DEPARTMENT OF ZOOLOGY

FACULTY OF SCIENCE

UNIVERSITY OF JAFFNA

SRI L ANKA

2014/15

REVISED CURRICULUM UNDER BIOLOGICAL SCIENCE STUDY PROGRAMME PRINCIPAL SUBJECT: ZOOLOGY

CURRICULUM FOR BACHELOR OF SCIENCE

HONOURS IN ZOOLOGY

LEVEL & 4M

2016

REVISED CURRICULUM UNDER BIOLOGICAL SCIENCE STUDY PROGRAMME PRINCIPAL SUBJECT: ZOOLOGY

The course units and their credit values for 4M

Course code	Course title	Lectures and Tutorial (hrs)	Practical and/ or field (hrs)	Credit value	Resource person (s)
ZOL 401 MC3	Advanced Parasitology and vector control	30	54 (P+F)	03	Prof. SNS, Dr. KG
ZOL 402 MC3	Insect Structure and Function	30	54 (P+F)	03	Prof. SNS, Dr. RG , Ms. NR
ZOL 403 MC3	Insect Ecology	30	54 (P+F)	03	Dr. RG
ZOL 404 MC3	Aquaculture	30	54 (P+F)	03	Mr.WVL
ZOL 405 MC3	Marine Biology	30	54 (P+F)	03	Mr. WVL Mrs.PS
ZOL 406 MC2	Seminar and Essay	30		02	Ms. N.R
ZOL 407 MC6	Research Project	270 (P+F)		06	Prof SNS
ZOL 408 ME2	Coastal and Mangrove Conservation and Management	22	23 (F)	02	Ms. N.R Dr. RG
ZOL 409 ME2	Herpetology	22	23 (F)	02	Dr.AS
ZOL 410 ME2	Ornithology and Mammalogy	22	23 (F)	02	Dr.AS Mr.WVL
ZOL 411 ME2	Advanced Animal Physiology	22	23 (P)	02	Dr.TE
ZOL 412 ME2	Advanced Evolutionary Biology and Molecular Systematics	22	23 (P)	02	Dr.KG
ZOL 413 ME2	Research Methodology and Data Analysis	30	-	02	Prof SNS
ZOL 414 ME2	Scientific Writing and Presentation	30	-	02	Prof. SNS

Course title	**Advanced Parasitology and Vector Control**
Course code	**ZOL 401 MC3**
Credit value	03 - (30 hours L and 54 P+F) 60% Theory + 40 % Practical and/ or Field
Prerequisites	ZOL304GC3: Parasitology and Vector Biology
Objectives	This course aims to, discuss the adaptations of parasites and their hosts for survival through evolution; document Statistics on prevalence and prediction of vector borne diseases; outline the principles of different diagnostic techniques for identification of parasitic diseases; discuss the objectives and control strategies of various vector borne diseases.
Intended Learning Outcome	Upon the completion of this course unit, the student should be able to; • Categorize the adaptations of the major animal parasites and vectors and their survival strategies • Analyze the survival/ evolutionary significance of these adaptations • Assess the parasitic and vector borne disease epidemiology • Evaluate the major parasitic and vector borne diseases in Sri Lanka • Recommend suitable control strategy to the existing parasitic and vector borne diseases
Course content	Parasite-Host interactions- parasitic adaptations, defense mechanisms of host and parasite; Diagnostic techniques for parasitic diseases- basic laboratory, immunological and molecular biological techniques, Disease control- chemotherapy, vaccine developments; vector control – approaches, challenges and case studies (chemical, biological, environmental management, novel approaches – RNAi, transgenic vectors, cytoplasmic incompatibility etc; Integrated vector control applications; Insecticide resistance and resistance mechanisms
Teaching and learning methods	Lecture presentation , tutorial discussion, field based studies, laboratory based experiments, take-home assignments
Evaluation Methods	Theory: In-Course Assessments (30%) End of Course Examination (70%) Practical: In-Course Assessments (30%) End of Course Examination (70%) **Marks obtained in theory component (MT) and practical component (MP) will be computed into Overall Marks as (6MT+4MP)/10**
References	1. LaMann, GV., (2010) Veterinary Parasitology.Nova Biomedical Press. New York. 2. Mullen, GR and Durden, IA., (es).(2009). Medical and Veetrinary Entomology, 2nd Edition.Academic Press. 3. Gajapathy, K., (2015). Beginners Guide to Sandfly Taxonomy.Lambert Academy Press, Germany. 2015. 4. Ramasamy, R. and Surendran, SN., (2013).*Global Environment Changes and Salinity Adaptation in Mosquito Vectors*.LAMBERT Academic Publishing. Germany.
Resource person	Professor S.N. Surendran and Dr. K. Gajapathy

Course title	**Insect Structure and Functions**
Course code	**ZOL 402 MC3**
Credit value	03 - (30 hours L and 54P+F) 60% Theory + 40 % Practical and/ or Field
Prerequisites	ZOL302MC2: Entomology and Pest Biology
Objectives	This course aims to; introduce insect taxonomy and diversity and tostudy insect functional morphology and physiology
Intended Learning Outcome	Upon the completion of this course , the student should be able to; • Identify insects and their life stages into family level using keys • Prepare slide mounts of insects and their appendages • Describe insect structure in relation to function, biology, growth and metamorphosis • Interpret methods of insect communication and their application in management of pest populations
Course content	Distinguishing characteristic features of insect families (all life stages) and use of identification keys, Use of morphometric, morphological features and molecular systematics in species identification. Anatomy and physiology of major organ systems of insects, Insect flight, bioluminescence.
Teaching and learning methods	Lecture presentation , tutorial discussion, field based studies, laboratory based experiments, take-home assignments
Evaluation Methods	Theory: In-Course Assessments (30%) End of Course Examination (70%) Practical: In-Course Assessments (30%) End of Course Examination (70%) **Marks obtained in theory component (MT) and practical component (MP) will be computed into Overall Marks as (6MT+4MP)/10**
References	• Chapman R.F. Stephen J. S. Angela E. D. *The Insects: Structure and Function* 5th Edi. • Norman F. J. and C.A. Triplehorn (2005) *Borror and DeLong's Introduction to the Study of Insects*, 7th Edi. • Nation J.L. (2015) Insect Physiology and Biochemsitry. 3rd Edition. CRC Press. • Imms AD., Richards , OW.,Davies, RG., (Eds) (1977) IMMS' General Textbook of Entomology: Volume I: Structure, Physiology and Development ; Volume II- classification
In-charge	Professor S.N. Surendran , Dr. Mrs. R. Gnaneswaran, Mrs. N. Rajan

Course title	**Insect Ecology**
Course code	**ZOL 403 MC3**
Credit value	03 - (30 hours Lectures and 54P+F) 60% Theory + 40 % Practical and/ or Field
Prerequisites	**ZOL 204 GC2: Animal Ecology**
Objectives	This course aims to; provide knowledge on the role of insects in the ecosystems they inhabit and to study how the ecosystems interact with the insects
Intended Learning Outcome	Upon the completion of this course , the student should be able to; • Identify and recall fundamental ecological concepts in relation to insects • Recognize the general role of insect in ecosystem • Construct the ecological framework for management of insect abundance • Outline the experimental and modelling approaches for studying insect ecology
Course content	Fundamental principles of insect population dynamics. Functional role of insects in populations, communities, and ecosystems, including intra and inter specific interactions, and trophic dynamics Insect trophic relationships, co-evolution;- pollination ecology ; Physiological ecology, Behavioural ecology, Chemical ecology, Population ecology of insects Ecology of terrestrial (forest, desert, chena cultivation and grass land), aquatic (freshwater, estuary, marine), arboreal and aerial insects: Insect adaptations to specific environments; The significance of insects as model systems in development of ecological and evolutionary principles. demonstrate techniques used in insect ecology through field research and laboratory rearing
Teaching and learning methods	Lecture presentation , tutorial discussion, field based studies, laboratory based experiments, take-home assignments
Evaluation Methods	Theory: In-Course Assessments (30%) End of Course Examination (70%) Practical: In-Course Assessments (30%) End of Course Examination (70%) **Marks obtained in theory component (MT) and practical component (MP) will be computed into Overall Marks as (6MT+4MP)/10**
References	• Speight, M.R., Hunter, M.D., & Watt, A.D. (2008). *Ecology of Insects: Concepts and Applications*. Wiley-Blackwell. • Peter A Henderson , TRE Southwood,(2016) *Ecological Methods* 4th Wiley-Blackwell. • Southwood, TRE, (1978) Ecological methods with particular reference to the study of insect populations • Sinu, P.A. and Shivanna, KR (2016) Mutualistic interactions between flowering plants and animals. Manipal University press, India. 317 Pp
Resource person	Dr. Mrs. R. Gnaneswaran

Course title	**Aquaculture**
Course code	**ZOL 404 MC3**
Credit value	03 - (30 hours Lectures and 54P+F) 60% Theory + 40 % Practical and/ or Field
Prerequisites	None
Objectives	This course aims to; Achieve an understanding on food – protein harvest strategies, enumerating world human population; Practice of culture-methods to cultivate and harvest aquatic organisms for consumption by human and domestic-organisms; Hybridizing marketable characters of aquatic-animals for consummator and commercial prospectus; Technically formatting culture techniques to reach culture goals successfully and to Contribute to national and international low priced protein per capita consumption.
Intended Learning Outcome	Upon the completion of this course , the student should be able to; • differentiate the aquatic organism used for animal protein culture • interpret the basic needs of cultivable aquatic organisms . • -construct culture – of cultivable organisms– based on their favorable features. • design production systems with best harvest .
Course content	Principles of aquaculture, methods and practices, Cultivable types; fin fish, shell fish, seacucumber, turtles, crocodiles and some algae. Culture types based on species, stocking densities, feed and water. Integrated aquaculture. Fish nutrition, diseases, induced breeding and seed fish production. Propagation – natural, semi-natural, artificial; Spawning and Hormonal induction; Incubation; Hatchery and Nursery
Teaching and learning methods	Lecture presentation , tutorial discussion, field based studies, laboratory based experiments, take-home assignments
Evaluation Methods	Theory: In-Course Assessments (30%) End of Course Examination (70%) Practical: In-Course Assessments (30%) End of Course Examination (70%) **Marks obtained in theory component (MT) and practical component (MP) will be computed into Overall Marks as (6MT+4MP)/10**
References	• Aquaculture. Blackwell Publ. Company, Oxford, U.K. ISBN: 0-632-05515-4. • Chakraborthy, Chiranjib, P. Sadhu, 2001. Biology, Hatching and Culture technology og Tiger Prawn and Giant Freshwater Prawn. Daya Publishing House, Delhi, India. ISBN: 81-7035-231-2.
Incharge	Mr. W.Venkatesh Lucksman and Mrs.Piratheepa Sivakumar

Course title	**Marine Biology**
Course code	**ZOL 405 MC3**
Credit value	03 - (30 hours L and 54 P+F) 60% Theory + 40 % Practical and/ or Field
Prerequisites	None
Objectives	this course aims to define fundamental concepts in marine biology;explain faunal adaptations based on different zones of marine environment; analyze the physical, chemical and biological factors of the ocean and to investigate the human impact on marine environment.
Intended Learning Outcome	Upon the completion of this course , the student should be able to; • Identify and classify the zones in natural marine oceanic environments. • Execute techniques to characterize properties of water in various zones. • Qualitatively analyze adaptations of Marine organisms.
Course content	Types of Marine ecosystem: Sea and Ocean, Lagoon and Estuary, Sand dunes, Salt Marshes, mangrove, Rocky shore, Sandy shore, muddy shore, coral reefs, sea grass bed, Distribution of organisms with respect to life zones and their adaptations, Diversity and Life histories of Marine plankton, nekton, neuston, benthos, invertebrates, vertebrates, Biological sampling, biotic and abiotic factors of Marine environment, Marine productivity, primary production, factors, regulating marine production, food chain, food web and energetic events. Human impacts on marine environment
Teaching and learning methods	Lecture presentations, Tutorial discussions, Assignments [library, take home]; Field studies and Reports,
Evaluation Methods	Theory: In-Course Assessments (30%)End of Course Examination (70%) Practical: In-Course Assessments (30%)End of Course Examination (70%) **marks obtained in theory component (MT) and practical component (MP) will be computed into Overall Marks as (6MT+4MP)/10**
References	• Barnes, Richard Stephen Kent, and Hughes, N. Roger, 1989. An Introduction to Marine Ecology. Third Edition. Blackwell Publishing, Blackwell Science Ltd, U.K.ISBN-13: 978-0-86542-834-8. • National Research Council (NRC). 2003. Ocean Noise and Marine Mammals. Washington, DC: National Academy Press. 192 pp ISBN: 0-309-08536-5.
In-charge	Mr. W.Venkatesh Lucksman and Mrs. Pratheepa. Sivakumar

Course title	**Seminar and Essay**
Course code	**ZOL 406 MC2**
Credit value	02
Prerequisites	None
Objectives	this course unit aims to demonstrate scientific, oral and written communication competency
Intended Learning Outcome	Upon the completion of this course , the student should be able to; • review scientific articles and deliver an oral presentation • author written reports on selected topics • construct scientific essays
Course content	Students will carry out a literature survey using print and electronic scientific journals and periodicals on assigned topics and present the information as an oral presentation and an essay. Different topics to be assigned to different students by the academic staff in charge for the course unit. Students will sit a written examination for those topics they presented during the course unit
Teaching and learning methods	Literature survey using print and electronic journals, discussions, oral presentation
Evaluation Methods	**In-Course Assessments (30%)** • oral Presentation (20%) • written reports(10%) **End of Course Examination (70%)**
References	Print and electronic journals, Scientific Books and Periodicals
In- charge	Mrs. N. Rajan

Course title	**Research project**
Course code	**ZOL 407 MC6**
Credit value	06 (270 Contact hours- laboratory and /or field wok)
Objectives	The aim of the course is to impart concepts and training to undertake a research study with respect to develop a research proposal, setting up experiments, data collection and analysis, and presentation of findings.
Intended Learning Outcome	Upon the completion of this course , the student should be able to; • Articulate a clear research question or problem and formulate hypothesis • Conduct a literature survey, using print & electronic media • Prepare a project proposal giving objectives, research design/ methodology • Collect and analyse the data related to the methodology • Know and apply problem solving skills • Construct the project report and present the findings
Course content	A guided research project is an integral component of the degree programme; Student must identify a research topic/problem in consultation with a Senior Lecturer/supervisor at the beginning of the level 4M. The duration of the project is 2 semesters in parallel to the 4M academic year. On completion of the research work a report, in a specified format, must be submitted within the stipulated period for evaluation. The student is required to deliver three presentations, (a) pre-project presentation, based on preparatory work and research plan (b) progress presentation and (c) end of the project presentation, based on the outcome of research and prepare a comprehensive report containing Title page, Abstract, Introduction and Literature Review, Objectives, Materials & Methods, Results, Discussion and References.
Teaching and learning methods	Library and laboratory work, field visits, software and internet resource application, consultation with supervisor, presentation (oral and poster)
Evaluation Methods	**In-Course Assessments (30%)** Pre-project presentation (10%) Mid-project Presentation (20%) **End of Course Examination (70%)** Final Presentation- oral and poster (10%) Project report (60%)
References	• Myers JL and Well AD. (2003)Research design and statistical analysis. Lawrence Erlbaum Associates. . • Cargil, M. and P O'Connor. (2009) Writing scientific research articles – strategy and steps.
Resource person	Prof. S. N. Surendran

Course title	**ZOL 408 ME2: Coastal and Mangrove Conservation and Management**
Course code	**ZOL 408 ME2**
Credit value	2 (22 hours L & 23 hours F)
Objectives	This course aims to provide necessary knowledge on Sustainable coastal and Mangrove ecosystem management.
Intended Learning Outcome	Upon the completion of this course , the student should be able to; • distinguish and explain the coastal environment – importance and threat • formulate action plans for coastal zone management with special attention to Sri Lanka. • design sustainable conservation measures to protect coastal , coral and mangrove ecosystems.
Course content	Problems faced by the Coastal zone and mangroves of Sri Lanka- special reference to Northern Province: natural hazards and manmade causes. Coastal pollution, degradation of mangroves & coral reefs, coastal erosion, sand mining, coastal livelihood practices. Coastal zone management: Initiatives in Sri Lanka, Coastal Conservation Act, Integrated coastal zone management plan, Coastal pollution management Conservation and sustainable utilization of coastal, coral and mangrove ecosystems in Sri Lanka – policy ; action plan; implementation
Teaching and learning methods	Lecture presentation , tutorial discussion, field and laboratory based studies, take-home assignments
Evaluation Methods	Theory: In-Course Assessments (30%) End of Course Examination (70%)
References	• Hanum. F; Mohamad. A.L; Hakeem. K.R; Ozturk. M (2013) **Mangrove Ecosystems of Asia** Springer Science+Business Media, LLC, ISBN: 978-1-4614-8581-0 • Giesen,W., Wulffraat,S. , Zieren, M. and Scholten. L., (2007)**Mangrove Guide book** ISBN: 974-7946-85-8 FAO and Wetlands International, Printed by: Dharmasarn Co., Ltd. • Saenger, P. (2002**) Mangrove Ecology, Silviculture and Conservation** Kluwer academic publications London ISBN – 1-40200686-1
Resource persons	Ms. Nithiyagowry R (Coastal) Dr. Mrs. R. Gnaneswaran (Mangrove)

Course title	**Herpetology**
Course code	**ZOL 409 ME2**
Credit value	2 (22 hours Ls & 23 hours F)
objectives	This course aims to provide basic and essential knowledge on the survival of amphibians and non-avian reptiles and their conservation management.
Intended Learning Outcome	Upon the completion of this course , the student should be able to; • describe the diversity and evolution of amphibians and non-avian reptiles • distinguish the structural and functional variations of herpetofauna as a distinct group • develop plans to alleviate threats
Course content	Biogeography, origin and early evolutionary history, Systematics, diversity and endemicity of herpetofauna in Sri Lanka, reproduction and life histories of herpetofauna. Foraging and feeding interaction with predators, communication, adaptive radiation, field techniques for monitoring, conservation of herpetofauna.
Teaching and learning methods	Lecture presentation , tutorial discussion, field and laboratory based studies, take-home assignments
Evaluation Methods	Theory: In-Course Assessments (30%) End of Course Examination (70%)
References	Vitt.LJ., and Caldwell.JP., 2014. Herpetology, Fourth Edition: **An Introductory Biology of Amphibians and Reptiles.** 4th Edition. Academic press of Elsevier, USA. Lillywhite.HB., 2014**. How Snakes Work: Structure, Function and Behavior of the World's Snakes** 1st Edition. Oxford University Press, New York.
Resource person	Dr. Mrs. A. Sivaruban

Course title	**Ornithology and Mammology**
Course code	**ZOL 410 ME2**
Credit value	2 (22 hours L & 23 hours F)
Objectives	This course aims to; provide essential knowledge on the biology, conservation and management of Birds and Mammals with special reference to Sri Lanka.
Intended Learning Outcome	Upon the completion of this course , the student should be able to; • Recall the diversity and evolution of birds and mammals • Distinguish the structural and functional variations among birds and mammals • Analyse conservation and management strategies
Course content	Biogeography, origin and early evolutionary history, Diversity of birds andmammals of Sri Lanka, Avian and mammalian structure and physiology, adaptations for flight, migration and navigation, communication, Nesting /territorial biology, reproductive biology :mating system and parental care, Conservation of birds and mammals with particular emphasis to endemic species, large mammals and migratory birds.
Teaching and learning methods	Lecture presentation , tutorial discussion, field based studies, laboratory based observation and learning, take-home assignments
Evaluation Methods	In-Course Assessments (30%) End of Course Examination (70%)
References	• Lovette,J., and Fitzpatrick, JW., (Eds.), (2016). . **Handbook of Bird Biology (Cornell Lab of Ornithology) 3rd Edition** • Ackerman, J.,(2016). **The Genius of Bird**s. Penguin Press, New York. • Lederer, R.,(2016). **Beaks, Bones and Bird Songs: How the Struggle for Survival Has Shaped Birds and Their Behavior**. Timber Press, Portland Oregon • Kotagama.S and Sampth, A. G (2013) Pictorial pocket guide to the Mammals of Sri Lanka. FOGSL, University of Colombo Sri Lanka. ISBN 9789558576342 • Yapa, A.and Ratnasooriya G (2013) The Mammals of Sri Lanka . FOGSL, University of Colombo Sri Lanka. ISBN 9789558576328.
Resource persons	Mr. W.Venkatesh Luckshman (Mammology), Dr. Mrs.A.Sivaruban, (Ornithology)

Course title	**Advanced Animal Physiology**
Course code	**ZOL 411 ME2**
Credit value	2 (22 hours L & 23 hours P)
objectives	
Intended Learning Outcome	Upon the completion of this course , the student should be able to; • Explain physiological functions and their molecular mechanisms in animals • Describe and identify known physiological diseases in humans
Course content	Basic cellular and molecular processes such as intracellular trafficking of proteins and lipids, ion transport, signal transduction, regulation of gene expression, cell growth control, cytoskeletal dynamics, and cell migration. diseases of the digestive system , cancer, osteoporosis, wound healing, pulmonary and cardiovascular diseases, spinal cord regeneration, and cellular mechanisms of aging, with emphasis on genetic diseases such as cystic fibrosis, polycystic kidney disease; lysosomal storage diseases; Common diseases having a genetic basis such as hypertension, diabetes mellitus, obesity, breast cancer and Alzheimer's disease
Teaching and learning methods	Lecture presentation , tutorial discussion, field based studies, laboratory based experiments, take-home assignments
Evaluation Methods	Theory: In-Course Assessments (30%) End of Course Examination (70%) Practical: In-Course Assessments (30%) End of Course Examination (70%) **Marks obtained in theory component (MT) and practical component (MP) will be computed into Overall Marks as (6MT+4MP)/10**
References	
Resource person	Dr. T. Eswaramohan

Course title	**Advanced Evolutionary Biology and Molecular Systematics**
Course code	**ZOL 412 ME2**
Credit value	2 (22 hours Lectures & 23 hours P)
objectives	This course aims to: Outline and explain the concepts in evolutionary biology; evolutionary process, mechanisms and types;
Intended Learning Outcome	Upon the completion of this course , the student should be able to; • Construct ideas about the process of evolution • Interpret the theories in detail and discriminate them • Distinguish bio molecules as tools for taxonomy • Investigate different techniques and models to evaluate the evolution of different groups of organisms
Course content	Mechanism of most accepted and plausible evolutionary theories. Processes other than natural selection . Developing phylogenetic trees using morphological and molecular data-parsimony, maximum likelihood, neighbour joining and Bayesian approaches. Recent advances in molecular taxonomy and its use in biological systems.
Teaching and learning methods	Lecture presentation , tutorial discussion, field based studies, laboratory based experiments, take-home assignments, problem based student presentations
Evaluation Methods	Theory: In-Course Assessments (30%) End of Course Examination (70%) Practical: In-Course Assessments (30%) End of Course Examination (70%) **Marks obtained in theory component (MT) and practical component (MP) will be computed into Overall Marks as (6MT+4MP)/10**
References	• Gajapathy,K. (2015).Beginners Guide to Sandfly Taxonomy. Lambert Academy press, Germany. • Darwin's Ghost (2000); the origin of species updated. Steve Jones. Ballantine Publishing Group. New York.. • Gajapathy et al. (2016) Use of Bioinformatics in Revealing the Identity of Nature's Products with Minimum Genetic Variation: The Sibling Species. In (edited by Sumiko Anno): Gene environment Interaction Analysis; methods in Bio Informatics and Computational Biology. Pan Stanford press. Singapore.
Resource person	Dr. K. Gajapathy

Course title	**Research Methodology and Data Analysis**
Course code	**ZOL 413 ME2**
Credit value	2 (30 hours)
Any prerequisite	None
Objectives	The course aims to provide fundamental concepts of research design, data collection, statistical and interpretative analysis, focus on the ability to use research in Zoology.
Intended Learning Outcome	Upon the completion of this course , the student should be able to; • Explain principles of Zoological research problems • Describe different research methods and designs in Zoological studies • Sketch accurate data collection methodology • Analyse, interpret and construct zoological data • Assemble and present data and results
Course content	Research in Zoology - Purpose, types and characteristics; Process of research -identifying research questions/problems, formulation of objectives, postulating and testing hypothesis, Research plan and its components (survey, observation, case study, experimental, historical and comparative methods) - Components of an Experiment, Randomization and Design, Multiple Comparisons, Checking Assumptions, Power and Sample Size, Factorial Treatment Structure, Nesting, Completely Randomized Designs, Complete Block Designs, Incomplete Block Designs, Split-Plot Designs, Latin Squares. Survey design and analysis: Random sampling, stratified sampling, questionnaire construction, data base management; Mean separation, Regression and correlation, ANOVA, Multivariate analysis, Covariance analysis, Analysis of counts and log linear models, Analysis of binary data, Probit analysis and bootstrap methods, Animal diversity indices and distribution analysis; Use of statistical computer software to analyze data from animal research. Ethical, legal and social issues in biological research.
Teaching and learning methods	Lecture presentation , tutorial discussion, take-home assignments, problem based learning
Evaluation Methods	Theory: In-Course Assessments (30%) End of Course Examination (70%)
References	• Quinn, G.P. and Michael J.K. (2011)***Experimental Design and data analysis for biologists***, Cambridge University Press I • Gerald Van Belle ,L. D. Fisher ,P. J. Heagerty ,T. Lumley (2004) ***Biostatistics: a methodology for the Health Sciences***– 2nd ed. Wiley - ISBN 0-471-03185-2
Resource person	*Invited experts*

Course title	**Scientific Writing and Presentation**
Course code	**ZOL 414 ME2**
Credit value	02 (30 hours of lectures)
Objectives	This course aims to; elucidate the writing process and teach the fundamentals of effective scientific writing and presentation
Intended Learning Outcome	Upon the completion of this course , the student should be able to; • Identify types of scientific literature and their characteristics • Weigh the format and content of a scientific publication- Research Proposal, Report and Research Paper • Author scientific publication -Research Proposal, Report and Research Paper written in scientifically efficient language • Construct scientific oral and poster presentation
Course content	This course is designed to train, impart skills and provide guidelines for writing a research proposal, research report, scientific publication and a thesis. The course will also train them in effective presentation of research and other professional materials. Topics covered in this course include: searching the scientific literature; scientific writing style; writing graduate level papers, proposals, projects, and thesis components; preparing scientific presentations. Ethics in research and scientific writing.
Teaching and learning methods	Lecture presentation , tutorial discussion, problem based studies, take-home and library assignments and student presentations
Evaluation Methods	In-Course Assessments (30%) End of Course Examination (70%)
References	• Matthews, JR., and Matthews, RW., (2007) ***Successful Scientific Writing A step-by-step guide for the biological and medical sciences***, 3rd Ed. CAMBRIDGE UNIVERSITY PRESS ISBN-13 978-0-511-35560-8 • Day. RA. and Barbara Gastel. (2006) **How to Write and Publish a Scientific Paper**. 6th Edn ISBN: 0-313-33040-9 • John B. And Martin. J., (2011) ***A Scientific Approach to Scientific Writing*** Springer New York ISBN 978-1-4419-9787-6
Resource person	Professor S. N. Surendran