DEPARTMENT OF ZOOLOGY

The program leading to the degree of M.Sc. in Zoology involves an advanced course of instruction, consisting of formal taught modules, which may include lectures, seminars, group discussions, laboratory work, course work, field work; and a research project taken within a chosen area of specialization. Graduate education and training has been co-ordinated within 10 major groups:

Group Code	
85500-8509	General Courses
8510-8519	Group (1)- Animal Genetics
8520-8529	Group (2)- Animal Physiology
8530-8539	Group (3)- Entomology
8540-8549	Group (4)- Histology and Embryology
8550-8559	Group (5)- Invertebrates
8560-8569	Group (6)- Marine and Aquatic Biology
8570-8579	Group (7)- Parasitology
8580-8589	Group (8)- Toxicology and Pollution
8590-8598	Group (9)- Vertebrates

Within each group are a variety of courses from which the supervisor may chose those most relevant to the student. Students are encouraged to study courses from other specializations, provided they are relevant to their course of study and complement it. Full details of M.Sc. course structure for graduate Zoology students is available in a separate booklet.

Unless otherwise stated, all taught courses consist of 2 hour theory lectures, and a 3 hour practical session per week, that is, all courses have 3 credit hours. In contrast, research methodology, which is mainly a practical course, has 2 credit hours equivalent to two separate practical sessions per week. In addition, the seminar has 1 credit hour.

The following is a short description of the course syllabus offered by the department of Zoology. All the above mentioned programmes are under constant review and the department reserves the right to make changes to the courses, their contents, and may introduce new topics, whenever it deems necessary.

Description of Courses

8500 Seminar (Credits)

The student is expected to undertake a thorough library search and to write a report on a specific topic which may be either related to the student's research project or to his/her field of specialization. Presentation of the report and participation in group discussions of other reports are essential.

8501 Research Methodology(Credits)

Introduction to laboratory work and its tools. Health and safety in laboratories. Basic laboratory techniques and procedures. Experimental design to include control and replicates. Samples and sampling. Collecting, fixing and preserving animals. Developing observation skills.

Introduction to microscopy. Photography and photographs. Using biological systems. Analysis and presentation of data. The use of animals in research. General aspects of scientific writing. Organizing a poster display; giving an oral presentation; writing essays; sitting exams. Finding and using literature references.

8502 Special Topics(Credits)

The course covers in detail selected topics that have not been studied in other scheduled courses. It may thus be registered by students of any one of the specializations, and requires the supervisor's consent. The supervisor or tutor(s) should provide the department with the title and written syllabus of the suggested topic for approval. The number of credit hours is to be fixed by the course instructor and may not exceed 3. This course may include, whenever necessary, some irregular laboratory periods.

GROUP(1)- Animal Genetics

8510 Animal Genetics(Credits)

Gene segregation in organisms. Multiple alleles. Sex determination and sex linkage. Nature of gene. Polygenic inheritance. Gene and chromosome mutations. Gene frequencies in populations. Recombinant DNA. Transgenic animals.

8511 Cytogenetics(Credits)

The architecture of the chromosome. Chromosome morphology. Types of chromosomes. Chemical structure and chromosome replication. Changes in chromosomal behavior during mitotic and meiotic division. Crossing-over. Variation in chromosome structure and number. Agents affecting the occurrence and frequency of chromosomal aberrations. Chromosomes and sex etermination.

8512 Molecular genetics(Credits)

Genome structure. Gene coding and expression. Molecular genetic variation. Gene mapping. DNA fingerprinting. Gene cloning and insertion. Transgenics.

8513 Quantitative Genetics(Credits)

Population genetics. Gene frequency. Change due to selection and genetic drift. Genetic basis of quantitative traits. Heritability. Correlation amongst relatives. Selection in short and long term. Design and analysis of selection experiments. Genetic correlations. Fitness inbreeding depression and heterosis.

GROUP (2)- Animal Physiology

8520 Physiology(Credits)

Cell physiology. Nerve and muscle. Neurophysiology. Cardiovascular physiology. Respiration. Renal physiology. Acid base Balance. Thermoregulation. Digestion and metabolism. Endocrinology. Reproduction.

8521 Digestion and Metabolism(Credits)

General principles of gastrointestinal functions. Transport and mixing of food in the alimentary tract. Secretory functions of the alimentary tract. Digestion and absorption in the gastrointestinal tract. Metabolism and temperature regulation.

8522 Endocrinology and Reproduction(Credits)

Brain peptides. Hypothalamic control of the pituitary. Feedback mechanisms. Response to changes in external and internal environments.

Endocrine glands. Detailed study of the structure and function of male organs. Male hormones and behavior. Evaluation of semen. Structural-functional-chemical details of the female organs. Changes in hormones

and behavior. Pregnancy. Parturition. Lactation. Techniques in reproduction: *in vitro* matuartion of ovum; activation of sperm; *in vitro* fertilization; embryo freezing and transfer; embryo sexing and blastomere separation.

8523 Avian Physiology(Credits)

Introduction. Special aspects of anatomy of birds. Haematology. Avian nervous system. Cardiovascular system. Respiration. Fluid balance and renal function. Digestion. Thermoregulation. Endocrinology. Reproduction. Physiology of the egg.

8524 Comparative Physiology(Credits)

Detailed study of the comparative aspects related to the main morphological-functional entities of representative animal species. Simple stomach and ruminant mammals, avian, desert and aquatic vertebrates as well as selected invertebrates will be within the scope of investigation. Topics deal with cellular metabolic reactions. The fundamental physiological features of the nervous, locomotor, cardiovascular, respiratory, digestive, renal and reproductive systems will be emphasized. Students are expected to present reports on selected topics and to participate in group discussions of such reports.

8525 Neurophysiology(Credits)

Design and basic function of the nervous system. Nerves, junctions and reflexes. Somesthetic sensory mechanisms. Special senses. Regulation of motor activity. Visceromotor control. Temperature regulation and environmental physiology. Neurophysiology of consciousness. Behavioural physiology.

8526 Pathophysiology(Credits)

Introduction. Disorders of the immune system. Infectious diseases and Neoplasia. Blood disorders. Nervous system disorders. Diseases of the skin. Pulmonary disease. Heart disease. Vascular disease. Disorders of endocrine glands. Gastrointestinal disease. Liver disease. Disorders of the exocrine pancreas. Renal disease.

GROUP (3)- Entomology

8530 Advanced Systematic Entomology(Credits)

The science of Taxonomy. Theories of biological classification and their history. The hierarchy of categories and the higher taxa. Taxonomic

characters. The species category. The polytypic species, population systematic and infraspecific categories. Taxonomic decisions on species level. The procedure of classifying. Classification, nomenclature and identification. The rules of Zoological nomenclature. Interpretation of the rules of nomenclature. Taxonomic publication.

8531 Insect Morphology(Credits)

General body form. Segmentation and the integument. Body wall processes. Molting. The head and its segmental appendages. The thorax. Thorax appendages. Wing venation. The abdomen. Alimentary canal. Excretory structures. Respiratory system. Circulatory system. Haemolymph and haemocyte. Nervous system. Association centers of the brain and sensory organs. Auditory organs. Reproductive systems. Muscles.

8532 Insect Physiology(Credits)

Embryonic development. The integument. Growth and differentiation. Respiration. Digestive system. Excretion. Nutrition and metabolism. Reproduction. Muscles and movement. The nervous system. The endocrine system.

8533 Insect Ecology(Credits)

Definitions and history of ecology. Natural selection and natural balance. Host selection and host specificity. Population dynamics. Ecological genetics. Trophic relationship. Demography. Population growth and life tables. Strategies in reproduction. The niche concept. Intraspecific and interspecific competition. Social systems and behaviour. Pollination ecology. Diapause. Factors affecting distribution and abundance of insects. Biotic potential. Environmental resistance and population equilibrium. Biological attributes of population. Methods of determining population size. Density dependent and density independent population action in population control.

8534 Insect Pathology(Credits)

Infectious and non-infectious diseases of insects such as injuries, nutrition and metabolic disturbances. Epizootiology of insect diseases. Resistance and immunity of insects against diseases. Different kinds of microbiota (bacteria, fungi, viruses, protozoa) pathogenic to insects.

8535 Integrated Pest Management(Credits)

General principles of pest management. Strategies and tactics in pest management. Examples of insect pests of Libyan plants and animals. Present and future of pest management in Libya.

GROUP (4)- Histology and Embryology

8540 Advanced Histology(Credits)

Introduction and Definitions. Epithelial Tissues. Connective tissue. Blood and bone marrow. Muscular tissues. Nervous tissue. Cardiovascular system. Lymphatic system. Respiratory system. Digestive system. Urinary system. Female reproductive system. Male reproductive system. Endocrine system. Organs of special sense.

8541 Advanced Embryology(Credits)

Gametogenesis. Fertilization. Cleavage. Gastrulation. Neurulation. Extraembryonic structures. Development of the nervous system. Muscular development. Development of the skeletal system. Development of the digestive system. Development of the respiratory system. Development of the circulatory system. Development of the excretory system. Development of the reproductive system. Regeneration.

8542 Histochemistry(Credits)

Observation of living tissues. Tissue culture and transplantation. Autoradiography. Acidic and basic stains. Immunocytochemistry. Neurotransmitters and synapses. Metachromasia. Histochemistry of proteins, lipids, minerals and enzymes. Histopathology of some organs. Histochemistry of nucleic acids. Histochemistry of selective tissues.

GROUP (5)- Invertebrates

8550 Invertebrates(Credits)

Recent Invertebrate classification. Movement and fibrils. Muscle filaments and myonemes. Flagella and cilia. Movement and hydrostatics. Principles of hydrostatic skeleton in Cnidaria, Ctenophora, Porifera, Platyhelminthes and Nematoda. Movement, hydrostatics and coelom. Significance of coelom. Movement and metamerism. Significance of metamerism. Locomotion of Oligochaeta and Polychaeta. Movement and Arthropodisation. Skeleton of Arthropoda.

Locomotion of Arthropoda, Mollusca and Echinodermata. Nutrition in Protozoa, Parazoa and Metazoa. Respiration. Excretion. Advanced circulatory and nervous systems and chemical co-ordination in Invertebrates. Endocrine glands of Invertebrate animals. Reproduction.

GROUP (6)- Marine and Aquatic Biology

8560 Advanced Ichthyology(Credits)

8561 Fish Classification(Credits)

8562 Fish Biology(Credits)

8563 Fish Ecology(Credits)

8564 Limnology(Credits)

GROUP (7)- Parasitology

8570 Parasitology I(Credits)

The study of parasitic and helminth parasites with regards to the following: introduction; classification; diagnostic morphology; ultrastructure; pathogenesis; methods of transmission; host-parasite relationships; a brief mention of treatment; control and prevention. Emphasis is made on native and endemic infections.

8571 Parasitology II(Credits)

Epidemiology, biochemistry, physiology, nutrition and immunology of parasites and parasitic infections. Components of control programs and development of integrated control programs.

8572 Veterinary Parasitology(Credits)

Aims and importance of the course. Economic loss due to animal parasites. Zoonotic importance of parasites of domestic animals. The etiology, epidemiology, life cycle, pathogenesis, clinical findings, diagnosis, treatment, and control of animal diseases caused by protozoa, helminths, as well sas those caused by arthropods will be covered. Major consideration will be given to those diseases prevalent among Libyan livestock.

8573 Vector/Parasite Ecology(Credits)

GROUP (8)- Toxicology and Pollution

8580 Toxicology(Credits)

General patterns of pesticide use. Evaluation of toxicity. Classification of insecticides. Mode of action of insecticides. Carbamates. Metabolism of insecticides. Entry of insecticides into animal systems. Dynamics of insecticidal movement within the animal body. Hazards of insecticides to man and domestic animals.

8581 Pollution Biology(Credits)

Assessment of toxicity. Metabolism of toxic substances by animals. Atmospheric toxicants. Pesticides. Toxic metals. Chlorofluorocarbon. Movement of insecticides in the environment. Movement of residues in the environment. Environmental alterations of insecticide residues.

8582 Pesticide Ecology(Credits)

Insecticides, herbicides, fungicides. Insecticides and the Arthropod fauna. Insecticides and soil invertebrates. Effects of insecticides on soil macro-arthropods. Effects of insecticides on earthworms, slugs and nematodes. Fungicide effects on soil microflora, invertebrates and vertebrates. Herbicide effects on invertebrate and vertebrate fauna, and soil microflora. Effects of pesticides on wildlife.

GROUP (9)- Vertebrates

8590 Advanced Chordates(Credits)

8591 Advanced Comparative Anatomy(Credits)

The vertebrate body. Protochordates. Parade of the vertebrates. Early vertebrate morphogenesis. Skin. Vertebrate skeleton. The vertebrate skull. The appendicular skeleton. Muscles. Digestive system. Respiratory system. Circulatory system. Urinogenital system. Nervous system. Sense organs. Endocrine organs.

8599 Dissertation(Credits)

Students are asked to write a dissertation on a subject chosen in close consultation with the supervisor, which must be submitted at least, three

years after the start of the course, or within the full time allocated by the University (including extensions). This dissertation will account for 6 credit hours of the total hours accomplished by the graduate student. Students are encouraged to begin trial experiments related to their research work at an early stage, to counteract shortages in facilities. However, actual work on the project should not begin before 50% of the course work has been attempted, and successfully completed.

Each student will be assigned a supervisor with whom he/she should maintain constant contact, both during the execution of the laboratory and / or field work and the writing of the dissertation. The supervisor will also guide the progress of the student during the entire period of his/her candidature.