chromosomes in the mitosis and meiosis of the cell. Preparation and staining bacterial smears. preparation and staining blood film.

(4) Assessment Criteria

- Periodic Exams and Quizzes: 30 %
- Assignments, and Classroom Activities: 20 %
- Final exam: 50%

(5) Course Teaching Strategies

- Lectures, laboratory work, Reports and Essay Assignments, Homework, and Web-based Assignments.

(6) Text Book

- Optical laboratory preparations, by Hamed Ahmed Al Haj, 2015 (In Arabic).

(7) Reference Books

- Animal specimen techniques/ Osama A. Abuzinadah, Samar O. Rabah, Mona Mahmoud and Ferial M. Stietieh. Publisher: king Saud University- Riyadh (2015)
- Microscopy and Techniques, by Mohamed S. Khalifa. publisher: Deanship of Library Affairs, King Saud University (In Arabic).
- Bancroft & Stevens, (2007). Theory & Practical of Histological Techniques. Churchill Livingston, New York.

Course Title	Course Code	Number of Study Hours				Year	Level	Prerequisites
		Theo.	Tut.	Lab.	Credit			
Phycology	**331MIC-2**	**1**	**-**	**2**	**2**	**3rd**	**5th**	none

In-class activities		Self-learning/study	
	Contact Hours		**Hours**
Lectures	30	HW/Assignments	14
Laboratory	30	Case studies	
Exams and quizzes	6	Study for Exam	20.76
Lab demo		Working on lab experiment	10
		Preparation for classes	10
Total	**55**	Total	**54.76**
Total Learning Hours	**109.76**	Equivalent **ECTS points** = (Total LH/28)	3.92

(1) Brief Course Description:

- The Phycology course deals with different types of freshwater and marine algae and their habitats.

- This course describes the types of reproduction in algae in addition to the economic importance of algae.

(2) Course Objectives

This course is designed to provide students with the following concepts:

1- To understand the basic structure of prokaryotic and eukaryotic algal cell.
2- To study principles of reproduction in algae and different forms of life cycles.
3- To understand the basis of algal classification.
4- To study general characters of the different algal phyla with some examples for each one.
5- To study the economic importance of algae.

(3) Course Contents

1- . Structure of prokaryotic and eukaryotic algal cell.

2- . Reproduction of algae (vegetative, asexual and sexual reproduction) and life cycles.

3- . Classification of algae

4- . General characters of Cyanophyta with some examples.

5- . General characters of Chlorophyta with some examples.

6- . General characters of Basillariophyta with some examples.

7- . General characters of Xanthophyta with some examples.

8- . General characters of Phaeophyta with some examples.

9- General characters of Rhodophyta with some examples.

10- Economic importance of algae.

B) Practical:

This course is designed to reinforce the principles of the isolation, cultivation and identification of fresh and marine algae. It includes the studying of representative algal specimens of different phyla.

(4) Assessment Criteria

- Periodic Exams and Quizzes: 30 %
- Assignments, and Classroom Activities: 20 %
- Final exam: 50%

(5) Course Teaching Strategies

- Lectures, laboratory work, Reports and Essay Assignments, Homework, and Web-based Assignments.

(6) Text Book

- Abd-Elaziz El-Sarani, Idress El-Turk. Phycology, 2000 (In Arabic).
- Ibrahim Araf, Ali ElHamidan, Practical Phycology, 2015 (In Arabic).

(7) Reference Books

- Robert, E. 2000. Phycology, Cambridge Univ. Press, Cambridge.
- Van den Hoek, D.G. Mann and H.M Jahns. 1995. Algae: an Introduction to Phycology. Camridge University Press. Camridge.
- R. E. Lee. 2008. Phycology, 4th Edition, Cambridge University Press, New York.

Course Title	Course Code	Number of Study Hours				Year	Level	Prerequisites
		Theo.	Tut.	Lab.	Credit			
Mycology & Plant Pathology	333MIC-3	2	-	1	3	3rd	5th	-

In-class activities		Self-learning/study	
	Contact Hours		Hours
Lectures	45	HW/Assignments	20
Laboratory	30	Case studies	
Exams and quizzes	9	Study for Exam	31
Lab demo		Working on lab experiment	20

		Preparation for classes	20
Total	**70**	Total	**91**
Total Learning Hours	**161**	Equivalent **ECTS points** = (Total LH/28)	5.75

(1) Brief Course Description:

- Mycology course deals with characteristics of the kingdom fungi, major taxonomic groups.
- This course describes methods of sexual and asexual reproduction of fungi, their structures and plant diseases caused fungi and different causal organisms of diseases also their control.
- The course described an introduction to Abiotic diseases science and plant disease control.

(2) Course Objectives

This course is designed to provide students with the following concepts:

1- . To understand the ecology and nature of fungi and their major taxonomic groups.

2- . To study the different reproduction methods of fungi and different structures.

3- . To emphasize the importance of plant pathogens with special reference to kingdom fungi.

4- . To discuss different ecological factors, lead to non -pathogenic diseases.

5- . To establish important methods for controlling plant diseases.

(2) Course Contents

Theoretical;

1- Introduction: Identification, structures of fungi, growing process and study fungal ecology.

2- Economic importance: Studying the structures and economic importance of fungi.

3- Discussing the fungal nature: discuss the science of fungi which related to rhizosphere ecology.

4- Fungal morphology: fungal reproduction. Sexual and asexual reproduction methods.

5- Studying Major taxonomic groups of fungi: Lower and higher fungi and their ecology.

6. Introduction to Plant Pathology: defining fungal diseases, bacterial, and disease symptoms- classification of diseases and discuss different ecological factors, lead to non -pathogenic diseases.

7-Examples of some plant pathogenic fungi: affecting some economical crops and estimating the losses due to infection.

8- Symptoms of infection: Studying the symptoms on the infected plants, disease cycle and control managements application.

Practical:

This course is designed to reinforce the principles of methods of isolation and identification of fungi and maintain them in pure cultures; field trips to collect plant samples representing different disease syndrome, and studying prepared slides of different fungi. Application principles of plant pathology and control plant diseases.

(4) Assessment Criteria

- Periodic Exams and Quizzes: 30 %.
- Assignments, and Classroom Activities: 20 %.
- Final exam: 50%

(5) Course Teaching Strategies

- Lectures, laboratory work, Reports and Essay Assignments, Homework, and Web-based Assignments.

(6) Text Book

- Abdullah Nasir El-Ramah, King Saud University,.2000 (In Arabic).
- Agrios, G.N. 2005. Plant Pathology. Elsevier Academic Press, San Diego, USA. (In English).

- Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996) Introductory Mycology, New York.

- Agrawal, A.A., Tuzun, S., Bent, E. (1999). Induced Plant Defenses Against Pathogens and Herbivores. APS Press, St. Paul.

(7) Reference Books: Abdullah Nasir El-Ramah, King Saud University, .2000 (In Arabic).

- Practical Mycology. Abd Allah Nasir El-Rahma.2003. King Saud University. (In Arabic).

Course Title	Course Code	Number of Study Hours				Year	Level	Prerequisites
		Theo.	Tut.	Lab.	Credit			
Microbial Physiology	334MIC-3	2	-	2	3	3rd	6	231MIC-2

In-class activities		Self-learning/study	
	Contact Hours		Hours
Lectures	45	HW/Assignments	24
Laboratory	30	Case studies	
Exams and quizzes	9	Study for Exam	30
Lab demo		Working on lab experiment	25
		Preparation for classes	20.84
Total	70	Total	99.84
Total Learning Hours	169.96	Equivalent **ECTS points** = (Total LH/28)	6.07

(1) Brief Course Description:

To study the principal characteristics of microorganisms, structure and function of their different organelles, growth, their biological activities and metabolism. Environmental and nutritional factors affecting microbial growth.

(2) Course Objectives

This course is designed to provide students with the following concepts:

1- Study of the growth of microorganisms.

2- Study the factors affecting microbial growth including Physical Chemical and Biological

3- Nutritional mechanisms in microorganisms, metabolism and role of cell membranes in transport

4- Classification of microorganisms according to nutritional categories

5- Chemical control of microbial growth and their mechanisms

6- Study the methanogenic bacteria and its role in environment.

(2) Course Contents

(1) Introduction: Introduction of microbial physiology. Growth in microorganisms. Measuring Microbial Growth

(2) Microbial growth curve. Lag phase. Exponential phase. Stationary phase. Death phase.

(3) Culture systems: Closed system, open system: continuous culture.

(4) Physical factors affecting microbial growth: Temperature. pH. Oxygen. Redox potential. Surface tension. Water activity. Osmotic pressure. Pressure. Radiation. Visible light

(5) Chemical factors affecting microbial growth: Germistatic agents. Germicidal agents. Disinfectants. Antibiotic. Growth-Factor Analogues.

(6) Microbial interactions: Neutral, Antagonism and Synergism Relationships

(7) Microbial nutrition: Macronutrients. Micronutrients. Physiological functions of the basic elements. Growth factor. Autotrophic. Heterotrophic. Metabolism in microorganisms. Enzymes.

(8) Photosynthesis in microorganisms. Nitrogen fixation (Symbiotic and asymbiotic)

(9) Microbial Metabolism: Microbial Metabolism of carbohydrates, proteins, and lipids.

(10) Methanogenic bacteria: characteristics. Obligate methoanogens. Methylotrophic methanogens. Methane formation. Methanogens and Methanotrophs

(11) Transport of nutrients: Passive Diffusion. Facilitated Diffusion. Active Transport.

B) Practical:

This course is designed to reinforce the principles characteristics of microorganisms, structure and function of their different organelles, their biological activities and metabolism

(4) Assessment Criteria

- Periodic Exams and Quizzes: 30 %
- Assignments, and Classroom Activities: 20 %
- Final exam: 50%

(5) Course Teaching Strategies

- Lectures, laboratory work, Reports and Essay Assignments, Homework, and Web-based Assignments.

(6) Text Book

- Kawther foaad aabed (2006) Microbial Physiology. Dar alandalus , Saudi Arabia.(In Arabic).
- Albert G. Moat, John W. Foster, Michael P. Spector (2002) Microbial Physiology. John Wily & Sons, New York (In English).

(7) Reference Books

- Microbiology an introduction 12th edition (2016). Gerard J. Tortora. Pearson Education. USA

Course Title	Course Code	Number of Study Hours				Year	Level	Prerequisites
		Theo.	Tut.	Lab.	Credit			
Plant Water Relationships	341BOT-2	1	-	1	2	3rd	5th	241BOT-3

In-class activities		Self-learning/study	
	Contact Hours		Hours
Lectures	30	HW/Assignments	20
Laboratory	30	Case studies	
Exams and quizzes	6	Study for Exam	22.92
Lab demo		Working on lab experiment	10
		Preparation for classes	15
Total	55	Total	67.92
Total Learning Hours	122.92	Equivalent **ECTS points** = (Total LH/28)	4.39

(1) Brief Course Description:

- . Study of Plant Water and soil Relationships

(2) Course Objectives

This course is designed to provide students with the following concepts:

1- Plant water relationships.

2- Diffusion, imbibition, and osmosis.

3- Transpiration and water stress.

4- Plant soil relationships.

5- Plant Mineral nutrition and salt stress.

(3) Course Contents

1- Plant Water Relations. Absorption of Water. Ascent of Sap.

2- Plant Water Relations. Transpiration. Water Stress.

3- Soil: Origin, Formation, Physical and Chemical Properties.

4- Plant Mineral Nutrition. Mineral Elements. Mineral Uptake.

5- Role of Mineral Elements. Mineral Deficiency Symptoms.

6- Water and Salt Stress.

B) Practical:

This course is designed to reinforce the principles of Plant Water and Soil Relationships such as membrane permeability, osmosis, soil properties, and Transpiration.

(4) Assessment Criteria

- Periodic Exams and Quizzes: 30 %
- Assignments, and Classroom Activities: 20 %
- Final exam: 50%

(5) Course Teaching Strategies

- Lectures, laboratory work, Reports and Essay Assignments, Homework, and Web-based Assignments.

(6) Text Book

- (In Arabic).
- Hopkins W.G. (2012) Introduction to Plant Physiology. Wiley, London (In English).

(7) Reference Books

- Kirkham M.B. (2005) Principals of Soil and Water relations. Elsevier, Amsterdam.

Course Title	Course Code	Number of Study Hours				Year	Level	Prerequisites
		Theo.	Tut.	Lab.	Credit			
Taxonomy Flowering Plants	342BOT-2	1	-	2	3	3rd	6th	241BOT-3

In-class activities		Self-learning/study	
	Contact Hours		Hours
Lectures	30	HW/Assignments	10
Laboratory	30	Case studies	
Exams and quizzes	6	Study for Exam	15.88
Lab demo		Working on lab experiment	10
		Preparation for classes	13
Total	55	Total	48.88
Total Learning Hours	103.88	Equivalent **ECTS points** = (Total LH/28)	3.71

(1) Brief Course Description:

- . The course describes the basis of plant taxonomy which is represented in flower structure.
- . It deals with the old and modern plant classification

(2) Course Objectives

This course is designed to provide students with the following concepts:

1- . Study of old and contemporary classification systems

2- . Floral morphology and Botanical Keys

3- . Representative Plants of different dicot and monocot plant families with special reference to Saudi/Jazan flora.

(3) Course Contents

1- . Definition of plant taxonomy with different system development classifications

2- . Nomenclature of plant species

3- . Description of non-essential floral parts (Calyx and Corolla)

4- . Description of essential floral parts (Androecium and Gynoecium)

5- . Sexes and Symmetry in flowers

6- . Different Placentation in flowers

7-. Different types of inflorescences

8- Different types of fruits

9- Floral formula and diagram

10- Study of monocots and dicots families

B) Practical:

How to identify floral parts, types and forms, how to draw flower, inflorescence and fruits. How to dissect flower and make transverse and longitudinal sections, Compare between different families of monocots and dicots

(4) Assessment Criteria

- Periodic Exams and Quizzes: 30 %
- Assignments, and Classroom Activities: 20 %
- Final exam: 50%

(5) Course Teaching Strategies

- Lectures, laboratory work, Reports and Essay Assignments, Homework, and Web-based Assignments.

(6) Text Book

- **سعد، شكري ابراهيم. (2016) النباتات الزهرية. دار الفكر العربي. القاهرة.**

(7) Reference Books

- **. الجندي، أحمد (وآخرون). (2010) التطبيقات العملية في تقسيم النبات. أوزوريس. القاهرة.**
- Chaudhary, 1989-2000. Flora of Saudi Arabia. Riyadh KSA

Course Title	Course Code	Number of Study Hours				Year	Level	Prerequisites
		Theo.	Tut.	Lab.	Credit			
Plant Hormones	344BOT-2	1	-	2	2	3rd	6th	341BOT-2

In-class activities		Self-learning/study	
	Contact Hours		Hours
Lectures	30	HW/Assignments	20
Laboratory	30	Case studies	
Exams and quizzes	6	Study for Exam	20.96
Lab demo		Working on lab experiment	10
		Preparation for classes	15
Total	55	Total	**65.96**
Total Learning Hours	**120.96**	Equivalent **ECTS points** = (Total LH/28)	**4.32**

(1) Brief Course Description:

- Study of growth phenomena, plant hormones and growth regulators and inhibitors.
- Study Tropisms (Phototropism, Geotropism) and Phytochrome (Photoperiodism, Flowering).

(2) Course Objectives

This course is designed to provide students with the following concepts:

1- Define all principals, concepts, theories and aspects concerning with Plant hormones and growth stages.
2- Differentiate between different mechanisms, functions, practices and aspects related to Plant hormones.
3- Debate the biological theories, principles and processes related to Plant hormones and Tropisms

4- Argue different biological approaches in laboratory or field or even theoretically related to Plant Hormones (Auxins, Gibberellines, Cytokinenes, Ethylene, Abscisic Acid).

5- Illustrate awareness of risk assessment and safety observation when dealing with various equipment at various fields with Plant hormones.

(3) Course Contents

1- Introduction to plant Hormones and Growth (Definition, Measurement).

2- Differentiation and Development in plants.

3- Plant Hormones (Auxins, Gibberellines, Cytokinenes, Ethylene, Abscisic Acid).

4- Growth Movements (Tropisms, Nastic Movements).

5- Tropisms (Phototropism, Geotropism)

6- Tissue Culture technique and Circadian rhythms, Biological Clock.

7- Stress Physiology and Phytochrome (Photoperiodism, Flowering).

Practical:

This course is designed to reinforce the principles of Phototropism, Geotropism, Nastic Movements, Auxin and Elongation of Barley Seedling, Measuring the growth rate (plant Height, fresh and dry weight and leaf area). Effect of Gibberellins on Growth of Lettuce, Effect of Kenetine on Callus, Tissue Culture, Plant hormones and differentiation. Photoperiodism

(4) Assessment Criteria

- Periodic Exams and Quizzes: 30 %
- Assignments, and Classroom Activities: 20 %
- Final exam: 50%

(5) Course Teaching Strategies

- Lectures, laboratory work, Reports and Essay Assignments, Homework, and Web-based Assignments.

(6) Text Book

- Davis P.J. (2005) Plant Hormones. Kluer Academic Publishers, Dordrecht.

(7) Reference Books

- Hopkins, WG & Huner, NPA 2008, Introduction to plant physiology, 4th edn, John Wiley and Sons, New York. (ISBN 0 470 24766 5).
- Abu Zeid, El-Shahat Nasr (2000) Plant hormones and agricultural applications. Arab House for Publishing and Distribution. (In Arabic)
- BaSalah, Mohamed Omar (1998) General Plant Physiology, Part Two. Dar Reham Jeddah, Kingdom of Saudi Arabia. (In Arabic)
- www.users.rcn.com/jkimball.ma.ultranet/BiologyPages/
- www.emc.maricopa.edu
- www.biology.clc.uc.edu

Course Title	Course Code	Number of Study Hours				Year	Level	Prerequisites
		Theo.	Tut.	Lab.	Credit			
Animal physiology	351ZOO-3	2	-	1	3	3rd	5th	

In-class activities		Self-learning/study	
	Contact Hours		Hours
Lectures	45	HW/Assignments	20
Laboratory	30	Case studies	
Exams and quizzes	9	Study for Exam	30.76
Lab demo		Working on lab experiment	25
		Preparation for classes	20
Total	**70**	Total	**95.76**
Total Learning Hours	**165.76**	Equivalent **ECTS points** = (Total LH/28)	5.92

(1) Brief Course Description:

- Animal physiology course deals with studying and understanding the functional activities and its mechanisms in the biological body.
- This course describes some topics in animal physiology such as nervous System (Nerves, Neurons, Transmission of nerve impulse), nervous system (Receptor Types

and their Action), Circulation (Systems, Blood Flow and Pressure, Regulation), respiration, locomotion and reproduction.

(2) Course Objectives

This course is designed to provide students with the following concepts:

1- To understand the principles, basic facts and their significance to animal physiology.
2- To emphasis on studying the physiological aspects of nervous, muscular, digestive, excretory, respiratory, reproductive and circulatory systems.
3- To investigate the cytoplasmic and plasma membrane receptors.
4- To examine the structure, function of the different types of muscles and principles of muscle contraction.
5- To study the mechanisms of digestive enzymes, gas exchange in lungs, the mode of action of hormones, the spermatogenesis /oogenesis and the mechanism of blood clotting.

(3) Course Contents

1- Nervous system: Nerve cell structure, types of nerve cells, myelinated and unmyelinated nerve fibers, different types of receptors as per cellular location

2- Muscular system: structure of muscle cell, different types of muscles and theories of muscle contraction.

3- Digestive system: carbohydrates, lipids, proteins, minerals, water, vitamins, enzymes, structure of digestive system, saliva and its secretion, gastric digestion, mechanism of gastric juice and HCl secretion, intestinal digestion, large intestine Absorption.

4- Excretory system: Structure, composition of kidney, renal functions, urine formation, homeostasis, control of water reabsorption, regulation of water reabsorption by ADH hormone, mechanism of reabsorption of water and sodium, action of Henle loop, sodium, potassium and calcium regulation, acid base renal regulation and acidic urine formation.

5- Respiratory system: Respiration(External), mechanism of respiration, lung capacity, gas exchange, transport of respiratory gases, regulation of respiration process and control of respiration

6- Endocrine system: Mechanism of hormone action, cell surface receptors and second messenger, plasma membrane receptors, pituitary gland, thyroid gland, parathyroid hormones, adrenal glands, cortex hormones, medulla hormones, pancreatic hormones, reproductive hormones, menstrual cycle.

7-Reproductive system: male and female reproductive systems, their composition, spermatogenesis process, Oogenesis stages, pregnancy and placenta.

8-Circulatory system: composition, blood vessels (veins and arteries), blood circulation, blood composition and its functions, blood cells(RBCs), factors affecting RBCs production, blood hemolysis, Anemia, pernicious anemia, microcytic anemia, polyerythremia, jaundice, WBCs (granulocytes, agranulocytes), sites of WBCs production, regulation of leucopoiesis, functions of WBCs, blood platelets, blood plasma, blood coagulation, mechanism of coagulation, intravascular clotting, clot lysis, prevention of coagulation, abnormalities of coagulation, regulation of blood volume, blood transfusion, A,B,O system, Rh factor

B) Practical:

This course is designed to reinforce the principles of blood physiology. It involves, demonstration of blood smear film to investigate the different subtypes of white blood cells, determination of the total red blood corpuscles counts, measurement of hemoglobin and hemoglobin variants (hematocrit), determination of the total white blood cell count and its differential count. Additionally, demonstrating the blood groups (A, B, O and Rh factor) plus measuring blood glucose levels and blood pressure.

(4) <u>Assessment Criteria</u>

- Periodic Exams and Quizzes: 30 %
- Assignments, and Classroom Activities: 20 %
- Final exam: 50%

(5) Course Teaching Strategies

- Lectures, laboratory work, Reports and Essay Assignments, Homework, and Web-based Assignments.

(6) Text Book

- (In Arabic)
- Mohamed Bin-Saleh Al-Khalifa (2008). General physiology. King Saud scientific publications

(In English).

- Withers, P.C. (1992). Comparative Animal Physiology, Saunders College Publishing, USA.

- Schmidt-Nielsen, K. (1994). Animal Physiology: Adaptation and Environment . Cambridge University Press, Cambridge, U.K.

(7) Reference Books

- Guyton and Hall, (2006) Text book of Medical physiology 11th edition
- William O. Reece (2015). Functional Anatomy and Physiology of Domestic Animals. Wiley – Blackwell
- Bruce M Koeppen and Bruce A Stanton Berne(2017). Berne & Levy Physiology, Elsevier
- Guyton and Hall (2020). Textbook of Physiology, international edition, 14 editions, Elsevier

Course Title	Course Code	Number of Study Hours				Year	Level	Prerequisites
		Theo.	Tut.	Lab.	Credit			
Parasitology	352ZOO-2	1	-	1	2	3th	6th	251ZOO-3

In-class activities		Self-learning/study	
	Contact Hours		Hours
Lectures	30	HW/Assignments	17
Laboratory	30	Case studies	
Exams and quizzes	6	Study for Exam	20
Lab demo		Working on lab experiment	10
		Preparation for classes	10.84
Total	55	Total	**57.84**
Total Learning Hours	**112.84**	Equivalent **ECTS points** = (Total LH/28)	**4.03**

(1) Brief Course Description:

- **The parasitology course deals with definition of different groups of animal and human parasites**.
- **This course describes stages, life cycles and diseases caused by animal and human parasites.**

(2) Course Objectives

This course is designed to provide students with the following concepts:

1- A comprehensive review of parasitology and detailed study in human and animal parasites.

2- The medical and economic importance of the parasites and how to detect and the methods of protection.

(3) Course Contents

1- Introduction to biological associations

2- Definition of parasitism.

3- Biology of parasitism: parasite stages, life cycle of different parasites, parasite habits, infective stages and parasitic diseases.

4- Host parasite relationship.

5- Epidemiology of parasitic diseases.

3- Examples of human & animal parasites (parasitic protozoa, trematodes, cestodes, nematodes,
ectoparasites, intermediate hosts & vectors of arthropods and parasitic insects) .

6-. Parasite diagnosis (biological & serodiagnosis).

4- Protection of infectious diseases.

B) Practical:

This course is designed to reinforce the principles of examination of parasite life cycle through detection of adult worms or slides of parasite, eggs, cercaria, redia, or sections illustrating the internal structures of the parasite. Introduction to immune-diagnosis of parasites

(4) Assessment Criteria

- Periodic Exams and Quizzes: 30 %
- Assignments, and Classroom Activities: 20 %
- Final exam: 50%

(5) Course Teaching Strategies

- Lectures, laboratory work, Reports and Essay Assignments, Homework, and Web-based Assignments.

(6) Text Book

- الطبية الطفيليات في الوجيز .عبدالله أدهم. WWW.DORARLAB.ALLGOO.NET

- الطبية الطفيليات علم .د والتر .د بيك، جون .د ترجمة ديفيز، محمد خير الحلبي

- Loker, E.S. and Hofkin, B.V. (2015) parasitology. A conceptual approach. Garland science. Taylor and Franis group. New York and London. 577 pages.

(7) Reference Books

- Cox F.E.G. (2004) Modern Parasitology. Blackwell Science Publishers, Oxford.

- Smith J.D. (1994). Introduction to Animal Parasitology. Cambridge University Press, Cambridge.

- Mahlhorn H. (1988) Parasitology in Focus. Springer- Verlag, Berlin.

Course Title	Course Code	Credit Units			Year	Level	Pre-Requisite
		Theoretical	Practical	Total			
Marine Biology	353ZOO-3	2	1	3	3rd	5th	

In-class activities		Self-learning/study	
	Contact Hours		Hours
Lectures	45	HW/Assignments	25
Laboratory	30	Case studies	
Exams and quizzes	9	Study for Exam	30
Lab demo		Working on lab experiment	27
		Preparation for classes	20.76
Total	70	Total	102.76
Total Learning Hours	172.76	Equivalent **ECTS points** = (Total LH/28)	6.17

1) Course Objectives:

Marine life (marine organisms). Marine-Ecosystem. Marine Biodiversity. Economic and ecological importance of marine plants and marine animals

2) Course Contents:

Biology of marine life and organisms (Fauna, Flora, Benthos, plankton, Neikton). Taxonomy, Diversity, Anatomy, Ecology (Divisions of marine environment). Methods of conversation of aquatic organisms. Methods of aquacultures of economic species

B) Practical:

Methods of fields study. Water sampling techniques. Marine organisms (Flora and fauna), Instruments and equipments. Field marks, reserving the data. Methods of analysis of marine flora and fauna using special instruments and apparatus. Statistical analysis. Scientific references. Preparing reports

4) Assessment:

Exams: Essay/Objective, oral, class work, research work, translations

Practical: Identifying samples and slides, drawings.

Quiz 20%

Practical 30%

Final 50%

5) Teaching Methods:

Lectures, photographs, slides, multimedia, web-based learning. Samples, Light microscopes, glassware, chemicals.

6) Text Books:

علم الاحياء البحرية (الطبعة الثانية) ترجمة أ.د.عبد الكريم محمد على خفاجي (1420 هـ). جامعة الملك عبد العزيز .

7) References:

1. Biology, Campbell & Reece, 2005, Pearson Benjamin Cummings.
2. Suniech J.L., Morrissey J. (2005) Introduction to the biology of marine life, Jones and Bartlett Publishers, London.
3. Kennish M.J. (2003) Practical Hand book of marine science. CRC Press, London. Castro P., Huber M.E. (2007) Marine Biology, California State Polytechnic University,USA.

Course Title	Course Code	Number of Study Hours				Year	Level	Prerequisites
		Theo.	Tut.	Lab.	Credit			
Molecular Biology	411BIO-2	2		2	3	4	7th	211BIO-3

In-class activities		Self-learning/study	
	Contact Hours		Hours
Lectures	30	HW/Assignments	20
Laboratory	30	Case studies	
Exams and quizzes	6	Study for Exam	35.76
Lab demo		Working on lab experiment	16
		Preparation for classes	25
Total	55	Total	**96.76**
Total Learning Hours	151.76	Equivalent **ECTS points** = (Total LH/28)	5.42

(1) Brief Course Description

Molecular biology is a science that deals with the different relations between all cellular systems, especially between DNA and RNA and protein synthesis. In addition, the mechanisms regulate these processes and other biological processes.

(2) Course Objectives

This course is designed to provide students with the following concepts:

1- Study biology at the molecular level and the flow of genetic information inside the biological system
2- The course will concern the structure, expression, regulation, and manipulation of genetic materials, particularly DNA and RNA.
3- Concludes the application of the knowledge gained in this study.

(3) Course Contents

1- An introduction about DNA and RNA structures.

Definition, Nucleotide structure, Double helix, the difference between DNA and RNA

2- Chromatin and chromosomes structure:

structure of chromatin, the structure of the chromosome, the difference between chromatin and the chromosome,

3- Replication of DNA:

Events before and after the DNA replication, separation, Annealing, extension

4- Transcription and translation of genetic codes

RNA processing, the structure of the different types of RNA, Genetic code, Ribosome structure

5- Protein synthesis.

Events happen during the protein synthesis, building the polypeptide chain, the role of tRNA in protein synthesis, the role of the endoplasmic reticulum in protein synthesis.

6- Damage and repair of DNA

Major DNA repair pathways—base excision repair (BER), nucleotide excision repair (NER), mismatch repair (MMR), homologous recombination (HR) and non-homologous end-joining (NHEJ)

7- **Plasmid DNA structure and types.**

Definition of plasmids, Different types of plasmids, the function of plasmids.

8- **Mitochondrial DNA structure and functions.**

Structure and function of mitochondria, how the mtDNA is inherited, the difference between chromosomal DNA and mtDNA.

9- **DNA sequencing of genetic material.**

Definition of DNA sequence, Procedure is done for Sequencing, Data analysis.

4) Practical content:

Bio-safety of molecular biology lab., DNA-RNA electrophoresis- Mini-prep plasmid isolation from bacteria, DNA isolation from bacteriophages, PCR, Bacterial transformation, Restriction enzymes, Ligation enzymes, Identification of bacteria by 16SrRNA, Methods used to discover the mutations of the genes.

(5) Assessment Criteria

- Periodic Exams and Quizzes: 30 %
- Assignments, and Classroom Activities: 20 %
- Final exam: 50%

(6) Course Teaching Strategies

- Lectures, Reports and Essay Assignments, Homework, and Web-based Assignments.

(7) Text Book

- **-البيولوجيا الجزيئية للخلية (2013)**
- **الناشر: المكتب المصري الحديث**

(8) Reference Books

- Brock Biology of Microorganisms (global Edition) (2019). Michael T. Madigan, Kelly S. Bender, Daniel H. Buckley, Pearson, USA

-Microbiology an introduction 12th edition (2016). Gerard J. Tortora. Pearson Education. USA.

- Molecular biology (academic cell update) (2012). David clark. Academic press imprint of Elsevier

Course Title	Immunology & Serology			Course Code		354ZOO-2
Number of Study Hours				Year	Level	Prerequisites
Theo.	Tut	Lab.	Credit			
1	--	2	2	3rd	6th	--

In-class activities		Self-learning/study	
	Contact Hours		Hours
Lectures	30	HW/Assignments	16
Laboratory	30	Case studies	
Exams and quizzes	6	Study for Exam	20.76
Lab demo		Working on lab experiment	10
		Preparation for classes	15
Total	55	Total	61.76
Total Learning Hours	116.76	Equivalent **ECTS points** = (Total LH/28)	4.17

Brief Course Description		- This course includes a detailed description of the immune response made in humans to foreign antigens including microbial pathogens. - A description of cells involved in the immune response. How the immune system recognizes self from non-self? B and T cell maturation and specific responses.
Course Objectives		**This course is designed to provide students with the following concepts to:** **1-** The course will provide the student with basic comprehensive study of the immune system and immune responses to different pathogens. **2-** Be able to compare and contrast humoral versus cell-mediated immune responses **3-** Be able to compare and contrast the innate versus adaptive immunity**.** 4- understand the significance the Major Histocompatibility Complex in terms of immune response and transplantation **5-** Students will gain some laboratory skills including different immunization methods, serum and plasma preparation and detection of antigen-antibody interactions using different immunological assays**.**
Course Contents	**Theory**	1- Introduction: Overview of the Immune System, Cells and Organs of the Immune System, 2- Antigen: Antigens and Immunogens definitions, General Properties of Immunogens, Antigen classification, Epitopes, Hapten, Cross

		reaction, Antigen receptors, Clusters of Differentiation (CD), Major Histocompatibility Complex (MHC), Tolerance. 3- Antibodies: Structure of the Immunoglobulin (Ig), Antibodies Isotypes, Antigen-Antibody Interactions. 4- The Complement System: Activation of the Complement, Biological Activities of Complement. 5- Innate Immunity: Non-Specific Defense Mechanisms. 6- Cell-Mediated Immunity (CMI): Antigen-Presenting Cells (APCs), Antigen Processing and Presentation, Activation of T helper (T_H) Cells, Activation of T cytotoxic (T_C) Cells, Activation of Suppressor T Cells. 7- Antibody Production: Humoral Immune Response. 8- Immunohematology: Blood Group Antigens, Blood Group Systems, The ABO Blood Group System, Isoantibodies. 9- Hypersensitivity (Allergy): Types of Hypersensitivity, Skin Test, Desensitization. 10- Autoimmunity& Immunodeficiency: Autoimmune Diseases, Classification of Autoimmune Diseases, Classification of Immunodeficiencies.
	Practical	This course is designed to reinforce the principles of: Organs and cells of the immune system (the dissection of experimental animals to clarify organs of the immune system) , Blood smears to study white blood cells under microscope, Immuno-precipitation and Agglutination assays, phagocytosis, Blood Typing and Crossmatching, Rhesus factor, Serum protein electrophoresis, ELISA, Immunodiffusion (Ouchterlony test),Skin allergy test, flowcytometry.

Assessment Criteria	**Periodic Exams and Quizzes**	**Assignments, and Classroom Activities**	**Final Exam**
	30%	**20%**	**50%**

Course Teaching Strategies	Interactive lectures, Classroom discussions, Tutorials, Individual assignments, Group discussion, Lab-work, Self-learning activities, E-Videos, Field trips, Micro-Project, Presentation (individual and teamwork).
Text Book	• D. M. Weir, John Stewart (1997) Immunology. Churchill Livingstone; (Translation in Arabic Dr. Maher Al Bassiouni Hussein. Publisher: king Saud University-Riyadh (2004) • Peter J. Delves, Seamus J. Martin, Dennis R. Burton, Ivan M. (2017) Roitt's Essential Immunology, 13th Edition. • Electronic Materials, Web Sites etc.: http://www.roitt.com/default.asp
Reference Books	• Helen Chapel, Mansel Haeney, Siraj Misbah, Neil Snowden (2014) Essentials of Clinical Immunology, Includes Wiley E-Text, 6th Edition

	• Richard Coico, Geoffrey Sunshine (2015) Immunology: A Short Course, 7th Edition • William E. Pual (2013) Fundamental Immunology, 7th Edition. • Howard G.C., Bethel D.R (2002) Basic methods in Antibody production and characterization. CRC Press, London. • Weir, D. M. (1977): Immunology. An Outline for Students of Medicine and Biology. 4th edition. Churchill Livingstone, Edinburgh, U.K.

Course Title	General Entomology			Course Code		356ZOO-3
Number of Study Hours				Year	Level	Prerequisites
Theo.	Tut	Lab.	Credit			
2	--	2	3	3rd	6th	251ZOO-3

In-class activities		Self-learning/study	
	Contact Hours		Hours
Lectures	45	HW/Assignments	20
Laboratory	30	Case studies	
Exams and quizzes	9	Study for Exam	30
Lab demo		Working on lab experiment	23
		Preparation for classes	20.8
Total	**70**	Total	**93.8**
Total Learning Hours	**163.8**	Equivalent **ECTS points** = (Total LH/28)	**5.85**

Brief Course Description	- The General entomology course deals with the description Basic and applied information of entomology for undergraduate students with emphasis on: The external and internal essential characteristics of insects, Metamorphosis and insect classification. - This course describes some of the special topics in entomology like, Ecdysis, external and internal anatomy, Exopterygota, Parthenogenesis, Ovoviviparity and endopterygota.	
Course Objectives	**This course is designed to provide students with the following concepts to:** 1. emphasize the Basic and applied information of entomology for undergraduate students. 2. examine the external and internal essential characteristics of insects. 3. study the Metamorphosis, and its role in insects classification. 4. understand the concept of parthenogensis reproduction and oviparity. 5. study the modification in digestive system and structure of circulatory system.	
ourse Contents	**Theory**	1- Introduction to Entomology. General characters of insects: 2- The insect importance and classification

		3- Insect morphology: [insect head and antennae - mouthparts - eyes - major wing and leg types - study of abdomen appendages] 4- Anatomy and internal structure: Digestive and Excretory Systems - Respiratory System-Circulatory System, Nervous System - Reproductive System. 5- The body wall - (integument): steps of moulting, layers of body wall. 6- Metamorphosis: Insect Metamorphosis - Types larvae and pupae. 7- Taxonomy - Basics of insect taxonomy – subclass apterygota - Subclass pterygota.
	Practical	This course is designed to reinforce the principles of: This course is designed to reinforce the principles of insect's classification and collection. It includes; types of nets و types of traps, different ways to preserve and store insects for a long period of time, Appendages of the head, Structure of antenna, Types of mouth parts, Types of Legs, Abdominal appendages, Types of metamorphoses and insects taxonomy.

Assessment Criteria	**Periodic Exams and Quizzes**	**Assignments, and Classroom Activities**	**Final Exam**
	30%	**20%**	**50%**
Course Teaching Strategies	Interactive lectures, Classroom discussions, Tutorials, Individual assignments, Group discussion, Lab-work, Self-learning activities, E-Videos, Field trips, Micro-Project, Presentation (individual and teamwork).		
Text Book	• General entomology (2011). Roqaya bint Mohammed Awad Al-Mahmadi. Sci Publication Center, King Abdulaziz University. (In Arabic).		
Reference Books	• Cedric Gillott (2015) Entomology (3rd.) Pub. Springer, the Netherlands. • INTRODUCTION TO APPLIED entomology (2016) "by Rick Weinzierl. University of Illinois. USA.		

Course Title	**Industrial Microbiology**			**Course Code**		**431MIC-2**
Number of Study Hours				**Year**	**Level**	**Prerequisites**
Theo.	**Tut**	**Lab.**	**Credit**			
1	**--**	**2**	**2**	**4th**	**7th**	**334MIC-3**

In-class activities		**Self-learning/study**	
	Contact Hours		**Hours**
Lectures	30	HW/Assignments	15
Laboratory	30	Case studies	
Exams and quizzes	6	Study for Exam	20.96
Lab demo		Working on lab experiment	10
		Preparation for classes	20

Total	55	Total	**65.96**
Total Learning Hours	120.96	Equivalent **ECTS points** = (Total LH/28)	4.32

Brief Course Description	Industrial microbiology involves the utilization of microorganisms in the production of a wide range of products, including enzymes, foods, beverages, chemical feedstocks, fuels and pharmaceuticals, and clean technologies employed for waste treatment and pollution control	
Course Objectives	**This course is designed to provide students with the following concepts to:** 1. give the students broad theoretical and practical skills in industrial microbiology. 2. This course covers the principles of various processes associated with the production and recovery of different bio-products derived from microorganisms. 3. discuss the role of microorganisms in industry. 4. carry out experiments to produce microbial metabolites.	
Course Contents	**Theory**	**1)** Introduction: Industrial Microbiology, Fields of application. Why are microorganisms used in industry? Groups of microorganisms used in industry. The principles adopted in the selection of microbial strains in the industry. The economic and scientific importance of microbiology. Types of microbial products. **2)** Fermentor: Agricultural medium. Ventilation. Temperature, pH and foam control in fermenter. Physical and chemical methods of controlling (control) microbes. **3)** Production of antibiotics: Natural sources of antibiotics. Mechanism of action of antibiotics. Types of antibiotics. Biosynthesis of antibiotics. Penicillin production. **4)** Baker's yeast production: Principal Factors in Commercial Yeast Production. Bread yeast production requirements. Yeast production stages. **5)** Role of microbes in the production of enzymes: The importance of enzymes. Production of amylase enzyme. Control the amount of enzyme produced **6)** Yogurt production: Yogurt production stages. Microorganisms used in the dairy industry (Starters). Reasons for the failure of the yogurt industry. Good Yogurt Qualities. Disadvantages of yogurt. Importance of yogurt. **7)** **Probiotics:** Definition of probiotics. Examples of probiotics. Characteristics of the organisms used as a probiotic.Lactic acid fermentation. Lactobacillus activities. Citric acid production. Vitamins production. Bacteriocins. **8)** **Synthesis of amino acids**: Glutamic acid.

		9) **Biogas Production:** The importance of biogas. Biogas production systems. Biogas production unit. Biogas-producing fermentation reactions. Factors affecting biogas production. 10) **Mushroom cultivation:** Mushroom life cycle, growing environments and containers. Spawn production. Tissue culture. The importance and objectives of mushroom cultivation. Method of cultivation and **P**roduction. preservation and storing the product. 11) **Biofertilizers:** Types of biofertilizers. Nitrogen fixers. Phosphate Mobilizers. Potassium Mobilizers. Iron Mobilizers. Biofertilizer to get rid of some soil pollutants. 12) **Microorganisms and food spoilage:** Food Spoilage. Hazard analysis critical control point. sources of danger. Canned food spoilage. Food poisoning. Food poisoning prevention.
	Practical	This course is designed to reinforce the principles of: isolation and This course is designed to reinforce the principles of Aerobic and anaerobic Fermentation technology and fermentors.

Assessment Criteria	**Periodic Exams and Quizzes**	**Assignments, and Classroom Activities**	**Final Exam**
	30%	**20%**	**50%**

Course Teaching Strategies	Interactive lectures, Classroom discussions, Tutorials, Individual assignments, Group discussion, Lab-work, Self-learning activities, E-Videos, Field trips, Micro-Project, Presentation (individual and teamwork).
Text Book	(In Arabic) • Abdelwhab and others (1996) Applied Microbiology. • Japer zaied and others (2011) Basics of industrial microbiology. (In English). • Glazer A.N., Nikaido H. (2010) Microbial Biotechnology - Fundamentals of Applied Microbiology, Cambridge University Press, Cambridge.
Reference Books	• Nair A.J. (2008) Introduction to Biotechnology and Genetic Engineering (CD-ROM). Infinity Science Press, USA.

Course Title	**Medical Microbiology**			**Course Code**		**433MIC-2**
Number of Study Hours				**Year**	**Level**	**Prerequisites**
Theo.	**Tut**	**Lab.**	**Credit**			
1	**--**	**2**	**2**	**4th**	**7th**	**334MIC-3**

In-class activities		**Self-learning/study**	
	Contact Hours		**Hours**
Lectures	30	HW/Assignments	10
Laboratory	30	Case studies	

Exams and quizzes	6	Study for Exam	22.84
Lab demo		Working on lab experiment	10
		Preparation for classes	15
Total	55	Total	**57.84**
Total Learning Hours	112.84	Equivalent **ECTS points** = (Total LH/28)	4.03

Brief Course Description	• The Medical Microbiology course deals with the different types of host parasite relationship. • This course describes medically important bacteria and fungi, which disease, they cause, and how we treat infection.		
Course Objectives	**This course is designed to provide students with the following concepts to:** 1. understand Host - parasite relationship, Pathogenesis and Host defense. 2. study medically important bacteria and fungi (characteristics, diseases, diagnosis and treatment). 3. emphasize the relationship between Microbial flora and health and disease; General mechanisms of bacterial, viral and fungal pathogenesis; bacterial, chlamydial, rickettsial, and fungal infections that affect the major organ systems. 4. understand Antimicrobials and Chemotherapy.		
Course Contents	**Theory**	1- Antibiotics and Chemotherapy: Antibiotics, Chemotherapy, Bactericidal, bacteriostatic, Drug resistance. Working of antibiotics. 2- Host parasite relationship: Basic terminology of infection, Specific and non-specific immunity, clinical disease, defence against infection, normal flora, overview of infection, Endo and exotoxin. 3- Gram Positive bacteria: Characteristics, antigenic structure, pathogenicity and diagnosis. 4- Gram Negative bacteria: Characteristics, antigenic structure, pathogenicity and diagnosis. 5- Mycosis and mycotoxicosis: Basic terminology of infection, Candidiasis. 6- Dermatophytosis: Basic terminology and examples. 7- Otomycosis and Penicillinosis: Epidemiology, clinical types and characteristics of otomycosis and penicillinosis.	
	Practical	This course is designed to reinforce the principles of disease. Microbial isolation, transfer and identification. Isolation and identification of Gram +ve and Gram -ve pathogenic bacteria as well as some pathogenic fungi.	
Assessment Criteria	**Periodic Exams and Quizzes**	**Assignments, and Classroom Activities**	**Final Exam**
	30%	**20%**	**50%**
Course Teaching Strategies	Interactive lectures, Classroom discussions, Tutorials, Individual assignments, Group discussion, Lab-work, Self-learning activities, E-Videos, Field trips, Micro-Project, Presentation (individual and teamwork).		

Text Book	• Kayser et al (2005) Medical Microbiology, Published by Thiem Stuttgart, New York, USA.. (In English).
Reference Books	• Volk W.A.(1994) Essentials of Medical Microbiology. Lippincott Company, Philadelphia. • Mims et al. (1993) Medical Microbiology. Mosby-Year Book, London. • Greenwood et al. (1992). Medical Microbiology. Churchill Livingstone, Edinburgh.

Course Title	Course Code	Number of Study Hours					Year	Level	Pre-requisites
		Theo.	Tut.	Lab.	Credit	ECTS			
Graduation Project	491 BIO-4	1	-	3	4	8.5	4	7	Department Approval

Student's workload

In-class activities	Contact Hours	Self-learning/study	Hours
Lectures (Fundmental of Scientific Resesrch & Orientation and Discussion with the supervisor	**10**	Studying of class lectures	**30**
Laboratory	**75**	Working on data and analysis	**45**
Exams and quizzes	**3**	Preparation for Quizez and Exams	**20**
Lab demo	**12**	Writing of the project report	**40**
Presentation & Discussion	**5**	Preparation for final presentation	**15**
Total	**88**	Total	**150**
Total Learning Hours = **238**		Equivalent **ECTS points** = Total LH/28 = **8.5**	

Brief Course Description	• The Graduation Project course was designed to assist the students in understanding the basic principles of writing scientific research, and supported with practical work in the department laboratories and fields, allowing the students to practice the real experience of writing scientific research, in different designs and styles.

	• This course was designed to provide students with hands-on experience in conducting independent research in the field of biology. It offers an opportunity to explore and contribute to ongoing scientific inquiries. Students will work closely with a faculty mentor to define a research question, design experiments, collect and analyze data, and communicate their findings. The course emphasizes critical thinking, problem-solving, and the development of research skills.
Course Objectives	• **Research Skills Development:** Develop students' foundational research skills, including the ability to design experiments, gather and analyze data, and interpret results. • **Scientific Inquiry:** Encourage students to explore scientific questions and hypotheses in the field of biology and develop their ability to think critically and scientifically. • **Experimental Design:** Teach students how to design well-structured experiments, select appropriate methods, and plan data collection strategies. • **Data Collection and Analysis:** Enable students to collect biological data using laboratory or field techniques and apply basic statistical analysis to draw meaningful conclusions. • **Scientific Communication:** Improve students' communication skills by requiring them to write research reports, give oral presentations, and potentially create research posters. • **Ethical Considerations:** Introduce students to ethical principles and considerations in biological research, emphasizing the responsible conduct of research. • **Independence and Collaboration:** Foster students' ability to work independently on research projects while also collaborating effectively with mentors or peers. • **Problem-Solving:** Enhance students' problem-solving abilities by challenging them with real research problems and helping them develop innovative solutions. • **Scientific Literature:** Familiarize students with the scientific literature in biology, teaching them how to search for, read, and cite relevant research articles.
Course Contents	• Introduction (what is a research project), area of study, research project structure, • Determine the project's title according to the student's area of interest. • Types of scientific research, The goal of research and scientific publishing • The main steps in preparing a research paper for publication • How do you produce research papers? • Ethics and values of scientific research, Citation (Plagiarism) • Religious perspective on the ethics of scientific research, Mechanisms for controlling the ethics of scientific research • Writing an essay, Revision of the project (research) • Submit the research to the Scientific Research Committee • Public discussion of the research

Assessment Criteria	Mid Term Exam and Quizzes (Fundamentals of Scientific Research): 25 % - Supervisor evaluation of students: 25 % - Referees evaluation for the writing project: 25 % - Referees evaluation for the presentation of the project: 25 %
Course Teaching Strategies	- Lectures, Presentations, Reports and Essay Assignments, Homework, and Web-based Assignments.
Text Book	• Dawah H. A., 2015(1436H), A comprehensive guide to writing and defending scientific projects, Jazan University Department of Scientific Publishing and Printing Press, Indexing of King Fahd National Library during publication.
Reference Books	• Abu Soliman, A.,I.,(1423): Writing the Scientific Research.El- Roushed .press.KSA. • Chris A. Mack (2018), How to Write a Good Scientific Paper. SPIE Press, Washington, USA.

Course Title	**Biodiversity**			**Course Code**		**402BIO-2**
Number of Study Hours				**Year**	**Level**	**Prerequisites**
Theo.	**Tut**	**Lab.**	**Credit**			
1	**--**	**2**	**2**	**4th**	**8th**	**301BIO-2**

In-class activities		**Self-learning/study**	
	Contact Hours		**Hours**
Lectures	30	HW/Assignments	20
Laboratory	30	Case studies	
Exams and quizzes	6	Study for Exam	20
Lab demo		Working on lab experiment	10
		Preparation for classes	14
Total	**55**	Total	**64**
Total Learning Hours	119	Equivalent **ECTS points** = (Total LH/28)	4.25

Brief Course Description	- The biodiversity course deals with the description Study of the diversity of living organisms on the planet, which is the number of species and individuals that live in a specific ecological area. - The biodiversity course deals with the description Study of the natural vegetation of different habitats of Saudi Arabia - The biodiversity course deals with the description Study of the fauna habitats of Saudi Arabia
Course Objectives	**This course is designed to provide students with the following concepts to:** 1- To study the biodiversity of the kingdom and its importance 2- Getting to know the different environments in the Kingdom. 3- Identifying animal species (invertebrates and vertebrates) in the Kingdom, their distribution and abundance, and their most important characteristics.

	4- To Study of the natural vegetation of different habitats of Saudi Arabia	
Course Contents	**Theory**	1- Introduction: Introduction to the biodiversity, the importance of biodiversity, the benefits of biodiversity, 2- Elements of biodiversity (Genetic diversity, Species diversity, Ecosystems diversity) 3- Factors affecting biodiversity: - Abiotic factors: as (Temperatures, Humidity, the light, wind, Space. Time and Pollution) - Biotic factors: as (Predation-migration, - Extinction, - Competition 4- Examples of some important habitat in the Kingdom: Coral Reef, Coral forms (Fringing Reef, Barrier Reef, Atolls, Patch Reef) Coral bleaching phenomenon, Human effect on coral. 5- International and local efforts to protect biodiversity: Red List of Threatened Species ((IUCN), terminology of the Red List of Threatened Species., Conservation of biodiversity, Natural Reserves, Wildlife Reserves, Marine reserves. 6- The Fauna in Saudi Arabia: represented by: - Chondrichthyes (Cartilaginous Fishes) (General characters, ecology, distribution examples) - Osteichthyes ،Teleostomi ،or Bony Fishes)(General characters, ecology, distribution. examples) - Amphibians (General characters, ecology, distribution. examples) - Reptiles (General characters, ecology, distribution. examples) - Aves (General characters, ecology, distribution. examples) - Mammals (General characters, ecology, distribution. examples) 7- The Flora in Saudi Arabia - Geographical regions of Saudi Arabia and protected areas in KSA -Vegetation and plant communities in Jazan -Communities of coastal line and sabakhas - Communities of Tehama coastal plain - Communities of Tehama hill slopes & mountains - Wades and Cultivated flora of Jazan
	Practical	This course is designed to reinforce the principles of: This course is designed to study biodiversity flora and fauna of Saudi Arabia. - Scientific trips to learn about the local plant and animal environments, along with collecting samples of those animals and plants. Definition of specimens and methods of preserving them. - Identifying the environmental geographical division of the Kingdom of Saudi Arabia - Identifying vertebrate and invertebrate animals, their locations and their adaptation to the surrounding environment

		- The study of flora in the Arab Kingdom, Study of the plant geography of the vegetation of the Kingdom of Saudi Arabia
Assessment Criteria	**Periodic Exams and Quizzes**	**Assignments, and Classroom Activities**	**Final Exam**
	30%	**20%**	**50%**
Course Teaching Strategies	Interactive lectures, Classroom discussions, Tutorials, Individual assignments, Group discussion, Lab-work, Self-learning activities, E-Videos, Field trips, Micro-Project, Presentation (individual and teamwork).		
Text Book	• مسرحي، يحيى سليمان (2011) الدليل المصور للنباتات البرية في منطقة جازان • حجي، عدنان محمد (1996) . مقدمة لفونة المملكة العربية السعودية		
Reference Books	• Collette S. (2000) Wild Flora of Saudi Arabia. Saudi Arabian National Authority for Wildlife Protection, Riyadh. • Wilhelm Büttiker, Friedhelm Krupp, Iyad Nader, Wolfgang Schneider. Fauna of Arabia. Vol. (1- 25). Basel. http://www.saudiwildlife.com/site/home/index , https://www.iucnredlist.org/		

Course Title	**Biotechnology**			**Course Code**		**412BIO-2**
Number of Study Hours				**Year**	**Level**	**Prerequisites**
Theo.	**Tut**	**Lab.**	**Credit**			
1	**--**	**2**	**2**	**4th**	**8th**	**411BIO-2**

In-class activities		**Self-learning/study**	
	Contact Hours		**Hours**
Lectures	30	HW/Assignments	20
Laboratory	30	Case studies	
Exams and quizzes	6	Study for Exam	21.84
Lab demo		Working on lab experiment	10
		Preparation for classes	20
Total	**55**	Total	**71.84**
Total Learning Hours	**126.84**	Equivalent **ECTS points** = (Total LH/28)	4.53

Brief Course Description	Biotechnology course deals with various fundamental techniques for the handling manipulating DNA in the different organisms. It Study of the applications of biotechnology in the different fields.
Course Objectives	**This course is designed to provide students with the following concepts to:** 1. understand the basic structure of DNA and RNA. 2. study the role of microorganisms in traditional and modern biotechnology. 3. study tools and techniques used in biotechnology. 4. understand the application of biotechnology in the field of agriculture and bioremediation.

	5. study the application of biotechnology in health care and forensic medicine. 6. understand the bioethics related to biotechnology.	
Course Contents	**Theory**	1. Structure of DNA and RNA. 2. Microbes in biotechnology. 3. Human Genome Project, Proteomes and Bioinformatics. 4. Tools of Biotechnology. 5. Traditional biotechnology and fermentation. 6. Farm Products 7. Pharmaceutical Products 8. Gene Therapy. 9. Forensics 10. Bioremediation 11. Food technology. 12. Bioethics
	Practical	This course is designed to reinforce the principles of: This course is designed to reinforce the techniques for isolating genes and the subsequent engineering of these genes are discussed with an emphasis on the way engineered genes may be used to create transgenic, microbes, animals and plants or to produce recombinant proteins in cell factories.

Assessment Criteria	**Periodic Exams and Quizzes**	**Assignments, and Classroom Activities**	**Final Exam**
	30%	**20%**	**50%**

Course Teaching Strategies	Interactive lectures, Classroom discussions, Tutorials, Individual assignments, Group discussion, Lab-work, Self-learning activities, E-Videos, Field trips, Micro-Project, Presentation (individual and teamwork).
Text Book	• Rulf D. Schmid. Guid to biotechnology and genetic engineering, 2003 (In Ara • Abd-Elmenim Al-Alaeser. Introduction of Biotechnology, 2013 (In Arabic).
Reference Books	• Glazer A.N., Nikaido H. (2010) Microbial Biotechnology - Fundamentals of Applied Microbiology, Cambridge University Press, Cambridge. • Sambrook, R.W. Russell (2008) Molecular Cloning. Laboratory Manual. Cold Spring Harbour Laboratory Press. • W. J. Thieman and M. A. 2010. Palladino, Introduction to Biotechnology. United States of America: Pearson Benjamin Cummings.

Course Title	Environmental Microbiology			Course Code		432MIC-2
Number of Study Hours				Year	Level	Prerequisites
Theo.	Tut	Lab.	Credit			
1	--	2	2	4th	8th	334MIC-3

In-class activities		Self-learning/study	
	Contact Hours		Hours
Lectures	30	HW/Assignments	15
Laboratory	30	Case studies	
Exams and quizzes	6	Study for Exam	20.92
Lab demo		Working on lab experiment	10
		Preparation for classes	15
Total	55	Total	**60.92**
Total Learning Hours	115.92	Equivalent **ECTS points** = (Total LH/28)	4.14

Brief Course Description

- The environmental microbiology course deals with illustrating the roles and interactions of microorganisms in their natural environments
- This course focuses on topics such as microbial roles in biogeochemical cycles, usage of microbes as biological indicators, as well as usage of microbes to solve environmental problems such as pollutions.

Course Objectives

This course is designed to provide students with the following concepts to:

1. Understand roles of microbes in air environments and what factors effect on them.
2. Study roles of microbes in natural water environments, their interactions and what factors impact on them.
3. Understand roles of microbes in the purifications of drinking water.
4. Study usage of microbes as biological indicators when testing the safety of drinking water.
5. Understand roles of microbes in the waste water treatment facilities.
6. Study roles of microbes in the biogeochemical cycles in terrestrial ecosystems.
7. Study the usage of microbes in the field of applied environmental microbiology.

Course Contents

Theory

1. Introduction: introduction to science of environmental microbiology and its branches.
2. Air microbiology: components of air gases, microbes in the air, spread of diseases, factors controlling air microorganisms.
3. Natural water microbiology: classification of aquatic environments, factors influencing microbes in these environments.
4. Drinking water microbiology: water purification, bioindicators, chemical analysis of water. Bacteriological analysis of water, differentiation between members of coliform bacteria, membrane

		filter technique, endo-agar technique, coli titre test, contamination of swimming pools 5. Waste water microbiology: types of wastes, sewage treatment steps, and roles of microbes in these steps. 6. Terrestrial microbiology: soil as an environment, soil structure, microbial communities of soil, bacteria, actinomycetes, fungi, algae, protozoa, rhizosphere. 7. Carbon cycle: role of soil microorganisms in biogeochemical cycle of carbon. 8. Nitrogen cycle: role of soil microorganisms in biogeochemical cycle of nitrogen. 9. Phosphorus cycle: role of soil microorganisms in biogeochemical cycle of phosphorus. 10. Sulfur cycle: role of soil microorganisms in biogeochemical cycle of sulfur. 11. Applied environmental microbiology: role of soil microorganisms in pesticides biodegradation, soil microorganisms as biofertilizers, biogas production.
	Practical	This course is designed to reinforce the principles of: isolation and purification of microbes from different air and water environments, practicing on multiple laboratory instruments used for microbial analysis and detections, practical experiments on microbial interactions in different ecosystems, practical tests on multiple microbial activities found in the environments, and practicing the preparation of different microbial growth media used in the field of environmental microbiology.

Assessment Criteria	**Periodic Exams and Quizzes**	**Assignments, and Classroom Activities**	**Final Exam**
	30%	**20%**	**50%**

Course Teaching Strategies	Interactive lectures, Classroom discussions, Tutorials, Individual assignments, Group discussion, Lab-work, Self-learning activities, E-Videos, Field trips, Micro-Project, Presentation (individual and teamwork).
Text Book	• The Applied Microbiology, by Abdul-Wahab Abdul-Hafez and Muhammed Mubarak, 1996 (In Arabic).
Reference Books	• Environmental Microbiology, Academic Press, by Pepper I. L., C. P. Gerba, T. Gentry, and Raina Maier (In English). • The principles of agricultural microbiology, by Rashed Zaghlol and Hamed Abu-Ali, 2019 (In Arabic) • Terrestrial microbiology, by Salah Taha and Sa'ad Mahmud, 1960 (In Arabic).

Course Title	Economic Botany			Course Code		442BOT-2
Number of Study Hours				Year	Level	Prerequisites
Theo.	Tut	Lab.	Credit			
1	--	2	2	4th	8th	

In-class activities	Contact Hours	Self-learning/study	Hours
Lectures	30	HW/Assignments	20
Laboratory	30	Case studies	
Exams and quizzes	6	Study for Exam	20.92
Lab demo		Working on lab experiment	10
		Preparation for classes	17
Total	55	Total	67.92
Total Learning Hours	122.92	Equivalent **ECTS points** = (Total LH/28)	4.39

Brief Course Description	This course studies verities of plants that are grown by humanity and economically used for food, tools and all civilization purposes through history of humanity and in the presence	
Course Objectives	**This course is designed to provide students with the following concepts to:** This course aims at giving the student knowledge in the fields: - Groups of economic plants. - Food and fodder - Oil and Fiber. - Aromatic and Medicinal Plants - Volatile oils and their uses. - Processes of the manufacture of sugar and vinegar. - Role plants as basis of industrialization in developing countries. - Role plants as basis of industrialization in local community.	
Course Contents	**Theory**	Groups of Economic Plants – Fiber Plants (Anatomy of Fibers, Types of Fibers, Cotton, Flax, Wood Industry, Paper Industry, Synthetic Fibers, Nitrocellulose) – Oil Plants (Oil Storage in Plants, Oils, Waxes, Saponification, Rancidity, Soap Industry, Margarine Industry) – Aromatic Plants (Volatile Oils, Perfume Industry) – Medicinal Plants (Medicines from Roots, Stems, Leaves, Flowers, Fruits, Seeds, Folk Medicine) - Sugar Plants (Sugars, Sugarcane, Beetroot, Sugar Industry, Starch Industry) – Fermentation (Alcohol fermentation, Lactic Acid Fermentation, Alcohol Industry, Dairy Industry, Vinegar Industry) – Hormones, Steroides, and Antibiotics)
	Practical	This course is designed to get the students knows the economic plants and write topics and give presentations regarding these plants. Also, students might be obligated to collect these plants to have them interact with the subject.
Assessment Criteria	**Periodic Exams and Quizzes**	**Assignments, and Classroom Activities** / **Final Exam**

	30%	20%	50%
Course Teaching Strategies	Interactive lectures, Classroom discussions, Tutorials, Individual assignments, Group discussion, Lab-work, Self-learning activities, E-Videos, Field trips, Micro-Project, Presentation (individual and teamwork).		
Text Book	- Simpson B., Ogorzaly M. (2006) Economic Botany. John Wile, New York.		
Reference Books	حسانين (2003) النبات الاقتصادي..المكتبة الاكاديمية..القاهره		

Course Title	**Embryology**			**Course Code**		**452ZOO-2**
Number of Study Hours				**Year**	**Level**	**Prerequisites**
Theo.	**Tut**	**Lab.**	**Credit**			
1	**--**	**2**	**2**	**4th**	**8th**	

In-class activities		**Self-learning/study**	
	Contact Hours		**Hours**
Lectures	30	HW/Assignments	12
Laboratory	30	Case studies	
Exams and quizzes	6	Study for Exam	20.84
Lab demo		Working on lab experiment	10
		Preparation for classes	15
Total	**55**	Total	**57.84**
Total Learning Hours	**112.84**	Equivalent **ECTS points** = (Total LH/28)	4.03

Brief Course Description		➢ The embryology course deals with the description of early developmental stages of the embryos of some vertebrate animals also human embryo. ➢ This course describes some of the special topics in embryology like, parthenogenesis, congenital anomalies, stem cells and artificial fertilization.
Course Objectives		**This course is designed to provide students with the following concepts to:** 1- Emphasize the human developmental stages and the differences between it and different examples of different vertebrate phyla. **2-** Examine abnormal development and teratological defects of developing embryos. 3- Study the stem cells, different types, and its role in regenerative medicine. 4- Understand the concept of parthenogensis reproduction and artificial parthenogensis. 5- Study the types of artificial insemination, collection of sperms and eggs, artificial insemination. Also *in vitro* fertilization (ICSI) in humans and test tube babies.
Course Contents	**Theory**	1- Introduction: Embryology in Quran and Sunnah, Historical Introduction to Embryology, different historical development theories, different branches of embryology, somatic cells, germ cells and stem cells. 2- Reproduction: Development, cell differentiation, stem cells. 3- Gametogenesis: Primordial germ cells, sexual differentiation, testis development, ovary development, Spermatogenesis, spermiogenesis, sperm

<table>
<tr><td rowspan="2"></td><td></td><td>structure, cell culture of spermatogenic cells, oogenesis, ovum structure, classification of ova, egg membranes, ovum culture.
4- Fertilization: Membrane structure and chemical reaction, molecular aspects and the role of acrosome, the role of cortical granules, biochemical changes.
5- Cleavage& Gastrulation: types of cleavage, blastulation, , fate maps.
6- Development of some vertebrate examples: amphioxus, fishes, amphibian, reptilia, birds and human. Early embryonic development, development of some system organs, extra-embryonic membranes, metamorphosis, development of some sense organs, placenta of human and twins.
7-Parthenogenesis & Artificial insemination: types of parthenogenesis, mechanisms, Sperm collection, Preservation of semen, Collection of ova, Preservation of ova, artificial animal fertilization, and artificial human fertilization.
8- Congenital malformation: causes, types, examples, mechanisms.</td></tr>
<tr><td>Practical</td><td>This course is designed to reinforce the principles of early embryonic development of some vertebrate animals. It includes; male reproductive system in vertebrate animals, spermatogenesis, female reproductive system in vertebrate animals, oogenesis, early embryonic development of amphioxus, early embryonic development of amphibian, early embryonic development of birds</td></tr>
<tr><td rowspan="2">Assessment Criteria</td><td>Periodic Exams and Quizzes</td><td>Assignments, and Classroom Activities</td><td>Final Exam</td></tr>
<tr><td>30%</td><td>20%</td><td>50%</td></tr>
<tr><td>Course Teaching Strategies</td><td colspan="3">Interactive lectures, Classroom discussions, Tutorials, Individual assignments, Group discussion, Lab-work, Self-learning activities, E-Videos, Field trips, Micro-Project, Presentation (individual and teamwork).</td></tr>
<tr><td>Text Book</td><td colspan="3">• Introduction to descriptive and experimental embryology, by saleh abdelaziz koraim 1990. (In Arabic).</td></tr>
<tr><td>Reference Books</td><td colspan="3">• Experimental Embryology: by Ahmad Rashed Al Himaidi and Saleh Abdulaziz Karim / King Saud University Press, 2008.(in Arabic)
• Developmental Biology "by Scott F. Gilbert 2003 7th ed .Sinauer Association Inc. Sunderland Massachusetts's.
• Hickman C.P., Roberts L.S, Larson A., I'Anson H., Eisenhour D.J. (2006) Integrated Principles of Zoology. McGraw-Hill Higher, New York.</td></tr>
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Course Title	Animal Ecology & Behavior			Course Code		454ZOO-2
Number of Study Hours				Year	Level	Prerequisites
Theo.	Tut	Lab.	Credit			
1	-	2	2	4th	8th	

In-class activities		Self-learning/study	
	Contact Hours		Hours
Lectures	30	HW/Assignments	20
Laboratory	30	Case studies	
Exams and quizzes	6	Study for Exam	20.92
Lab demo		Working on lab experiment	12
		Preparation for classes	15
Total	55	Total	67.92
Total Learning Hours	122.92	Equivalent **ECTS points** = (Total LH/28)	4.39

Brief Course Description	• The universal and local habitats and adaptability of animals to habitats. • Importance and need for conservation and protection of wild life. • Animal behavior under natural or laboratory conditions in three different lines of scientific thought: the psychological, the physiological and the zoological.	
Course Objectives	**This course is designed to provide students with the following concepts to:** The universal and local habitats and adaptability of animals to habitats. Importance and need for conservation and protection of wild life. Animal behavior under natural or laboratory conditions in three different lines of scientific thought: the psychological, the physiological and the zoological.	
Course Contents	**Theory**	Geographical distribution of animals according to habitats and trophic levels. Effect of biotic and abiotic components of ecosystems on animals. Structure and type of populations and communities and seasonal and random changes (Growth, migration, aestivation, hibernation, distribution, diversity, dominancy). Introduction to the fauna of Saudi Arabia and its conservation, protection and development. Introduction, coordination and animals phenomenon, nervous system and behavior, hormones and behavior, sexual behavior, reproductive – parental care (epigenetic), aggression, social behavior, animal language, orientation and migration, ritualization communication
	Practical	Local habitats and the adaptability of animals to habitats. Animal behavior under natural or laboratory conditions

Assessment Criteria	Periodic Exams and Quizzes	Assignments, and Classroom Activities	Final Exam
	30%	20%	50%

Course Teaching Strategies	Interactive lectures, Classroom discussions, Tutorials, Individual assignments, Group discussion, Lab-work, Self-learning activities, E-Videos, Field trips, Micro-Project, Presentation (individual and teamwork).
Text Book	•
Reference Books	- Festa-bianchat, M., Apollonia M. (2003) Animal behavior and wild life conversation. Island Press, Washington D.C. - Pringle, I.P. (1986) The Secret World of Animals (National Geographic). - Smith, R.L. (1996) Ecology and Field Biology. - Ridley, M. (1995). Animal Behavior. Blackwell Scientific Publications, Oxford.

Course Title	**Medical and Economic Entomology**			**Course Code**		**456ZOO-3**
Number of Study Hours				**Year**	**Level**	**Prerequisites**
Theo.	**Tut**	**Lab.**	**Credit**			
2	**--**	**2**	**3**	**4th**	**8th**	**356ZOO-3**

In-class activities		**Self-learning/study**	
	Contact Hours		**Hours**
Lectures	45	HW/Assignments	20
Laboratory	30	Case studies	
Exams and quizzes	9	Study for Exam	30.92
Lab demo		Working on lab experiment	24
		Preparation for classes	20
Total	**70**	Total	**94.92**
Total Learning Hours	164.92	Equivalent **ECTS points** = (Total LH/28)	5.89

Brief Course Description	• The course provides basic information on insects of medical and economic importance in the local environment and the impact of insect pests on various agricultural production systems and public health. • The course provides methods of pest control. Beneficial insects and making use of them.
Course Objectives	**This course is designed to provide students with the following concepts to:** 1. Identify pests by their general morphology, biology, ecology and geographical distribution. 2. Understand vector - host - pathogen relationships in insects-borne diseases 3. Describe the life cycles of medical and economic important insect groups. 4. Understand the principles of insect pest management. 5. Identify beneficial insects and making use of them.

<table>
<tr><td rowspan="2">Course Contents</td><td>Theory</td><td>1- Definition of medical insect, The relationship between the vector and pathogen, Types of pathogen transmission, Classification medical insects.
2- Order Diptera: General characters, Suborder Nematocera, Family Culicidae, External morphology and types of mosquitoes, Medical importance (malaria, yellow fever, dengue fever, rift valley fever, elephantiasis, life cycle and control of mosquitoes, plasmodium malaria cycle. Study of models of flies species and myiasis.
3- General characters, life cycle, Medical importance and control of Orders: Blattaria, Phthiraptera, Hemiptera, Siphonaptera.
4- Agriculture pests: Study of models of species in the local environment in terms of life cycle, harmful phases and damage to plants, stored materials and the most important ways to control them.
5- Beneficial insects: Such as Honey bee, Silk worm, Predators.
6- Natural enemies of insect and types of pest control.</td></tr>
<tr><td>Practical</td><td>This course is designed to reinforce the principles of common insect's specimen and slides of economic and medical importance in local environment. Microscopic slides for some pathogens and specimen of insects, Damages they cause to humans, animals and plants. Life cycles and methods of these pest control.</td></tr>
<tr><td rowspan="2">Assessment Criteria</td><td colspan="2">Periodic Exams and Quizzes</td><td>Assignments, and Classroom Activities</td><td>Final Exam</td></tr>
<tr><td colspan="2">30%</td><td>20%</td><td>50%</td></tr>
<tr><td>Course Teaching Strategies</td><td colspan="4">Interactive lectures, Classroom discussions, Tutorials, Individual assignments, Group discussion, Lab-work, Self-learning activities, E-Videos, Field trips, Micro-Project, Presentation (individual and teamwork).</td></tr>
<tr><td>Text Book</td><td colspan="4">Introduction to Medical and Veterinary Entomology (2015) written by Dr. Azzam Muhammad Al-Nasser Al-Ahmad - House of King Saud University for Publishing - Kingdom of Saudi Arabia .(in Arabic).</td></tr>
<tr><td>Reference Books</td><td colspan="4">• Glenn W. Herrick (2015) Insects of economic importance; outlines of lectures in economic entomology. Classic Library, Amazon.com.
• The Agricultural Guide Guide (2013): First Edition - Dr. Muhammad Ali Tanani - Dar Al-Batool Publishing - Arab Republic of Egypt.
• The red palm weevil - the problem and the solution 2015 - the first edition, authored by \ Dr. Jamal Al-Din Hassan Sweifi - Center for Scientific Publishing - King Abdulaziz University
• Louis Compton Miall (2017) Injurious and Useful Insects: An Introduction to the Study of Economic Entomology, Leopold Classic Library, Amazon.com.
• Chabman and Hall, (2012), (5th ed) Medical Entomology for Students, Cambridge University.
• Biological control of insects 1426 AH - Ali Muhammad Al-Sihayai - First Edition - Scientific Publication Center - King Saud University</td></tr>
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