King Saud University
College of Science
Zoology Department

2023

Zoology Department Handbook

Contents

Preface

Zoology department was established when College of Science was established in 1958 G (1378 H). The purpose was to graduate students acquainted with the basics of scientific research in the field of Zoology to enable them performing their national duties in development and building up movement through working in numerous fields of the kingdom sectors and establishments such as ministry of health, laboratories of hospitals, ministry of agriculture, ministry of water, ministry of education, measurements and specifications commission, laboratories of ministry of interior. All the zoology courses for BSc. degree are given by the department staff since the study starts from the third semester, whereas in the first and second semesters, the student fulfills the University and the college requirements. Also, the department introduces field studies course (field training) throughout the summer session just prior to graduation, additionally, the department contributes in teaching specialized courses to students of the unified program (Health Sciences) and College of Agriculture.

Vision and Mission and Objectives

Vision

Our vision is to be a pioneer of excellence in education and scientific research in the field of Zoology.

Mission

Providing quality education and scientific research in zoological science to meet the needs of the community and labor market through stimulating academic and administrative environment, optimal use of technology as well as partnership with national and international related institutions.

Zoology Program Objectives

The Zoology Department aims to take advantage of the available potential at King Saud University in collaboration with other similar departments in renowned and highly reputed national and global institutions:

1. To achieve excellence in advanced knowledge and scientific research in Zoology.
2. To understand the living organisms and their relationship with their environment.
3. To develop applied practical skills among the students of conducting research in the laboratory and the field
4. To develop the skill of qualitative and quantitative analysis and interpretation of biological data.
5. To nurture and develop the students as an independent individual
6. To develop national and international collaborations with academic institutions and research centers for employability and career plans.

Work Areas and Opportunities

- Administrators, laboratory technologists, Research assistants (Ministry of Education).
- Teachers at the Ministry of Education.
- Technologists at Hospital laboratories and clinics (Ministry of Defense and Aviation, Ministry of Interior and National Guard).

- Technologists at Research and hospitals diagnostic Laboratories at the Ministry of Health.
- Researcher at Animal research units and at Wildlife centers and Fishery wealth (Ministry of Environment, Water and Agriculture).
- Expert in quality laboratories (Saudi Standard, Metrology and Quality Organization).
- Researcher and Technologists at King Abdul-Aziz City for Science and Technology.
- Technologists at National Hospitals and Salesmen at Scientific suppliers' companies (Private sector).

Zoology Program Learning outcomes

1.0 **Knowledge and understanding**

1.1 To describe the fundamentals and principles of Zoology.

1.2 To outline the theories and scientific facts in the field of Zoology and interrelations among organisms and their biosphere.

1.3 To recognize various laboratory bio-techniques and their applications.

1.4 To state the concepts of laboratory management, organization and evaluation.

1.5 To outline the management and concepts of bio-systems, organization and evaluation.

1.6 To name the policy and legislation of animal Science and ethics.

2.0 **Skills**

2.1 To design, plan and conduct different experiments in the field of Zoology,

2.2 To analyze data, interpret results, and write scientific reports.

2.3 To evaluate peers' scientific reports and criticize such reports and presentations.

2.4 To develop new learning skills and approach to research related problems in the field of Zoology

2.5 To compose and write projects or research studies in the field of Zoology.

3.0 **Values, Autonomy and Responsibility**

3.1 To communicate effectively with other members of the team.

3.2 To demonstrate communication skills such as: writing, reading, presenting, negotiating and debating

3.3 To show skills in the usage of computers, networks, and software packages relevant to Zoology

3.4 To operate programs used in the field of biostatistics to help in interpreting and explaining findings.

Departmental Prerequisites for the Bachelor's Degree (B.Sc.)

Under the terms of admission to the College of Science, the Zoology Department requires the following for undergraduate departmental admission:

1. The student holds a Secondary School Certificate (Section of Natural Sciences).
2. Upon applying to the department, the student's cumulative rate in the preparatory phase to the College of Science not to be less than 2.5 out of 5.

Description of teacher education

The study plan allows the opportunity to Zoology graduates to work either in technical field of laboratories, wildlife and ecosystems or in the field of teaching as biology teachers in Secondary Schools.

The second opportunity was made available since the graduate student was able to choose 12 credit units from Botany and Microbiology Department. These units are within the elective courses which appear in the study plan in 6^{th}, 7^{th} and 8^{th} levels (4 hours / level).

The teaching record of Zoology graduate accompanied the graduation certificate, illustrates the nature of elective courses chosen by the student which determine the tendency to work in the appropriate place. Furthermore, Zoology graduate who wishes to work as a teacher has to pass a written examination and an interview held by people in charge in Ministry of Education.

Graduation methodology

To be successfully graduated in Zoology department, student must accomplish 136 credit hours distributed on 8 levels besides the summer session. Upon completion of the 6^{th} level, the student would be able to take Field studies (Zoo 465) during summer which enables him to get acquainted with the fine details of field work, since student can practice hands on of what gained in previous levels of the plan under supervision of distinguished instructors. One of the prominent courses given in the 8^{th} level is Graduation research project (Zoo 498) in which student learn how to gather information concerning specific point in animal biology from different resources, then gain the skill of designing and executing a practical experiment, then perform data analysis, finally write the

scientific report, which would be graded by the supervisor. A final copy with the grade will be submitted to the department chairman.

The Study System at the College of Sciences

Study at the College of Sciences has been moving according to the following:
1. The school year is mainly two regular semesters and a summer one, if it is available.

2. The academic level is an indication of the level. The number of levels to graduate is at least eight levels according to the study plan approved.

3. The term of the level is a full semester (not less than 15 weeks) and this term does not include the periods of registration and final exams.

4. The summer semester period is not less than eight weeks doubled in time allocated for teaching each course.

5. A number of courses (subjects) are taught during the academic level according to the program of each specialty in the different departments.

6. Students have to study 136 class units (credit hours) to obtain a bachelor's degree as follows:

A. The student studies a number of 31 class units during the preparatory year (two semesters in one academic year).

B. The student studies 97 class units of study (optional + mandatory) at program of specialization in various college departments throughout the six semesters following the preparatory year (beginning with the third semester).

C. University Requirements: The student selects 8 class units of the requirements of the university out of 22 optional course units during the period of study at the college.

7 - The student chooses the specialty department before the end of the preparatory year according to the conditions set by each department.

The Academic System (e-Register)

Registration is the cornerstone of the academic system, the center of the educational process, and the first step to start university life. The new academic system (e-Register) gives new students the following opportunities:

1. To create an e-mail through the site of Deanship of Electronic Transactions and Communications

http://www.ksu.edu.sa/sites/KSUArabic/Deanships/Computer/Pages/

2. To have an access to the academic system through the link: http://edugate.ksu.edu.sa
   Then, he enters a user name and password obtained making his e-mail accounts.

3. Online Registration (registration, adding, and dropping): a student can register -in person- from any place where he is during the registration, dropping, and addition period specified in the academic calendar. There is no need for the student to visit the college or department to do the following:

   A. Registration: Registration of courses and deciding on the number of hours required to study.
   B. Adding and dropping: The applicant may drop and add courses during the first week of the class year. The study load does not have to be less or more than the course load allowed.

4. To view the course schedule of the college and the available/closed groups.
5. To view the study schedule of the student and print it.
6. To view the academic record and print a copy of it (so far unofficial).
7. To view results of final exams as soon as done.
8. To view the plan of study and courses that he passed and the ones he has to study.
9. To know about penalties imposed on the student.
10. To view the financial rewards.
11. To make suggestions and write complaints.
12. To write the academic performance evaluation of faculty members.
13. To exchange electronic messages and change the password.

* If there any problems while registering, please consult the college registration office (room 1 a 7 - Building 4).

Students' Admission

The admission process provides students with access to the University but also ensures that all learners are given every opportunity to succeed in their studies, enabling them to attain their personal objectives. Entrance requirements are determined at three levels: the University, the College and the Department. The admission procedure is carried out electronically via the Deanship of Admissions and Registration's website (http://dar.ksu.edu.sa/ar/e_admission) and the College of Science and the Department of Zoology' websites (http://sciences.ksu.edu.sa/ar), (http://Sciences.ksu.edu.sa/zoology). The following information is available on the websites mentioned above: admission requirements; requirements and responsibilities for enrolled students; degree, certificate, graduation and transfer requirements; suspension, probation, dismissal and re-admission policies; and policies regarding the collection and retention of student academic records and data.

Although the Department reviews and updates its requirements for both new and enrolled students on an annual basis as part of its drive to improve performance and to ensure that all learners are given every opportunity to be successful in their studies, most students are admitted into the Department centrally by King Saud University. This is done largely to increase the number of students who wish to pursue higher education at KSU.

The applications for admission are considered by the Deanship of Admissions and Registration Affairs (DAR) according to the following conditions:

1. The student must hold the General Secondary Certificate (i.e. a High School Diploma) (or equivalent) from inside or outside the Kingdom of Saudi Arabia.
2. This certificate (or equivalent), mentioned above, must not be more than five years old.
3. The student must be able demonstrate good behaviour and conduct.
4. The student must pass the examination or interview held by the Senate.
5. The student must be medically fit.
6. The student must obtain his/her employer's approval if he/she works in the public or private sector.
7. The student must meet any conditions assigned by the Senate at the time of registration.
8. The student should not have previously been expelled from any University for disciplinary or academic reasons.

9. Any student who already holds a Bachelor's degree (or equivalent) will not be admitted to study for another such degree. However, exceptions may be allowed by the Senate.

Procedures governing the application are as follows:

1. The students must carry out any necessary tests held by the National Centre for Measurement and Assessment. The student should also read the admission conditions; these can be viewed via the University's electronic gate or on the website of the Deanship of Admission and Registration: http://dar.ksu.edu.sa
2. The application form must then be filled in with the necessary data and the desired courses of study via the e-admission website within the allotted period of time.
3. After the admission period, students are admitted on the basis of meeting (or not meeting) all the admission requirements.
4. Selection is made on the basis of meeting the set conditions in terms of scores (i.e. those from the general secondary certificate examination; admission exams, if available; and tests of general potential).
5. After evaluation, successful students are informed via e-mail and mobile phone message (SMS) and receive information concerning the College and subject(s) for which they have been selected.

A student may submit a request not to continue a semester without being considered a failure. In such a case, he/she must offer an acceptable reason, at least five weeks before the final examination, to the Department's Chair. Students should not request to defer more than two consecutive or three non-consecutive semesters.

A student is entitled to apply to postpone his/her course of study before the end of the first week if an acceptable reason is given to the Head of the Department and with the provision that the postponement does not exceed two consecutive semesters or three non-consecutive semesters. The Senate of the University may make an exception and the period of postponement is then not counted as part of the period required to fulfil the graduation requirements.

Absence is calculated from the first day of the academic year. Students must attend lectures and practical lessons as he/she will not be allowed to sit final exams if his/her attendance is less than 75% during the semester and any student who does not sit the examination as a result of absence fails the subject. Students receive a warning if their cumulative attendance average falls below 2.00; if three consecutive warnings are received, the student is dismissed from the University.

Students are dismissed from their course of study in the following cases:

1- If three warnings are received because the cumulative average for attendance falls below 2.00. They may be given fourth chance, if they manage to increase their GPA.

2- If a student still fails to fulfil the graduation requirements during an ensuing period of up to half the total time allotted for graduation or up to half the duration of the Program. The Department Council and College Board can make an exception in order to allow students to fulfil their graduation requirements giving them (as a maximum) a period not exceeding twice the original amount of time for graduation under those conditions described in the rules.

Using technological admission and registration systems has simplified the management of student records. The Department of Zoology uses KSU's electronic service, *E-Register* (On Demand University System) (http://eregapp.ksu.edu.sa:7778/forms/frmservlet?config=eregister), to allow students to register and to manage their records; in fact all University students' records are managed electronically. Both faculty members and students are permitted access to *E-Register*, which is highly confidential; user names and protected passwords are employed, and the Department of Zoology students' records are maintained in a secure location with automated processes. The *E-Register*, on request, provides students with information concerning their Program, the courses of study they have completed with the grades they have attained, and the period of enrolment.

The Department of Zoology students' academic record maintains complete and accurate records of all students enrolled from the time of registration to withdrawal or graduation. These records form a part of the well-organized system of student accounting, which is accessible and reflects the current status of all students. Such records conform to KSU rule and regulation for privacy.

The Department of Zoology' student academic records are comprehensive, accurate and secure while such records at KSU are maintained in a central secure location and protected behind firewalls.

The Vice Rector for Academic and Educational Affairs is the guardian of student data whiles the Dean of Admission and Registration deanship fulfils a similar role student record; all requests for access require their approval. Sensitive records, such as test scores, are kept in locked filing cabinets or electronically on a firewall-protected server; these are retained as per KSU regulations. Procedures to remove access to records when employees change jobs or leave KSU are in place.

Student Management

A document is issued to all students informing them of their rights and responsibilities. A Department, consisting of a permanent committee and branch committees throughout the various Colleges, has been established specifically to defend and support the legal rights of students; a higher-level committee also investigates and makes decisions on students' complaints. If a student wishes to make a complaint, this must be communicated to the Committee for Student Rights Protection Branch in his/her respective College. Complaints may also be pursued through the Permanent Committee for Student Rights Protection; this is situated in Building #17 on Floor #4 in the University Centre. Relevant policies and procedures are approved by the University Council and are widely available. This system is designed to lessen the chances of minor complaints becoming major problems; it also ensures procedural consistency and to encourages good practice for both students and faculty.

The Department treats all complaints seriously and responds quickly and fairly to student complaints and is committed to treating all students in an unbiased and respectful manner. In this regard, the College of Science implemented the Student Rights Protection Unit to implement fair and consistent processes for student management and to ensure that no punitive actions or discrimination follow any expression of dissatisfaction or grievance. It also advises students in the event of complaints and explains how the policy works. Disciplinary and appeals processes are consistent with the mission and values, both of which promote high-quality education, of the Department and the College.

Rules and Mechanisms for Registration of Courses

- The study course is a module that meets needs of the level specified in the approved plan of study in each specialty (program). The course has a number; code, title, and description according to the different departments (see the Department Manual Guide).
- The study course is divided into a set of theoretical lectures and practical lessons (study units) given weekly during the academic level.
- The class unit is a weekly theoretical lecture that is not less than fifty minutes, or a practical lesson which is not less than one hundred minutes.
- The registration of courses for all students is done automatically through the website http://edugate.ksu.edu.sa
- Levels of study vary in the number of units of stud, from12 to 20, units of study for each level.
- Courses are registered automatically at the beginning of the following semester for the student's convenience. Then, he can modify the course schedule by adding or dropping.
- The following table shows the student's study load in proportion to the cumulative average:

GPA	2	2.5	3	3.5	4	4.5	5
Hours allowed for registration	14	15	16	17	18	19	20

- Processes of dropping and adding are done by the student electronically in the first week of the semester through accessing the gate of the academic system of the University Deanship of Admission and Registration (http://edugate.ksu.edu.sa)
- No student has the right to register a course without passing its Prerequisite course.
- Students who have no difficulties because of failure in the courses are registered in the courses of the level gradually beginning with the lower levels, according to the study plans approved.
- Students who have study difficulties are registered in courses that ensure their minimum study load in each semester taking into account the following points:

- No conflict in the course study schedule.
- Meet the previous requirements of the course or courses to be registered.

Calculating the average and cumulative GPA

Average and cumulative GPA is calculated every semester for the student automatically by the system. To know how to calculate the averages, you should follow the following steps:
Calculating the semester average:

GPA is calculated considering the following points:

1. Knowing the number of hours of courses.
2. knowing the mark obtained in each course.
3. Knowing the corresponding grade of each mark.
4. Knowing the value of each grade.
5. Knowing points = number of hours of the course × value of the grade
6. Total points obtained in all courses of the semester.
7. Total number of hours registered in the semester.
8. Average is calculated every semester according to the following equation:

GPA=	**Total points (Article 6)** / **Number of hours of registration in the semester (item 7)**

The following table shows the percentage of grades, grade and value obtained by the student in each course, which is used to calculate the points:

Mark	Grade	Letter Grade	Value of Grade
From 95-100	**Excellent +**	**A+**	**5.00**
From 90 to less than 95	**Excellent**	**A**	**4.75**
From 85 to less than 90	**Very Good+**	**B+**	**4.50**
From 80 to less than 85	**Very Good**	**B**	**4.00**
From 75 to less than 80	**Good +**	**C+**	**3.5**
From 70 to less than 75	**Good**	**C**	**3,00**
From 65 to less than 70	**Pass +**	**D+**	**2.5**
From 60 to less than 65	**Pass**	**D**	**2.00**
Less than 60	**Failure**	**E**	**1,00**
Absence from lectures, 25% or more	**Debarred**	**H**	**1,00**

Calculating the average cumulative:

GPA semester rate is calculated as follows:

1) The grand total of points (for all semesters that have been studied.)
2) The grand total of credit hours (for all semesters that have been studied).

The cumulative average is calculated according to the following equation:

$$GPA = \frac{\text{total points total}}{\text{\_\_\_\_\_}}$$

	Grand total of credit hours

Here is an example to calculate the grades above:

Calculating the grade of the first semester:

Course	Credit Hours	Mark	Grade	Grade Value	Points
Phys 101	4	67	D+	2.5	4 × 2,5 = 10
Cheimis101	4	73	C	3	3 × 3 = 9
Eng 121	3	77	C+	3.5	3 × 3,5 = 10.5
Arab 101	2	81	B	4	2 × 4 = 8
	13				37.5
GPA = total points ÷ hours of registration per semester = 40,5 ÷ 13 = 3,88					

Calculating the grade of the second semester:

Course	Credit Hours	Mark	Grade	Grade Value	Points
Math 101	3	61	D	2	3 × 2 = 6
Stat 101	3	73	C	3	3 × 3 = 9
Computer Science 206	3	80	B	4	3 × 4 = 12
Arab 103	3	88	B+	4.5	3 × 4,5 = 13,5
Islam 101	2	92	A	4.75	2 × 4,75 = 9,5
Eng 122	3	97	A+	5	3 × 5 = 15
	17				65
GPA = total points ÷ hours of registration to chapter = 65 ÷ 16 = 4.06					

Calculating the average cumulative:

GPA = total points ÷ total hours of the semester = 105.5 ÷ 29 = 3.64

Dropping and adding of a course:

- The process of dropping and adding is done through portal http://edugate.ksu.edu.sa during the first week of the semester but the number of credit hours registered has to be at least 12 hours.
- The student may drop only one course, five weeks at least, before the final exams begin due to an acceptable excuse to Dean of the College. The student has the right to apply for such an excuse at a maximum of four courses during the whole period of study at the college.

Attendance, postponement and dropping out of school:

- The student must be regular in attendance to achieve at least 75% of lectures and lab classes.
- If any student has a percentage of absence of 25% or more in any course, this denies him access to the final exam of this course and his result is F.
- A student may apply for postponement of the study before the beginning of the semester for an excuse accepted by the College Board should. The postponement should not exceed two consecutive semesters or three semesters as a maximum duration while studying at the college.
- The University Council may, in case of necessity, exempt the previous provision.
- If a student drops out of the college for one semester without a request to postpone his registration, the University has the right to cross out his registration. The University Council has the right to do this for a less period of time.
- The student has no right to be a visiting student at another University of another if he drops out of the College of Sciences.

Visiting Student:

- The visiting student is a student who studies some courses at another university or at a branch of the university to which he belongs without being transferred. The courses he studied are accredited according to the following regulations:
- The student has to have a class record (grade point average) for, at least, two semesters at his college before he applies for a visiting student.

- The student must obtain a prior approval of the faculty for the student to allow him to study as visiting student who has to specify the curses that will be studied and the faculty requirements to obtain a specific grade to offset the course. He is directed to study due to an official letter from the Deanship of Admission and Registration.
- He has to join a college or a university officially recognized.
- That the courses outside the university, under consideration by the student, must be equivalent in their description to the university courses and of no less units of study for any of the courses contained in the graduation requirements.
- The maximum of total units of study that can be calculated from outside the university is twenty percent (20%) of the total units to graduate at King Saud University.
- The courses that are studied by the visiting student are not included in the cumulative average. These courses are recorded in his academic record.
- The student must provide the Deanship of Admission and Registration with the results he obtained during the first two weeks of study in the semester following a period of study as a visitor. If not reported, at that period, his results are discarded for those semesters.

Dismissal from the university:

The student is dismissed from the university in the following cases:

- If he receives three consecutive warnings due to a cumulative average below a minimum of (2).
- The student may be given a fourth opportunity by the Council of the University based on the recommendation of the Faculty Council to raise his cumulative GPA by studying the courses that are available.
- University Council may give the dismissed students -because of warnings- an opportunity that does not exceed two semesters as a maximum.
- If the student does not fulfill his graduation requirements at the college in a period of up to half of the period prescribed for graduation in addition to the duration of the program.
- The student is given an exceptional opportunity by the University Council to meet the graduation requirements up to a maximum period not exceeding twice the original term specified for graduation.
- University Council may allow dismissed students, due to exhaustion of failure times, to attend twice the length of the program. That period does not have to exceed an utmost of two semesters.

- Examinations and Grades:
- The College Council - based on the proposal of the department council- specifies mark of from (40%) to (60%) of the final grade of the course.
- The semester work mark of a course is calculated in one of the following two methods:
  - Oral or practical tests, research or other types of classroom activity or from all or some of them in addition to at least one a written test.
  - Two written exams at least.
- It is permissible for the council of the department that teaches the course due to the recommendation of the course professor to allow the student to complete the requirements of any course in the following semester and to give the student a grade of I (incomplete) in his academic record and not to be included in the GPA or cumulative. Only the grades received by the student after completing the requirements of that course are considered.
- If ever one-semester did not change the grade incomplete (l), the student is given an F and it is calculated in the GPA and cumulative.
- The grades obtained by the student in each course are calculated according to the schedule mentioned above.

Restrictions of the Final Examination

- No student may be tested in more than two courses in one day. The student is not allowed to enter the final exam after half an hour of its beginning, and is not allowed to leave the exam room before half an hour after its beginning.
- The College Council - due to recommendation from the Council of the relevant department- may specify the period of at least one hour, and a maximum of three hours, for a final written exam.
- Cheating in the exam, initiating it, or violating of instructions and rules of testing are actions punishable according to regulations of students' discipline issued by the University Council.
- The College Council, in charge of teaching a course, in cases of necessity, has to approve re-marking of the answer sheets in a period of time not later than the beginning of the following semester in accordance with the following rules:

1. A student may apply for re-marking the answer sheets of only one course per semester.

2. The student -who wishes to remark his answer sheets- may apply for re-marking them to the department that examines this course not later than one month after taking the final exam.
3. A student, who has already applied for re-marking his answer sheets and proved the invalidity of his application, should never apply for re-marking his answer sheets in any exams in the future.

Transferring

I: Transferring from one college to another within the university:

- It is permissible with the consent of the respective deans of the colleges to transfer from one college to another in accordance with the conditions approved by the College Council, which the student wishes to transfer to.
- The student's academic record of the college has to show all courses previously studied, including grades and semester and cumulative rates throughout the study at the college from which he is transferred.

II: Transferring from one major to another within the College:

- The student may, after the approval of the Dean, transfer to another specialty within the College according to the guidelines established by the College Council.
- The student's academic record of the college has to show all courses previously studied, including grades and semester and cumulative rates throughout the study at the college from which he is transferred.

The Study Plan

The Zoology Department, College of Science, King Saud University, adopts constant assessment and upgrading of its curricula to be acquainted with the pros and cons that have occurred in earlier plans, which was most recently approved in 1429/1430 AH, which allows the preparation of an apt curriculum versus academic variables and vocational needs of the society and labor market, to enable the development and upgrading of the output of its various programs.

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

Course Code	Course Title	Pre-requisite	Credits (Lect. – Exer. - Pract.)
IC 100	Studies in the Biography of the Prophet	-	2 (2+0+0)
IC 101	Introduction of Islamic Culture	-	2 (2+0+0)
IC 102	Islam and Building up the Society	-	2 (2+0+0)
IC 103	Economic System in Islam	-	2 (2+0+0)
IC 104	Political system in Islam	-	3 (2+0+1)
IC 105	Human Rights	-	3 (2+0+1)
IC 106	Islamic Jurisprudence	-	2 (2+0+0)
IC 107	Ethics of Occupation	-	2 (2+0+0)
IC 108	Contemporary Issues	-	2 (2+0+0)
IC 109	Woman and Her Developmental Role	-	2 (2+0+0)
Total			8

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

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

3rd Semester				
Course code	Course Title	Pre-req.	Co-Req.	Credits (Lect. Exer. – Pract.)
Elective course from University requirement			-	2 (2+0+0)
Elective course from University requirement			-	2 (2+0+0)
CHEM 103	General chemistry (1)	-	-	3 (3+0+0)
GEO 105	Geology	-	-	2 (2+0+0)
STAT 106	Biostatistics	-	-	2 (1+1+0)
BOT 102	General Botany	-	-	3 (2+0+1)
ZOOL 103	Principles of General Zoology	-	-	3 (2+0+1)
Total of Credit Hours				17

4th Semester				
Course code	Course Title	Pre-req.	Co-Req.	Credits ect. Exer. –Prac
Elective course from University requirement			-	2 (2+0+0)
BCH 101	General biochemistry	-	-	4 (3+0+1)
PHYS 205	Biophysics	-	-	2 (2+0+0)
MBIO 140	Microbiology	-	-	3 (2+0+1)
ZOOL 212	Parasitology	ZOOL 103	-	3 (2+0+1)
ZOOL 242	Cell biology & Physiology		-	3 (2+0+1)
Total of Credit Hours				17

5th Semester				
Course code	Course Title	Pre-req.	Co-Req.	Credits (Lect. Exer. – Pract.)
ZOOL 245	Histology	ZOOL 242	-	2 (1+0+1)
ZOOL 262	Microtechniques	ZOOL 103	-	2 (1+0+1)
ZOOL 305	Animal modern Taxonomy		-	2 (1+0+1)
ZOOL 320	Ichthyology		-	2 (1+0+1)
ZOOL 327	Herpetology		-	3 (2+0+1)
ZOOL 332	General physiology		-	3 (2+0+1)
ZOOL 373	Terrestrial ecology		-	2 (1+0+1)
Total of Credit Hours				16

6th Semester				
Course code	Course Title	Pre-req.	Co-Req.	Credits (Lect. Exer. – Pract.)
Elective course from University requirement			-	2 (2+0+0)
ZOOL 311	General Entomology	ZOOL 103	-	3 (2+0+1)
ZOOL 325	Ornithology		-	2 (1+0+1)
ZOOL 326	Mammology		-	2 (1+0+1)
ZOOL 342	Molecular biology	ZOOL 242	-	2 (1+0+1)
ZOOL 374	Aquatic ecology	ZOOL 103	-	2 (1+0+1)
Elective courses		Variable	-	4
Total of Credit Hours				17

Summer Semester				
Course Code	Course Title	Pre- Requisite	Co- Requisite	Credits (Lect. Exre. –Pract.)
ZOOL 465	Field studies	Finishing 34 Specialized Units	-	5(0+0+5)
Total of Credit Hours				5

7th Semester				
Course Code	Course Title	Pre-Req.	Co-Req.	Credits Lect. Exre. –Pract.
ZOOL 317	Medical arthropods	ZOOL 311	-	3 (2+0+1)
ZOOL 352	Principles of genetics	ZOOL 342	-	2 (1+0+1)
ZOOL 375	Pollution	ZOOL 103	-	2 (1+0+1)
ZOOL 420	Comparative vertebrate anatomy		-	2 (1+0+1)
ZOOL 423	Principles of descriptive embryology		-	2 (1+0+1)
ZOOL 432	Endocrinology		-	2 (1+0+1)
ZOOL 497	Training Course	ZOOL 342	-	2 (0+0+2)
Elective course		Variable	-	2
Total of Credit Hours				17

8th Semester				
Course Code	Course Title	Pre- Req.	Co- Req.	Credits (Lect. Exre. – Pract.)
ZOOL 424	Principles of experimental embryology	ZOOL 423	-	2 (1+0+1)
ZOOL 425	Economic fishes and crustaceans	ZOOL 320	-	2 (1+0+1)
ZOOL 433	Immunology	ZOOL 332	-	2 (1+0+1)
ZOOL 461	Laboratory technology	ZOOL 262	-	2 (0+0+2)
ZOOL 471	Animal behavior	ZOOL 103	-	2 (1+0+1)
ZOOL 498	Graduation project	Finishing at least 95credit hours		2 (2+0+0)
Elective Courses		Variable	-	4
Total of Credit Hours				16

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

List of Elective courses

[Student selects 10 Credit hours from list (A) OR (B)]

(A) Elective courses from Zoology			
Course Code	**Course Title**	**Pre-req.**	**Credits Lect. Exre. – Pract.)**
ZOOL 355	Animal Wildlife Genetics	ZOOL 352	2 (2+0+0)
ZOOL 366	Management of fish culture	ZOOL 320	2 (1+0+1)
ZOOL 381	Economics of Aquaculture	ZOOL 320	2 (1+0+1)
ZOOL 382	Entomofauna of Saudi Arabia	ZOOL 311	2 (1+0+1)
ZOOL 412	Parasite Immunology	ZOOL 212	2 (1+0+1)
ZOOL 413	Entomology and Environmental-Health	ZOOL 311	2 (1+0+1)
ZOOL 434	Renal Physiology	ZOOL 332	2 (1+0+1)
ZOOL 435	Neurophysiology	ZOOL 332	2 (1+0+1)
ZOOL 436	Reproductive Physiology	ZOOL 332	2 (1+0+1)
ZOOL 441	Histochemistry	ZOOL 245 ZOOL 262	2 (1+0+1)
ZOOL 455	Genetic Engineering	ZOOL 342 ZOOL 352	2 (1+0+1)
ZOOL 456	Bioinformatics	ZOOL 342	2 (1+0+1)
ZOOL 457	Cytogenetics and Cell Culture	ZOOL 242 ZOOL 352	3 (2+0+1)
ZOOL 458	Human Genetics	ZOOL 342 ZOOL 352	2 (1+0+1)
ZOOL 462	Experimental parasitology	ZOOL 212	2 (1+0+1)
ZOOL 464	Biotechnology	ZOOL 424	2 (1+0+1)
ZOOL 466	Industrial Environmental Pollution	ZOOL 375	2 (1+0+1)
ZOOL 480	Wildlife Protection	ZOOL 373	2 (2+0+0)
ZOOL 481	Venomous Animals	ZOOL 327	2 (1+0+1)
ZOOL 482	Organic adaptations of Chordates	ZOOL 103	2 (1+0+1)
Total of Credit Hours			40

(B) Elective courses from Botany and Microbiology Department			
Course Code	**Course Title**	**Pre-req.**	**Credits (Lect. Exre. – Pract.)**
BOT 212	Plant Anatomy	BOT 102	4 (2+0+2)
BOT 222	Principles of Flowering Plants Taxonomy	BOT 102	3 (2+0+1)
BOT 231	Economic Botany	BOT 102	2 (2+0+0)
BOT 241	Plant ecological factors	BOT 102	3 (2+0+1)
BOT 263	Archegonate	BOT 102	2 (1+0+1)
BOT 345	Flora of Saudi Arabia	BOT 102	2 (1+0+1)
BOT 384	Phycology	BOT 102 or MBIO 140	3 (2+0+1)
BOT 442	Hot desert ecology	BOT 102	1 (1+0+0)
BOT 444	Ecological resources	BOT 102	2 (1+0+1)
BOT 487	Phytoplanktone	BOT 102	2 (1+0+1)
BOT 488	Lichens	MBIO 140	2 (1+0+1)
MBIO 250	Virology	MBIO 140	3 (2+0+1)
MBIO 260	General Bacteriology	MBIO 140	3 (2+0+1)
MBIO 270	General Mycology	MBIO 140	3 (2+0+1)
MBIO 340	Microbial ecology	MBIO 140	3 (2+0+1)
MBIO 344	Sanitation and water microbiology	MBIO 140	2 (1+0+1)
Total of Credit Hours			40

Description of bachelor's courses

ZOO 103	Principles of Zoology	3 (2+1)
Content	Structure, function and cytogenetics of the animal cell; different animal tissues; general characteristics and taxonomy of the Animal Kingdom; general characteristics of Subkingdom Protozoa with selected representative examples; taxonomy and characteristics of the Animal Kingdom from Porifera to Chordata with selected representative examples; an introduction in animal physiology with special emphasis on nutrition, digestion and metabolism; blood composition and functions.	
Pre-requisite	—	

ZOO 212	Parasitology	3 (2+0+1)
Content	Understanding and practicing the different methods and techniques applied for identification of parasitic infections. Identification of the main characteristics of the different stages of the parasites. How to determine: the site of infection, diagnosis and diagnostic stages, pathogenicity and treatment. How to elucidate the life cycle of a parasite (host (s) and mode of transmission). Mastering photography, measurements and report writing.	
Pre-requisite	Zoo 103	

ZOO 242	Cell Biology and Physiology	3 (2+0+1)
Content	The emergence of modern cell biology; prokaryotes and eukaryotes; structure and function of biological membranes; transport of substances through biological membranes; intercellular signals and directing synthesized proteins to their sites inside and outside the cell; cell organelles in terms of structure and function; the cytoskeleton; the cell cycle; apoptosis (programmed cell death); stem cells; glycolysis; Krebs Cycle; oxidative phosphorylation.	
Pre-requisite	ZOO 103	

ZOO 262	Microscopic Preparations	2 (1+0+1)
Content	Different types of fixatives and their advantages and disadvantages; the steps involved in light microscopic technique, and how to treat samples with appropriate; electron microscope, methods of fixation, washing, dehydration, embedding, ultramicrotomy, staining and investigation of ultrathin sections by transmission electron microscopy to identify cell organelle ultrastructure.	
Pre-requisite	ZOO 103	

ZOO 305	Modern Animal Taxonomy	2 (1+0+1)

Content	The general fundamentals of taxonomy; history of taxonomy and classification stages; objectives and mission of taxonomy; significance of taxonomy to biology; classification theories; species and subspecies; systematics and higher ranks; diversity and insulation mechanism; classification characteristics, traditional (virtual), numerical, molecular, chromosomal, chemical, immunological and cellular classification methods; taxonomic discrimination and differentiation (intraspecific individual variations); taxonomic procedures [displaying systematic results including: description, classification key (definition, types and design), taxonomic papers, statistical methods, the importance of quantitative methods in taxonomy]; binomial nomenclature; philosophical concept, interpretation and regulations of scientific nomenclature.
Pre-requisite	ZOO 103

ZOO 311	General Entomology	3 (2+0+1)
Content	External structure: cuticle structure and function, structure of head, thorax and abdomen; internal structure (anatomy): structure of the digestive, excretory, circulatory, respiratory, nervous and endocrine systems and types and functions of hormones; structure of the reproductive system; insect growth and development (metamorphosis): eggs and fertilization, types of larvae and pupae; general insect taxonomy: apterygota, pterygota (exopterygota and endopterygota).	
Prerequisite	ZOO 103	

ZOO 317	Medical Arthropodology	3 (2+0+1)
Content	General morphology; dynamic relationship between the host and parasite of some insects of minor medical importance as cockroaches, beetles, true ants, wasps and moths, and of some insects of major medical importance as blood sucking species of order Hemiptera including Family Cimicidae (Bed Bugs), order Phthiraptera (Body lice), order Diptera including families of Ceratopogonidae (punkies, small biting flies), Simulidae (black flies), Psychodidae (sandfly), Culicidae (mosquitoes), Asilidae (robber flies), Tabanidae (horse flies), Sarcophagidae (flesh flies), Muscidae (House flies) and Glossinidae (tsetse fly); order Siphonaptera (fleas), order Ixodida (ticks), suborder Opilioacariformes (parasitiform mites); arthropod toxins, allergic secretions and endemic pathogens in Saudi Arabia; personal protection and prevention of arthropod pests.	
Pre-requisite	ZOO 111	

ZOO 320	Ichthyology	2 (1+0+1)
Content	Introduction; classification of fish; fish environments; fish external features; skin structure; internal structure including muscular, digestive, circulatory, respiratory, urogenital, nervous, endocrine and skeletal systems; fish growth	

	and age estimation; fish migration and geographical distribution.
Pre-requisite	ZOO 103

ZOO 325	Ornithology	2 (1+0+1)
Content	Historical introduction in ornithology; definition of birds; economic benefit; profiles of the effects of birds on ecological balance; external structure of birds; energy required for feather moulting; maintaining temperature; mechanism of temperature regulation of birds compared to mammals; study of different bird systems; most common bird diseases including Newcastle disease and avian influenza; bird migration and reasons; most important migratory birds via Saudi Arabia and times; birds mating; egg incubation; parental care of Newly hatched birds; maturation; bird classification; bird species endemic to the Arabian Peninsula; conservation and development of birds and most significant conservation organizations.	
Pre-requisite	ZOO 103	

ZOO 326	Mammalogy	2 (1+0+1)
Content	Classification of and a historical overview on mammals; study of anatomically and functionally distinctive mammalian organs and their responses to stimuli including hair, mammary gland, sweat gland, scent glands, chewing system and terminal skeleton; study of some mammalian orders.	
Pre-requisite	ZOO 103	

ZOO 327	Herpetology	3 (2+0+1)
Content	Introduction to amphibians and reptiles; biological study of the two classes (Amphibia and Reptilia) in terms of external features and internal structures; the emergence of amphibians and reptiles, reproduction and life history; homeostasis; relationship with the external environment; brief on amphibians and reptiles in Saudi Arabia.	
Pre-requisite	ZOO 103	

ZOO 332	General Physiology	3 (2+0+1)

Content	Study the physiological functions and relevance of form to function; neural and hormonal control of the various systems in mammals, including the digestive, cardiovascular, blood, respiratory, excretory, nervous and reproductive systems in male and female.
Pre-requisite	ZOO 103

ZOO 342	Molecular Biology	2 (1+0+1)
Content	Nature and properties of genetic material; DNA as a genetic material; RNA as a genetic material of some viruses. DNA synthesis and the molecular gene concept; DNA sequence and duplication in chromosomes; The concept of gene expression (transcription and translation and processing of RNA molecules); an introduction to regulation of gene expression in eukaryotes.	
Pre-requisite	ZOO 242	

ZOO 352	Fundamentals of Genetics	2 (1+0+1)
Content	Branches of genetics; the relationship between genes and characteristics of living organisms; genetics as an experimental science; chromosomal basis of inheritance (chromosomes, mitotic and meiotic divisions and chromosomal theory); Mendelian inheritance; extensions of Mendelian Genetics; Non-Mendelian inheritance; mutations and DNA repair pathways and sex identification in eukaryotes; introduction to recombinant DNA technology and its applications.	
Pre-requisite	ZOO 342	

ZOO 355	Wildlife Animal Genetics	2 (2+0+0)
Content	Animal genetic diversity concept. Loss of genetic diversity and its effects on the population. Population size and its effects on the survival of species (Genetic drift, inbreeding and the reduction in gene flow). Genetic erosion and genetic diversity. Methods used in genetic diversity conservation (Ex situ and in situ conservation). Population augmentation. Gene pools and endangered animal species.	
Pre-requisite	ZOO 352	

ZOO 366	Fisheries Management	2 (1+1)
Content	Introduction; fish pond management: irrigation, drainage and cleaning; water quality management: water control and analysis; production management: fingerling production, feeding and harvesting; nutrition management: natural feeding, artificial feeding (diet preparation), feeding methods and feeding rates; marketing management: live fish marketing, frozen fish marketing, market surveillance and monitoring.	

Pre-requisite	ZOO 320

ZOO 373	Wilderness Ecology	2 (1+0+1)
Content	Introduction (basic concepts in ecology); ecosystem basics (living and non-living components); element cycles; terrestrial communities; geographical distribution of animals; natural environmental factors (temperature, light, humidity); bio-environmental factors (symbiotic relationships); adaptations of animals to the desert environment.	
Pre-requisite	ZOO 103	

ZOO 374	Aquatic Ecology	2 (1+0+1)
Content	Introduction; properties of the aquatic environment; characteristics: physical characteristics (temperature, salinity, transparency and turbidity); chemical characteristics (dissolved oxygen, other dissolved gases, pH and hardness); aquatic ecosystem: aquatic plants and animals.	
Pre-requisite	ZOO 103	

ZOO 375	Pollution	2 (1+0+1)
Content	Definition of pollution and its relationship to the ecosystem; definition of pollutants; types of air, water and food pollution; physical contaminants (heat, noise and radiation); ways of pollutant control; biological effects of pollutants; pollution in Saudi Arabia and Gulf countries.	
Pre-requisite	ZOO 103	

ZOO 381	Aquaculture Economics	2 (1+0+1)
Content	Introduction; fisheries and aquaculture; the need to fish farming; contribution of aquaculture to food security; project planning and feasibility study; key factors determining site selection: water resources, soil, site topography and water bodies; obstacles to aquaculture development; future of fish farming in the Arab World.	
Pre-requisite	ZOO 320	

ZOO 382	Insect Diversity in Saudi Arabia	2 (1+0+1)
Content	Biodiversity in the deserts of the Arabian Peninsula; insect adaptation to desert life; study of the biology, nomination and distribution of the most important insect species in Saudi Arabia; collecting insect species from selected environmental tribes in various regions of Saudi Arabia; definition and preserving insects collected from the field	
Pre-requisite	ZOO 311	

ZOO 412	Parasite Immunology	2 (1+0+1)

Content	Basics of parasite biology; preliminary information on innate and acquired immunity; immunological properties of some parasites endemic in Saudi Arabia; protective or pathologic pathways of the immune system; laboratory tests for antigen preparation and diagnosis using external antigen-antibody interaction.
Pre-requisite	ZOO 212

ZOO 413	Insects and Environmental Health	2 (1+0+1)
Content	Definition of entomology and its impacts on environment health; insects as a source of inconvenience; insect propagation; terrestrial insects; aquatic insects; life cycle of insects and seasonal outbreak; activity rate and distribution in different environments; beneficial and harmful insects; plant infection through insect nutrition; human infection through insect egg laying; insect pests of stored material; negative and positive impact of insects on environmental health.	
Pre-requisite	ZOO 311	

ZOO 420	Comparative Vertebrate Anatomy	2 (1+0+1)
Content	Review of anatomical terms, historical overview and study methods and significance; comparative anatomy of the skin and skeletal systems in vertebrate classes.	
Pre-requisite	ZOO 103	

ZOO 423	Fundamentals of Descriptive Embryology	2 (1+0+1)
Content	Basic principles of embryogenesis, such as: gametogenesis stages, fertilization, cleavage, gastrulation, formation of the three embryonic germ layers (endoderm, mesoderm and ectoderm), organogenesis and the formation of some main body organs.	
Pre-requisite	ZOO 103	

ZOO 424	Principles of Experimental Embryology	2 (1+0+1)
Content	Introduction and historical overview of experimental embryology and generation theories; cellular differentiation, embryonic induction, embryonic organizers; embryonic malformations; embryonic tissue culture; parthenogenesis; artificial insemination; some applied studies on embryos (production of monozygotic twins, chimera, stem cells).	
Pre-requisite	ZOO 423	

ZOO 425	Economic Fish and Crustaceans	2 (1+0+1)

Content	Introduction; economic fishes: freshwater, marine and brackish water fish; fish with most hatching, rearing and nurturing potential in Saudi Arabia; reproduction and life cycles of selected fish examples; economic crustaceans: reproduction and life cycle of selected crustacean examples; general principles of fish and crustacean rearing: ponds, water, nutrition; stages of fish farming.
Pre-requisite	ZOO 320

ZOO 432	Endocrinology	2 (1+0+1)
Content	Simplified study of hormones or chemical messengers, giving an example of each; chemical structure of hormones; study of the endocrine system in some animals.	
Pre-requisite	ZOO 332	

ZOO 433	Immunology	2 (1+0+1)
Content	Background in immunology, including: definition and history of immunology, structure of cells and organs of the immune system, innate immunity, complement system, passive, negative and adoptive immunization; antigens and immunogens; antigen presentation; antibody functions; humoral and cell-mediated immunity; excessive immune response; immune deficiency disorders and autoimmune immune diseases.	
Pre-requisite	ZOO 332	

ZOO 434	Excretion Physiology Same name as 435	2 (1+0+1)
Content	Anatomical structure of the excretory system in mammals; kidney functions; filtration rate in kidneys and its hormonal regulation; juxta-glomerular apparatus; steps of urine formation; skin and its functions.	
Pre-requisite	ZOO 332	

ZOO 435	Excretion Physiology	2 (1+0+1)
Content	Coordination and integration between the nervous system and endocrine system; nervous tissue; neuroreceptors; neural coupling; Start and transport of nerve impulses; reflex action; structure of the nervous system and functions of its different parts.	
Pre-requisite	ZOO 332	

ZOO 436	Reproductive Physiology	2 (1+0+1)

Content	Anatomical structure of the male reproductive system in mammals; reproductive physiology in male including puberty, sex identification and differentiation and spermatogenesis; ovulation. Reproductive cycles in females; fertilization.
Pre-requisite	ZOO 332

ZOO 441	Histochemistry	2 (1+0+1)
Content	Theoretical and scientific foundation of the detection of chemicals in animal tissue including carbohydrates, proteins, lipids, amino acids, nucleic acids, other enzymes, chromosomes and mineral elements.	
Pre-requisite	ZOO 245, ZOO 262	

ZOO 455	Genetic Engineering	2 (1+0+1)
Content	Introduction to the fundamentals of recombinant DNA technology; human genome project; gene therapy; biotechnology; plants and animals and genetically engineered food; an overview of some features of the controversy over genetic engineering; laws, regulations and rules.	
Pre-requisite	ZOO 342, ZOO 352	

ZOO 456	Bioinformatics	2 (1+0+1)
Content	Introduction to computational biology and bioinformatics; data analysis; sequencing of proteins and nucleic acids; determination and assembly of genome sequences; predicting protein structure; DNA microarray data analysis; data collection; biological pattern discrimination; bionetworks; applications of bioinformatics software and tools.	
Pre-requisite	ZOO 342	

ZOO 457	Cytogenetics and Cell Culture	2 (1+0+1)
Content	Sterilization and contamination prevention techniques; media types and preparations; cell separation and culturing; chromosome structure and terminology; numerical and structural variations and aberrations of chromosomes; chromosomal profiling and staining techniques.	
Pre-requisite	ZOO 342, ZOO 352	

ZOO 458	Human Genetics	2 (1+0+1)
Content	Analysis of pedigree records and Mendelian inheritance patterns in humans; Non-Mendelian inheritance (Mitochondrial inheritance, anticipation phenomenon, genomic imprinting and dosage compensation); twin studies and genetic applications; chromosomal aberrations and syndromes; multi-factorial inheritance and most common genetic disorders in humans; consanguineous marriages; genetic counseling.	

Pre-requisite	ZOO 342, ZOO 352

ZOO 461	Laboratory Techniques	2 (0+0+2)
Content	Laboratory safety instructions; experimental animals; properties of water as a solvent; pH and buffer Solutions; methods and technologies for separation of molecules; types and uses of colorimetric measurements; separation of amino acids by thin layer chromatography and identifying abnormalities in the metabolism of amino acids; separation and determination of alkaline phosphatase and the determination of its physiological and pathological levels; determination and clinical evaluation of serum total protein and albumin/globulin ratio; study of carbohydrate metabolism in laboratory animals by comparing the levels of blood glucose and liver glycogen in fasting and fed animals; determination of hormones by radioimmunoassay and enzymatic techniques; study of electrophoresis of blood proteins and hemoglobin; visual urine analysis; stool routine analysis; stone analysis; semen analysis; analysis techniques of cell pathology; examinations of microbial cultures; methods and keys of bacteria identification; antibiotics test methods; red blood cell tests (whole blood clotting time CT, bleeding time BT, hematocrit Hct, hemoglobin Hb, complete blood count CBC, erythrocyte sedimentation rate ESR); differential WBC test; sickle cell anemia test.	
Pre-requisite	ZOO 262	

ZOO 462	Experimental Parasitology	2 (1+0+1)
Content	Study of parasitism including topics on parasite biology, Biochemistry and ecology; Laboratory techniques including: experimental design, collection and treatment of the parasite and host samples and handling and identification of parasites; laboratory methods of infection for the assessment the preemptive protection against some parasitic antigens and the healing power of certain medications and biomaterials.	
Pre-requisite	ZOO 212	

ZOO 464	Biotechnology	2 (1+0+1)
Content	Definition of biotechnology; areas and methods of biotechnology; genetic engineering; applications of biotechnology in agriculture, medicine and industry; future prospects and potential risks of biotechnology.	
Pre-requisite	ZOO 424	

ZOO 465	Field Studies	5 (0+0+5)
Content	Introduction to the importance of field studies; theoretical and practical information on local animal groups in terms of classification and geographical distribution, environmental activity, pollutants of major concern to animal groups in their natural habitats; training students in the field or lab to distinguish between various environmental habitats (mountains, valleys, plains, beaches, dams, valleys) and to monitor daily animal activities; training of students on methods of collecting animal specimens, methods of recording	

	standard and descriptive information, photography and designing a final map for a selected location within work areas; discussing student results all through the training duration; preparation of reports, including the most important conclusions obtained by students during the field training.
Pre-requisite	Completion of 34 specialized credit hours

ZOO 466	Environmental Industrial Pollution	2 (1+0+1)
Content	Introduction; industrial pollution: sources, types and causes in the terrestrial and marine environments; chemical industries; heavy metals; sewage treatment; radioactive waste; pesticides and fertilizers; adverse effects of industrial pollution on the environment and wildlife; strategic control, standards and legislation; monitoring of industrial pollutants; prevention, reduction and removal of industrial pollution; industrial case studies: petrochemicals, fertilizers, and oil.	
Pre-requisite	ZOO 475	

ZOO 471	Animal Behavior	2 (1+0+1)
Content	Definition of behavior, types and importance; natural selection and behavior; environmental and behavioral adaptation; behavioral search for food; genetics and behavior; jealousy, instincts and behavior; group-living and behavior; animal cooperative and reproductive behavior; Social behavior; enemy resistance behavior; hormones and behavior; the nervous system and behavior; animal communication; learning and experience; intelligence and behavior regulation.	
Pre-requisite	ZOO 103	

ZOO 480	Wildlife Conservation	2 (2+0+0)
Content	Introduction; geographical distribution of animals; environmental balance; importance of animals in environmental balance; importance of wild animal conservation; causes of extinction of living organisms; methods of wildlife conservation; role of national and international organizations in the conservation of living organisms; legislation and regulations of the wildlife protection (locally and globally); wild animals on the Arabian peninsula (vertebrates and invertebrates; the current status of wildlife in Saudi Arabia; endangered species; nature reserves in Saudi Arabia; wildlife management.	
Pre-requisite	ZOO 373	

ZOO 481	Venomous Animals	2 (1+0+1)
Content	Biological study of the types of venomous animals and the structure of the venom gland; the chemical composition and impact of animal venoms on living organisms; prevention and treatment of poisoning; overview of the most important venomous animals in Saudi Arabia.	
Pre-requisite	ZOO 327	

ZOO 482	Organ Skills in Chordates	2 (1+0+1)

Content	Study of several body organs such as skin, skeleton, heart, kidney, etc, in a group of chordates to demonstrate their functional skills so as to enable chordates to live in their environments with the least stress effect.
Pre-requisite	ZOO 326

ZOO 497	Applied Training in Zoology	**2 (0+0 +4)**
Content	Hands on training students on various instruments, equipment and recent techniques in the specialized field. These equipment include: - Polymerase Chain Reaction (PCR) - DNA Sequencer - DNA Microarray - Enzyme Linked Immune-Sorbent Assay (ELISA). Semen Analyzer - Micromanipulator • Acquiring skills of how to draw and record the scientific data • Training students on the appropriate routes to reach to the data base and various learning sources related to the specialized field of study • Preparing and writing down lab reports and how to draw conclusions recommendations. • Preparing and presenting the scientific results in an informative and simple way to the related audiences.	

ZOO 498	Graduation Project	2 (1+0+1)
Contents	Use of scientific periodicals; search for information in various databases; designing and carrying out scientific experiments; data analysis; writing scientific reports.	
Pre-requisite	**Finish at least 95 credit hours**	

Completion of 95 or 100 credit hours

Post graduate programs

Master's Program in Zoology

Admission Requirements:

Applicants must adhere to the rules of the Deanship of the Graduate Studies:

1. Must have a bachelor's degree in Zoology from King Saud University, or the equivalent estimate of at least "good."
2. To pass the written test and personal interview.
3. Approval of the employer.
4. Should be entirely dedicated for the study in the M.Sc. program.
5. To pass any supplementary courses if department sees the need for that.

General program for a master's degree (M.Sc.) in Zoology
(12 hours compulsory (Core) + 12 hours specialization + 6 hours of research)

Compulsory hours (12 hours)

Course No.	Course Name	Credit hours
ZOO 500	Experimental Design in Zoology	2 (1+0+1)
ZOO 511	Applied Entomology and Parasitology	2 (1+0+1)
ZOO 521	Aquatic Animals	2 (1+0+1)
ZOO 531	Advanced Animal Physiology	2 (1+0+1)
ZOO 543	Cell and Tissue Biology	2 (1+0+1)
ZOO 571	Animal Ecology and Pollution	2 (1+0+1)
Total		**12 hours**

Student choose [12 hours] from one of the following Paths

Path 1: Animal Ecology and Pollution

Course No.	Course Name	Credit hours
ZOO 572	Animal Conservation	2 (2+0+0)
ZOO 573	Advanced Ecology	3 (2+0+1)
ZOO 574	Animal Zoogeography	2 (2+0+0)
ZOO 575	Eco-physiology	3 (2+0+1)
ZOO 576	Pollution Measurements Methods	3 (2+0+1)
ZOO 577	Animal Pollution	3 (2+0+1)
ZOO 578	Geographical Distribution of Pollutants	2 (1+0+1)
ZOO 579	Selected Topics in Ecology and Pollution	2 (2+0+0)
Total		**20 hours**

Path 2: Cell Biology, Genetics, and Histology

Course No.	Course Name	Credit hours
ZOO 541	Advanced Histo-Chemistry	3 (2+0+1)
ZOO 542	Advanced Cytology	3 (2+0+1)
ZOO 544	Advanced Histology	3 (2+0+1)
ZOO 546	Advanced Techniques in Histology	1 (1+0+0)
ZOO 551	Advanced Genetics	3 (2+0+1)
ZOO 552	Quantitative and Population Genetics	2 (1+0+1)
ZOO 553	Molecular Biology and Genetic Engineering	2 (2+0+0)
ZOO 554	Developmental Genetics	3 (2+0+1)
ZOO 556	Advanced Cytogenetics	2 (1+0+1)
ZOO 558	Selected Topics in Cell Biology, Genetics, and Histology	2 (2+0+0)
Total		**24 hours**

Path 3: Physiology and Developmental Biology

Course No.	Course Name	Credit hours

ZOO 532	Advanced Cell Physiology	2 (1+0+1)
ZOO 533	Physiology of Reproduction	3 (2+0+1)
ZOO 534	Physiology of Hormones	2 (1+0+1)
ZOO 536	Invertebrate Physiology	2 (1+0+1)
ZOO 537	Molecular Developmental Biology	3 (2+0+1)
ZOO 538	Advanced Descriptive and Experimental Embryology	3 (2+0+1)
ZOO 539	Selected Topics in Physiology and Development	2 (1+0+1)
ZOO 541	Advanced Histo-Chemistry	3 (2+0+1)
ZOO 575	Eco-Physiology	3 (2+0+1)
Total		**23 hours**

Path 4: Entomology and Parasitology

Course No.	Course Name	Credit hours
ZOO 510	Advanced Parasitology	3 (2+0+1)
ZOO 512	Physiology of Parasites	3 (2+0+1)
ZOO 513	Ecology of Insects	3 (2+0+1)
ZOO 514	Physiology of Insects	3 (2+0+1)
ZOO 515	Ecology of Parasites	3 (2+0+1)
ZOO 516	Acarology	3 (2+0+1)
ZOO 517	Selected Topics in Entomology and Parasitology	2 (2+0+0)
ZOO 518	Advanced Techniques in Entomology and Parasitology	1 (1+0+0)
Total		**21 hours**

Path 5: Aquatic Animals

Course No.	Course Name	Credit hours
ZOO 522	Aquatic Ichthyology	3 (2+0+1)
ZOO 523	Economic Aquatic Invertebrates	3 (2+0+1)
ZOO 524	Fish Culture and Management	3 (2+0+1)
ZOO 525	Economic Invertebrates Culture	3 (2+0+1)
ZOO 526	Selected Topics in Aquatic Animals	2 (2+0+0)
ZOO 527	Standard Environmental Specifications Aquatic Animal	1 (1+0+0)

ZOO 528	Fishery Resources	2 (1+0+1)
Total		**17 hours**

Later (classes) Paths …….		
Course No.	**Course Name**	**Credit hours**
ZOO 596	Research project	
ZOO 600	Thesis	6
Total		**6 hours**

Brief Description of the Master's Degree Courses

1: Compulsory hours (12 hours):

ZOO 500	Experimental Design in Zoology	2 (1+0+1)
Contents	Animal surveys and censuses, concepts of sampling experimental animals. Sampling units, random sampling techniques, use of random numbers for sampling experimental animals. Methods of summarizing data and graphical representation of data. Estimation, regression, correlation, contingency tables and the Chi square, analysis of variance, and experimental design. Methods of experimental design. Growth and its estimation.	

ZOO 511	Applied Entomology and Parasitology	2 (1+0+1)
Contents	A brief of arthropods and parasites of medical, veterinary, and economic importance. Host-parasite relationships. Methods of infection with parasites and parasitic arthropods. Diseases of man and domestic economical animals caused by the various groups of parasites (protozoa, platyhelminthes and nematode arthropods as vectors of aetiological agents of diseases of man and domestic animals- mange, myiasis, allergy-). Parasitic zoonoses. Immunity against arthropods and parasitic infections. Economical arthropods.	

ZOO 521	Aquatic Animals	2 (1+0+1)
Contents	Advanced biology of aquatic vertebrates (mammals, reptiles, amphibians, birds, fishes) and invertebrates (mollusks, crustaceans, echinoderms) characteristics, phylogeny, classifications, reproduction, and geographical distributions.	

ZOO 531	Advanced Animal Physiology	2 (1+0+1)
Contents	The importance of metabolic activities control in living organisms. Molecular, biological, neural, hormonal and homeostatic controlling mechanisms in living organisms. Co-ordination of body functions: interaction of cardiovascular functions, control of respiration, renal regulation of extracellular volume and osmolarity, regulation of K+, Ca2+, and H+ concentration, regulation of gastro-intestinal processes, regulation of organic metabolism and energy balance, and regulation of reproductive processes.	

ZOO 543	Cell and Tissue Biology	2 (1+0+1)
Contents	Biological membranes and their functions. The chemical nature of genetic material, the cellular and molecular basis of chromosomes. DNA replication, gene expression and its regulation in prokaryotes, cellular tissue contents of bone marrow, brain and kidneys, macrophages, mast cells and the general functions of these tissues.	

ZOO 571	Animal Ecology and Pollution	2 (1+0+1)
Contents	Introduction, ecology of individuals: organisms limiting factors, important a biotic factors, dispread Population ecology; structure and diversity; Biomass system population regulation, interspecific competition. Community and Ecosystem ecology: Zoogeography. Aquatic ecological zones in Saudi Arabia, ecological relationship between plankton and nekton in marine, fresh water and estuarine habitats. Effects of ecological factors on aquatic animals and their media. Aquatic community stratification. Productivity, methods and measurements and primary productivity. Pollution and pollutants. Ozone layer pollution, heavy metals, oxides, sage and hydrocarbons pollution. Pesticides and physical pollution.	

12 Hours specialization

Path 1: Animal Ecology and Pollution

ZOO 572	Animal Conservation	2 (2+0+0)
Contents	Ecological introduction, species and population characteristics, and ecological equilibrium. Reasons behind species extinction, study of animals in Saudi Arabia (terrestrial and aquatic). The importance of animal conservation, endangered species, protected areas in Saudi Arabia. Management of both terrestrial and aquatic animals.	

ZOO 573	Advanced Ecology (1)	3 (2+0+1)
Contents	Characteristics of aquatic and terrestrial populations (natality rate, mortality rate, density, and age distribution). Population growth, effect of abiotic factors on population growth (terrestrial and aquatic). Species intra- and inter-relationships. Population cycles, community changes, desert animal communities.	

ZOO 574	Animal Zoogeography	2 (2+0+0)
Contents	Patterns of life, continental drift, theory, the zoo-bio-geo-graphic subdivisions of the earth. Center of species dispersal and diffusion, island zoogeography. Population dispersion (random, regular, and aggregational). Population distribution (emigration, immigration, and migration). Aquatic zoogeography of animal species in freshwater and marine ecosystems. Bipolar animal species.	

ZOO 575	Eco-physiology	3 (2+0+1)
Contents	Responses of different systems (respiratory, circulatory, and digestive systems of both vertebrates and invertebrates) to environmental factors. Environmental factors effects on animals. Quantitative analysis of energy exchange, thermo-regulation, water and osmo-regulation of animals.	

ZOO 576	Pollution Measurement Methods	3 (2+0+1)
Contents	Introduction and definition of the different polluting agents to measure pollution. Utilization of some living organisms for measurement and estimation of pollution percentage. Investigation of the factors that may affect the accuracy of aids utilized in measurement of the pollution agents. Methods adopted for measurement of air and soil pollutants and determination of the international accepted pollution limits. Study of some of the methods for measurement of pollutants in Saudi Arabia and the Gulf States and the limits of pollution in the Gulf States.	

ZOO 577	Pollution in Animals	3 (2+0+1)
Contents	Introduction to pollution. Pollution glossary, pollution and the food chains. The effect of pollution on animal physiology and distribution. Selected studies on the effect of pollution on animals in Saudi Arabia and the Gulf States.	

ZOO 578	Geographical Distribution of Pollutants	2 (1+0+1)
Contents	Introduction to pollution. Quantitative and qualitative distribution of pollutants. Statistical methods used in pollution distribution. The relationships between pollutant distribution, species diversity and equitability indices and animals distribution. Pollution control as related to their geographical distribution.	

ZOO 579	Selected Topics in Ecology and Pollution	2 (2+0+0)
Contents	Selection and discussion of recent research papers in ecology and pollution.	

Path 2: Cell Biology, Genetics, and Histology

ZOO 541	Advanced Histo-Chemistry	3 (2+0+1)
Contents	Histochemical battery for detection and differentiation of carbohydrates, carboxylated and sulphated acid muco-substances as well as neutral muco-substances. Enzyme histochemistry to detect and isolate various enzymes by different methods. Methods for detection of different types of simple and conjugated lipids. Histochemical techniques to detect minerals in human and animal tissues. Immuno histochemical techniques.	

ZOO 542	Advanced Cytology	3 (2+0+1)
Contents:	Brief study of the concept of the cell. Cell growth and division, cell synchronization, and cell cycle regulation. Cell chromatin structure and function, the structure of the chromosome, and nucleic acids. DNA replication and repair.	

ZOO 544	Advanced Histology	3 (2+0+1)

Contents	Histology of the immune system (lymph nodes, tonsils, spleen, thymus, bursa of fabricius). Histology of the sense organs (ear, eye, taste buds). Histology of the endocrine glands (thyroid, pituitary, adrenal glands). Histology of the central nervous system.

ZOO 546	Advanced Techniques in Histology	1 (1+0+0)
Contents	Special techniques for preparation of sections of the eye, various parts of the central nervous system, and sections of soft and hard bones. Biological staining techniques in histology. Histological preparation of museum specimens.	

ZOO 551	Advanced Genetics	3 (2+0+1)
Contents	Mutations, recombination in bacteria, transposable of genetic material. Genetic control of the immune response and cell division (oncogenes and proto-oncogenes). Important studies in genetics such as the experiments of Lederberg and Tatum, Hershey and Chase, Melson and Stahl. Chargaff's Rules and Griffin experiments. Watson and Craig contributions in discovery of the DNA structure.	

ZOO 552	Quantitative and Population Genetics	2 (1+0+1)
Contents	Genetic structure of the population. Forces of gene frequency changes, small populations, measurements of variability, resemblance between relatives, heritability, selection, inbreeding and cross breeding. Metric traits. BLUB estimation.	

ZOO 553	Molecular Biology and Genetic Engineering	2 (2+0+0)
Contents	Restriction enzymes, cloning vectors and cloning. Construction of genomic, chromosome and cDNA libraries. Identification of specific clones sequences in cDNA and genomic libraries. DNA sequence analysis. Application of genetic engineering, hazards and problems of recombinant DNA technology and the possible techniques to minimize bio-hazards.	

ZOO 554	Developmental Genetics	3 (2+0+1)
Contents	Short and long term regulations of gene expression and their mechanisms in eukaryotes. The differentiation of the egg and maternal influences on development. Study of the developmental genetics of Drosophila sp., vertebrates and the general principles of abnormal development.	

ZOO 556	Advanced Cytogenetics	2 (1+0+1)
Contents	Architecture of viral, prokaryotic and eukaryotic chromosomes. Nature and consequences of altered chromosomal structure. Sources and consequences involving chromosome number. Karyotype preparation, banding chromosomal techniques. Human chromosomes and the genetic maps.	

ZOO 558	Selected Topics in Cell Biology, Genetics, and Histology	2 (2+0+0)
Contents	Selection and discussion of recent scientific research papers in cell biology, genetics, and histology.	

Path 3: Physiology and Developmental Biology

ZOO 532	Advanced Cell Physiology	2 (1+0+1)
Contents	A study of cells at the physiological level, including the structure and function of organelles and membranes. Enzymology, energy relationships and metabolic control, response to radiations, excitability and contractibility, and the regulation of cell growth and differentiation.	

ZOO 533	Physiology of Reproduction	3 (2+0+1)
Contents	Comparative anatomy and physiology of the reproductive system of higher vertebrates. Reproductive cycle and reproductive hormones, puberty, gametogenesis, fertilization, implantation, prenatal growth, parturition and initiation of lactation. Endocrine regulation of reproductive phenomena.	

ZOO 534	Physiology of Hormones	2 (1+0+1)
Contents	Cellular and organismal action of hormones in vertebrates. Regulation of hormones secretion, mechanism of action of hormones, hormones and blood sugar level, hormonal regulation of body fluids, regulation of calcium and phosphorus metabolism. Hormonal regulation of metabolic rate, food intake and body composition and growth. Hormonal regulation of reproduction. Hormones and animal behavior, hormones homeostasis.	

ZOO 535		2 (1+0+1)
Contents	Overview of cell and tissues of the immune system (Different types of immune cells – lymphoid tissues – immune cells migration)- Innate immune response (innate immune cells – Complement system – phagocytosis – inflammation)- Adaptive immune response (T cells adaptive immunity – B cells adaptive immunity – antibodies – lymphocyte memory)- Cytokines (Cytokines properties – Cytokines receptors – Cytokines actions – Cytokines in diseases)- The major histocompatibility complex (MHC) class I and class II (MHC class I molecules – MHC class II molecules – antigen processing and presentation by MHC class I and class II)- Tolerance immunology (mechanisms of tolerance induction – maintenance of tolerance)- Abnormalities of immune system- Immunological assays methods.	

ZOO 536	Invertebrate physiology	2 (1+0+1)
Contents	Comparative study of invertebrate physiology including: nervous system, support and locomotion, endocrine system, respiratory system, circulatory system, digestive system, excretory system and reproductive system.	

ZOO 537	Molecular Developmental Biology	3 (2+0+1)
Contents	The role of cytoplasm and nuclear contents in gametogensis, physical and chemical changes and metabolism during fertilization and cell division, protein synthesis during cleavage. Examples on the molecular development of oocytes in invertebrates, amphibians and mammals. Inhibitors and exhibitors of cellular differentiation. Relationship between cellular differentiation and cancer development.	

ZOO 538	Advanced Descriptive and Experimental Embryology	3 (2+0+1)
Contents	Oocyte growth, the role and function of follicle cells, vitellogenesis, pinocytosis and phagocytosis during oocyte growth. Partenogenesis, control of number and size of cells during growth. The tissue growth after embryological stages, the role of embryonic organizers and induction experiments, embryonic tissue culture. Radioactive labeling, artificial insemination and test tubes offspring.	

ZOO 539	Selected Topics in Physiology and Development	2 (1+0+1)
Contents	Selected topics of interest in the field of physiology and development which will depend and focus on the subfield of study of each graduate student.	

ZOO 541	Advanced Histo-Chemistry	3 (2+0+1)
Contents	Histochemical battery for detection and differentiation of carbohydrates, carboxylated and sulphated acid muco-substances as well as neutral muco-substances. Enzyme histochemistry to detect and isolate various enzymes by different methods. Methods for detection of different types of simple and conjugated lipids. Histochemical techniques to detect minerals in human and animal tissues. Immuno histochemical techniques.	

ZOO 575	Eco-Physiology	3 (2+0+1)
Contents	Responses of different systems (respiratory, circulatory, and digestive systems of both vertebrates and invertebrates) to environmental factors. Environmental factors effects on animals. Quantitative analysis of energy exchange, thermo-regulation, water and osmo-regulation of animals.	

Path 4: Entomology and Parasitology

ZOO 510	Advanced Parasitology	3 (2+0+1)
Contents	The concept of parasitism. Comparison of the origin of parasitism, predation, and other related animal associations. Economic and social importance of parasites to be highlighted through the studies of specific examples of parasitic protozoa, helminthes and arthropods. Methods of treatment of parasitic infections. Control of parasitic infections.	

ZOO 512	Physiology of Parasites	3 (2+0+1)
Contents	A study of the metabolism of carbohydrates, proteins, and lipids in various parasites. A study of enzyme systems of various parasites in relation to host infection. A study of the various physiological methods followed by parasites in the infection and establishment in the hosts. A study of the effects of parasites on their hosts, especially the competition between the parasites and their hosts for food and other vital substances, and the deleterious effects on the host immune system such as stimulation and inhibition. A study of the structure of systems of some parasitic helminthes, especially the digestive and reproductive systems. A study of the general characteristic of teguments and other outer walls of various parasites.	

ZOO 513	Ecology of Insects	3 (2+0+1)
Contents	Introduction to insect communities and their habitats. Zoo-geographical distribution of insects. A study of the various insect communities and their habitats with emphasis on the ecological factors affecting the prevalence and distribution of insects. Reproduction and life cycles of insects and their relationships to the insect bio-tops. The relationship between the insects feeding requirement and their habitat.	

ZOO 514	Physiology of Insects	3 (2+0+1)
Contents	A comparative histological and physiological study on the digestive systems of two insects, a carnivorous insect and a sap-feeding one, together with a detailed study on the digestive enzymes, food needs and secretions of the salivary glands of each insect. A detailed study of chemo-coloration of insects. A detailed histological and physiological study of the central and the anatomic nervous systems of insects and their roles in physiology, especially in growth, reproduction and protein synthesis. A detailed histological study of insect blood cells. A physiological study of the blood volume in insects and the various methods used in measuring it. An experimental physiological study of metamor-phosis in insects. A detailed study of the physiology of respiration in insects.	

ZOO 515	Ecology of Parasites	3 (2+0+1)

Contents	Types of parasites and hosts. The host as an environment for the parasite. A study of specific examples of the interactions of the various stages of parasites with their living environments (hosts), as well as the external environment. The zoogeography of parasites. Parasites as ecological control agents of hosts. A study of specific examples of parasites of terrestrial and aquatic animal hosts.

ZOO 516	Acarology	3 (2+0+1)
Contents	A review of the acari. The taxonomic status of ticks and mites. A morphological study of ticks and mites. The internal structures and physiology of the acari with special emphasis on hard ticks. Ecology of the acari. The classification of the acari (especially ticks) into families and genera with emphasis on species found in Saudi Arabia. The economic and medical importance of acari. Control of acari.	

ZOO 517	Selected Topics in entomology and Parasitology	2 (2+0+0)
Contents	Entomology and parasitology bibliography and reference sources, reference indexing, writing up of research proposals, writing up of research papers.	

ZOO 518	Advanced Techniques in Entomology or Parasitology	1 (1+0+0)
Contents	Students specializing in entomology will focus on the advanced entomological techniques, according to their specialization. Likewise, students specialized in parasitology will focus on the advanced parasitological techniques especially immune-parasitology, according to their specialization.	

Path 5: Aquatic Animals

ZOO 522	Advanced Ichthyology	3 (2+0+1)
Contents	Advanced phylogeny, classification, anatomy, physiological adaptation, reproductive strategies, relationships and diversification of fishes.	

ZOO 523	Economic Aquatic Invertebrates	3 (2+0+1)
Contents	Advanced biology of aquatic invertebrates: their characteristics, anatomy, classification, phylogeny, reproduction, adaptations, and diversity.	

ZOO 524	Fish Culture and Management	3 (2+0+1)
Contents	General principles of fish culture, common procedures of tilapia, catfish, and carps culture. Aquaculture economics.	

ZOO 525	Economic Invertebrates Culture	3 (2+0+1)
Contents	Natural histories, special requirements of culture and management of economically important invertebrates adaptable to artificial impoundments: prawn, lobster, crabs, oyster, and squid.	

ZOO 526	Selected Topics on Aquatic Animals	2 (2+0+0)
Contents	Selected topics on research in aquatic animals.	

ZOO 527	Standard Environmental Specifications for Aquatic Animals	1 (1+0+0)
Contents	To provide the students with the general test procedures to establish water quality criteria and tentative water quality criteria for temperature, dissolved oxygen, carbon dioxide, finely divided solid matter, monohydric phenols, pH, ammonia, chlorine, zinc, copper, and cadmium.	

ZOO 528	Fishery Resources	2 (2+0+0)
Contents	Contents: Fisheries as a renewable natural resource. Its contribution to the food security of the nation, and its superiority to the other sources of animal proteins. Modern and recent methods of fisheries development and preservation. Laws of protection of the fisheries. The Saudi Arabian fisheries and its future. Aquaculture development to meet the demand for fish. Mariculture prospects for Saudi Arabia.	

Later (classes)

ZOO 596	Research project	
Contents	The course aims to train students to design and conduct scientific research experiments, record data, analyze them statistically, discuss their meanings and scientific interpretations, and submit them in seminars	

ZOO 600	Thesis	6 (6+0+0)
Contents	The student conduct scientific research in one of the tracks before then writes a dissertation under the supervision of a faculty member supervisor.	

Master of Science in Zoology (Courses Option)

Program Objectives:

1- To qualify students scientifically and practically in order to fulfill their duties upon graduation in various scopes of knowledge.

2- To provide eligible scientific cadres able to participate in the scientific progress in the kingdom.

3- To improve the efficiency of the employees in the governmental sectors by getting acquainted with the latest aspects of the scientific progress

Admission Requirements:

1) The admission requirements enumerated in the 15th article of the unified law organizing the graduate studies in Saudi universities.

2) The candidate must obtain B.Sc. degree in Zoology from KSU or equivalent university.

3) The candidate must pass successfully the interview held by the supervising committee.

Degree requirements:

A. Successful completion of 42 credit hours of graduate courses distributed as follows:

1- 34 credit hours from the core Courses (If applicable).

2- 8 credit hours from the elective Courses (If applicable).

Program Structure:

Course No. & Code	No. of Courses	No. of units
	15 Compulsory courses	30
	(3-6) elective courses	8
Zoo 599	Research project	4
Total		

Courses Distribution

First Level

Course code	Course title	Credit hrs.
Zoo 511	Applied Entomology and Parasitology	2 (1+0+1)
Zoo 521	Aquatic Animals	2 (1+0+1)
Zoo 531	Advanced Animal Physiology	2 (1+0+1)
Zoo 543	Cell and Tissue Biology	2 (1+0+1)
Zoo 556	Advanced Cytogenetics	2 (1+0+1)
Zoo 571	Animal Ecology and Pollution	2 (1+0+1)

Second Level

Course code	Course title	Credit hrs.
Zoo 519	Medical Entomology	2 (1+0+1)
Zoo 520	Common Parasites of Animal and Man	2 (1+0+1)
Zoo 529	Fish Culture	2 (1+0+1)
Zoo 534	Physiology of Hormones	2 (1+0+1)
Zoo 553	Molecular Biology and Genetics	2 (2+0+0)
Zoo 580	Advanced Animal Ecology	2 (1+0+1)

Third Level

(A) 6 Compulsory Units

Course code	Course title	Credit hrs.
Zoo 528	Fishery Resources	2 (2+0+0)
Zoo 561	Embryonic Development	2 (1+0+1)
Zoo 581	Advanced Pollution	2 (1+0+1)

(B) 6 Optional Units

Course code	Course title	Credit hrs.
Zoo 500	Experimental Design in Zoology	2 (1+0+1)
Zoo 516	Acarology	3 (2+0+1)
Zoo 518	Advanced Techniques in Entomology or Parasitology	1 (0+0+1)
Zoo 523	Economic Invertebrates	2 (1+0+1)
Zoo 524	Advanced Ichthyology	2 (1+0+1)
Zoo 527	Standard quality for Aquatic Environment	1 (0+0+1)
Zoo 541	Advanced Histochemistry	3 (2+0+1)
Zoo 546	Advanced Techniques in Histology	1 (0+0+1)
Zoo 552	Quantitative and Population Genetics	2 (1+0+1)
Zoo 560	Advanced Biotechnology	2 (1+0+1)
Zoo 562	Reproductive physiology and Artificial Insemination	2 (1+0+1)
Zoo 563	Physiological Immunology	2 (1+0+1)
Zoo 564	Recent Techniques in Embryology	2 (1+0+1)
Zoo 565	Immunoparasitology	2 (1+0+1)
Zoo 584	Animal Diversity in Saudi Arabia	2 (2+0+0)
Zoo 585	Ecophysiology	2 (1+0+1)
Zoo 586	Advanced Animal Behaviour	2 (1+0+1)
Zoo 597	Selected Topics in Zoology	1 (1+0+0)
Zoo 598	Seminar	1 (1+0+0)

Fourth Level

Course code	Course title	Credit hrs.
	The student choses two optional units from the previous list provided that they pertaining to his specialization	2
Zoo 599	Research project	4 (0+0+4)

Courses Description

Zoo 500	Experimental Design in Zoology	2 (1+0+1)
Contents	Animal surveys and censuses, concepts of experimental animal sampling, animal experimental population, random sampling methods and the conditions under which they are used, advantages and disadvantages. Methods of summarizing animal data, graphical representation of data, estimation. Regression, correlation, contingency tables and the Chi-Square, analysis of variance, and experimental design Growth and its estimation	

Zoo 511	Applied Entomology and Parasitology	2 (1+0+1)
Contents	A review of arthropods and parasites of medical, veterinary and economic importance. Host-parasite relationships. Methods of infection with parasites and parasitic arthropods Diseases of man and domestic animals caused by the various groups of parasites (Protozoa, Platyheminthes and Nematode Arthropods as vectors of aetiological agents of diseases of man and domesticated animals. (mange, myiasis, allergy). Parasitic zoonoses. Immunity against arthropod and parasitic infections Economical arthropods.	

Zoo 516	Acarology	3 (2+0+1)
Contents	A review of Acari the taxonomic status of ticks and mites. A morphological study of ticks and mites. The internal structures and physiology of Acari with special emphasis on hard ticks. Ecology of Acari. The classification of Acari (especially ticks) into families and genera with emphasis on species found in Saudi Arabia. The economic and medical importance of Acari. Control of Acari.	

Zoo 518	Advanced Techniques in Entomology or Parasitology	1 (0+0+1)
	Students specializing in entomology will study the advanced entomological techniques, each according to his specialization. Likewise, students specialized in parasitology will study the advanced parasitological techniques especially immunoparasitological, one each according to his or her specialization	

Zoo 519	Medical Entomology	2 (1+0+1)
Contents	Studying the feeding organs of disease-transmitting insects and other Arthropods (mouth parts, structure and function of digestive system and feeding mechanism). Studying disease-transmitting insects and other Arthropods: Experimental, Transmission, Relationship between the pathogen, vector and host. Response of vertebrate host to insect-transmitted pathogens. Insect-transmitted diseases of wild animals. Studying insect different mechanisms of diseases transmission: Mechanical, Biological, Transovarial, and Propagative Transmission. Studying Myiasis that caused by insect to vertebrate hosts.	

Zoo 520	Common Parasites of Animals and Man	2 (1+0+1)
Contents	Understanding of relationships between environmental and biotic factors that affect transmission of parasites between Man and domesticated animals. Study of the histopathological effects and diseases of these parasites on the infected hosts. Factors that help control and maintain of the environmental health.	

Zoo 521	Aquatic Fauna	2 (1+0+1)
Contents	Introduction and general characteristics of Aquatic fauna, Classification and systematic relationships, Examples of reproduction in some aquatic animals, Geographical distribution of the following groups: Mollusca, Echinodermata, Crustaceans, Fishes, Amphibians, Reptiles, Birds and Mammals.	

Zoo 523	Economic Invertebrates	2 (1+0+1)
Contents	Introduction, Classification, Advanced Biological studies including: Morphology, Anatomy, Reproduction and Geographical distribution of some chosen examples.	

Zoo 524	Advanced Ichthyology	2 (1+0+1)
Contents	Introduction, Classification, Biological and anatomical studies, Aquatic environment and relationships between fish groups, physiological studies (adaptations), Reproduction and life cycle.	

Zoo 527	Standard Quality for Aquatic Environments	1 (0+0+1)
Contents	Introduction, Characteristics of aquatic environment, Standard measurements including: Temperature, Dissolved oxygen, Carbon dioxide, Salinity, pH, Ammonia and Heavy metals.	

Zoo 528	Fishery Resources	2 (2+0+0)
Contents	Introduction, Fisheries and food security, Development of fisheries, Importance and superiority of fish protein, Fisheries of Saudi Arabia, Present and future.	

Zoo 529	Fish Culture (Fish Farming)	2 (1+0+1)
Contents	Introduction of fish culture, Economic importance of aquaculture, Requirements of fish culture, types of aquaculture, Chosen examples of cultivated fishes including: Tilapia, Carp and Catfish.	

Zoo 531	Advanced Animal Physiology	2 (1+0+1)
Contents	The importance of control in living systems, molecular control mechanisms; biological control systems: homeostatic, neural and hormonal control mechanisms; coordination of body function: integration of cardiovascular function, control of respiration, renal regulation of extracellular volume and osmolality, regulation of K^+ , Ca^{++} and H^+ concentration, regulation of gastrointestinal processes, regulation of organic metabolism and energy balance, regulation of the reproductive process.	

Zoo 534	Physiology of Hormones	2 (1+0+1)
Contents	Cellular and organism action of hormones in vertebrates. Regulation of hormone secretion, mechanism of action of hormones, hormones and blood sugar, hormone regulation of body fluids, regulation of calcium and phosphorus metabolism, hormonal regulation of metabolic rate, food intake, body composition and growth, Hormones and animal behavior, hormones and homeostasis.	

Zoo 541	Advanced Histochemistry	3 (2+0+1)
Contents	Histochemical methods for detecting and differentiating of the various types of carbohydrates especially neutral muco-substances, sialomucins, sulfomucins; conjugated and non-conjugated carbohydrates. Histochemical methods for detecting enzymes. Histochemical methods for detecting neutral lipids, phospholipids, saturated and unsaturated lipids, cholesterol and the histochemical tools to differentiate between simple and compound lipids. Metal detection by histochemical techniques. Immunohistochemical methods.	

Zoo 543	Cell and Tissue Biology	3 (2+0+1)
Contents	Biological membranes and their functions, the chemical nature of the genetic material, cellular and molecular basis of chromosomes, DNA replication, gene expression and its regulation in prokaryotes, cellular and tissue contents of bone marrow, brain and kidney macrophages, mast cells and the general functions of these tissues.	

Zoo 546	Advanced Techniques in Histology	1 (0+0+1)
Contents	Special techniques for preparation of sections of the eye, parts of the central nervous system, and soft and hard bones. Biological staining techniques used in histology, Section preparations of museum specimens.	

Zoo 552	Quantitative and Population Genetics	2 (1+0+1)
Contents	Genetic structure of populations, forces of gene frequency changes, small populations, measurements of variation, resemblance between relatives, heritability, selection, inbreeding and crossbreeding, metric traits. BLUP estimation.	

Zoo 553	Molecular Biology and Genetic Engineering	2 (2+0+0)
Contents	Restriction enzymes, cloning vectors and cloning, construction of genomic, chromosome and cDNA libraries, identifying specific cloned sequences in cDNA and genomic libraries, DNA sequence analysis , applications of genetic engineering, hazards and problems of recombinant DNA technology and the possible techniques to minimize biohazards.	

Zoo 556	Advanced Cytogenetics	2 (1+0+1)
Contents	Architecture of viral, prokaryotic and eukaryotic chromosomes, nature and consequences of altered chromosomal structure, sources and consequences involving chromosome number karyotype preparation banding techniques, human chromosomes and the genetic maps.	

Zoo 560	Advanced Biotechnology	2 (1+0+1)
Contents	Monoclonal polyclonal antibody drugs, drug delivery and gene therapy. Animal Biotechnology: Cloning livestock, crop biotechnology, and food biotechnology. Recombinant DNA technology, embryonic stem cells, and therapeutic cloning Genetic information nondiscrimination Act (GINA), social responsibility of biotechnology. Human genome project and genomics.	

Zoo 561	Embryonic Development	2 (1+0+1)
Contents	The role of cytoplasm and nuclear contents in gametogenesis and fertilization Oocyte growth and the role and function of follicle cells, vitellogenesis, Pinocytosis and phagocytosis during oocyte growth control of number and size of cells during growth, tissue growth after embryological	

	stages, the role of embryonic organizers and induction experiments, embryonic tissue culture.

Zoo 562	**Reproductive Physiology and Artificial Insemination**	**2 (1+0+1)**
Contents	The structure of reproductive system in higher vertebrates, reproductive cycles and their hormonal regulation, seasonality of reproduction, Sprmatoginc waves and cycles. The basic steps for performing. Artificial insemination (A. I). The role of A. I. in improving animal production.	

Zoo 563	**Physiological Immunology**	**2 (1+0+1)**
Contents	Regulation of immune responses and effectors mechanisms. Molecular regulation of MHC and immunoglobulin production, their types and classes. Functions and types of B and T cell receptors and CD molecules. Regulation of cytokine production by T lymphocyte and some non-lymphocyte. Physiological mechanisms involved in tumors, primary and secondary immunodeficiency and types of hypersensitivity.	

Zoo 564	**Recent Techniques in Embryology**	**2 (1+0+1)**
Contents	Migration of primordial germ cells, In vitro fertilization (IVF), intracytoplasmic sperm injection (ICSI), production of test tube babies, embryo culture and development, cloning and identical twins production, chimera, establishment of stem cells and developments, Cryopreservation of gametes and embryos, genome banks.	

Zoo 565	**Immunoparasitology**	**2 (1+0+1)**
Contents	Study of the relations between various parasites and the immune system against them. Topics covered are Malaria, Trypanosomiasis, Leishmaniasis, Schistosomiasis and other gastrointestinal parasites.	

Zoo 571	Animal Ecology and Pollution	2 (1+0+1)
Contents	Introduction, ecology of individuals: organisms limiting factors, important abiotic factors, dispread population Ecology; structure and diversity; Biomass system Population regulation, interspecific competition. Community and Ecosystem ecology: zoogeography aquatic ecological zones and ecosystems in Saudi Arabia. Effects of ecological factors on aquatic animals and their media. Aquatic community stratification. Productivity, Ozone layer pollution, Heavy metals, oxides, sewage and hydrocarbons pollution. Pesticides and physical pollution.	

Zoo 580	Advanced Animal Ecology	2 (1+0+1)
Contents	Characteristics of aquatic and terrestrial animal populations (natality rate, density, age distribution). Population growth, effect of abiotic factors on population growth (aquatic & terrestrial) species intra-and inter-relationships. Desert animal communities Aspects of modifications & adaptations of body structures of some desert animals. Ecosystem conservation.	

Zoo 581	Advanced Pollution	2 (1+0+1)
Contents	Pollution & pollutants, physical: particles, gases, ozone layer, radiations and noise chemical pollution: heavy metals, oil, pesticides, sewage; organic and biological pollution; hydro-pollution; food pollution. Pollution in the G. C. C. states.	

Zoo 584	Animal Diversity in Saudi Arabia	2 (2+0+0)
Contents	Introduction, Plate tectonic and the formation of the Arabian Peninsula. The origin of the animal groups in Arabia. Terrestrial and Aquatic habitats, Animal diversity (Mammals, Birds, Reptiles, Amphibians and Invertebrates). Status of Animal groups. Conservation of wild life. Protected areas. Laws and systems. Movements and NGOs.	

Zoo 585	Ecophysiology	2 (1+0+1)
Contents	Responses of different systems to environmental factors including respiration, circulation and digestion of vertebrae and invertebrate animals- Responses of vertebrates and invertebrates various systems to changes in environmental factors. Quantitative analysis of energy exchange and respiration. Thermoregulation, water, osmoregulation and excretion.	

Zoo 586	Advanced Animal Behavior	2 (1+0+1)
Contents	Introduction to animal behavior and types of behavior. Meaning of behavior. Ecology and adaptive behavior. Foraging behavior and different regulations. Instinctive behavior. Sexual behavior and cooperative breeding. Social behavior and aggression behavior and different regulations. The role of Hormones in behavior. Learning and experience and intelligence and Pavlov experiments. Ethnopharmacology and different regulations. The role of animal behavior in Biomedical studies. The role of nervous system in behavior.	

Zoo 597	Selected Topics in Zoology	1 (1+0+0)
Contents	The student showed be able to look for related information to his field in some of Zoology branches such as histology, cytology, physiology, Embryology, genetics, Ecology or classification in vertebrates or invertebrates.	

Zoo 598	Seminar	1 (1+0+0)
Contents	The student should obtain and gather the Scientific materials in his area of study, then give presentation including discussion with the interested staff members and postgraduate students.	

Zoo 599	Research Project	4 (0+0+4)
Contents	This course aims at training students on designing and executing research experiments, recording, analyzing, and discussing date giving scientific explanations, then offering a presentation in a scientific meeting.	

Master's Program in Biodiversity

Attention paid to biodiversity conservation has become a basic worldwide awareness because of its impact on the continuation of life on this planet. This awareness has evolved into the "Convention on Biological Diversity" signed up by more than 150 countries in the framework of the United Nations Conference on Environment and Development (UNCED) within the "Rio Earth Summit" held in Brazil, 1992. This conference confirmed the importance of conservation and sustainable use of biological resources in each country and gave emphasis on the responsibilities of member countries in conducting studies and training and supporting cooperation for biodiversity conservation. The Kingdom of Saudi Arabia has acceded to the "Convention" at the beginning of 1422 AH (2001) out of a sense of the importance of biodiversity preservation and conservation and to maintain and take advantage of the benefits arising from the application of the Convention by member countries.

With a stable awareness of the importance of biodiversity and its conservation, King Saud University had approved a joint program between the College of Science, represented by the Departments of Zoology and Botany and Microbiology and the College of Food and Agricultural Sciences, represented by Departments of Animal Production and Plant Production, to tutor specialists in the field of biodiversity and to contribute to research and studies in this area. This program aims at: - Preparation of scientific researchers and equipping them with skills and expertise in the field of biodiversity for the conservation of natural resources and bio-cultural heritage. - Contribution in the studies and research on wildlife and natural resources to perceive the Kingdom's biota inventory and to get use of it. - Keeping abreast of the scientific developments and concerns of the environmental issues and bio-components and addressing risk confrontation for the sake of a better life. - Contribution to the achievement of national policies aiming at study-based protection of living organisms and paying attention to finding appropriate answers to key environmental issues, locally and globally.

- Admission Requirements:

1. The applicant must have received a bachelor's degree in a bio-interdisciplinary as: Botany, Zoology, Rangelands and Forests or another relevant discipline from King Saud University or equivalent.
2. The applicant should pass a personal interview conducted by the program administration committee.
3. Other conditions, enclosed in the "Graduate Studies Regulation List", should apply.

- Study System:

The study in this program offers a thesis and curricula Master's Degree according to the university semester system, in which the applicant has to finish24credits spread over 3 semesters: 10 credit hours in the first semester, 9 credit hours in the second semester and 5 credit hours in the third semester. Afterward, the student has to write his/her research project proposal, undertake the research work and write down the thesis as preludes to "dissertation defense".

- Some Courses of the Program:

- Biodiversity in ecosystems
- Classification of flora and fauna
- Biodiversity and development
- Wildlife management
- Rangeland management for the multi-use.
- Diseases of wild flora and fauna
- Genetic resources
- Regulations and legislation on environmental conservation
- Forest development and arboriculture
- Animal Conservation

Doctoral Program in Zoology

Admission Requirements:

Applicants must adhere to the rules of the Deanship of the Graduate Studies:

- Must have a master's degree in Zoology from King Saud University, or what is equivalent.
- To pass the written test and personal interview.
- Must have obtained at least a score of 450 in the Test of English as a Foreign Language (TOEFL) or International English Language Testing System (IELTS) with a score not less than 4.5, as well as passing the Academic Reading and writing modules.
- Approval of the employer.
- Should be entirely dedicated for the study in the Ph.D program.
- To pass any supplementary courses if department sees the need for that.

Doctoral Program in Zoology Science

(10 hours compulsory (Core) + 8 hours specialization + 6 hours of research)

Compulsory hours (10 hours)

	Course No.	Course Name	Credit hours
Level One	ZOO 611	Applied Entomology and Parasitology (1)	2 (2+0+0)
	ZOO 621	Advanced Aquatic Animals	2 (2+0+0)
	ZOO 631	Comparative Reproductive Physiology	2 (2+0+0)
	ZOO 641	Advanced Cell Biology	2 (2+0+0)
	ZOO 671	Advanced Animal Ecology and Pollution	2 (2+0+0)
	total		10 hours

Specialized hours (8 hours)

The student chooses 8 credit hours according to their specialization			
Level Two	**Course No.**	**Course Name**	**Credit hours**
	ZOO 612	Advanced Entomology	2 (2+0+0)
	ZOO 613	Parasites Culturing	2 (2+0+0)
	ZOO 614	Selected Topics in Parasitology or Entomology	2 (2+0+0)
	ZOO 622	Aquatic Vertebrates	2 (2+0+0)
	ZOO 623	Nutrients Requirement and Metabolism in Fish	2 (2+0+0)
	ZOO 624	Bio-Economics in Fisheries Resources	2 (2+0+0)
	ZOO 635	Advanced Animal Behavior	2 (2+0+0)
	ZOO 637	Medical immunology	2 (2+0+0)
	ZOO 638	Advanced Topics in Physiology	2 (2+0+0)
	ZOO 639	Recent Topics in Developmental Biology	2 (2+0+0)
	ZOO 642	Advanced Cytology	2 (2+0+0)
	ZOO 643	Functional Histology	2 (2+0+0)
	ZOO 651	Molecular Genetics	2 (2+0+0)
	ZOO 672	Terrestrial Animal Ecology	2 (2+0+0)
	ZOO 673	Aquatic Animal Ecology	2 (2+0+0)
	ZOO 674	Advanced Studies in Pollution	2 (2+0+0)
	ZOO 691	Dissertation	2 (2+0+0)
			32 hours

Following Levels

Course No.	**Course Name**	**Credit hours**
ZOO 699	Research project	
ZOO 700	Dissertation	6 (0+0+6)
		6 hours

Brief Description of the Doctoral Degree Courses

1: Compulsory Courses (10 hours)

ZOO 611	Applied Entomology and Parasitology	2 (2+0+0)
Contents	Advanced economical and pathological survey of arthropods and other parasites. Advanced studies on the arthropods of their economic importance. Advanced studies on the pathogenesis of some diseases caused by or transmitted by arthropods. Advanced studies on the pathogenesis of some parasitic diseases of man and his domesticated animals.	

ZOO 621	Advanced Aquatic Animals	2 (2+0+0)
Contents	Recent advances in aquatic animal characteristics, phylogeny, adaptations, zoogeography and reproductive strategies.	

ZOO 631	Comparative Reproductive Physiology	2 (2+0+0)
Contents	Comparative study of reproduction in fishes, amphibians, reptiles, birds and mammals, including the male and female reproductive systems, reproductive cycle, gametogenesis and fertilization, care of the embryo and fetus and their expulsion, and the effect of environment on reproduction.	

ZOO 641	Advanced cell Biology	2 (2+0+0)
Contents	The cell as a cytotoxic testing system. Labeling the cell molecules. Cell fusion by inactivated viruses and by polyethylene glycol. Study of specialized cells and cells in cultures. Immuno-genetics and the major histocompatibility complex.	

ZOO 671	Advance Animal Ecology and Pollution	2 (2+0+0)
Contents	Species diversity, community structure and diversity, predators and predation, aquatic community regulation. Habitat types. Feeding mechanisms, factors controlling diversity. Fresh water wetland, Mangrove mangles, inorganic pollutants, organic pollutants, biological pollutants and physical pollutants.	

2: Students Choice of hours (8 hours)

ZOO 612	Advanced Entomology	2 (2+0+0)
Contents	Morphological and physiological adaptation of insects. Habitat problems of insects, respiration and osmoregulation. Organization of the nervous and muscular systems. Neurosecretory hormones: Diapause, moulting and juvenile hormones. Pheromones and their applications. Insects and their relationship with man: Physical and chemical disturbances, environmental impact assessment, insects as vectors of diseases.	

ZOO 613	Parasite culture	2 (2+0+0)
Contents	This course aims to provide parasitology Ph.D. students with the theoretical principles of parasite culture (in culture media and in laboratory animals) that they might need for their Ph.D. research programs. It includes: An introduction about animal tissue culture, the theoretical principles of culturing (in culture media) the following parasites: *Trypanosoma* spp. *Leishmania* spp. Entamoeba spp. Bladder worms, especially hydatid cysts, free-living strongly larvae and methods of identification of infective forms. Maintenance of various parasites in laboratory animals.	

ZOO 614	Selected topics in Entomology and Parasitology	2 (2+0+0)
Contents	Advanced selected topics in entomology or parasitology according to the need of the student and the guidance of the supervisor.	

ZOO 622	Aquatic vertebrates	2 (2+0+0)
Contents	Broad and detailed view of the recent advances in systematic, comparative anatomy, functional morphology, adaptations and zoogeography of aquatic vertebrates. Recent issues and current interest in the biology and the distribution of Arabian aquatic vertebrates.	

ZOO 623	Nutrients requirements and Metabolism in Fish	2 (2+0+0)
Contents	Advanced study of nutrients requirement and metabolism of fish in various physiological conditions. Factors affecting the nutrients requirement. Interaction of protein, fat and carbohydrate metabolism. Students' reports on recent journal articles.	

ZOO 624	Bioeconomics of fisheries resources	2 (2+0+0)
Contents	Economic analysis used in the evaluation of fisheries resources, supply and demand statistical analysis and data generation, laws affecting production and catch, economics of fisheries projects.	

ZOO 635	Advanced Animal behavior	2 (2+0+0)
Contents	An Introduction to animal behavior and types of behavior. Foraging behavior and different regimes. Behavioral physiological adaptations. Animal behavior and applied Pharmacology. The role of animal behavior in biomedical studies. Biological rhythm, homing and migration. Animal communication. Applications of Pavlov experiments. Biological control. The role of nervous system in behavior.	

ZOO 637		2 (2+0+0)
Contents	Overview of different types of immune responses – cellular interaction in the immune system – the immune response regulation – Immunogenetics – Autoimmunity and autoimmunte diseases (causes of autoimmune diseases – classification of autoimmune diseases – immunopathology of autoimmune diseases - autoimmune diseases in Saudi Arabia)- Immunodeficiency diseases (Classification of Immunodeficiency diseases- primary Immunodeficiency diseases – acquired Immunodeficiencies – Immunodeficiency diseases in Saudi Arabia)- Immunology of transplantation (overview of organ transplantation – immunological mechanisms in hyperacute rejection - immunological mechanisms in acute rejection - immunological mechanisms in chronic rejection - organ transplantation in Saudi Arabia)- Tumour immunology (overview of cancer incidence in Saudi Arabia – causes of malignancy – tumour antigens – tumour cell evasion of the immune response – tumour immunotherapy).	

ZOO 638	Advanced topics in Physiology	2 (2+0+0)
Contents	Reviewing the up-to-date knowledge and information available in the various disciplines of animal physiology including: neuro, endocrine, immuno, cardio-vascular, renal, gastrointestinal and reproductive physiology.	

ZOO 639	Current topics in Developmental Biology	2 (2+0+0)
Contents	Follow up of the recently published research in the area of developmental biology including: The molecular basis of developmental biology, gametogenesis and maturation of gametes, in vitro fertilization and embryo transfer, immune response during embryogenesis, recent techniques for tracing embryonic growth, factors involved in controlling embryonic cell proliferation.	

ZOO 642	Advanced Cytology	2 (2+0+0)
Contents	Cell membranes and their principal functions. Cell organelle's functions and the relationship between them. The cytoskeleton and its role in cell support and transport. Cell development and differentiation and factors affecting its growth. The nucleo cytoplasmic interactions. Properties and types of cell cancer.	

ZOO 643	Functional Histology	2 (2+0+0)
Contents	Detailed studies on the correlation between the histology and the function of the digestive, urinary and reproductive systems and the sense organs.	

ZOO 651	Molecular genetics	2 (2+0+0)
Contents	Control of gene expression and enzyme differentiation, hormonal control of gene expression, genetic polymorphism among enzyme loci, molecular population genetics and its techniques, DNA sequencing, genetic factors in developmental regulation and the molecular basis of the cytoplasmic inheritance.	

ZOO 672	Terrestrial Animal Ecology	2 (2+0+0)
Contents	Nature of communities, influence of competition and predation on community structure, terrestrial communities (desert, grass land, tropical community). Biodiversity in desert ecosystem, island ecology, topics on wildlife conservation, special topics on desert ecology (desertification).	

ZOO 673	Aquatic Animal Ecology	2 (2+0+0)
Contents	Advanced consideration of the aquatic ecology of aquatic animals species emphasizing current issues which include: community structure, population growth, population regulation, dispersion, species interaction, diversity, competition, predation, age composition, density and niche theory. Recent advances of the interrelationships between aquatic fauna and their environment. In depth studies, of recent advances, of statistical design and analysis of ecological measurement of selected aquatic populations.	

ZOO 674	Advanced studies in Pollution	2 (2+0+0)
Contents	Chemistry of ecological pollutants, physics of ecological pollutants, advanced studies in pollutants measurement. Advanced studies in geographical distribution of pollutants with relation to animal distribution. Advanced studies in effects of pollutants on animal physiology.	

ZOO 691	Seminar	2 (2+0+0)
Contents	Presentation and discussion of advanced topics in Zoology according to the guidance of the course instructor.	

ZOO 700	Dissertation	
Contents	The student conduct scientific research in one of the tracks before then writes a dissertation under the supervision of a faculty member supervisor.	

Research Chairs including the followings:

The following is a brief summary of these chairs:

1. DNA Research Chair:

Research Chair highlights the importance of the discovery of DNA in the molecular characterization of the genetic material of living organisms and the transfer of those properties to be valuable knowledge and impact practical help in reducing the economic costs and increase the gross national product in all sectors of production and service types. This will result in increased knowledge to design quick, effective and low-cost sets of examination and analysis for living organisms or parts thereof, either alone or mixed, for human or non-human materials, pathogens and toxic and harmful and dangerous materials of economic importance. Leading to development and improvement of experimentation techniques, thus creating opportunities for scientific publications and registration of patents, in the field of DNA, which will benefit the community to grow and progress and this chair.

Aims to:

1. Support research in the field of DNA for the detection of DNA and genotypes of different organisms, both human and non-human pathogens and toxic, harmful, dangerous and of economic importance.
2. The development of techniques for examining and analyzing DNA.
3. Development and increased opportunities for patenting and commercialization of inventions in research.
4. Support graduate and specialized training in the field.
5. Consulting and technical services for public and private sectors.

2. Chair of Bio-Products **research**:

- Development of a laboratory room to clear and analyze natural and synthetic chemical compounds.
- Discovery and development of natural substances derived from living organisms like bacteria, fungi, plants and others for the purpose of discovery

of new types of growth inhibitors that can be developed to resist the growth and treatment of various types of cancer cells.

Aims to:

- Discovery and development of novel molecules to serve as targets of new pharmaceutical drugs and then create a dynamic innovative way of clearing the discovery of new types of drugs.
- Discovery of new types of antibiotics.
- Establishing a base for synthetic compounds (small molecules libraries) to be used to study the mechanisms of cellular systems.

3. Research Chair for fetal programming in relation to diseases:

The research in this Chair cares about studying fetal programming diseases and the impact of negative changes in the uterine environment on fetal development and how this correlates with the emergence of chronic diseases in the post-puberty. The Barker Theory indicates that the fetus is able to adapt to negative placental environmental factors, - such as lack of food- a way that maintains the continued growth and safety of the most important organs such as the brain and heart at the expense of the least important ones- progressively – such as the kidneys, lungs, liver and genitals; since the fetus is not in direct need at that stage to the kidneys and lungs, where the mother purify the blood and breathing on his/her behalf. As a result, to the adaptation of the organs that have not had sufficient quantity of food during their formation during the embryonic stage, they become unable to function as normal in the post-puberty, when conditions are more difficult.

Recent studies conducted on many human societies in the developing and developed countries shows that malnutrition in pregnant women – quantity or quality – results on many chronic diseases as blood pressure, diabetes, obesity and kidney failure. The chair focuses to study the relationship between the nature of nutrition among pregnant women in Saudi society and the emergence and spread of chronic diseases in future generations. It is well known that each community's food habits are different from other communities; so it is very important to conduct studies on Saudi society rather than the adoption of general recommendations based on the results of studies that have been applied in other societies. Therefore; the chair seeks to determine the effect of dietary patterns in Saudi Arabia (presence / absence of breakfast; eating / not eating dairy products is inadequate; eating / not eating fruits and vegetables fresh enough; fasting / non fasting of Ramadan during pregnancy ... etc.) on the programming of chronic

diseases in future generations; and the exploration of early biomarkers that indicate the possibility of the emergence of chronic diseases.

The team consists of a number of scientific national and international researchers with medical specialties and vitality within and outside the university. The joining of Professor David Parker to the research team - founder of the theory of programming of embryonic diseases – is considered as a big asset to the team because of its extensive experience and reputation contributing in the delivery of scientific production of the Chair to the international research levels.

Aims to:

Support and execution of research in the areas of embryonic programming of chronic diseases with the health and economic value.

- Conduct research to highlight the role of dietary patterns of pregnant mother in the Saudi community in the programming and the emergence of diseases such as high blood pressure and other chronic diseases in future generations. Then draw the proper nutrition strategies for pregnant women in order to reduce the spread of these diseases.
- To benefit from medical databases to re-categorize and analyze the statistics for the service of scientific research at the national level.
- In collaboration with health authorities, educational and informative agencies, contribute to educate the Saudi family in general and pregnant women in particular with the negative effects of unbalanced nutrition on the health of children.
- Collaboration with international research points to the transfer of expertise and improve the quality of national research.
- Establishment of an advanced unit for the production of animal models with special emulate physiological conditions found in some patients with high blood pressure in the Saudi society for more scientific experiments.
- Provide advice and recommendations to the health sector and to help drawing national health strategies.
- Support for postgraduate courses and specialized training.

4. KSU **Mammals Research Chair**

Establishment of Centre of excellence, to keep up with the knowledge creativity system, providing cutting edge research through reaching internationally peer reviewed periodicals. Attracting outstanding researchers as well as technology transfer.

Aims to:

1. Bolstering genuine scientific research.
2. Establishing strategic research group forming point of strength to the university and the country.
3. Supporting the university 2030 strategic plan toward the knowledge-based economy.
4. Expanding regional and international collaboration in the field of mammalian research.
5. Enriching the Arabic library through publishing and translating books focusing on Mammalogy.
6. Contribution in supporting the international effort to evaluate species red lists.
7. Contribution in supporting national/international initiatives toward a "ONE HEALTH" program.
8. Supporting the effort of conserving endangered mammals in the Kingdom of Saudi Arabia.
   Supporting the Department of Zoology Museum through providing different samples from all over the Kingdom of Saudi Arabia

Support Units

1- Microscopic preparations Unit:

This Unit was established in 1427 AH, and serves mainly researchers from the undergraduate and graduate studies and faculty members from both the department and other departments. This unit is designed to the following:

- Preparing all the fixatives, solutions, reagents, and stains for the unit and practical sessions.
- Preparing paraffin and frozen sections for student researchers as well as faculty members.
- Staining tissue sections.
- Detection of the enzymes in animal tissue samples.
- Detection of fat in animal tissues using various ways.
- Preparing immunological stains for cells and tissues.
- Possibility of preparing educational materials of samples from animal and plant tissues.

In order to achieve these goals, this unit contains the equipment necessary to prepare the tissue sections and staining them. These equipment include:

- Chemically treated tissue samples (Tissue Processor).
- Station landfill wax (Embedding station).
- Devices to cut samples with different thickness up to 3 micrometers (Rotary microtome/ Cryostat).
- Automatic staining and covering tissue sections machine (Autostainer).

2- Photography Unit using Light Microscopes:

This unit was established during 1429 / 1430 AH. The aim of this unit is to examine sections from animal tissues and other sections. It also examines microorganisms, parasites or insects' samples using modern light microscopes.
Available microscopes in the Unit:
1- Image analysis microscope (Nikon with Digital camera).
2- Image analysis microscope (Lieca with Digital camera).
3- Cool scope (Nikon with digital camera).
4- Ordinary light microscope (Olympus with analog camera).

3- Cells and Tissue Cultivation Unit:

This unit has been activated at the beginning of the second semester of the academic year 1429/1430 H benefiting all the faculty members and graduate students in the department. This unit includes all machines and equipment necessary for the cultivation of cells and tissues, which include:

- Laminar flow hood.
- Carbon dioxide (CO_2) incubator.
- Inverted microscope.
- Autoclave.
- Water Distiller.
- Refrigerators and Freezers.
- Liquid Nitrogen containers.

Many other facilities such as water baths / pH meter and a Western blot, stickers. etc.

4- Transmission and scanning electron Microscope Unit:

The unit focuses on examination of fine structures of the biological samples (tissue or micro-organisms) after taking very thin sections of them, and the unit has three laboratories for the preparation of the samples, namely:

- Glass knives Laboratory.
- Sections and semi-thin sections preparation Laboratory.
- High-precision cutting Laboratory.

5. Zoology Department Museum

The Museum is an important unit in the department since it benefits students of the department being an applicable learning process-seeing the animals mummified and displayed- and continuous to what they learned theoretically. The museum was founded in the month of Shawwal of the year 1390 AH with a small number of samples for the above mentioned objective, having been updated and re-opened again in

the second half of the academic year 1416/1417 AH, when it began receiving visitors, students from the college and other colleges as well as students of schools in all their academic levels from within the city of Riyadh and beyond to see the contents of the museum samples including animals from a local and external environments.

The museum participates in exhibitions held inside and outside the university such as the gallery of natural phenomena in the Faculty of Science and the National Events Festival for Heritage and Culture in Janadriya, as well as exhibitions organized by some schools in Riyadh, also the museum joins from time to time in training sessions in the preservation of fish and insects samples.

Quality Committees and their tasks

1. Department's Steering Committee

Supervision and follow-up of quality activities:

1. Supervising the implementation of the working plans of the various activities of the department.
2. Follow up the completion of all academic accreditation requirements.
3. Preparing and updating the manuals of the department and program.
4. Holding a monthly meeting to discuss the reports of the quality management system in the department.
5. Follow-up and coordination with the Vice Dean of Development and quality and providing it with periodic reports.

The strategic plan:

1. Define the vision, mission and goals of the department and review it periodically.
2. Follow up the implementation of the department's action plan.
3. Identifying elements of strength and weakness in the various activities of the program and drawing up the necessary plans to benefit or address them.
4. Looking forward to the future plans of the department.

2. The Development and Quality Committee (DQC):

1. Enhancing quality culture among faculty members, department staff and students.
2. Develop, manage and monitor quality control processes in the department.
3. Prepare, monitor, distribute, collect and analyze all five questionnaires of the National Commission for Academic Evaluation and Accreditation.
4. Selecting performance indicators and benchmarking of the program, analyzing it and building improvement plans based on it.
5. Select and follow up the independent auditor's report and develop improvement plans based on his / her recommendations.
6. Follow up the development of modern trends in methods, methodology and teaching techniques.

3. The Evaluation and Academic Accreditation Committee (EAAC):

1. Preparing and revising reports of Program's Description, course specification, and Courses Reports that are assembled from college members, and running its electronic saving, and then sorting them in their specific files in the program's academic room (PAR).
2. Organizing, supervising and preserving program's documentations in the academic room, in order to be ready prepared and organized at the time of the external auditors' surveillance stopover.
3. Ensure the preparation of copies of the student exams and copies of their answer sheets for all courses of the program each semester.
4. Regularly updating and revising all (QMS) accreditation files documentation of ACR's, in order to be ready at any sudden visit of scrutiny, and any allowed users.
5. Regularly organizing, preparing and submitting periodical reports of the Committee's meeting, and also placing all these reports in the program's Academic Accreditation room (ACR).
6. Supervising and Preparing the Self-study report (SSR) for obtaining or updating national and international accreditations.

4. Student Affairs Committee

Guidance and student rights:

1. Prepare a plan for the student guidance program and update it annually.
2. Raising awareness of the importance of academic, professional, psychological and social accreditation.
3. Raising students' awareness of supporting services and activities provided by the college and university and follow-up.
4. Receiving and responding to students' proposals or complaints and working to overcome them.
5. Prepare preventive programs to protect students from vulnerability.
6. Academic support (study the situation of students with default or low rates) and preparing academic programs to support students with unsatisfactory performance.
7. Follow-up of extra-curricular activities

Registration and tests:

1. Equation of the courses of the program with the courses of other programs.
2. Work on the preparation of study schedules; to be delivered on time.
3. Follow up the commitment of the departments with the regulations of the college in the preparation of the time table of the study.

4. Prepare and review the teaching load of faculty members.
5. Follow-up distribution of the courses of the departments on the halls assigned to each department.
6. Checking the suitability of the number of students in each section with the capacity of the class assigned for the course.
7. Follow up the work of the examination committees.
8. Receive the results from the teachers of the courses in preparation for adoption before monitoring.

5. Study Plans and Learning Resources Committee

Study Plans:

1. Arbitration of study plans from internal and external bodies to ensure access to an academic excellence plan, with emphasis on the fulfillment of the "National Qualifications Framework".
2. Developing plans, curricula and scientific curricula in accordance with the needs of the society and the labor market.
3. Activate the role of the advisory committee in the department.
4. Identify and implement training programs to develop teaching, research and technical skills for faculty members.
5. Determine the appropriateness of courses for practical life.
6. Submit periodic reports on the curricula and scientific programs to the department council.
7. Introducing good interdisciplinary programs.
8. Preparation and implementation of workshops for proposed or new programs in the department.

Learning Resources:

1. Supervising the library of the department
2. Follow-up and work to provide sources of learning to meet all the needs of the program and its courses.
3. Ensuring an easy access to learning resources when students need them.
4. Collecting the needs of the teaching staff from the learning resources before using them in sufficient time and work to provide them.
5. Follow-up updating the scientific references of the decisions.

E-Learning:

1. Activating and integrating the work with electronic courses and digital content at all levels of study in the department.
2. Commitment to the Blackboard system to be the tool in delivering electronic course information.

3. Determine the appropriate training needs for faculty members and students to apply e-learning.
4. Supervising the department's website.
5. Urging faculty members to update their electronic pages on the department's website and to develop their educational materials and scientific production.

6. Alumni and Human Resources Committee

1. Establishing a database of graduates of the department and update it periodically.
2. Collecting personal data of the students who are expected to graduate including their contact details
3. Attract graduates qualified to continue their higher studies.
4. Follow-up promotion of faculty members.
5. Collecting, tabulating and documenting the data of employers and employers, indicating how to contact them, and exploring the possibility of cooperation with them in recruiting graduates and creating effective partnership in this context.
6. Develop communication programs, whether electronic or otherwise, to strengthen the relationship between graduate students and employment.
7. Surveying (preparation, distribution and collection of questionnaires) graduates opinions who have jobs in the public and private sectors outside the college.
8. Find an effective mechanism to provide employment opportunities for graduates in their fields of specialization.
9. Communicating with the public and private sectors to find opportunities to train students and qualify them to work in summer classes.

7. Laboratories and Safety Committee

Laboratories:

1. Inventory materials, equipment and equipment in various laboratories and their requirements of materials, and organize the process of placing them in the correct place and maintenance periodically.
2. Make a list of the day and date and sign the examiner at each device and follow it up first.
3. Ensure the availability and operation of all laboratory equipments in the student laboratories.

4. Ensure that maintenance plans (periodic and preventive) are available for laboratories and scientific equipments.
5. Working to provide the required spare parts through guaranteed signed and approved maintenance and purchase contracts.
6. Supervising and following-up the updating of the equipment in the student labs, providing the necessary maintenance, and ensuring full care for their cleanliness.
7. Follow up the requests of faculty members for equipping laboratories and follow up the implementation of these requests.
8. Provide teaching and learning aids for students in laboratories.

Safety:

1. Develop safety policies and regulations that achieve the safety in the department.
2. Monitor the inspection of the equipments and all safety measures in the laboratory.
3. Inventory safety equipment and organize the process of placing it in the correct place and maintenance periodically.
4. Ensure that safety measures are provided in laboratories and classrooms before starting the study in each semester.
5. Communicate with the main safety committee in the college regarding coordination, training courses and other works.
6. Development of emergency phone numbers - Preparation of awareness-raising instructional publications for students on safety procedures for various hazards (electrical and/ or chemicals) at the beginning of the academic year.
7. Follow up the conservation of chemical and radioactive wastes in the department.
8. Follow-up safety procedures in laboratories and classrooms and Place the safety phone numbers in the laboratory.
9. Conducting periodic training for faculty members and students to comply with the implementation of evacuation methods and dealing with safety methods in laboratories.
10. Follow-up of all safety requirements in the Department - Raising awareness among the staff of the department and students of the importance of complying with safety instructions.

8. Graduate Studies and Research Committee

1. Develop a strategic plan for scientific research in the department and follow up on its implementation.
2. Examining the files of applicants for postgraduate studies, sorting and nominating suitable candidates.
3. Follow-up of the comprehensive examination for doctoral students.
4. Supervising the performance of graduate students and submitting recommendations thereon to the department council.
5. Follow-up student scholarship, and submit periodic reports about them to the department.
6. Establishing and updating a database of research, scientific projects and conferences locally and internationally, in addition to patents, prizes, books and translations.
7. Encouraging publication in scientific journals with a global classification.
8. List of graduate students involved in research, projects, conferences, patents, and local or international awards.
9. Evaluation of the graduate programs in the departments periodically.
10. Prepare a list of graduates of the master's and doctoral students.
11. Prepare a list of the faculty members supervising the scientific theses of the higher studies and its numbers.
12. Conducting an annual evaluation of scientific research projects in the department and submitting recommendations to the Higher Studies and Scientific Research Committee at the College.

9. Public Relations and Community Partnership Committee

Public relations:

1. Caring for social relations between faculty members and / or department.
2. Develop programs of internal and external visits to the college or department.
3. Follow-up files and correspondence with internal and external bodies and twinning projects and inform the Dean of the College or the Head of the Department of the progress and results later to make the appropriate decisions.
4. Receiving foreign delegations and organizing their residency programs and visits.
5. Contribution in providing the university magazine and the site of the college on web with the activities and events that taking place.
6. Caring for social relations between faculty members or the department.

Community Partnership:

1. Develop practical programs to strengthen the relationship between the department and the community, and follow up their implementation.
2. Monitor and categorize scientific research projects carried out by the department and its members that contribute to the service of society and development plans.
3. Monitoring and tabulating training programs and scientific consultations, and cultural and awareness activities carried out by the department, which contribute to community service and development plans.
4. Supervising the activities that serve the community, namely: museums, astronomical observatory, permanent exhibition, greenhouse etc.
5. Encouraging and developing the spirit of initiative among the employees of the department and the students to maximize the return of the service role to society.
6. Activating the partnership between the program and the various community institutions, in particular public and private schools.
7. Deepening communication between the department (Program) and the bodies responsible for development plans in the Kingdom of Saudi Arabia.

10. Statistics Committee

1. Updating a database of faculty members, administrators, technicians, scholarships and internal supervision in the department and keeping them in a special record.
2. Making list of the scientific works of each member of the teaching staff, and the activities they has undertaken since the previous year whether writing books, research projects, scientific research, attending seminars or conferences inside or outside the Kingdom.
3. Making list of seminars, conferences, lectures, training courses, scientific consultations, research services, cultural, social and awareness activities of the faculty members which they have undertaken for community service over the past three years.
4. Making list of the prizes received by faculty members or students in the department.

11. ISO Committee

1. Preparing the organizational structure, job descriptions and tasks for each of its units.
2. Supervise the implementation of the administrative quality system and address the gaps that prevent its implementation.
3. Preparing plans to develop and improve the department's quality management system.
4. Working on achieving and applying the objectives and policy of administrative quality.
5. Making recommendations for improving financial and administrative performance.
6. Surveying the satisfaction of beneficiaries (internal and external) about the services provided.
7. Provide the necessary facilities to implement the system.
8. To identify, analyze and solve the employee problems.
9. Analyzing and treatment of complaints of beneficiaries and take the necessary corrective and preventive measures.
10. Supervise internal and external audit and follow up the implementation of its recommendations.

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