

## Doctoral Program in Zoology

### Admission Requirements:

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

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

### General program for a doctoral degree (PhD) in Zoology

(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)

**Specialized hours (8 hours)**

<b>The student chooses 8 credit hours according to their specialization</b>			
<b>Level Two</b>	<b>Course No.</b>	<b>Course Name</b>	<b>Credit hours</b>
	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 637	Medical immunology	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)
			<b>32 hours</b>

**Following Levels**

<b>Course No.</b>	<b>Course Name</b>	<b>Credit hours</b>
ZOO 699	Research project	
ZOO 700	Dissertation	6 (0+6)
		<b>6 hours</b>

## Brief Description of the Doctoral Degree Courses

### 1: Compulsory Courses (10 hours)

<b>ZOO 611</b>	<b>Applied Entomology and Parasitology</b>	<b>2 (2+0)</b>
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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.

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

<b>ZOO 631</b>	<b>Comparative Reproductive Physiology</b>	<b>2 (2+0)</b>
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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, and the effect of environment on reproduction.

<b>ZOO 641</b>	<b>Advanced cell Biology</b>	<b>2 (2+0)</b>
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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.

<b>ZOO 671</b>	<b>Advance Animal Ecology and Pollution</b>	<b>2 (2+0)</b>
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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: Students Choice of hours (8 hours)**

<b>ZOO 612</b>	<b>Advanced Entomology</b>	<b>2 (2+0)</b>
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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.

<b>ZOO 613</b>	<b>Parasite culture</b>	<b>2 (2+0)</b>
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**Contents:** This course aims to provide parasitology PhD students with the theoretical principles of parasite culture (in culture media and in laboratory animals) that they might need for their Ph.D. research programmes. 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.

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

<b>ZOO 622</b>	<b>Aquatic vertebrates</b>	<b>2 (2+0)</b>
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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.

<b>ZOO 623</b>	<b>Nutrients requirements and Metabolism in Fish</b>	<b>2 (2+0)</b>
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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 on recent journal articles.

<b>ZOO 624</b>	<b>Bioeconomics of fisheries resources</b>	<b>2 (2+0)</b>
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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.

<b>ZOO 635</b>	<b>Advanced Animal behavior</b>	<b>2 (2+0)</b>
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**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.

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

<b>ZOO 638</b>	<b>Advanced topics in Physiology</b>	<b>2 (2+0)</b>
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**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.

<b>ZOO 639</b>	<b>Current topics in Developmental Biology</b>	<b>2 (2+0)</b>
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**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.

<b>ZOO 642</b>	<b>Advanced Cytology</b>	<b>2 (2+0)</b>
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**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.

<b>ZOO 643</b>	<b>Functional Histology</b>	<b>2 (2+0)</b>
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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.

<b>ZOO 651</b>	<b>Molecular genetics</b>	<b>2 (2+0)</b>
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**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.

<b>ZOO 672</b>	<b>Terrestrial Animal Ecology</b>	<b>2 (2+0)</b>
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**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).

<b>ZOO 673</b>	<b>Aquatic Animal Ecology</b>	<b>2 (2+0)</b>
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**Contents:** Advanced consideration of the aquatic ecology of aquatic animal's 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.

<b>ZOO 674</b>	<b>Advanced studies in Pollution</b>	<b>2 (2+0)</b>
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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.

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

<b>ZOO 699</b>	<b>Research project</b>	
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**Contents:** The course aims to train students to design and conduct scientific research experiments, record data, analyze them statistically, discuss their meanings and scientific interpretations, and submit them in seminars.

<b>ZOO 700</b>	<b>Dissertation</b>	<b>6 (0+6)</b>
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**Contents:** The student conduct scientific research in one of the tracks before then writes a dissertation under the supervision of a faculty member supervisor.