

Kingdom of Saudi Arabia

Department Handbook

Zoology Department

College of Science

King Saud University

1431 H / 2010 G

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Preface

Zoology Department is one of oldest academic departments at King Saud University. The Department was founded in the year 1378 H (1957 G) when the College of Science was established, for the preparation of qualified scientific professionals who were, and still are, involved in the revival and development of their beloved and precious homeland, the Kingdom of Saudi Arabia. The qualified faculty members contribute to the various fields such as general and higher education, agriculture, health and community services through teaching undergraduate students in various Departments of the College of Science, namely; Zoology, Biochemistry, Botany, Microbiology and Geology; in addition to offering courses to students from the College of Food and Agricultural Sciences and students in the preparatory phase to Colleges of Health Sciences.

By the Grace of Almighty God and thanks to the officials in charge of Higher Education, King Saud University now witnesses a significant leap in all scientific and research fields under the auspices of the Custodian of the Two Holy Mosques, May God Protect Him. That is why the Zoology Department has developed from a limited number of faculty members, lecturers, technicians, laboratories and equipment, to a proud situation where it, currently, includes more than 63 faculty members in different disciplines of Zoology who authored and translated numerous books and contributed to many and varied research work published in the World renowned scientific journals and periodicals. In addition, more than 35 faculty assistants including lecturers, demonstrators, specialists and technicians contribute effectively to the activities of the Department. Furthermore, over 40 well equipped laboratories are available for empirical studies at different levels, undergraduate, graduate and research studies. The Zoology Department has started the Master's Degree Program (M.Sc.) in 1401 H (1981) and the Ph.D. Program in 1421 H (2000), conferring more than 80 M.Sc. and more than 10 Ph.D. degrees upon male and female students.

The Department is supported internally and externally, by specialized scientific units which include a central laboratory equipped with high-tech devices serving research groups from different disciplines, units for light microscopic preparations, a unit for modern integrated electron microscopy. It also houses a museum featuring specimen and models for different animal taxa, and welcoming visitors from all segments of the society.

We ask God to be our Guide to His Worship and Contentment.

Vision

To be a pioneer of excellence in education, scientific research and community services.

Mission

To prepare highly qualified educational and technical professionals capable of responding to the need of the labor market, in the field of life sciences, through advanced educational, research and professional activities developed to serve the community.

Objectives

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

1. Prepare highly qualified educational and technical professionals.
2. Restructure curricula in harmony with the vocational requirements of the labor market.
3. Undertake advanced basic and applied research to be published in prestigious international periodicals.
4. Communicate with the community through providing informative programs that contribute to enhancing public awareness and solving society problems.

Employment Zones

- Administrators, laboratory technicians, research assistants (Ministry of Higher Education).
- Teachers, laboratory experts (Ministry of Education).
- Technicians in hospital laboratories and clinics (The Ministry of Defense and Aviation, The Ministry of Interior, and The National Guard).
- Technicians in research laboratories, medical analysis laboratories, Health units, and Hospitals (The Ministry of health).
- Researchers in animal research units and in fishery wealth (The Ministry of Agriculture).
- Experts in quality laboratories. (The Saudi Standard, Metrology and Quality Organization).
- Researchers, Technician (The National Commission for Wildlife Conservation and Development, King Abdul-Aziz City for Science and Technology).
- Technicians in Hospital and Salesman at Scientific companies. (The Private Sector).

Bachelor's Program in Zoology

Eligibility

Under the terms of admission to the College of Science, the Zoology Department stipulates the following conditions:

1. The student must hold a Secondary School Certificate (Natural Sciences Section).
2. The student's cumulative rate in the Preparatory Year must not be less than 2.5 out of 5.

Preparation for the Teaching Profession

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

The second opportunity is made possible by allowing the student to select 12 credit units from the Botany and Microbiology Department. These units are within the elective courses which appear in the Study Plan in 6th, 7th and 8th levels (4 hours / level).

The academic transcript of the Department's graduate shows the nature of the elective courses selected by the student which in turn determines the appropriate place of employment. Furthermore, the Department's graduate, who wishes to work as a teacher, has to pass a written examination and an interview arranged by the Ministry of Education.

Degree Requirements

To graduate successfully from the Zoology Department, the student must pass 136 credit hours distributed on 8 levels besides the summer session. Upon completion of the 6th level, the student is able to take Field studies (Zoo 465) during summer which enables him to get acquainted with the fine details of field work where he can apply, under the supervision of accompanying instructors, the knowledge gained in the previous levels of the Plan. One of the prominent courses taught in the 8th level is the Graduation research project (Zoo 498) in which the student learns how to gather information concerning a specific point in animal biology from different resources, gain the skill of designing and executing a practical experiment, perform data analysis, and finally write the scientific report which would be graded by his supervisor. A final copy with the grade is submitted to the Chairman of the Department.

The Study System at the College of Science

Teaching at the College of Science is subjected to the following scheme:

1. The school year consists mainly of two regular semesters and a summer semester, if available.
2. The stage of academic progress is indicated by the academic level since the number of levels to graduate is at least eight levels in conformity with the approved Study Plan.
3. The duration of the level is a full semester (not less than 15 weeks) and this period does not include the periods of registration and final exams.
4. The duration of the summer semester is not less than eight weeks where the teaching time allocated for each course is doubled.
5. A number of courses (subjects) are taught during each 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 credit hours during the Preparatory Year (two semesters in one academic year).
 - B. The student studies 97 credit hours (optional + compulsory) in the Program of Specialization in the various College departments throughout the six semesters following the Preparatory Year (beginning with the third semester).
 - C. University Requirements: The student selects 8 credit hours of the requirements of the University out of 22 optional credit hours during the period of study at the College.
7. The student chooses the preferred and specialized department before the end of the Preparatory Year based on the conditions set by each department.

1. The New 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) offers the following opportunities to the students:

1. To create an e-mail through the site of the 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 by using the link: **<http://edugate.ksu.edu.sa>**; then, entering a user name and a password.
3. **Online Registration** (registration, adding, and dropping): a student can register, in person, from any location during the periods of registration and dropping plus an additional period specified in the academic calendar; thus, without having to visit the College or the Department, the student can perform the following:
 - 3.1. **Registration:** Registration of courses and deciding the required number of credit hours.
 - 3.2. **Adding and dropping:** The student may drop and add courses during the first week of teaching provided that the study load does not go above , or lower than, the allowed course load.
4. To view the course schedule of the College and the available/closed groups.
5. To view the study schedule and print it.
6. To view the Academic Record and print a copy (an unofficial copy).
7. To view the results of the final exams as soon as they are put online.
8. To view the Study Plan, the courses passed by the student, and the ones remaining to be studied.
9. To know about the penalties imposed upon the student.
10. To view the financial rewards.
11. To make suggestions and submit complaints.
12. To write the academic performance evaluation of faculty members.
13. To exchange electronic messages and change the password.
* In case of any problem while registering, please consult the College Registration Office (room 1A7 - Building 4).

2. Rules and Regulations for Registration of Courses

- **The Course** is a module that meets the needs of the level specified in the approved Study Plan in each specialization Program. The Course has a number, a code, a title, and a description depending on the different departments (see the Department's Manual Guide).

- **The Course** is divided into a set of theoretical lectures and practical lessons (study units) taught weekly during the academic level.
- **The Credit Hour** 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 the courses for all students is done automatically through the website: **<http://edugate.ksu.edu.sa>**
- The academic levels vary in the number of the units of study, ranging from 12 to 20 units, for each level.
- The Courses are registered automatically at the beginning of the following semester for the student's convenience. Then, the student can modify the course schedule by adding or dropping.
- The following table shows the student's study load corresponding 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

- **The Processes of dropping and adding** are performed 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 is allowed to register a course without passing its pre-requisite course.
- Students, who pass all courses without failures, are registered in the courses of the subsequent level beginning gradually after the lower levels according to the study plans approved.
- Students, who fail in some courses, are registered in courses that ensure their minimum study load in each semester taking into account the following points:
 - No clash in the course study schedule.
 - Satisfying the previous requirements of the course or courses to be registered.

Calculating the Average and Cumulative GPA:

The Average and cumulative GPA are 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:

The GPA is calculated considering the following points:

1. Knowing the number of hours of the courses.
2. Knowing the marks obtained in each course.
3. Knowing the corresponding grade of each mark.
4. Knowing the value of each grade.
5. Knowing the points = number of hours of the course \times value of the grade.
6. Determining the total points obtained in all courses of the semester.
7. Determining the total number of hours registered in the semester.
8. The average is calculated every semester according to the following equation:

GPA =	Total points (item 6) <hr/> Number of hours registered in the semester (item 7)
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The following table shows the percentage of marks, grade and value obtained by the student in each course, which is used to calculate the points:

Mark	Grade	Letter of 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+	3.50
From 70 to less than 75	Good	C	3.00
From 65 to less than 70	Passed +	D+	2.5
From 60 to less than 65	Passed	D	2.00
Less than 60	Failed	E	1.00
Absence from lectures (25% or more)	Debarred	H	1.00

Calculating the Average Cumulative:

The GPA semester average 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).
- 3) The cumulative average is calculated according to the following equation:

GPA =	Grand total of points
	Grand total of credit hours

Here is an example of how to calculate the grades above:

Calculating the grades of the first semester:

Course	Credit Hours	Mark	Grade	Grade Value	Points
Phys 101	4	67	D+	2.5	$4 \times 2.5 = 10$
Chem101	4	73	C	3	$4 \times 3 = 12$
Eng 121	3	77	C+	3.5	$3 \times 3.5 = 10.5$
Arab 101	2	81	B	4	$2 \times 4 = 8$
	13				40.5
GPA = Total points \div No. of hours registered in semester = $40.5 \div 13 = 3.12$					

Calculating the grade of the second semester:

Course	Credit Hours	Mark	Grade	Grade Value	Points
Math 101	3	61	D	2	$3 \times 2 = 6$
Stat 101	3	73	C	3	$3 \times 3 = 9$
Computer Science 206	3	80	B	4	$3 \times 4 = 12$
Arab 103	3	88	B+	4.5	$3 \times 4.5 = 13.5$
Islam 101	2	92	A	4.75	$2 \times 4.75 = 9.5$
Eng 122	3	97	A+	5	$3 \times 5 = 15$
	17				65
GPA = Total points \div No. of hours registered in semester = $65 \div 17 = 3.82$					

Calculating the average cumulative:

$$\text{GPA} = \text{Total points} \div \text{Total hours of the semester} = 105.5 \div 30 = 3.52$$

Dropping and adding of a course:

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

Attendance, postponing and dropping out of College:

- The student must be regular in attendance attending at least 75% of the lectures and the practical classes.
- If any student has a percentage of absence of 25% , or more, in any course, he is denied 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. The postponement should not exceed two consecutive semesters or three intermittent semesters as a maximum limit while studying at the College.
- The University Council may, in case of necessity, exempt the applicant from the previous provision.
- If a student drops out of College for one semester without requesting the postponement of his registration, the University has the right to dismiss his registration. The University Council has the right to do this for a lesser period of time.
- The student is not considered as dropping out of College if he is a visiting student at another university.

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 transcript (including a grade point average) for, at least, two semesters at his college before he applies as a visiting student.

- The student must obtain a prior approval from his college permitting him to study as a visiting student while specifying the courses that will be studied. The College has the right to require a specific grade to be achieved by the student to offset the course. The student should obtain an official letter from the Deanship of Admission and Registration directing him to study as a visiting student.
- The student has to join a college or a university officially recognized.
- The courses, under consideration by the student to be studied outside the University, must be equivalent in their description to the University courses, and their course units should be no less than the units of any of the courses contained in the graduation requirements.
- The maximum of the total units of study that can be calculated from outside the University is twenty percent (20%) of the total units required for graduation 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 the period of study as a visitor. If not reported within that period, the student is considered as dropping out of College during 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 upon the recommendation of the College Council to raise his cumulative GPA by studying the available courses.
- The University Council may give the dismissed students, due to 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 during a maximum period not exceeding twice the original term specified for graduation.

- The University Council may allow dismissed students, due to the exhaustion of failure times, to attend twice the duration of the Program. This extension should not exceed a maximum of two semesters.

Examinations and Grades:

- Based on a proposal from the Department Council, the College Council specifies a mark for the student's semester work, varying from 40% to 60% of the final grade of the course.
- The mark of the course's semester work is calculated by one of the following two methods:
 - Oral, practical tests, research, or other forms of classroom activity, or from all the above or some of them, in addition to at least one written exam.
 - Two written exams at least.
- Based on the recommendation of the course teacher, it is permissible for the Council of the Department, that teaches the course, 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. Only the grades achieved by the student are included in the GPA or cumulative after the completion of the requirements of that course.
- If one semester passes without changing the grade incomplete (I), the student is given an F which 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.
- Based on a recommendation from the relevant Department Council, the College Council specifies the duration of the final written exam to be within a period not less than one hour, and not more than three hours.
- Cheating in the exam, initiating it, or violating the instructions and rules of examination procedures are actions punishable in accordance with the Regulations of the Students' Discipline issued by the University Council.

- In cases of necessity, the College Council, in charge of teaching a course, has the right 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:
 - A student may apply for re-marking the answer sheets of only one course per semester.
 - The student, who wishes to re-mark his answer sheets, may apply for re-marking to the department, that teaches this course, not later than one month after taking the final exam.
 - A student, who has already applied for re-marking and proved the invalidity of his application, should never apply for re-marking his answer sheets in any exam in the future.
 -

Transfer:

1) College to another College 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 to which the student wishes to transfer.
- The student's college academic record has to show all courses previously studied, including grades, semester and cumulative averages throughout the study at the college from which he is transferred.

2) 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 college academic record has to show all courses previously studied, including grades, semester and cumulative averages throughout the study at the college from which he is transferred.

Graduation:

The student graduates after completing successfully the graduation requirements in accordance with the study plan, provided that his cumulative average is no less than 2 (Pass).

Study Plan

Department adopts a constant assessment and upgrading of its study plans to be acquainted with the pros and cons that have occurred in earlier plans. The most recent of these plans is the one that was approved in 1429/1430 H, which allows the implementation of an apt curriculum versus academic variables and vocational needs of the society and labor market to secure the development and upgrading of the output of various programs of the Department.

Updated Plan of the Bachelor's Degree in Zoology

Preparatory Year (first semester)				
Course Code		Course Title	Prerequisites	Units
ENGL	140	English Language (1)	NA	8 (8+0)
MATH	140	Mathematics (1) - Introduction to Mathematics	NA	2 (1+1)
CI	140	Learning, Thinking and Research Skills	NA	3 (3+0)
CHS	140	Health and Fitness	NA	2 (2+0)
15 units				

Preparatory Year (second semester)				
Course Code		Course Title	Prerequisites	Units
ENGL	150	English Language (2)	NA	8 (8+0)
MATH	150	Mathematics (2) - Calculus	MATH 140	3 (1+1)
CT	140	Information Technology Skills (IT Skills)	NA	3 (3+0)
MC	150	Communication Skills	NA	2 (2+0)
16 units				

Level 3				
Course Code		Course Title	Prerequisites	Units
IC		University Requirement	NA	2 (2+0)
IC		University Requirement	NA	2 (2+0)
CHEM	103	General Chemistry (1)	NA	3 (3+0)
GEO	105	Geology	NA	2 (2+0)
STAT	106	Biostatistics	NA	2 (1+1)
BOT	102	General Botany	NA	3 (2+1)
Zoo	103	Principles of Zoology	NA	3 (2+1)
17 units				

Level 4				
Course Code		Course Title	Prerequisites	Units
IC		University Requirement	NA	2 (2+0)
BCH	101	General Biochemistry	NA	4 (3+1)
PHYS	205	Biophysics	NA	2 (2+0)
MIC	140	Microbiology	NA	3 (2+1)
Zoo	212	Parasitology	Zoo 103	3 (2+1)
Zoo	242	Cell Biology and Physiology	Zoo 103	3 (2+1)
17 units				

Level 5				
Course Code		Course Title	Prerequisites	Units
Zoo	245	Histology	Zoo 242	2 (2+0)
Zoo	262	Microscopic Preparations	Zoo 103	4 (3+1)
Zoo	305	Modern Animal Taxonomy	Zoo 103	2 (2+0)
Zoo	320	Ichthyology	Zoo 103	3 (2+1)
Zoo	327	Herpetology	Zoo 103	3 (2+1)
Zoo	332	General Physiology	Zoo 103	3 (2+1)
Zoo	373	Wilderness Ecology	Zoo 103	2 (1+1)
16 units				

Level 6				
Course Code		Course Title	Prerequisites	Units
IC	311	University Requirement	NA	2 (2+0)
Zoo	325	General Entomology	Zoo 103	3 (2+1)
Zoo	326	Ornithology	Zoo 103	2 (1+1)
Zoo	342	Mammalogy	Zoo 103	2 (1+1)
Zoo	374	Molecular Biology	Zoo 103	2 (1+1)
Zoo	311	Aquatic Ecology	Zoo 103	2 (1+1)
Zoo	325	Elective Courses	NA	4
17 units				

Summer session				
Course code		Name	Prereq.	Units
Zoo	465	Field studies	34 Specialized Units	5 (0+5)
Total				5

Level 7				
Course Code		Course Title	Prerequisites	Units
Zoo	317	Medical Arthropods	Zoo 311	3 (2+1)
Zoo	352	Fundamentals of Genetics	Zoo 342	2 (1+1)
Zoo	375	Pollution	Zoo 103	2 (1+1)
Zoo	420	Comparative Vertebrate Anatomy	Zoo 103	2 (1+1)
Zoo	423	Fundamentals of Descriptive Embryology	Zoo 103	2 (1+1)
Zoo	432	Endocrinology	Zoo 332	2 (1+1)
		Elective Courses		4
17 units				

Level 8				
Course Code		Course Title	Prerequisites	Units
Zoo	424	Principles of Experimental Embryology	Zoo 423	2 (1+1)
Zoo	425	Economic Fish and Crustaceans	Zoo 320	2 (1+1)
Zoo	433	Immunology	Zoo 332	2 (1+1)
Zoo	461	Laboratory Techniques	Zoo 262	2 (2+0)
Zoo	471	Animal Behavior	Zoo 103	2 (1+1)
Zoo	498	Graduation Project	✱	2 (2+0)
		Elective Courses		4
16 units				

✱ Zoo 498: Completion of at least 95 credit unit

A Brief description of the Updated Study Plan for the Bachelor's Degree in Zoology

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.	
Prerequisite	—	

Zoo 212	Parasitology	3 (2+1)
Content	Understanding and application of various methods and techniques applied to identify the parasitic infection; identifying the basic characteristics of the different stages of the parasite; identifying and determining the site of infection in the host's body and the diagnosis and treatment of pathological effects; recognizing the parasite's life cycle and identifying its host(s); mastering photographing and achieving sound measurements of the parasite; writing down the final diagnostic report.	
Prerequisite	Zoo 103	

Zoo 242	Cell Biology and Physiology	3 (2+1)
Content	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.	
Prerequisite	Zoo 103	

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

Zoo 305	Modern Animal Taxonomy	2 (1+1)
Content	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.	
Prerequisite	Zoo 103	

Zoo 311	General Entomology	3 (2+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+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), Simuliidae (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.	
Prerequisite	Zoo 311	

Zoo 320	Ichthyology	2 (1+1)
Content	Introduction; classification of fish; fish environments; fish external features; skin structure; internal structure including muscular, digestive, circulatory, respiratory, urinogenital, nervous, endocrine and skeletal systems; fish growth and age estimation; fish migration and geographical distribution.	
Prerequisite	Zoo 103	

Zoo 325	Ornithology	2 (1+1)
Content	Historical introduction to 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.	
Prerequisite	Zoo 103	

Zoo 326	Mammalogy	2 (1+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.	
Prerequisite	Zoo 103	

Zoo 327	Herpetology	3 (2+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; a brief on amphibians and reptiles in Saudi Arabia.	
Prerequisite	Zoo 103	

Zoo 332	General Physiology	3 (2+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.	
Prerequisite	Zoo 103	

Zoo 342	Molecular Biology	2 (1+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 euokaryotes.	
Prerequisite	Zoo 242	

Zoo 352	Fundamentals of Genetics	2 (1+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; <u>extensions</u> of Mendelian Genetics; Non-Mendelian	

	inheritance; mutations and DNA repair pathways and sex identification in eukaryotes; introduction to recombinant DNA technology and its applications.
Prerequisite	Zoo 342

Zoo 355	Genetics of Wild Animal Species	2 (1+1)
Content	Concept of animal genetic diversity and tribe-based effects of its loss; tribe size and its effects on species survival (genetic deviation, mating among relatives and low gene flow); genetic erosion and animal diversity; ways to conserve genetic diversity (off-site and in-site); increased tribe size; genetic reservoirs; endangered animal species.	
Prerequisite	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.	
Prerequisite	Zoo 320	

Zoo 373	Wilderness Ecology	2 (1+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.	
Prerequisite	Zoo103	

Zoo 374	Aquatic Ecology	2 (1+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.	
Prerequisite	ZOO 103	

Zoo 375	Pollution	2 (1+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.	
Prerequisite	Zoo 103	

Zoo 381	Aquaculture Economics	2 (1+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.	
Prerequisite	Zoo 320	

Zoo 382	Insect Diversity in Saudi Arabia	2 (1+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	
Prerequisite	Zoo 311	

Zoo 412	Parasite Immunology	2 (1+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.	
Prerequisite	Zoo 212	

Zoo 413	Insects and Environmental Health	2 (1+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.
Prerequisite	Zoo 311

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

Zoo 423	Fundamentals of Descriptive Embryology	2 (1+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.	
Prerequisite	Zoo 103	

Zoo 424	Principles of Experimental Embryology	2 (1+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).	
Prerequisite	Zoo 423	

Zoo 425	Economic Fish and Crustaceans	2 (1+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.	
Prerequisite	Zoo 320	

Zoo 432	Endocrinology	2 (1+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.	
Prerequisite	Zoo 332	

Zoo 433	Immunology	2 (1+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.	
Prerequisite	Zoo 332	

Zoo 434	Excretion Physiology	2 (1+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.	
Prerequisite	Zoo 332	

Zoo 435	Neuro Physiology	2 (1+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.	
Prerequisite	Zoo 332	

Zoo 436	Reproductive Physiology	2 (1+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.	
Prerequisite	Zoo 332	

Zoo 441	Histochemistry	2 (1+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.	
Prerequisite	Zoo 245, Zoo 262	

Zoo 455	Genetic Engineering	2 (1+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.	
Prerequisite	Zoo 342, Zoo 352	

Zoo 456	Bioinformatics	2 (1+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.	
Prerequisite	Zoo342	

Zoo 457	Cytogenetics and Cell Culture	2 (1+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.	
Prerequisite	Zoo 342, Zoo 352	

Zoo 458	Human Genetics	2 (1+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.
Prerequisite	Zoo 342, Zoo 352

Zoo 461	Laboratory Techniques	2 (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 Ht, hemoglobin Hb, complete blood count CBC, erythrocyte sedimentation rate ESR); differential WBC test; sickle cell anemia test.	
Prerequisite	Zoo 262	

Zoo 462	Experimental Parasitology	2 (1+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 of the preemptive protection against some parasitic antigens and the healing power of certain medications and biomaterials.	
Prerequisite	Zoo 212	

Zoo 464	Biotechnology	2 (1+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.	
Prerequisite	Zoo 424	
Zoo 465	Field Studies	5 (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 field training.	
Prerequisite	Completion of 34 specialized credit hours	

Zoo 466	Environmental Industrial Pollution	2 (1+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.	
Prerequisite	Zoo 475	

Zoo 471	Animal Behavior	2 (1+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.	
Prerequisite	Zoo 103	

Zoo 480	Wildlife Conservation	2 (2+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.	
Prerequisite	Zoo 373	

Zoo 481	Venomous Animals	2 (1+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.	
Prerequisite	Zoo 327	

Zoo 482	Organ Skills in Chordates	2 (1+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.	
Prerequisite	

Zoo 498	Graduation Project	2 (1+1)
Content	Use of scientific periodicals; search for information from various databases; designing and carrying out scientific experiments; data analysis; writing scientific reports.	
Prerequisite	Completion of 95 or 100 credit hours	

<p>General Program for a Master's Degree (M.Sc.) in Zoology (12 hours compulsory (Core) + 12 hours specialization + 6 hours of research)</p>

Eligibility

- 1-The admission requirements are stipulated in the Unified Graduate Studies Statutes for Saudi universities.
- 2- The candidate should hold a Bachelor's Degree (B.Sc.) in Zoology from King Saud University or an equivalent degree with a grade not less than C (good).
- 3- The candidate must pass a written test and a personal interview.
- 4- The candidate must have the approval of the employer.
- 5- The admission is for full time registration.
- 6- The candidate must pass any supplementary courses deemed necessary by the Department's Council.

<p>Compulsory hours (12 hours)</p>

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

Student selects [12 hours] from one of the following Tracks

Track 1: Animal Ecology and Pollution

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

Track 2: Cell Biology, Genetics, and Histology

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

Track 3: Physiology and Developmental Biology

Course No.	Course Name	Credit hours
Zoo 532	Advanced Cell Physiology	2 (1+1)
Zoo 533	Physiology of Reproduction	3 (2+1)
Zoo 534	Physiology of Hormones	2 (1+1)

Zoo 536	Invertebrate Physiology	2 (1+1)
Zoo 537	Molecular Developmental Biology	3 (2+1)
Zoo 538	Advanced Descriptive and Experimental Embryology	3 (2+1)
Zoo 539	Selected Topics in Physiology and Development	2 (1+1)
Zoo 541	Advanced Histo-Chemistry	3 (2+1)
Zoo 575	Eco-Physiology	3 (2+1)
		23 hours

Track 4: Entomology and Parasitology

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

Track 5: Aquatic Animals

Course No.	Course Name	Credit hours
Zoo 522	Advanced Aquatic Ichthyology	3 (2+1)
Zoo 523	Economic Aquatic Invertebrates	3 (2+1)
Zoo 524	Fish Culture and Management	3 (2+1)
Zoo 525	Economic Invertebrates Culture	3 (2+1)
Zoo 526	Selected Topics in Aquatic Animals	2 (2+0)
Zoo 527	Standard Environmental Specifications Aquatic Animal	1 (1+0)
Zoo 528	Fishery Resources	2 (1+1)
		17 hours

Later (Semesters) Levels		
Course No.	Course Name	Credit hours
Zoo 600	Thesis	6 (6+0)
		6 hours

A Brief Description of the Master's Degree Courses

Requirements of the Master's Program in Zoology:

1) Compulsory hours (12 hours):

Zoo 500	Experimental Design in Zoology	2 (1+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, experimental design, methods of experimental design, growth and its estimation.		
Zoo 511	Applied Entomology and Parasitology	2 (1+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+1)
Contents: Advanced biology of aquatic vertebrates (mammals, reptiles, amphibians, birds, fishes) and invertebrates (mollusks, crustaceans, echinoderms) characteristics, phlogeny, classifications, reproduction, and geographical distributions.		
Zoo 531	Advanced Animal Physiology	2 (1+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 osmlarity, regulation of K^+ , Ca^{2+} , and H^+ concentration, regulation of gastro-intestinal processes, regulation of organic metabolism and energy balance, regulation of reproductive processes.		
Zoo 543	Cell and Tissue Biology	2 (1+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 (2+0)
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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.

2) Elective Hours (12 hours):

Track 1: Animal Ecology and Pollution

Zoo 572	Animal Conservation	2 (2+0)
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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+1)
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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)
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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+1)
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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+1)
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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+1)
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Contents: Introduction to pollution, pollution glossary, pollution and the food chains, the effect of pollution on animal physiology and distributions, selected studies on the effect of pollution on animals in Saudi Arabia and the Gulf States.

Zoo 578	Geographical Distribution of Pollutants	2 (1+1)
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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)
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Contents: Selection and discussion of recent research papers in ecology and pollution.

Track 2: Cell Biology, Genetics, and Histology

Zoo 541	Advanced Histo-Chemistry	3 (2+1)
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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+1)
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Contents: A brief study of the concept of the cell, cell growth and division, cell synchronization, cell cycle regulation, cell chromatin structure and function, the structure of the chromosome, nucleic acids, DNA replication and repair.

Zoo 544	Advanced Histology	3 (2+1)
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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)
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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+1)
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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 the discovery of the DNA structure.

Zoo 552	Quantitative and Population Genetics	2 (1+1)
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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)
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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+1)
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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+1)
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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)

Contents: Selection and discussion of recent scientific research papers in cell biology, genetics, and histology.

Track 3: Physiology and Developmental Biology

Zoo 532 Advanced Cell Physiology 2 (1+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, the regulation of cell growth and differentiation.

Zoo 533 Physiology of Reproduction 3 (2+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+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 536 Invertebrate physiology 2 (1+1)
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Contents: A 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+1)
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Contents: The role of cytoplasm and nuclear contents in gametogenesis, 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+1)
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Contents: Oocyte growth, the role and function of follicle cells, vitellogenesis, pinocytosis and phagocytosis during oocyte growth. Parthenogenesis, 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+1)
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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+1)
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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+1)
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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.

Track 4: Entomology and Parsitology

Zoo 510	Advanced Parasitology	3 (2+1)
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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+1)
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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+1)
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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+1)
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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 metamorphosis in insects. A detailed study of the physiology of respiration in insects.

Zoo 515	Ecology of Parasites	3 (2+1)
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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+1)
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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)
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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)
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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, corresponding to their specialization.

Track 5: Aquatic Animals

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

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

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

Zoo 525	Economic Invertebrates Culture	3 (2+1)
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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)
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Contents: Selected topics on research in aquatic animals.

Zoo 527	Standard Environmental Specifications for Aquatic Animals	1 (1+0)
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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)
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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.

Zoo 600	Thesis	6 (6+0)
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Contents: The student conduct scientific research in one of the tracks and writes a dissertation under the supervision of a faculty member.

Doctorate Degree (Ph.D.) Program in Zoology

Admission Requirements:

- 1-The admission requirements stipulated in the Unified Graduate Studies Regulations for Saudi universities.
- 2- The candidate should hold a Master's Degree in Zoology from King Saud University or an equivalent degree.
- 3- The candidate must pass a written test and a personal interview.
- 4- The candidate must have obtained at least a score of 450 in the Test of English as a Foreign Language (TOEFL), or score of not less than 4.5 in the International English Language Testing System (IELTS), in addition to passing the Academic Reading and Writing Modules.
- 5- The candidate must have the approval of the employer.
- 6- Admission is for full - time registration.
- 7- The candidate must pass any supplementary courses deemed necessary by the Department's Council.

Study Plan:

(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)
	Zoo 621	Advanced Aquatic Animals	2 (2+0)
	Zoo 631	Comparative Reproductive Physiology	2 (2+0)
	Zoo 641	Advanced Cell Biology	2 (2+0)
	Zoo 671	Advanced Animal Ecology and Pollution	2 (2+0)
			10 hours

Specialized hours (8 hours)

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

**Following
Levels**

Course No.	Course Name	Credit hours
Zoo 700	Dissertation	6 (6+0)
		10 hours

A Brief Description of the Ph. D. Courses

1) Compulsory Courses (10 hours):

Zoo 611	Applied Entomology and Parasitology	2 (2+0)
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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)
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Contents: Recent advances in aquatic animal characteristics, phylogeny, adaptations, zoogeography and reproductive strategies.

Zoo 631	Comparative Reproductive Physiology	2 (2+0)
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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. the effect of environment on reproduction.

Zoo 641	Advanced cell Biology	2 (2+0)
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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 histo compatibility complex.

Zoo 671	Advance Animal Ecology and Pollution	2 (2+0)
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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) Elective Courses (8 hours):

Zoo 612 Advanced Entomology	2 (2+0)
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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)
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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.* Bladderworms, 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)
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Contents: Advanced selected topics in entomology or parasitology in accordance with the needs of the student and the guidance of the supervisor.

Zoo 622 Aquatic vertebrates	2 (2+0)
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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)
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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 from journal articles on recent advances.

Zoo 624 Bioeconomics of fisheries resources	2 (2+0)
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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)	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.
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Contents: An Introduction to

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Zoo 638	Advanced topics in Physiology	2 (2+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.
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Zoo 639	Current topics in Developmental Biology	2 (2+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, <i>in vitro</i> fertilization and embryo transfer, immune response during embryogenesis, recent techniques for tracing embryonic growth, factors involved in controlling embryonic cell proliferation.
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Contents: Follow up of

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,

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.

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)	Contents: Detailed studies on the correlation between the histology and the function of the digestive, urinary and reproductive systems and the sense organs.
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Contents: Detailed studies on the correlation between the histology and the function of the digestive, urinary and reproductive systems and the sense organs.

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

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.

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)	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.
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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.

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Zoo 674	Advanced studies in Pollution	2 (2+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.
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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.

Contents: Presentation and discussion of advanced topics in Zoology according to the guidance of the course instructor.

Zoo 700 Dissertation **Contents:** The student conducts scientific research in one of the tracks and writes a dissertation under the supervision of a faculty member.

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Different Units of the Department

1) Departmental Academic Accreditation Unit

The Academic accreditation represents a paramount important priority at King Saud University aiming at quality control to raise the level of output and keep pace with global developments in creativity and innovation in educational institutions. This is to be reflected in the better classification of the University worldwide and enhancing the trust in the certificates awarded to its graduates to the world level which offers them a competitive advantage in the field of employment and the pursuit of postgraduate education anywhere in the world.

Departmental Academic Accreditation Unit committees:

A) The Departmental Steering Committee which is composed of:

The Chairman of the Department, the head of the Females' Section of the Department, the Program Coordinator, the head of the Quality and Development Committee, the head of the Commission for Academic Accreditation, and any member whose presence is deemed necessary by The Chairman of the Department.

The Tasks of the Committee:

1. Supervising the implementation of the Action Plan of the Program.
2. Selecting a consultant to counsel on qualifying the Department for academic accreditation in accordance with the standards of the accrediting authority and in coordination with the Vice - Deanship for Development and Quality in the College.
3. Preparing the mission, vision and objectives of the Program.
4. Completing all academic requirements for accreditation in accordance with the criteria of

The National Commission for Assessment and Academic Accreditation (NCAAA).

5. Follow-up and coordination with the Vice - Deanship for Development and Quality in the College and reporting to it.
6. Preparing a visual presentation of the Department and the preparation of the Department's Guide and Program.

B) Academic Evaluation and Accreditation Committee (six members):

The Tasks of the Committee:

1. Supervision, follow-up, preparation, and collection of: (the description and report of the Program, the description and report of the course).
2. Supervising the selection of the academic benchmark, and follow-up and preparation of self-study (SSR) for the Department.
3. Supervising the preparation of a room in the Department devoted to the evaluation and academic accreditation, and provided with full documentation of the Program. In addition, the room can be made accessible for reviewers during the periods of accreditation.
4. Reporting Periodically on the extent to which the requirements for academic accreditation has been completed.
5. Supervising the preparation of exams and answers models for the Program courses.
6. Supervising procedures to enhance accessibility of education and learning to students in coordination with the relevant committees in the Department.

C) Quality and Development Committee (six members):

The Tasks of the Committee:

1. Develop, manage and follow-up quality control in the Department.
2. Follow-up and select benchmarks for the academic programs in the Department.
3. Supervise and follow-up plans for development and future planning in the Department.
4. Encourage development projects which improve the educational, research and technical

programs.

5. Urge scientific publishing in scientific journals of international ranking.
6. Follow-up recent trends in teaching methodology and techniques.
7. Supervise the plans of graduate studies.
8. Prepare, distribute and collect questionnaires of undergraduate students concerning the extent of the benefits of the training program during their years of study, the appropriateness of the courses to practical life, and their suggestions for further improvement. Then, categorize and compile the results statistically.

D) Students' Counseling Committee (six members):

The Tasks of the Committee:

1. Disseminate awareness of the importance of the accreditation of the Program during guidance meetings.
2. Maximize the concept of academic guidance and the role of the academic advisor to guide the student to future educational planning.
3. Prepare, distribute and collect the questionnaires necessary for the academic accreditation. Then, perform the necessary analysis of the results
4. Deepen the trust between students and faculty members.
5. Receive and respond to the students' suggestions or complaints.
6. Disseminate awareness among students concerning the support services and activities offered by the College and University, as well as ensure the availability of textbooks and learning resources.

E) Laboratories, Equipments and Services Committee (six members):

The Tasks of the Committee:

1. Ensure the availability of all laboratory equipments and students' services required for the Program.
2. Ensure the availability of plans for equipment maintenance and students' services.

3. Report to the Chairman of the Department at the end of each academic year to undertake needed repairs / modifications.
4. Supervise the availability of security and safety procedures in the laboratories and the classrooms before the beginning of the academic year, and report, thereon, to the Chairman of the Department.
5. Disseminate awareness, prepare, and distribute guidelines, at the beginning of the academic year, about students' safety and security procedures in regard to various risks (chemical, electrical, radiation).
6. Put up security and safety procedures signs in prominent positions in all laboratories and classrooms, as well as the emergency phone numbers.

F) Alumni and Employment Committee (six members):

The Tasks of the Committee:

1. Collect and compile personal data of the Department's students and means of contacting them (especially the undergraduate students).
2. Collect and compile data of employers and means of contacting them.
3. Develop programs to strengthen the links between graduates and recruiters.
9. Prepare, distribute and collect questionnaires about the degree of the graduates' satisfaction of their study program, and analyze the results statistically.
4. Create an effective mechanism to provide employment opportunities to graduates in their respective fields (for example, through the convening of forums of employment, soliciting the views of employers on the performance of graduates, and exploring the views of employers on important decisions concerning the Program and the Department.)
5. Activate means of communicating with the alumni (such as the Alumni Association)
6. Explore the views of graduates, who joined the working force, on their assessment of the extent of the benefit resulting from their study program in the Department.

G) Community Service Committee (six members):

The Tasks of the Committee:

1. Collection and compilation of the projects carried out by the Department and its members, and the output of the contributions of these projects in the service of the community and the development plans.
2. Encouraging the development of entrepreneurship among students to maximize the return of the role of community service. This is implemented through seminars and publications in coordination with the various committees in the Department.
3. Deepening the links between the College and agencies responsible for development plans in Saudi Arabia.
4. Developing scientific programs to strengthen the relationship between the Department and the local community, and the follow-up of their implementation.

H) Higher Studies and Research Committee (six members):

The Tasks of the Committee:

1. Setting up a system for the observation, documentation and propagation of scientific research data and the participation in conferences.
2. Establishing and updating a data base for research papers and projects published by faculty members in the Department.
3. Urging scientific publication in scientific journals of renowned world ranking.
4. Announcing a list of the research papers of faculty members on the Department website and updating it annually.
5. Evaluate periodically the present Higher Studies Courses as mandated by the permanent Vice – Deanship Committee of Higher Studies in the College.
6. Undertaking the tasks referred to it by the Committee of Higher Studies and Scientific Research in the College.
7. Registering the present research projects, and those already finalized, in the Department and the announcement of their titles on the Department website and their return on the community service.
8. listing the names of the supervisors of the theses in the Department and their numbers, while observing the world ratios in this regard.

2) Research Chairs

The Research Chairs in the Zoology Department are as follows:

- A) Abdel Rahman Al-Jeraisy Research Chair for DNA.
- B) Chair of Advanced Proteomics and Cytomics Research.
- C) Research Chair for Fetal Programming.

The following is a brief summary of these chairs:

A) Abdel Rahman Al-Jeraisy Research Chair for DNA:

This 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 to impact practical help in reducing the economic costs and increase the gross national product in all sectors of production and service modes. This increased knowledge will result in the design of quick, effective and low cost sets of examination and analysis of living organisms or parts thereof, either alone or mixed, human or non-human pathogens, toxic, harmful and dangerous materials; all of which are of economic importance. This should lead to the 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 and cause to grow and progress.

The Chair's Objectives:

1. Support research in the field of DNA for the detection of DNA and genotypes of different organisms, both human and non-human pathogens, toxic, harmful, dangerous and those of economic importance.
2. Develop techniques for examining and analyzing DNA.
3. Develop and increase opportunities for registering patents and their commercialization.
4. Support graduate studies and specialized training in the field.
5. Offer consultations and technical services to public and private sectors.

B) The Chair of Advanced Proteomics and Cytomics Research:

This Research Chair is primarily interested in studying the effects of medical and

chemical extracts on carefully selected laboratory models (animal, plant, bacterial). The objective is not only to discover new drugs for industries that manufacture medicine in Saudi Arabia, but also to examine the analysis of some molecular and cellular complex mechanisms to attain better and deeper understanding of the cellular system which will help develop methods and modern techniques for the treatment of many diseases.

The research team includes scientific professors and researchers with outstanding scientific expertise who have been carefully selected from around the world to serve the Research Plan of the Chair. As the diverse nationalities of the researchers vary; so does their scientific and research expertise to include, for example, molecular genetics, cell biotechnology, natural materials, microorganisms, cell cultures, developmental cell, organic and analytical chemistry, spectral analysis of compounds, and other specializations.

Furthermore, the Chair has strong ties within King Saud University and distinguished research groups in many countries of the world such as Germany, Spain, United Kingdom, Egypt, and Singapore.

The Chair's Objectives:

- 1) Develop a laboratory room to survey and analyze natural and synthetic chemical compounds.
- 2) Discover and develop natural substances derived from living organisms like bacteria, fungi, plants and others for the purpose of the discovery of new types of growth inhibitors that can be developed to resist the growth and treatment of various types of cancer cells.
- 3) Discover and develop novel cellular molecules to serve as targets of new pharmaceutical drugs and then create innovative ways of bio-survey for the discovery of new types of drugs.
- 4) Discover of new types of antibiotics.
- 5) Establish a base for synthetic compounds (small molecules libraries) to be used to study the mechanisms of cellular systems.

C) The Research Chair for fetal programming with respect to diseases:

The research in this Chair cares about studying fetal programming diseases, 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, in 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 purifies 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, show that malnutrition in pregnant women, quantitatively or qualitatively, results in many chronic diseases such as blood pressure, diabetes, obesity and kidney failure. The Chair focuses on studying the relationship between the nature of nutrition among pregnant women in Saudi society and the emergence and spread of chronic diseases in subsequent 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 the 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 adequately; eating / not eating fruits and vegetables fresh enough; fasting / non fasting of the month 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 and bio specialties 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 his extensive experience and reputation contributing to the promotion of the scientific production of the Chair to the international research levels.

The Chair's Objectives:

- 1) Support and execute research in the areas of embryonic programming of chronic diseases which have health and economic value.
- 2) Conduct research to highlight the role of dietary patterns of pregnant mothers in the Saudi community in the programming and the emergence of diseases such as high blood pressure and other chronic diseases in subsequent generations. Then, draw the proper nutrition strategies for pregnant women in order to reduce the spread of these diseases.
- 3) Benefit from medical databases to re-categorize and analyze the statistics for the service of scientific research at the national level.
- 4) Contribute, in collaboration with health, educational and informative agencies, to educate the Saudi family in general, and pregnant women in particular, about the negative effects of unbalanced nutrition on the children's health.

- 5) Collaborate with international research institutions for the transfer of expertise and the improvement of the quality of national research.
- 6) Establish an advanced unit for the production of special animal models, for more scientific experiments, which emulate physiological conditions found in some patients with high blood pressure in the Saudi society.
- 7) Offer consultations and recommendations to the health sector, and to help in drawing national health strategies.
- 8) Support postgraduate studies and specialized training.

3) The Center of Excellence in Research in Biological Diversity

The Center of Excellence at King Saud University supports research in biodiversity through collaboration in scientific research and participation in supporting modern technology in the Kingdom of Saudi Arabia. The Center supports short and long term research projects as well as the development of scientific instruments in both laboratory and field studies in the Kingdom. The Center also supports and develops research capacities and scientific talented researchers through collaboration with centers of highly efficient scientific expertise and relevant qualitative research locally and internationally. It is considered an advanced technical training for students and staff of government and private institutions. This will result in distinguished research in the field of conservation of biodiversity and the sustainable use thereof. The Center also supports different research activities and promotes coordination of training cooperation between scientists and researchers at King Saud University and national and international organizations in order to make distinctive progress useful in the field of biodiversity. Furthermore, the Center gives a significant priority to the training and education of young researchers to achieve higher levels of research ranking with that of international bodies, and to meet the needs of international, governmental and private sectors to secure a better future.

The Tasks of the Center:

1. Scientific collaboration at the local and international levels.
2. Development and extension of the standards used to develop a strategy to preserve species.
3. Modern, innovative education to the new generations of students and researchers.

Objectives of the Center:

The most important objectives of the Centre in biological diversity are as follows:

1. Undertake significant scientific and applied research pertinent to species in the Kingdom.
2. Facilitate the collaboration between local and international researchers and scientists in the field of biological diversity to work together as teams.
3. Establish a database “Bioinformatics” to include information available in the international research centers, and establish an information base for all species in Saudi Arabia and the Arabian Peninsula.
4. Contribute to the multiplicity of sources of income of the Kingdom through private sector involvement in the sustainable development and economic benefits resulting from biological diversity in land and sea.
5. Meet the needs of the Government and the Private Sector by training and graduating qualified professionals.
6. Transfer advanced technology in the field of biodiversity.
7. Create attractive opportunities for research collaboration in the field of the specialty of the Center.
8. Promote scientific communication and seminars for the exchange of new scientific information and accruing benefits from international expertise.
9. Offer training and support to researchers, and help students to find scholarships for undergraduate and post-graduate studies and cooperative programs.
10. Support and assist in expanding technical awareness in the Kingdom by creating scientific occupations and other related employment opportunities.
11. Involve the Private Sector in research and applied projects of a sustainable economic return.
12. Contribute to education and environmental awareness as well as community participation in the activities of the Center.

4) The Central Laboratory

A) The Microscopic Preparations Unit:

This Unit was established in 1427 H, and serves mainly researchers from the undergraduate and graduate studies and faculty members from both the Department and other departments. The Unit’s objectives are :

1. Preparing all the fixatives, solutions, reagents, and stains required for the Unit and the practical sessions.
2. Preparing paraffin and frozen sections for research students and faculty members.
3. Staining tissue sections.
4. Detection of the enzymes in animal tissue samples.
5. Detection of fat in animal tissues using various methods.
6. Preparing immunological stains for cells and tissues.
7. The possibility of preparing educational materials of samples from animal and plant tissues.

In order to achieve these objectives, this Unit contains the latest equipments necessary to prepare the tissue sections and stain them. These equipments include:

1. The device for the chemical treatment of tissue samples (Tissue Processor).
2. A Landfill Wax Station (Embedding station).
3. Devices for cutting samples of different thickness up to 3 micrometers (Rotary microtome/ Cryostat).
4. Automatic staining and covering tissue sections machine. (Autostainer).

Location: AB 99 M5





Embedding machine



Microtome for paraffin sections





Autostainer



Cryostat **B) Photography Unit using Light Microscopes:**

B) Photography Unit using Light Microscopes:

B) Photography Unit using Light Microscopes:

This unit was established during the academic year 1429 / 1430 H. 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 (Licka with Digital camera).
3. Cool scope (Nikon with digital camera).
4. Ordinary light microscope (Olympus with analog camera).



C) Equipment Unit:

This Unit includes many machines that everyone can benefit from. Qualified technicians are operating the equipment for various research projects for undergraduates, graduates, and faculty members. This Unit is designed to provide technical services to the Zoology Department faculty members and students. This Unit also offers multiple services to the students of the Zoology Department to help develop their research capabilities and to make them able to cope with the labor market. The available machines in this Unit are:

1. Atomic Absorption.
2. Machine for determining DNA sequences (DNA sequencer).
3. High Performance Liquid Chromatography (HPLC).
4. Spectrophotometer.
5. Flame photometer.
6. Deep Freezer at -86 °C.
7. Refrigerated Centrifuge.
8. Autoclave (High pressure sterilizer).
9. Measuring pH (pH meter).
10. Ice Maker (Ice Maker).
11. Carbon dioxide (CO₂) Incubator.

Location AB 85 M5



High Performance Liquid Chromatography

Atomic Absorption

DNA Sequencer

D) 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 equipments necessary for the cultivation of cells and tissues, which include:

1. Laminar Flow Hood.



2. Carbon Dioxide (CO₂) Incubator.
3. Inverted Microscope.
4. Autoclave.
5. Water Distiller.
6. Refrigerators and Freezers.
7. Liquid Nitrogen containers.
8. Many other facilities such as water baths / pH meter and a Western blot, stickers, etc.

Location: 2B 162 M5

E) 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:

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



F) Scanning Electron Microscope Unit:

This is used to study the surface of samples of various types and to show their ultra-structure. This Unit also serves the equipments for coating samples with gold and chrome.

5) Digital Laboratory

This Laboratory was launched on the beginning of the first semester of the academic year 1429/1430 H for the purpose of teaching three courses, namely; Parasitology (ZOO 213), Histology (ZOO 245), and Descriptive Embryology (ZOO 421).

The Laboratory contains 21 computers connected to each other via an internal network. Each computer is equipped with a light microscope and a camera enabling the course instructor to take a picture of the slide and send it to the students to view on their computers. The course instructor can view the power point files and web pages with the students since a projector is connected to the computer. The students can write observations on the slides sent to them by the instructor and save them in their own folders to review at home. It should also be noted that a second digital laboratory had been opened at the beginning of the first semester of the academic year 1430/1431 H in the Department.

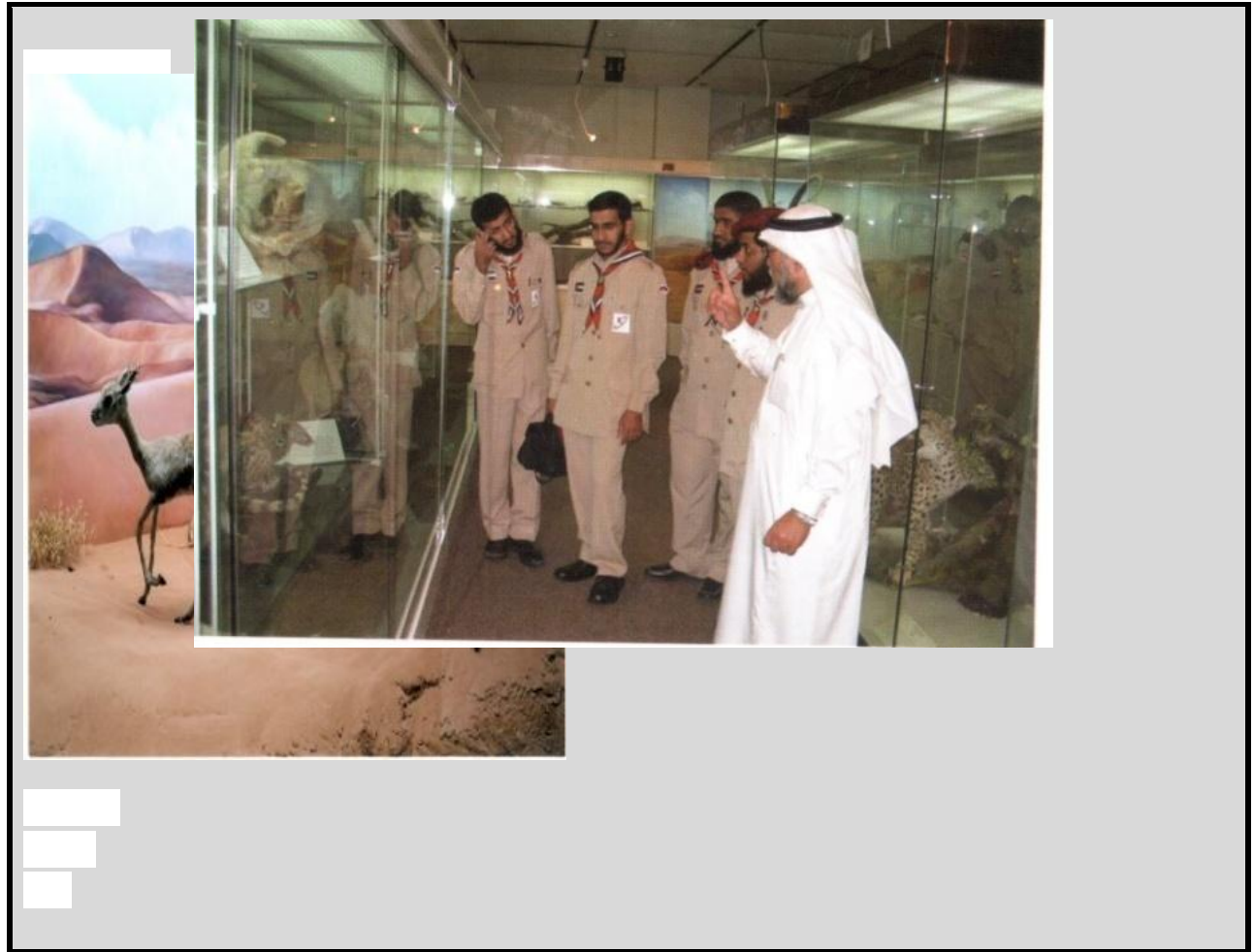
Location: 1B76 and 1B78

6) The Zoology Department Museum

The Museum is an important unit in the Department since it benefits the students of the Department, being an applied learning process of what they learned theoretically where they see the mummified animals displayed. The Museum was founded in the month of Shawwal of the year 1390 H with a small number of samples for the above mentioned objective. However, having been updated and re-opened again in the second half of the academic year 1416/1417 H, The Museum began receiving visitors and students from the College and other colleges as well as school students of all academic levels from within the city of Riyadh and beyond where they come to see the contents of the Museum samples including animals from local and other environments.

The Museum participates in exhibitions held inside and outside the University such as the Gallery of Natural Phenomena in the College of Science and in the Events of the National Festival for Heritage and Culture in Janadriya, as well as exhibitions organized by some schools in Riyadh. The Museum also joins, from time to time, in training sessions for the preservation of fish and insects samples.

Location: AB 96 M5



The Master's Program in Biodiversity

The attention, paid to biodiversity conservation, has become a basic worldwide awareness because of its impact on the continuation of life on the Planet. This awareness has evolved into the signing of the “Convention on Biological Diversity” by more than 150 countries within the framework of the United Nations Conference on Environment and Development (UNCED) held, on 1992, in Brazil (The Rio Earth Summit). This conference confirmed the importance of conservation and sustainable use of biological resources in each country, and emphasized the responsibilities of member countries in conducting studies, training and supporting cooperation for biodiversity conservation. The Kingdom of Saudi Arabia has acceded to the “Convention” at the beginning of 1422 H (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 the perception 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. The objectives of the Program are as follows:

- Preparing scientific researchers and equipping them with skills and expertise in the field of biodiversity for the conservation of natural resources and bio-cultural heritage.
- Contributing to the studies and research in wildlife and natural resources to perceive the Kingdom's biota inventory and its uses.
- Keeping abreast of the scientific developments and concerns of the environmental issues and bio-components, and addressing their problems in the pursuit of a better life.
- Contributing to the achievement of national policies aiming at a study-based protection of living organisms, and paying attention to finding appropriate solutions to key environmental issues, locally and globally.

Admission Requirements:

1-The admission requirements stipulated in the Unified Graduate Studies Regulations for Saudi universities.

2- The applicant should hold a Bachelor's Degree (B.Sc.) in one of the bio-disciplines, namely: Botany, Zoology, Rangelands and Forests, or another relevant discipline from King Saud University, or its equivalent.

3- The applicant must pass a written test and a personal interview conducted by the Program Administration Committee.

Study System:

The Program's Study System consists of a thesis and Master's Degree courses according to the University Semester System. The student has to complete 24 credits hours 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. Afterwards, the student has to write his/her research project


proposal, undertake the research work, and write down the thesis as a prelude to the “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 legislations on environmental conservation.
- Forest development and arboriculture.
- Animal conservation.

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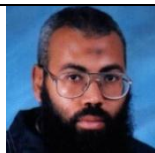



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Nouf Al-Yamy	39	Maksoud Sedeky	14
Al-Anoud Al-Sedairy	40	Gauid Ahmed	15
Iman Al-Shahary	41	Saeed Aseery	16
Al-bandry Al-Rageh	42	Al-Ameed Al-Hakeem	17
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Rym Al-Agamy	44	Mostafa Abdel-Maksoud	19
Afraha Al-Khoraigy	45	Badr Al-Motery	20
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