PROGRAMME MANUAL

BACHELOR OF SCIENCE HONOURS
IN

APPLIED BIOLOGY

DEPARTMENT OF BIOLOGICAL SCIENCES

FACULTY OF APPLIED SCIENCES

SOUTH EASTERN UNIVERSITY OF SRI LANKA

2018

Course Developer: Mr. EMJM Rizvi, Snr. Lecturer Gr I in Botany

Subject matter contributors:

Mr. EMJM Rizvi, Snr. Lecturer Gr I in Botany

Mr. AN Ahmed, Snr. Lecturer Gr. I in Agric.

Ms. V. Santhanam, Snr. Lecturer Gr. I in Zoology (Retd.)

Dr. MIS Safeena, Snr. Lecturer Gr. I in Botany

Dr. V. Sujarajini Lect. (Prob.) in Zoology

CONTENTS

BACHELOR OF SCIENCE HONOURS IN APPLIED BIOLOGY

1. INTRODUCTION

Biology is a rapidly developing subject resulting in the development of new sub-disciplines and sub-disciplines turning into major disciplines. Applied Biology is making use of basic biological knowledge for the purpose of fulfilling human needs.

The global and local economy is fast changing into a knowledge-based economy. Economic and social development involves biological applications. Consequences of development in turn affect the environment, ecology and finally life. Bio-products (bio-fuel, bio-fertilizer etc.), bio-remediation, eco-friendly approaches etc. have become terms of common man indicating the importance of the subject. Thus, the demand both locally and globally would be high for personnel with advanced knowledge in the subject. In this regard the Department of Biology will offer a four year degree named 'B.Sc. in Applied Biology (Special)' from the academic year 2009/2010. Due to the breadth of the subject it is not possible to cover all different applied biological discipline in a four year degree programme. Thus the proposed Degree Programme comprises selected areas of Applied Biology which have a greater demand i.e. agricultural technology, applied microbiology, natural resource management and environmental applications.

This course with value addition by the other features of our academic programme will provide an excellent ground for the graduates to be competent and excel in production or service based careers or further studies in a relevant biological discipline leading to academic or research careers.

2. AIM AND OBJECTIVES

2.1. Aim

To produce graduates with enhanced employable potential in areas of applied biology which have a greater demand regionally, nationally and globally.

2.2. Objectives

On completion of the course of study the graduates who will be equipped with a sound background on the principles and particular areas of applied biology are expected to be competent:

- in knowledge and skills in basic and the particular areas of applied biology.
- to engage in further studies in a relevant biological discipline leading to academic or research careers.
- to excel in production or service based careers.
- in other generic skills, thus adaptable to even a non-discipline based career.

2.3. GRADUATE PROFILE OF THE B.Sc. (HONOURS) STUDY PROGRAMME

1. Competent/specialized in a subject with an advanced knowledge and understanding of the core aspects of the subject.
2. Capability to critically analyze and innovatively solve problems.
3. Apply relevant experimental methods and modern technologies in research.
4. Be an effective oral and written communicator in the subject.
5. Perform successfully as an individual and as a team member or a team leader in multi-cultural and multi-disciplinary settings.
6. Demonstrate ability to apply academically gained knowledge, skills and commitment in pursuing group work in a wider context.
7. Use information technology (IT) for applications and to search, evaluate, utilize, share and create content.
8. Be a social and environment friendly professional, entrepreneur/manager.
9. Possess a strong intellectual integrity, ethical values, commitment and self-evaluation in completing responsibilities.
10. Be more attentive to the community, national and global needs and demands.
11. Be aware of own culture and values and appreciate and tolerate other cultures.
12. Be equipped to pursue higher studies, compete in national and global arena, and to engage in independent and life-long learning to achieve personal and career goals.

3. COURSE IDENTITY

Name of the Degree : **Bachelor of Science (Special) Degree in Applied Biology**
Department of Study : Dept. of Biological Science
Duration of the course : 8 semesters (4 academic years)
Medium of instruction : English

4. COURSE REQUIREMENTS

As per the UGC requirement, a student has to complete successfully a total of 120 credits in four academic years of which a minimum of 72 credits should be from the subject of specialization. Out of the minimum of 72 credits, 56 credits must be at level 3 and 4. Students have the option of selecting course units to the value of a maximum 33 per level as indicated in table 1.

Table 1: Summary of credit requirements for the Bachelor of Science Honours in Applied Biology

Level	Number of credits						
	Biology (General)	**Applied Biology**	**Other main subjects (X)**	**Compulsory Courses[1]**	**Elective Courses[2]**	**Auxiliary Courses[3]**	**Total (except auxiliary courses)**
1	08	-	18	02	01-03	02	**29-31**
2	09	-	18	-	03-04	03	**30-31**
3	09	18	-	-	04-05	01	**31-32**
4		24 06 (Research project)	-	-	-	-	**30**
Total	**26**	**48**	**36**	**02**	**08-12**	**06**	**120-124**

1. Supplementary courses **students must offer and successfully complete** to be eligible for the degree. The grades obtained will be included for the calculation of Grade Point Average (GPA).
2. Supplementary courses **students can select from among the available (with the consent of the Deaprtment) and successfully complete** to be eligible for the degree. The grades obtained will be included for the calculation of GPA.
3. Supplementary courses **students must offer** and successfully complete to be eligible for the degree. The grades obtained will **not** be included for the calculation of GPA.

Note: Some of the electives offered by the other departments too may be considered as comparable to main biology course units and thus would be considered to make up the minimum number of credit requirement (72 credits) of subject of specialization. Students should consult the Department of Biology in selecting electives.

5. ELIGIBILITY REQUIREMENTS TO FOLLOW THE HONOURS DEGREE IN APPLIED BIOLOGY

At the end of level 2, students who have offered Biology as a main subject in levels 1 and 2, are eligible to opt for the Honours programme in Applied Biology provided that they have met the following minimum requirements:

a. obtained a GPA of at least **2.50** from all credits**.**
b. obtained a GPA of at least **2.70** for all course units of biology.

The number of students admitted to the honours degree programme will be limited and decided by the department of biology depending on the resources available. In case there are

more applicants than can be admitted, only the most eligible candidates will be selected based on the order of rank of their GPA and the performance in an interview.

6. REVERT OR WITHDRAWAL FROM THE HONOURS PROGRAMME

If a student wants to revert to the general degree programme, he/she should do so before the commencement of Level IV. On the other hand, if the department of biology finds that a student is unable to reach the expected standards, he/she will be requested to revert to a general degree programme.

Such a student would be eligible for the General Degree if he/she has obtained the minimum requirements to be eligible for the General Degree as stipulated in the respective 'undergraduate student guide'. In such cases the special course units followed will be considered to fulfill the credit requirement for the General Degree.

7. CALCULATION GRADE POINT AVERAGE (GPA)

GPA is the credit weighted arithmetic mean of all Grade Points obtained by a student for the course units he/she completed excluding auxiliary courses. This will be calculated for the second decimal place according to the following formula:

$$GPA = \sum G_i N_i / \sum N_i$$

where, G_i is the grade point of the i^{th} course unit, N_i is the number of credits belonging to the i^{th} course unit.

In case, a student has successfully completed more credits than the minimum credit requirements (120) the grade points obtained for the main courses and the best grade points among the elective courses followed by him/her will be considered for GPA calculation.

8. AWARD OF BACHELOR OF SCIENCE HONOURS IN APPLIED BIOLOGY

To be eligible for the B. Sc. (Special) degree in Applied Biology, a student should have completed a total of **120 credits**, excluding Enhancement /Auxiliary course units and of this a minimum of 72 credits must be in Applied Biology and Biology. Moreover, a student should have obtained:

(a) Obtained a minimum GPA of **2.00**,

(b) Obtained no **E** grades in any course units within the minimum of total credit requirement of subject of specialization,

(c) Obtained no E grades in enhancement/auxiliary courses,

(d) Completed the degree programme within **Six** academic years except for a valid medical reason acceptable to the faculty board and the senate.

8.1.AWARD OF CLASS:

In addition to the above requirements, award of class will be decided by the board of examiners using the following criteria as guideline.

First Class:

a. Obtained a minimum GPA of **3.70,**
b. Completed the relevant requirements within a period of **four** consecutive academic years except for a valid medical reason acceptable to the faculty board and the senate.

Second Class (Upper Division):

a. Obtained a minimum GPA of **3.30,**
b. Completed the relevant requirements within a period of **four** consecutive academic years except for a valid medical reason acceptable to the faculty board and the senate.

Second Class (Lower Division):

a. Obtained a minimum GPA of **3.00,**
b. Completed the relevant requirements within a period of **four** consecutive academic years except for a valid medical reason acceptable to the faculty board and the senate.

9. SUMMARY OF COURSE UNITS

Table 2: Biology course units offered for the general degree programme

Biology				
Course Code	**Course Title**	**Credit Value***	**No. of Hours**	
			Lect. & Tute.	**Lab./Field Work**
BLM 11012	Principles of Biology	2 (2)	22	24
BLM 11022	Biological Chemistry	2 (2)	23	21
BLM 12032	Fundamentals of Ecology	2 (2)	23	21
BLM 12042	Fundamentals of Microbiology	2 (2)	22	24
BLM 21012	Form and Functions of organisms	2 (1)	22	24
BLM 21021	Ecosystems of Sri Lanka: Ecology, Conservation and Management	1 (1)	13	06
BLM 21031	Field Ecology	1 (1)	10	15
BLM 22043	Molecular Genetics and Biotechnology	3 (3)	33	24
BLM 22052	Animal Behaviour	2	22	21
BLM 31013	Horticulture	3 (3)	38	21
BLM 31022	Applied Entomology	2	22	24
BLM 32032	Aquaculture	2	22	24
BLM 32042	Applied Parasitology	2	23	21
	Total Credits	**26 (17)**		

***** Numbers in brackets indicate the credit weight of botany-related credits.

Table 3: Course units (of level 3 and 4) offered for the Honours degree programme in Applied Biology

Level	Semester	Code	Title	Credit value	Notional hours			Teaching learning methods *
					Lecture	Lab/field	self	
III or IV	I or II	BLS 00011	Animal Breeding	01	11	12	27	1,2,5,7
		BLS 00021	Animal Husbandry	01	11	12	27	1,2,5,7
		BLS 00032	Advanced parasitology and vector biology	02	22	16	62	1,2,3,4,6,11
		BLS 00042	Apiculture	02	22	16	62	1,2,3,5,6
		BLS 00053	Economic Marine Biology	03	33	36	81	1,2,5,6,7,11
		BLS 00063	Marine Bio-resources and Management	03	33	36	81	1,2,5,6,7,11
		BLS 00072	Natural Resource Management	02	30	-	70	1,2,6,7,11
		BTS 00073	Plant Pathology	03	30	45	75	1,2,4,6,8,10,11
		BTS 00092	Enzymology	02	22	16	62	1,2,4,6,7
		BTS 00102	Bioinformatics	02	22	16	62	1,2,3,4,6
		BTS 00112	Analytical Techniques	02	22	24	54	1,4,6,9
		BTS 00122	Post-Harvest Technology of Fruits, Vegetables and Grains	02	20	20	60	1,2,4,5,6,7,11
		BTS 00132	Plant Tissue Culture	02	25	15	60	1,2,4,7,8,9,11
		BTS 00142	Plant Breeding	02	22	16	62	1,2,3,4,5,6
		BTS 00152	Environmental Microbiology	02	22	16	62	1,2,3,4,5,6,9
		BTS 00162	Industrial and Food Microbiology	02	22	16	62	1,2,3,4,5,6,9
		BTS 00172	Restoration Ecology	02	22	24	54	1,2,3,4,5,6,7,9
		BTS 00192	Aquatic Ecology	02	22	24	54	1,2,3,4,5,6,7,9
		BTS 00202	Biodiversity Conservation and Management	02	22	24	54	1,2,3,4,5,6,7,9,10
		BTS 00212	Science Research Methodology	02	30	-	70	1,2,3,6,7,8,9,11
		BTS 00272	Experimental Designs and Analysis	02	22	16	62	1,2,3,4,6,8,11
		BLS 00261	Seminar – Applied Biology	01	-	-	50	6,8,10,11
		BLS 00522	Industrial Training – Applied Biology	02	-	-	200	5,6,9,10,11
		BLS 00536	Research Project - Applied Biology	06	-	-	800	6,9,10,11
Total number of credits				**52**				
Minimum number of credits required				**46**				

*** Teaching learning methods: 1** – Lecture, **2** - Tutorial discussion, **3** - Group discussion, **4** - laboratory exercise, **5** - Field visit/work, **6** - Individual Assignment/Project, **7** - Group Assignment/Project, **8** - Case study, **9** - Report writing, **10** – Presentation, **11** - Problem based learning.

10. DETAILED SYLLABI

BLS 00011: Animal Breeding

Course Code Course Title Credits Compulsory/optional	BLS 00011 Animal Breeding 1 Credit Compulsory
Aims	1. To impart knowledge on reproductive systems, genetic basis of breeding and scientific principles of conventional and molecular breeding techniques on increased yields, disease resistance, hardiness and appearance of livestock.
Work load (notional hrs.)	11 hrs lectures, 12 hrs laboratory and 27 hrs self-work
Learning outcomes	On successful completion of the course the students will be able to: 1. Recognize the genetic and environmental interactions on production traits. 2. Demonstrate the understanding of scientific principles of inbreeding and cross breeding on the production traits of livestock. 3. Identify conventional and modern breeding techniques in the enhancement of livestock.
Course Content	Traits of economic importance of dairy and beef cattle. Measurements, correlation among production traits; genetics and environmental interaction; selection and response to selection; genetic defects; inbreeding; cross breeding; use of reproductive technologies in breeding, molecular breeding, QTL mapping, marker assisted selection.
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended texts:

1. Quantitative Genetics with Special Reference to Plant and Animal Breeding (1996) Ralph E. Comstock, Wiley-Blackwell; 1st edition.
2. Breeding plants and animals (2009) W. M. Willet Martins., Cornell University Library.

BLS 00021: Animal Husbandry

Course Code Course Title Credits Compulsory/optional	BLS 00021 Animal Husbandry 1 Credit Compulsory
Aims	1. To impart knowledge on scientific principles in animal physiology, behavior and bioethics. 2. To develop skills in breeding, data handling and veterinary analytical techniques. 3. To provide exposure to applied aspects of animal business, animal industry and animal husbandry with insight into conservation and integrated health management.
Work load (notional hrs.)	11 hrs lectures, 12 hrs laboratory and 27 hrs self-work
Learning outcomes	On successful completion of the course the students will be able to: 1. Recognize basic concepts in animal nutrition, animal physiology, behavior and bioethics. 2. Identify the aspects of animal business practice, animal industry and land-based business management. 3. Recognize the concepts in animal health and welfare, integrated health management and epidemiology of diseases.

	4. Demonstrate understanding of the practical skills in the areas of breeding, data handling and basic laboratory and veterinary analytical techniques.
Course Content	Introduction, Exotic and domestic animals, basic concepts in animal nutrition, animal psychology, applied animal health and welfare, applied aspects of animal business practice, animal industry and trade, behavior ecology, breeding, conservation and management. integrated health management; bioethics; epidemiology of disease; data handling; Animal adaptation land-based business management; applied animal husbandry, Basic laboratory and veterinary analytical techniques.
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended texts:

1. A text book of Animal husbandary (1991) GC. Banerjee, Oxford and IbH.
2. Textbook of Animal Husbandry (2012) MK. Rai, Oxford Book Company.
3. Textbook of Animal Husbandry & Livestock Extension (3rd Revised & Enlarged) (2012) P. Mathialagan, Int. Book Distributing Co.

BLS 00032: ADVANCED PARASITOLOGY AND VECTOR BIOLOGY

Course Code Course Title Credits Compulsory/optional	BLS 00032 ADVANCED PARASITOLOGY AND VECTOR BIOLOGY 2 Credits Optional
Aims	1. To give students a sound insight into the biology of parasites and their control. 2. To provide a solid foundation on the major vector groups, their behavior, transmission potential, and the application of modern techniques in their control.
Work load (notional hrs.)	22 hrs lectures, 16 hrs laboratory and 62 hrs self-work
Learning outcome	On successful completion of the course the students will be able to demonstrate knowledge of/skills in: 1. cellular and humoral mechanisms involved in immunity, the immunology of the protozoan and helminth infections. T 2. molecular basis of the life cycle of parasites, drug targets, and mechanisms of resistance. 3. vectors and diseases carried by them, lifecycles of medically important insects and arthropods, their behavior and transmission potential and behavioral pattern of blood feeding vectors. 4. molecular approaches of identification, taxonomy and application of modern techniques of vector control.
Course Content	ADVANCED PARASITOLOGY: Introduction, Mammalian immune system, Cellular and humoral mechanisms involved in immunity, Regulation of the immune response, In depth studies into the immunology of selected helminthes and protozoan infections, Molecular biology of Plasmodium – lifecycle, drug targets and mechanisms of resistance, vaccine strategies and proteomic approaches, Molecular

	biology of Leishmania – virulence and drug resistance, Molecular biology of nematodes – lifecycles, chemotherapy, vaccine strategies; VECTOR BIOLOGY: Introduction, major vector groups in Medical Entomology (arthropods; insects), their behavior and transmission potential and the application of modern control techniques, Introduction to Culicidae and Anopheline Mosquitoes, Mosquito Reproduction, Molecular Insect Control, Blood Feeding in Vectors, Species Complex, New Approaches to Identification , Host Finding behavior, Molecular approaches to diagnosis and taxonomy & identification of vectors.
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended texts:

1. Modern Parasitology: A Textbook of Parasitology 2nd Edn. (1993) FEG CoxWiley-Blackwell.
2. Parasitism: The Diversity and Ecology of Animal Parasites (2001) AO. Bush et al., Cambridge University Press.
3. Parasitology and Vector Biology, Second Edition (1999) WH. Marquardt et al., Academic Press.
4. Biology of Disease Vectors, Second Edition (Marquardt, Biology of Disease Vectors) (2004) Ed. WH. Marquardt, Academic Press
5. Vector Biology, Ecology and Control (2009) Ed. PW. Atkinson.

BLS 00042: APICULTURE

Course Code Course Title Credits Compulsory/optional	BLS 00042 APICULTURE 2 Credits Optional
Aims	To provide a broad overview of bee biology and behaviour, management for honey production, products of the hive, pests and enemies.
Work load (notional hrs.)	22 hrs lectures, 16 hrs laboratory and 62 hrs self-work
Learning outcome	On successful completion of the course the students will be able to demonstrate knowledge of/skills in: 1. History of bee keeping in South Asian Countries including Sri Lanka. 2. Kinds of bees and characteristic features of their society. 3. Handling the bees. 4. Queen rearing and requeening. 5. Advance bee keeping techniques.
Course Content	History of bee keeping and importance, kinds of bees and their society, anatomy and ife cycle of bee; Environment of bee keeping, artificial feeding, swarm and its controls; Increasing bee colonies, bee diseases; Handling bees: queen rearing and requeening, bee migration; Extraction of honey: processing, storing and packaging honey, advanced bee keeping techniques; modern trend in apiculture and problems of bee keeping in Sri Lanka.
Assessment criteria	

Continuous assessment	30%
End-semester examination	70%

Recommended texts:

1. Bee keeping in India (1994) G. K . Ghosh, Published by s. G. Nangia.
2. The bee-master's companion, and assistant Bonner, James 1 edition - first published in 1789
3. Keeping bees (1983), Franklin H.
4. Bees & bee-keeping (1886) Frank Richard Cheshire (ebook).
5. Tips and Tricks in Beekeeping (1999) Franklin H.

BLS 00053: ECONOMIC MARINE BIOLOGY

Course Code Course Title Credits Compulsory/optional	BLS 00053 ECONOMIC MARINE BIOLOGY 3 Credits Optional
Aims	To provide a solid foundation on exploitation and management of marine living resources for economical gains
Work load (notional hrs.)	33 hrs lectures, 36 hrs laboratory and 81 hrs self-work
Learning outcome	On successful completion of the course the students will be able to demonstrate knowledge of/skills in: 1. proper management of exploitation of living resources to ensure continuous supply to meet increasing demands.
Course Content	AQUACULTURE & CONSERVATION: Aquaculture of marine organisms, Principles of Marine Eco Physiology, Marine Biodiversity Conservation practices, Principles of sustainable development & Fisheries management; VALUE ADDITION TO SEA FOOD: Preserving fish as food or specimens, Methods of food analysis, Sea Food & Human Nutrition, Biologically active fish products, Sea Food safety, regulations & quality control; MARINE ORNAMENTAL FISH AND OTHER ORGANISMS AND ITS TRADE: Aquarium & Ornamental organisms, Rearing of marine aquarium fish, Aquarium fish trade.
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended texts:

1. Aquaculture 2nd Edn. Ed. John Lucas* and Paul C Southgate (School of Biological Sciences, James Cook University, Australia).
2. Seafood Processing: Adding Value Through Quick Freezing, Retortable Packaging and Cook-Chilling (Food Science and Technology) (2005) Ed. Vazhiyil Venugopal, Blackwell CRC Press.
3. Marine Ornamental Species: Collection, Culture and Conservation (2008) JC. Cato and CL. Brown, John Wiley & Sons.
4. From Ocean to Aquarium: The Global Trade in Marine Ornamental Species (2003) C. Wabnitz et al., UNEP/Earthprint

BLS 00063: MARINE BIORESOURCES AND MANAGEMENT

Course Code Course Title Credits Compulsory/optional	BLS 00063 MARINE BIORESOURCES AND MANAGEMENT 3 Credits Optional
Aims	To provide insight into the principles of marine ecology, production, fisheries industry and contemporary issues.
Work load (notional hrs.)	33 hrs lectures, 36 hrs laboratory and 81 hrs self-work
Learning outcome	On successful completion of the course the students will be able to demonstrate knowledge of/skills in: 1. biology of and factors determining the distribution & abundance of marine food organisms. 2. interactions between marine communities and the flow of energy and materials through them. 3. the effects of human induced changes in climate and ecosystems on marine organisms. 4. the history of development of ocean technology (techniques used to locate, survey and assess marine bio resources) and its use in fisheries and management of marine environment.
Course Content	MARINE ECOSYSTEMS: Distribution & abundance of marine food organisms, Food Chains, Mineral recycling, Primary and secondary production, Population dynamics of fish species, Ocean circulation, Global Environmental Change & Marine Eco Systems; MARINE PRODUCTION: Food & feeding mechanisms of fishes, Metabolism & Biochemistry, Predators and competitors, Parasitic relationships & diseases, Growth & abundance, Reproduction, development, life cycle & life span; MARINE RESOURCE MANAGEMENT: Introduction to ocean technology, Fishing Technology, Marine Pollution & Bioremediation, Coastal resource management. MARINE FISHERIES: Introduction: Efficient allocation- Biological dimension, Static efficient sustainable yield, dynamic efficient sustainable yield:
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended texts:

1. Dynamics of marine Ecosystems-biological &physical interactions in the oceans (1991) KH.Mann and JRN. Lazier, Blackwell
2. Marine Production Mechanisms (2009) MJ. Dunbar, Cambridge University Press
3. Ecosystem-Based Management for the Oceans (2009) Island Press

BLS 00072: NATURAL RESOURCE MANAGEMENT

Course Code Course Title Credits Compulsory/optional	BLS 00072 NATURAL RESOURCE MANAGEMENT 2 Credits Optional
Aims	to provide students a broad view on basics and approaches on effective sustainable management of natural resources.
Work load (notional hrs.)	30 hrs. of lectures and 70 hours of self work

Learning outcome	On successful completion of the course the students will be able to demonstrate knowledge of/skills in: 1. how basic economic theory can be used to understand and analyze natural resource utilization. 2. the relationship between human activity and the world's natural resources 3. analyze and understand "real world" natural resource issues, with a Sri Lankan perspective.
Course Content	INTRODUCTION: Classification of resources- Renewable, non-renewable; ALLOCATION OF DEPLETABLE AND RENEWABLE RESOURCES: Introduction: Resource taxonomy; DEPLETABLE, NON RECYCLABLE ENERGY RESOURCES: OIL, GAS, COAL: Optimal extraction, Oil: The Cartel problem, Natural gas: Price controls; RECYCLABLE RESOURCES: MINERALS: Optimal extraction: REPLENISHABLE BUT DEPLETABLE RESOURCES: WATER: Introduction, The efficient allocation of scarce water- surface water, ground water; REPRODUCIBLE PRIVATE — PROPERTY RESOURCES: AGRICULTURE: Introduction, Global scarcity; STORABLE RENEWABLE RESOURCES: FORESTS: Introduction: Efficient management: Special attributes of timber resource, The biological dimension, The Economics of forest harvesting; RENEWABLE COMMON PROPERTY RESOURCES: PROPERTY RIGHTS, EXTERNALITIES AND ENVIRONMENTAL PROBLEMS: Property rights and efficient market allocations- Producer surplus, Scarcity rent, Externalities as a source of market failure- Concept introduced, Types of externalities, Public goods.
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended texts:

6. Environmental and Natural Resource Economics (2008) T. Titenberg, Pearson Education, USA.
7. Natural Resource and Environmental Economics (1999) T. prato. Wiley-Blackwell, UK.
8. Natural Resource Economic Notes and Problems (1987) JM Cornard and CW Clark, Cambridge Univ. Press.
9. Conservation of Biological Resources (1998) EJ. Milner- Galland and R Maie, Willey-Blackwell.

BTS 00073 - PLANT PATHOLOGY

Course Code Course Title Credits Compulsory/optional Prerequisites	BTS 00073 Plant Pathology 3 Credits Compulsory BTS 00052
Aims	To equip students with knowledge and skills to develop and implement disease management strategies for crop plants.
Work load (notional hrs.)	30 hrs lectures, 45 hrs laboratory and 75 hrs self work
Learning outcome	On successful completion of the course the students will be able to: 1. Learn living, non-living and other causes of disease or disorder in plants (Etiology)

	2. Understand mechanism of disease development i.e. processes of infection and colonization of the host by the pathogen. (Pathogenesis) 3. Comprehend the interaction between the causal agent and the diseased plants in relation to environmental conditions. (Epidemiology) 4. Develop management systems of the diseases and reduce losses caused by them. (Control/ Management)
Course Content	Review of major groups of plant pathogens; Disease development in plants: Plant resistance to infection; Introduction to disease triangle; Principles of crop loss assessment; Principles and strategies for designing disease management operations; Methods that reduce efficiency of inoculum; Disease transmission and vectors; Biological control strategies; Cultural control methods; Green house cultural control strategies; Field crops control strategies; Introduction to molecular plant pathology.
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended Texts:

1. Agrios, G.N. (1997). Plant Pathology. 7th Edition. Academic Press, New York.
2. Pandey B.P. (1994) A Textbook of plant. Pathology: pathogen and plant disease.
3. D. Gareth Jones, (1987). Plant pathology: principles and practice Open University Press
4. Pathak, V.N; Khatri, N.K; Pathak, Manish. (2003). Fundamentals of plant pathology, Agrobios, Jodhpur.

BTS 00092 - ENZYMOLOGY

Course Code Course Title Credits Compulsory/optional	BTS 00092 Enzymology 2 Credits Compulsory
Aims	To deliver fundamental knowledge on classification, structure, mechanism, and related application of enzymes. Basic concepts of enzymology including designing artificial enyzmes will be introduced to students.
Work load (notional hrs.)	22 hrs lectures, 16 hrs laboratory and 62 hrs self work
Learning outcome	On successful completion of the course the students will be able to: 1. Classify enzymes from their E.C. numbers and structures 2. Comprehend structural enzyme-substrate relationship and binding equilibria 3. Interpret inhibition and activation mechanisms of enzymes 4. Learn components of artificial enzymes, requirements for their design 5. Discuss the application of enzymes in different fields.
Course Content	Background on Enzymology; Chemical bonds/reactions and classification of enzymes; Structural components of enzymes; Enzyme-substrate equilibria; Effect of temperature pH etc. on enzyme activity, Kinetics of enzyme-substrate reactions; Chemical mechanisms in enzyme catalysis; Experimental measures of enzyme activity; Inhibitors: Reversible, tightly bound, time dependent; Enzyme reactions with multiple substrates; applications of enzymes, modeling enzymes and artificial enzyme synthesis.
Assessment criteria	

Continuous assessment	30%
End-semester examination	70%

Recommended texts:

1. John R. Whitaker (1994) Principles of enzymology for the food sciences, CRC press.
2. Bisswanger, Hans (2012) Practical enzymology Wiley-VCH Verlag GmbH & Co. KGaA.
3. Devasena,T. (2010) Enzymology, Oxford University press, India.

BTS 00102 – BIOINFORMATICS

Course Code Course Title Credits Compulsory/optional	BTS 00102 Bioinformatics 2 Credits Compulsory
Aims	To give students the knowledge of and the competence in use of bioinformatical methods central to conduction of molecular biological research projects.
Work load (notional hrs.)	22 hrs lectures, 16 hrs laboratory and 62 hrs self work
Learning outcome	On successful completion of the course the students will be able to: 1. Explain which type of data is available from the most common protein sequence and structure databases (uniprot, genebank, Protein Data Bank, CATH). 2. Explain the theories underlying the most common methods for sequence searches and sequence alignments, and in particular explains the principle and main steps for pairwise and multiple sequence alignments; 3. Explain and is able to apply the main steps of dynamic programing for/to simple alignments of short sequences; 4. List methods to uncover structure-function relationship in proteins and explains their underlying principles; 5. Explain the principles of computational methods for the prediction of secondary structure elements from protein sequence, prediction and modeling of three-dimensional protein structures (homology modeling, threading and ab initio methods). 6. Select and apply the most appropriate bioinformatics sequence or structure database to retrieve or search data given a specific question in molecular biology; 7. Select and apply the most appropriate method for aligning sequences, visualizing and analyzing protein structures, predicting secondary structure elements and modeling protein structures from sequence.
Course Content	Introduction: Definitions, need, development, potentials and applications, Genomics, Proteomics, pattern recognition and prediction, sequence-structure deficit; molecular biological information resources: Nucleic acid and protein sequence databases, specialized databases, links and integrated databases; Protein information resources: Secondary databases, composite protein sequence and pattern databases, protein structure databases; Bioinformatics resource providers and their functions: European Molecular Biology Network (EMBnet) and National Center for Biotechnology Information (NCBI), submission of DNA sequences to the data bases, their accuracy and use of databases; DNA information resources: DNA sequence analysis, cDNA and Expressed Sequence Tags (ESTs), Analysis and interpretation of ESTs, sequence editing, assembling, sequence alignment and data matrices, similarity searches on sequence databases using the data mining tool BLAST, analyses of sequence-structure-function-phylogenetic relationship of Query sequences, making evolutionary trees;

	Bioinformatics in pharmaceutical industry: Human genome project and medically relevant genes, identification of therapeutic and vaccine targets, structure-based drug design and drug discovery. Regulation of bioinformatics exchanges on endemic species.
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended texts:

1. Mount, David W. (2001) Bioinformatics: sequence and genome analysis 2nd Edn., Cold Spring Harbor Laboratory Press;.
2. Krane, Dan E; Raymer, Michael L. (2003) Fundamental concepts of Bioinformatics, San Francisco : Benjamin Cummings.
3. Lesk, Arthur M. (2006) Introduction to bioinformatics, Oxford University Press, Inc. New York, NY, USA
4. Kumar, Santosh. (2017) Crop breeding: bioinformatics and preparing for climate change 1st Edn. Apple Academic Press.

BTS 00112: ANALYTICAL TECHNIQUES

Course Code Course Title Credits Compulsory/ Optional	**BTS 00112** Analytical techniques 2 Credits Compulsory
Aims	1. To develop knowledge in different types of plant and soil analytical techniques 2. To make students familiarize with different apparatus used in plant analysis 3. To develop knowledge in identifying the features advantages and disadvantages of different methods
Work load (notional hrs.)	22 hrs lectures, 24 hrs laboratory and 54 hrs self work
Learning outcome	On successful completion of the course the students will be able to: 1. Identify suitable analytical methods for a particular purpose 2. Use different techniques/apparatus to carryout experiments 3. Distinguish between advanced analytical techniques and their usage
Course content	Laboratory organization and safety; soil and plant sampling and processing, physical and chemical analysis, major equipments used, their operation and maintenance; Use of radioisotopes in biological research, Principles and techniques of Chromatography, Spectrophotometry and Electrophoresis, Laboratory exercises based on above topics.
Continuous assessment End semester examination	30% 70%

Recommended texts:

1. Wilson, K. and Walker, J. M. (Eds.) (1994). Principles and techniques of practical biochemistry (4th edition). Cambridge University Press, UK.
2. Margaret E. Farago (Eds.) (2008) Plants and the Chemical Elements: Biochemistry, Uptake, Tolerance and Toxicity, https://www.wiley.com/enus/
3. Kurt Hostettmann et al., (Eds.) (2014) Handbook of Chemical and Biological Plant Analytical Methods, https://www.wiley.com/enus/

BTS 00122 – POST-HARVEST TECHNOLOGY OF FRUITS, VEGETABLES AND GRAINS

Course Code Course Title Credits Compulsory/optional	BTS 00122 Post – Harvest Technology of Fruits, Vegetables and Grains 2 Credits Compulsory
Aims	To provide adequate knowledge and skills on post-harvest handling, processing and preservation of fruits, vegetables and grains.
Work load (notional hrs.)	20 hrs lectures, 20 hrs laboratory and 60 hrs self work
Learning outcome	On successful completion of the course the students will be able to: 1. Explain the causes of post harvest food losses and the prevention measures. 2. Carryout post harvest food loss assessment. 3. Explain the pre-harvest factors affecting the post harvest life and quality aspects. 4. Carryout fresh produce handling appropriately: maturity determination, harvesting, grading, packaging, treatment and storage. 5. Survey the storage practices in the area and recommend for better storage techniques. 6. Explains various methods of food processing and preservation. 7. Carry out processing and preservation of vegetables and fruits.
Course Content	Introduction to Postharvest Technology; Post harvest losses of agricultural products; Biological/physiological and environmental factors affecting shelf life; Environmental factors influencing Deterioration; Post harvest technology procedures; Supplements to temp. & humidity management; Maturation and Maturity Indices; Harvesting systems; Preparation for fresh market; Preparation for packing; Storage systems; Post harvest pests & diseases of selected commodities; Food processing background; Food preservation principles and processes of fruit, vegetable and grain/cereal products; Food packaging. Laboratory exercises and field/industrial visits based on above.
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended texts:

1. Narayanasamy, P. (2006) Postharvest pathogens and disease management 1st Edn., Wiley-Interscience.
2. Kader, Adel A. (2002) Postharvest technology of horticultural crops, University of California Agriculture and Natural Resources.
3. Thompson, A.K. (2015) Fruit and vegetables; vol.1 : harvesting, handling and storage Wiley-Blackwell.,
4. Chakraverty, Amalendu; Singh, R. Paul. (2014) Postharvest technology and food process engineering, CRC press.

BTS 00132 - PLANT TISSUE CULTURE

Course Code Course Title Credits Compulsory/optional	BTS 00132 Plant Tissue Culture 2 Credits Compulsory

Aims	To provide knowledge and skills on techniques in plant tissue culture, in vitro conservation, protoplast culture and micropropagation.
Work load (notional hrs.)	25 hrs lectures, 15 hrs laboratory and 60 hrs self work
Learning outcome	On successful completion of the course the students will be able to: 1. Explain the concepts of plant tissue culture and transformation. 2. Demonstrate the basic and advanced tissue culture techniques. 3. Establish, maintain and subculture many types of plant tissue cultures (axenic shoot cultures, callus cultures, embryogenic callus cultures, cell suspension cultures), micro propagate their plants and most of all master aseptic technique to produce microbe/microorganisms-free cultures. 4. Demonstrate how to initiate and perform plant tissue culture research with a crop of choice.
Course Content	Introduction: Definition and technology; Plant cell & tissue culture techniques: A brief description, role of plant hormones, aseptic techniques, potential applications of organ culture, meristem culture, anther/pollen culture, callus & suspension cultures and protoplast culture; Plant propagation; Regeneration through meristem and callus cultures; Somatic embryogenesis: production, preservation and use of somatic embryos as propagules; Artificial seeds and automation of somatic embryo production: Principles, technology of automation and the application; Embryo culture; Haploid plant production; Cryopreservation: Storage of germ plasm; Protoplast culture; Somatic hybridization; Induction & utilization of somatic variants; Secondary metabolite production through cell cultures: Principles and the technology, pharmaceuticals, pigments, other natural products and beverage production; Commercialization of tissue culture technology: Concept of commercialization and the need, design of typical tissue culture laboratory and its management.
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended texts:

1. M.K. Razdan. (1993) An Introduction to plant tissue culture, Intercept.
2. S. Narayanaswamy. (1994) Plant cell and tissue culture, Tata McGraw-Hill Education.
3. Giano, Robert N and Gray, Dennis J. (1999) Plant tissue culture concepts and laboratory exercises 2nd Edn., CRC Press.
4. Pareek, L.K. and Swarnkar, P.L. (2001).Trends in plant tissue culture and biotechnology, Agro Botanical Publishers
5. Smith, H.Roberta. (2012) Plant tissue culture: Techniques and experiments, Academic Press.

BTS 00142 - PLANT BREEDING

Course Code Course Title Credits Compulsory/optional	BTS 00142 Plant Breeding 2 Credits Compulsory
Aims	To provide an understanding of genetic manipulation of sexually and asexually propagated crops with an emphasis on sustainable agricultural production.
Work load (notional hrs.)	22 hrs lectures, 16 hrs laboratory and 62 hrs self work
Learning outcome	On successful completion of the course the students will be able to: 1. Formulate breeding strategies that would lead to an increase in productivity and profitability in agriculture and horticulture. 2. Discuss the use of plant breeding in developing sustainable agricultural

	production systems that satisfy the increasing demand for food, fibre and plant based industrial products.
Course Content	Features of flowering plants and their products; variation and selection; origins of agriculture; Crop plants and their wild relatives, centres of origin and diversification of crop plants. Mating systems in crop plants; continuous versus discontinuous variation traits; heritability of economically important traits, genetics of self and cross-pollinated crops; breeding methods with self and cross-pollinated crops; design of field experiments; genetics of disease and insect pest resistance in crop plants; induced mutations and chromosome manipulation in crop improvement; genetic diversity in crops and gene banks; seed production industry; crop improvement through genetic engineering; general breeding problems associated with regional crops. Laboratory/field exercises based on above.
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended texts:

1. Gupta.S.K. (2008) Plant breeding: Theory and techniques, Agriobios, Jodhpur.
2. Acquaah, George. (2012) Principles of plant genetics and breeding (2nd edn.), John Wiley & Sons.
3. Sai Prasad, S.V. et. Al., (2016) Agri-facts: plant breeding: model papers, short notes, long answer, New Vishal Publication
4. Gupta, S.K. (2010) Practical plant breeding. Agribios, India.
5. Kumar Santosh. (2017) Crop breeding: bioinformatics and preparing for climate change, Apple Academic Press.

BTS 00152 - ENVIRONMENTAL MICROBIOLOGY

Course Code Course Title Credits Compulsory/optional	BTS 00152 Environmental Microbiology 2 Credits Compulsory
Aims	1. To provide an overview of physiology and ecology of microbes in natural environments and their impact on human life 2. To provide insight into exploiting microbial activities to manage environmental health
Work load (notional hrs.)	22 hrs lectures, 16 hrs laboratory and 62 hrs self work
Learning outcome	On successful completion of the course the students will be able to: 1. Describe/discuss microbial structures/functions and factors affecting microbial activities. 2. Relate/apply microbial ecological principles to solve environmental problems. 3. Describe/discuss/compare different microbial techniques used in pollution treatment.
Course Content	Microbial physiology: Microbial cell structure and function, microbial metabolism, effect of environmental conditions on growth, microbial environments, microbial ecology: interactions, Liebig's law of the minimum and Shelford's law of tolerance, microbial strategies under stress. Waste treatment: Solid waste: composition, problems, treatment techniques, microbiology and methods of composting. Liquid wastes:

	types of pollutants, sewage treatment process, fixed film systems, suspended cell systems, activated sludge process, modifications to remove N and P, aerobic and anaerobic digestion of sludge; tertiary treatment. Microbes and xenobiotics: recalcitrants, persistence and biomagnification, biodegradation. Bioremediation: environmental modification, inoculation, enzyme technology, soil bioremediation techniques, bioremediation of air pollutants. Novel methods of pollution control and microbes in mineral recovery. Toxigenic microorganisms (cyanobacteria and dinoflagellates), their occurrence in water bodies of Sri Lanka and strategies to minimize their proliferation. Laboratory exercises and field visits based on above.
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended texts:

1. RM Atlas and R Bartha (2000) Microbial ecology: Fundametals and applications, 4th Edn. Addison Wesley Longman, Inc.
2. I.L Pepper and CP Gerba. (2015) Environmental microbiology, Academic Press, USA.
3. S McEldowny, DJ. Hardman, S. Waite (1993) Pollution: Ecology and Biotreatment, Longman Scientific and Technical.
4. FB. Metting. Jr., Ed. (1993) Soil Microbial Ecology: Applications in Agricultural and Environmental Management, Marcel Decker, Inc.
5. GM Masters (1991) Introduction to environmental engineering and science Prentice –Hall International, Inc.
6. S.A. Kulasooriya (2016) Toxigenic freshwater cyanobateria of Sri Lanka, Cey Jour. Sci.

BTS 00162 - INDUSTRIAL AND FOOD MICROBIOLOGY

Course Code Course Title Credits Compulsory/optional	BTS 00162 Industrial and Food Microbiology 2 Credits Compulsory
Aims	1. To provide an overview of biological basis and processes of fermentation technology used in obtaining microbial products in commercial scale. 2. To develop an in-depth knowledge of the microbiology of food, food-borne diseases, food spoilage and preservation
Work load (notional hrs.)	22 hrs lectures, 16 hrs laboratory and 62 hrs self work
Learning outcome	On successful completion of the course the students will be able to: 1. Describe/discuss main steps and processes used in microbial products industry 2. Discuss microbiological principles behind different stages in fermentation industry 3. Explain microbial interactions in food, their significance and factors influencing their growth and survival. 4. Discuss the microbiology of different types of food commodities 5. Demonstrate skills of microbiological analysis of food.
Course Content	Industrial microbiology: introduction and history, significance of microbes, categories of microbial products, industrially important microbes, growth & nutrition, growth kinetics, microbial metabolism & fermentation; Upstream Processing: strain suitability and techniques of selection, fermentation media, crude media, defined media, fermentation systems, design and control, solid substrate fermentation and methods;

	Downstream processing: unit operations, factors determining unit operation selection. Food microbiology: Introduction, Food Spoilage and General Principles Underlying Spoilage, Intrinsic Parameters Extrinsic Parameters, implicit and processing factors; microbial spoilage of milk, meat, fish and plant products; sources of microorganisms in foods (contamination), factors influencing microbial growth, changes caused; principles and techniques of food preservation; Food Borne Infections/ Intoxications; Laboratory exercises and field/industrial visits based on above.
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended Readings:

1. MJ Waites et. al., (2004) Industrial Microbiology- An Introduction, Blacwell Science.
2. G. Reed, Ed., (1999) Industrial Microbiology 4th Edn. CBS India.
3. GJ. Banwart, (1987) Basic Food Microbiology CBS India.
4. WC. Frazier and DC. Westhoff (1988) Food Microbiology 4th Edn., McGraw-Hill Co.

BTS 00172: RESTORATION ECOLOGY

Course Code Course Title Credits Compulsory/optional	BLM 00172 Restoration Ecology 2 Credits Compulsory
Aims	4. To impart knowledge on scientific principles and applications in the area of restoration ecology 5. To develop skills in retrieving information about restoration ecology critical analysis and evaluation and communicating with a variety of audiences in written and spoken forms
Work load (notional hrs.)	22 hrs lectures, 24 hrs laboratory and 54 hrs self work
Learning outcome	On successful completion of the course the students will be able to: 1. Recognize local ecosystems and describe the theoretical aspects of restoring different types of ecosystems. 2. Apply content knowledge to real-world settings and contexts by developing and writing a restoration plan and preparation of a public presentation. 3. Recognize current issues in restoration ecology, engage in research and critical analysis. 4. Demonstrate understanding of the practical aspects of restoring ecosystems, working with communities and producing sound restoration plans through engagement with the community partner.
Course Content	Introduction to restoration ecology; ecosystem functioning, ecological relationships at various spatial scales as they apply to restoration, keystone species, invasive species management, reclamation of contaminated sites, restoration of various types of ecosystems (e.g. forest, degraded grasslands, wetland, riverine vegetation, coastal ecosystems), value of ecosystem services, financial and practical considerations in ecological restoration projects.
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended texts:

1. Andre F. Clewell, James Aronson (2013) Ecological Restoration, 2nd Edn: Principles, Values, and Structure of an Emerging Profession, Island Press.

2. Donald A. Falk, Margaret A. Palmer, Joy B. Zedler, Richard J. Hobbs. Eds. (2006) Foundations of Restoration Ecology (The Science and Practice of Ecological Restoration Series) 1st Edn. Isand Press.

BTS 00192 - AQUATIC ECOLOGY

Course Code Course Title Credits Compulsory/optional	BLM 00192 Aquatic Ecology 2 Credits Compulsory
Aims	1. To impart knowledge on the major elements of marine and freshwater habitats, the biology and their functions 2. To expose to various aquatic animals, algae, and macrophytes in freshwater and marine habitats of sri lanka. 3. To equip to identify and assess problems threatening aquatic ecosystems
Work load (notional hrs.)	22 hrs lectures, 24 hrs laboratory and 54 hrs self work
Learning outcome	On successful completion of the course the students will be able to: 1. Explain major elements of aquatic habitats. 2. Explain aspects of ecological functioning of freshwater and marine systems. 3. Explain methods and controversies regarding the exploitation of aquatic resources. 4. Explain environmental threats to aquatic systems. 5. Identify some of the more common aquatic species. 6. Comprehend, summarize and critique primary scientific literature.
Course Content	Water as the ideal medium for life, Types of fresh water and the origin of lake basins: Lentic and lotic water, Distribution of aquatic ecosystems in Sri Lanka: coastal ecosystem, inland water ecosystem and hydro-electric and irrigation schemes, Abiotic factors of the Aquatic ecosystems: Physical factors and chemical factors, Biotic component of the Aquatic ecosystem: Ecological classification; Taxonomic classification, Introduction to aquatic plants; microalgae, seaweeds, and vascular aquatic plants with an emphasis on their unique habitats; morphological and physiological adaptations to the aquatic environment; Primary Productivity, planktons-the power house of ocean food webs, adaptation of aquatic organisms, patterns of distribution and succession in rivers, lakes and wetlands; impacts on aquatic systems, Economically important aquatic organisms in Sri Lanka, Laboratories include use of field equipment, field research techniques, and identification of aquatic organisms, including protozoa, one required field trip off campus.
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended texts:

1. Dodds, Walter and Matt Whiles. (2010) Freshwater Ecology: Concepts & Environmental Applications of Limnology 2nd Ed., Academic Press.
2. Alice Outwater (1996) Water: a natural history, Basic Books
3. Dodson, S. (2005) Introduction to Limnology, McGraw Hill Companies Inc. New York.
4. M. Dobson and C. Frid. (2009) Ecology of Aquatic Systems, Oxford University Press.
5. W. Lampert and U. Sommer. (2007). Limnoecology, Oxford University Press.
6. G. W. Prescott (1964) How to Know the Algae, An Illustrated Key. W. C. Brown
7. Dobson Michael, Frid Chris (2009) Ecology of aquatic systems, 2nd Edn., Oxford University Press
8. J. Kalff (2001) Inland Water Ecosystems: a textbook of Limnology, Prentice-Hall.

9. R.G. Wetzel (2001) Limnology Academic Press.
10. W. Lampert and U. Sommer, (2007) Limnoecology: The Ecology of Lakes and Streams, Oxford University Press.

BTS 00202 - BIODIVERSITY CONSERVATION AND MANAGEMENT

Course Code Course Title Credits Compulsory/optional	BTS 00202 Biodiversity Conservation and Management 2 Credits Compulsory
Aims	1. Develop knowledge on biodiversity conservation and management. 2. To enable them to critically address the issues related to biodiversity and the environment and socio economic impacts. 3. To provide students basic skills for goal oriented research in biodiversity conservation and management.
Work load (notional hrs.)	22 hrs lectures, 24 hrs laboratory and 54 hrs self work
Learning outcome	Upon successful completion of this course, the student will be able to: 1. Understand key threats to biodiversity 2. Select appropriate techniques that can be used to achieve biodiversity conservation within reserves including control of pests of plants and animals, species translocations 3. Select techniques to conserve biodiversity outside reserves including retention of keystone structures, connectivity and corridors 4. Explain/describe key ecological concepts in ecosystem restoration 5. Identify key legislations relevant to biodiversity conservation 6. Critically analyse the fact that wildlife populations, man's actions and habitat are interconnected and dependent on each other. 7. Demonstrate the ability to apply concepts of experimental design and scientific method to solve management problems.
Course Content	Introduction to biodiversity: global and national biodiversity estimates; Techniques of measuring biodiversity; Loss of biodiversity; Threats to biodiversity including invasive species; Biodiversity Conservation: ex situ and in situ conservation strategies; sustainable management of biodiversity; IUCN categories for the conservation status of taxa, Red data book; key legislations available to conserve and manage biodiversity; priorities in conservation; indigenous knowledge in biodiversity; international conventions on Biodiversity, International trade and CITES, Ecotourism,. Biological diversity conservation in Sri Lanka
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended texts:

1. Braun, C. (2005) Techniques for Wildlife Investigations and Management, 6th edn. Wildlife Society
2. Cauhley, G and Sinclair, R.E.A. (1994) Wildlife ecology and management. Blackwell Scientific Publications, Boston, MA.
3. Gaston, K. and Spicer, J. (2003) Biodiversity: an Introduction. Blackwell Science.
4. Gatson, J.G. and Spicer, J. I. (2004) Biodiversity: An introduction (2nd Edition), Blackwell Publishing, Oxford
5. Groombridge B. (1992), Global biodiversity: Status of the earth's living resources, Chapman andmHill, London.
6. Jensen, J.R. (2000) Remote sensing of the environment: An earth resource perspective. Prentice Hall , New Jersey
7. Kotwal P. C. (2002) Biodiversity conservation in managed forests and protected areas, Agrobios, India.

8. Kumar V. (2003) Biodiversity: Principles and Conservation. Agrobios, India
9. Lévèque, C., (1997) Biodiversity dynamics and conservation, Cambridege Universtiy Press,
10. New, T.R. (1995) An Introduction to Invertebrate Conservation Biology, Oxford University Press.
11. Robinson W.L. and E.G. Bolen. (2002) Wildlife Ecology and Management,, Pearson.
12. Schulze, E. D. and Mooney, H. A. (1994) Biodiversity and ecosystem function. Springer,
13. Soule, M.E. (1986) Conservation Biology; The science of scarcity and diversity, Sinauer Associates Inc, Sunderland, Massachusetts, USA

BTS 00212: SCIENCE RESEARCH METHODOLOGY

Course Code Course Title Credits Compulsory/ Optional	**BTS 00212** Science Research Methodology 2 Credits Compulsory
Aims	1. To develop knowledge on basic concepts of research and its methodologies 2. To develop knowledge in identifying and defining appropriate research problems, formulating hypothesis, plan and conduct research and report and present research work.
Work load (notional hrs.)	30 hrs lectures and 70 hrs self work
Learning outcome	On successful completion of the course the students will be able to; 1. Identify research problems, access and review literature, formulate hypothesis, 2. Adopt appropriate experimental designs. 3. Prepare research proposal and budget. 4. Critically evaluate data, analyze and interpret. 5. Write/present a report
Course content	Research design, Literature search and review, Scientific writing, Scientific presentation, Critical scientific review, Ethical issues
End semester examination Continuous assessment	70% 30%

Recommended texts:

Creswell, J. (2014). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches Vol. 4, SAGE Publications.

BTS 00272 – EXPERIMENTAL DESIGNS AND ANALYSIS

Course Code Course Title Credits Compulsory/optional	BTS 00272 Experimental Designs and Analysis 2 Credits Compulsory
Aims	1. Provide insight into the need for statistics. 2. Develop skills in scientific experimentation and analysis.
Work load (notional hrs.)	22 hrs lectures, 16 hrs laboratory and 62 hrs self work
Learning outcome	On successful completion of the course the students will be able to; 1. Apply appropriate experimental designs. 2. Derive valid results from the scientific experiments. 3. Apply statistical methods in analyzing data. 4. Present the results of the findings of an experiment in scientific manner and make conclusions based on the results

Course Content	Principles of experimental designs, Completely Randomized Design, Randomized Complete Block Design, Latin Square Design, Mean separation procedures, Factorial experiments, Analysis of factorial experiments, Modifications to factorial experiments, Analysis of Covariance, Confounding in factorial experiments, Incomplete Block Designs.
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended texts:

1. Thattil R.O (1999)., Design and Analysis of Experiments., PGIA.
2. Cochran WG & Cox GM (1957)., Experimental Designs, John Wiley & Sons, Canada.
3. Murray R.S & Larry J.S (1999)., Statistics (Third Edition), McGraw-Hill, Singapore.
4. Murray R.S, John S & Srinivasan R.A (2004)., Probability & Statistics, McGraw-Hill, Singapore.

BLS 00261: SEMINAR – APPLIED BIOLOGY

Course Code Course Title Credits Compulsory/optional	BLS 00261 Seminar – Applied Biology 1 Credit Compulsory
Aims	1. To develop interest on current developments and applications of the subject area. 2. To develop skills self-learning and oral communication.
Work load (notional hrs.)	50 hrs self work
Learning outcome	On successful completion of the course the students will be able to: 1. Keep track on current developments in the subject area 2. Gather knowledge/relevant data and organize. 3. Prepare audiovisual aids for presentations. 4. Convey a scientific message orally in an attractive and concise manner.
Course Content	Awareness lectures and discussions on presentation skills. An individual seminar should be presented on a topic, on an issue at the forefront, selected with the consent of the assigned supervisor.
Assessment criteria Presentation Viva	 80% 20%

BLS 00522 INDUSTRIAL TRAINING

Course Code Course Title Credits Compulsory/optional	L00522 Industrial Training 2 Credits Optional
Aims	To expose students to real work of environment and gain knowledge and skills in work ethics, communication, management etc.
Work load (notional hrs.)	200 hrs self work (four weeks)
Learning outcome	On successful completion of the training the students will be able to: 1. apply subject knowledge and skills to real work situations. 2. work with responsibility, commitment and other good work habits.

	3. to write reports on technical works/projects. 4. perform with self-confidence, strength, teamwork spirit, good communication skills etc.
Course Content	Working in some established subject relevant industry, institute, enterprise etc. either state or private full time for four weeks either continuously or staggered during semester end vacation periods, on a programme agreed by the Department and the host institute with the supervision of a senior academic from the department and an executive of the host institute
Assessment criteria log book Progress reports Presentation and viva Final report	 20% 20% 20% 40%

BLS 00536: RESEARCH PROJECT

Course Code Course Title Credits Compulsory/optional	BLS 00536 Research Project 6 Credits Compulsory
Aims	To develop skills in research and scientific communication.
Work load (notional hrs.)	800 hrs self work (4-6 months)
Learning outcome	On successful completion of the course the students will be able to: 1. Identifying research problem and critically review literature 2. Experimental designing, laboratory/field activities, data collection, analysis and interpretation. 3. Oral, written and visual communication/presentation. 4. Planning, time management, collaborate with other researchers etc.
Course Content	An individual research project, of a duration of about 15 weeks, will be carried out under the supervision of a senior academic staff member of the department and a report should be submitted based on the work carried out in that research project. The project could also be a collaborative one with another department or with some other institute and in such cases there may be a co-supervisor from the collaborating department or institute.
Assessment criteria Project report Presentation and viva	 80% 20%