

CURRICULUM REVISION FOR LEVEL- 3G and 3M

PRINCIPAL SUBJECT: ZOOLOGY

(Effective from the Academic Year 2019/2020)

The last major curriculum revision for Zoology was done in 2014 under the Quality Innovation Grant of the Higher Education for Twenty First Century Project of the Ministry of Higher Education, Biological Science won the award in 2012 (HETC/QIG/W2/JFN Biological Sciences) for three major activities. Revising the curriculum was one of the major activities of the Biological Science study programme.

The Department of Zoology has been revising its curriculum since March 2013 under the Biological Science study programme with the guidance of subject experts. The whole set of revised curriculum for level 1G, 2G, 3G, 3M, 4M and 4X was submitted to the Faculty Board and approved at the 144th meeting held on 31st January 2014 (SFB/144/06(c)) and at the 160th meeting held on 13.06.2017 (SFB/160/06). The Senate has also approved the curriculum of Level 1G, 2G, 3G, 3M and 4M and recommended on its 389th meeting (S/389/10/d) held on 24.06.2014 and 426th meeting held on 18.09.2017 respectively.

With the introduction of the new structure of the Bachelor's Degree programmes in the Faculty of Science, the Department of Zoology has obtained the Senate approval already for the both 1G and 2G syllabi for the Bachelor Degree programmes for the Biological Sciences.

Now I submit the 3G and 3M courses for the approval of the Faculty Curriculum committee of the Faculty of Science.

The staff members of the Department of Zoology namely Professor S.N.Surendran, Dr. Mrs. R. Gnaneswaran, Dr. T. Eswaramohan, Dr. Mrs. A.Sivaruban, Mr. W. Venkatesh Luckshman, Dr. K.Gajapathy, Mrs. P. Sivakumar, Dr. T.W.Shanthakumar, Ms.S.Kokila and Mr.S.Arthiyan were involved in the revising the new curriculum.

Dr. T.Eswaramohan
Head/ Department of Zoology
Faculty of Science.
23.12.2019

CURRICULUM REVISION
PRINCIPAL SUBJECT – ZOOLOGY

General Description

Theory: Class room lectures, tutorials, group discussion, Presentation, assignments and Field session

In-course assessment(s): (30%)

Tutorials based written examination / library assignment /take home assignments / presentation/ oral examination/ Quiz/ poster presentation /online submission.

End of course examination: (70%)

Two hours duration.

Practical: Laboratory sessions, field sessions, group discussion and assignment

In-course assessment(s): (30%)

Spot examination/ skill evaluation/ field reports/ oral or poster presentation/ assignment/ practical records/ viva-voce examination.

End of course examination: (70%)

Two hours duration

The respective marks obtained in theory component (MT) and practical component (MP) will be computed into Overall Marks as $(3MT+2MP)/5$.

Obtaining minimum of Grade D⁺ in both practical and theory components is a requisite to qualify a pass in the Overall Marks computed in respective course.

3G courses

Course Code Title	Lectures +Practical + Field visit	Credit Value	Resource persons
ZOL 301G2: Entomology and Pest biology	20 L+24(P+1F)	2	Prof.Mrs.RGnaneswaran and Ms.Nithiyagowry Ratnasabapathy
ZOL 302G2: Molecular Biology and Genetics	20 L+24(P)	2	Dr.K.Gajapathy and Dr.Mrs.Thulasitha William Shanthakumar
ZOL 303G2: Environmental Zoology	20 L+24(P)	2	Mrs.Pratheepa Sivakumar
ZOL 304G2: Developmental Biology	20 L+24(P+1F)	2	Dr.T.Eswaramohan
ZOL 305 G2:: Parasitology and Vector Biology	20 L+24(P+1F)	2	Prof.S.N.Surendran and Dr.K.Gajapathy
ZOL 306 G2: Economic Zoology	20 L+24(P+2F)	2	Mr.W.Venkatesh Luckshamn, Prof.Mrs.RGnaneswaran and Ms.Nithiyagowry Ratnasabapathy
		12 credits	

Title of the Course Unit	Entomology and Pest biology			
Course Code	ZOL 301G2			
Credit Value	2			
Hourly Breakdown	Theory	Practical and field visits		Independent Learning
	20	24	-	56
Objectives	<ul style="list-style-type: none"> • Introduce the values of insects to human and environment • Develop skills in collection and preservation of insects for scientific study • Introduce major insect pests and vectors of crops • Describe biology and ecology of pests of selected crops • Explain integrated pest management practices 			
Intended Learning Outcomes	<ul style="list-style-type: none"> • Identify insects of various orders and their ecosystem services • Develop insect collection and curation skills • Identify major insects pests of crops • Explain the biology and ecology of selected insect pests and vectors • Analyze management strategies for different pest problems 			
Contents	<ul style="list-style-type: none"> • Introduction to insects and the study of insects. Values of insects to the ecosystem - beneficial and harmful: pollinators/forensic insects/ pests and vectors. External morphology of insects. Internal structure and function of insects. • Field collection and curation of insects. Insect classification – Characteristic features of major insect orders in apterygota, Exopterygota and Endopterygota. Identification of insects using taxonomic keys. • Life histories and biology of major insect pests : Household pests on Timber/ books/ food materials and similar material. Crop pests: agriculture/ plantation crop/ forest pests Stored product pests: grain/flour/herbarium/ museum. Life histories and biology of major plant parasitic vectors. Different pest management practices- components of integrated pest management. 			

Teaching learning Methods/Activities	<p>Theory: In-person lectures, oral and poster presentation, small group discussion, library assignment</p> <p>Practical: Hands on training, learning in laboratory and field, oral presentation - individual / group assignments</p>
Evaluation Strategy	<p>Theory: In-course assessment(s): (30%) End of course examination: (70%)</p> <p>Practical: In-course assessment(s): (30%) End of course examination: (70%)</p>
Recommended References	<ul style="list-style-type: none"> • Richards, O. W., and R. G. Davies. Imms' General Textbook of Entomology, Volume I: Structure, Physiology and Development. London, Chapman and Hall, 1997. • Imms, Augustus Daniel, Owain Westmacott Richards, and Richard Gareth Davies, eds. Imms' General Textbook of Entomology: Volume 2: Classification and Biology. Springer Science & Business Media, 2012. • Gillot, C. Entomology. Springer, The Netherlands, 2005

Title of the Course Unit	Molecular Biology and Genetics		
Course Code	ZOL 302G2		
Credit Value	2		
Hourly Breakdown	Theory	Practical and field visits	Independent Learning
	20	24	56
Objectives	<ul style="list-style-type: none"> • Introduce the molecular principles of animal inheritance • Develop the skills for molecular biology laboratory • Provide knowledge on the understandings of the structure and function of genes 		
Intended Learning Outcomes	<ul style="list-style-type: none"> • Discuss principles of genetics and molecular biology. • Review the principles of genetics • Analyze the basic and advanced molecular biology concepts and techniques • Gain an appreciation and knowledge of how to deal with ethical issues relating to molecular biology experiments • Develop laboratory skills related to molecular biology and genetics 		
Contents	<p>Genetics: Basic genetics principles. Sex determination and sex linkage; Recent advances in animal genetics; Genetics of animal breeding; Gene mutation; Population genetics; Oncogenes and cancer at molecular understanding; Genetics of cell and developmental biology.</p> <p>Molecular Biology: The concept of prokaryotic and eukaryotic cells; Genomes, Structure and organization of eukaryotic chromosomes, Gene and its functions, Non-coding DNA, DNA organization; Structure of the nucleic acids DNA and RNA: the nucleotide structure and characteristics of DNA helix; DNA replication in prokaryotes and eukaryotes; Organelle DNAs; Introduction to gene expression; Molecular biology lab techniques.</p>		
Teaching learning Methods/Activities	<p>Theory: In-person lectures; group presentation; library assignments; group discussion</p> <p>Practical: Hands on training, learning in laboratory, oral</p>		

	presentation - individual / group assignments
Evaluation Strategy	<p>Theory: In-course assessment(s): (30%) End of course examination: (70%)</p> <p>Practical: In-course assessment(s): (30%) End of course examination: (70%)</p>
Recommended References	<ul style="list-style-type: none"> • Brown, Terence A. Genomes. 2nd edition. Wiley-Liss, 2002. • Alberts, Bruce, et al. Molecular Biology of the Cell. 4th edition. Garland Science, 2002. • Carson, Susan. Molecular Biology Techniques. Elsevier, UK. 2012. • Frankham, R., Ballou, J.D. and Briscoe, D.A.. A primer of Conservation Genetics. Cambridge University Press, UK. 2004 • Gjedrem, T. Selection and breeding programs in aquaculture. Spriner, Netherlands. 2005. • Krebs, J.E., Goldstein, E.S. and Kilpatrick, S.T. Lewin's Genes XI. Jones and Bartlett Publishers.2014 • Lodish, H., Arnold, B., Paul, M. Kaiser, C. A., Krieger, C., Scott, M. P., Zipursky, L. and Darnell, J.. Molecular Cell Biology. Fifth Edition. W. H. Freeman, USA. 2003 • Robert Shlief.. Genetics and Molecular Biology. Second edition. Johnm Hopkins University Press, USA.1993

Title of the Course Unit	Environmental Zoology		
Course Code	ZOL 303G2		
Credit Value	2		
Hourly Breakdown	Theory	Practical and field visits	Independent Learning
	20	24	56
Objectives	<ul style="list-style-type: none"> • Impart knowledge on the environmental resources and their assessment • Introduce the concept of biodiversity, its importance, and current impacts on biodiversity • Develop the understanding on various sources of pollutants and the prevention practices 		
Intended Learning Outcomes	<ul style="list-style-type: none"> • Describe the concept of biodiversity and its importance • Explain biodiversity hotspots • Comment on endemic, endangered, and threatened species with special reference to Sri Lanka • Analyze the current threats to biodiversity and conservation measures • Assess the causes and effects and solutions of pollution • Analyze the mitigation measures for different kinds of pollution • Study treatment technology and management aspects of solid and water 		
Contents	<p>Environmental resources, global climatic changes, risk assessment, Environmental threats – global, national and local.</p> <p>Biodiversity and its present decline; Biodiversity in the past; Biodiversity hotspots; Indigenous and exotic species; Endemic, Endangered and Threatened species; IUCN Red List of threatened species; Viability of populations and species extinction; Sri Lankan biodiversity; Establishment and management of reserves and protected areas; in-situ and ex-situ conservation</p> <p>Environmental Parameters related to pollution, basic concepts of environmental monitoring and environmental standards.</p> <p>Solid waste management and wastewater treatment and</p>		

	<p>management.</p> <p>Sampling, and Measurement and determination of selected pollution indicators such as DO, COD, BOD, TOC, etc. Biological indicators and biomarkers.</p> <p>Environmental Impact Assessment; Environmental policies and regulations,</p>
Teaching learning Methods/Activities	<p>Theory: In-person lectures , tutorial discussion</p> <p>Practical: Hands on training, learning in laboratory, oral presentation-individual / group assignments</p>
Evaluation Strategy	<p>Theory:</p> <p>Theory:</p> <p>In-course assessment(s): (30%)</p> <p>End of course examination: (70%)</p> <p>Practical:</p> <p>In-course assessment(s): (30%)</p> <p>End of course examination: (70%)</p>
Recommended References	<ul style="list-style-type: none"> • Mayer, JR. Connections in Environmental Science: A case study Approach, McGraw- Hill, 2001 • Eldredge, N. Life in the Balance: Humanity and the Biodiversity Crisis. Princeton Univ. Press, 1998 • Hodgson, E. A text book of modern toxicology, 3rd Edition, John Wiley & Sons Inc., 2008 • Woolley, A.. A guide to practical toxicology: evaluation Prediction and risk. Informa Healthcare USA, 2008

Title of the Course Unit	ZOL 304G2: Developmental Biology		
Course Code	ZOL 304G2		
Credit Value	2		
Hourly Breakdown	Theory	Practical and filed visits	Independent Learning
	20	24	52
Objective/s	<ul style="list-style-type: none"> • Introduce developmental process in animal embryology. • Characterize the major life-stages and the concepts of embryological development. • Compare the developmental patterns in various developmental groups. • Impart knowledge on the current techniques applied in developmental biology 		
Intended Learning Outcomes	<ul style="list-style-type: none"> • Recall the developmental physiology of animals • Describe the embryonic development in different animals • Analyze the experimental models and experiments in animal developmental biology • Appraise recent advances in animal developmental biology studies. 		
Contents	Introduction to animal development, fertilization; cleavage; gastrulation; differentiation, cellular basis for competence, organogenesis and morphogenesis. Gene control in development. Application of embryological methodology- in-vitro fertilization (IVF), embryo transfer, transgenic animals.		
Teaching learning Methods/Activities	Theory: In-person lectures Practical: Hands on training, learning in laboratory, oral presentation - individual / group assignments, Field visit		
Evaluation Strategy	Theory: In-course assessment(s): (30%) End of course examination: (70%) Practical: In-course assessment(s): (30%) End of course examination: (70%)		
References	<ul style="list-style-type: none"> • Wolpert, Lewis, Cheryll Tickle, and Alfonso Martinez Arias. Principles of development. Oxford University Press, USA, 2015. • Gilbert, Scott F. Developmental Biology. Sunderland, MA. 2000 		

Title of the Course Unit	Parasitology and Vector Biology		
Course Code	ZOL 305G2		
Credit Value	2		
Hourly Breakdown	Theory	Practical and field visits	Independent Learning
	20	24	56
Objectives	<ul style="list-style-type: none"> • Introduce the importance of learning parasitology. • Identify the major parasites and insect vectors associated with human and animals, • Analyze the life cycle of major parasites and disease vectors, • Plan the control measures of the parasitic diseases 		
Intended Learning Outcomes	<ul style="list-style-type: none"> • Demonstrate the parasite's biology • Differentiate different parasite species and the interactions they have with host and environment • Compare the biology of different vector species • Analyze the control measures to control the parasitic diseases • Formulate appropriate control measures to control the parasitic diseases 		
Contents	<p>Infections, taxonomy, morphology, geographical distribution of selected parasites, biology of selected parasite groups.</p> <p>Concepts in parasitism; Morphology, interactions, life cycles, transmission, pathology and control.</p> <p>Parasitic forms in protozoa, flatworms, nematodes and arthropods, others vertebrates, etc.; Sri Lanka parasites of commercial importance - fish parasites – habitat types, host types, the nature and prevalence, pathology and control. medically important parasites of Human and their distribution, diagnostic tools and epidemiology;</p> <p>Biology of vectors of human diseases in relation to life cycle and disease transmission; vector population dynamics, vector behavior and vectorial capacity; vector surveillance; vector control and challengers - insecticide resistance and resistance mechanisms, insect transformation and transgenic insects.</p> <p>Medical importance of vector biology</p>		

Teaching learning Methods/Activities	Theory: In-person lectures Practical: Hands on training, learning in laboratory, oral presentation - individual / group assignments
Evaluation Strategy	Theory: In-course assessment(s): (30%) End of course examination: (70%) Practical: In-course assessment(s): (30%) End of course examination: (70%)
Recommended References	<ul style="list-style-type: none"> • K Gajapathy. Beginners Guide to Sandfly Taxonomy. Lambert Academy press, Germany. Chapters 2 and 3 – Morphometry and Molecular Taxonomy. 2015 • Ramasamy, Ranjan, et al. "Adaptation of mosquito vectors to salinity and its impact on mosquito-borne disease transmission in the South and Southeast Asian tropics." Socio-ecological dimensions of infectious diseases in Southeast Asia. Springer, Singapore, 2015. 107-122. • Surendran, Sinnathamby N., et al. "Karyotypic assignment of Sri Lankan Anopheles culicifacies species B and E does not correlate with cytochrome oxidase subunit I and microsatellite genotypes." Parasites & vectors 8.1 (2015): 327. • Ramasamy, Ranjan, and Sinnathamby Noble Surendran. Global environment changes and salinity adaptation in mosquito vectors. LAP LAMBERT Academic Publishing, 2013. • S.N. Surendran: Anopheline species complexes in Sri Lanka: A bio-ecological perspective. (pp 216-226) In: Entomology –Ecology & Biodiversity (eds: BK Tyagi & Vijay Veer). Scientific Publishers (India), ISBN978-81-7233-727-8, 2011, 522 pp • Hendrix, Charles M., and E. D. Robinson. Diagnostic Parasitology for Veterinary Technicians-E-Book. Elsevier Health Sciences, 2016.

Title of the Course Unit	Economic Zoology		
Course Code	ZOL 306G2		
Credit Value	2		
Hourly Breakdown	Theory	Practical and field visits	Independent Learning
	20	18	56
Objective/s	<ul style="list-style-type: none"> • Introduce economically important organisms • Provide details of the setup, harvesting, marketing methods and their sustainability • Define-terminology used in mass production of Insects • Describe different management strategies during mass production and their advantages and limitations 		
Intended Learning Outcomes	<ul style="list-style-type: none"> • Interpret the value of aquatic animals • Interpret the value of insects economically and ecologically. • Explain the strategy for mass production of insects for various purposes • Describe the effective utilization of organic waste through vermiculture • Explain the vermiculture and vermiproducs for sustatinable organic farming 		
Contents	<p>Mass Culture of animals for economic benefits. Methods of cultures, cultivable species, and their products and limitations.</p> <p>Aquatic animals-water based species, stock, harvest, market and export for ornamental and food purposes.</p> <p>Insects- silk worm, honey bee, lac insects, pollinators, parasitoids, predators and edible insects.</p> <p>Worms- Earthworm species for vermiculture, method of vermiculture, vermiproducs- vermicompost, vermiwash and vermi tea, production of vermiproducs and its role in sustainable organic farming and management of solid organic waste nematodes.</p>		
Teaching learning Methods/Activities	<p>Theory: In-person lectures</p> <p>Practical: Hands on training, learning in laboratory, oral presentation - individual / group assignments</p>		

Evaluation Strategy	<p>Theory: In-course assessment(s): (30%) End of course examination: (70%)</p> <p>Practical: In-course assessment(s): (30%) End of course examination: (70%)</p>
Recommended References	<ul style="list-style-type: none"> • Morales-Ramos, Juan A., M. Guadalupe Rojas, and David I. Shapiro-Ilan, eds. Mass production of beneficial organisms: invertebrates and entomopathogens. Academic Press, 2013. • Chakravarthy, Akshay Kumar, and Shakunthala Sridhara, eds. Economic and Ecological Significance of Arthropods in Diversified Ecosystems: Sustaining Regulatory Mechanisms. Springer, 2016.