Programme Manual
Bachelor of Science Honours in Botany

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CONTENTS

BACHELOR OF SCIENCE HONOURS IN BOTANY

1. INTRODUCTION

The Department of Biological Sciences from its inception (1997) offers Biology as a main subject for the B.Sc. general degree programme (3 years duration) and in addition a 'Special degree in Applied Biology' (4 years duration) since 2009.

Food, nutrition, medicine, housing, energy, cleaner environment etc. are all needs of high concern throughout and the demand is on the increase continuously in the world. Plants play a key role in all these aspects and they are the providers of foods and habitats for animals. They impact the world's climate, nutrient cycles and hydrology greatly. The role of a Botanist in understanding and applying the knowledge of basics and applications of biology and ecology of plants is of utmost important in almost all aspects of development in a sustainable manner. Thus, the demand both locally and globally would be high for personnel with advanced and applied subject knowledge and relevant skills in Botany. In addition, there is a continuous demand from students for a Special/Honours degree in Botany. In this regard the Department of Biology is planning to offer a Bachelor of Science Honours in Botany (four year duration). The programme encompasses a solid foundation in plant biology with more applied aspects such as molecular genetics & biotechnology, bioinformatics, industrial, food & environmental microbiology, plant tissue culture, post-harvest technology etc. including a research project and an optional industrial training component.

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 academic, research, production or service based careers in a relevant discipline.

2. AIM AND OUTCOMES

2.1. Aim

To produce graduates with knowledge and skills in classical and modern developments in Botany with enhanced career prospects both locally and globally.

2.2. Outcomes

On completion of the course of study the graduates will be equipped with a sound proficiency on the fundamental and advanced knowledge, modern developments and applications of Botany. They are expected to be competent:

- in profound knowledge and skills in fundamental, advanced, cross disciplinary and applied Botany,
- in practicing scientific process and engaging in collaborative and interdisciplinary research projects,
- in scientific communication,
- in solving biological problems through quantitative approaches,
- to apply knowledge and skills in social, environmental and production contexts,
- in achieving targets both individually and as a member of a team, and
- to excel in academic, research, production or service based careers.

3. COURSE IDENTITY

Name of the Degree : Bachelor of Science Honours in Botany
Abbreviation : BScHons (Botany)
Department of Study : Dept. of Biological Science
Duration of the Course : 8 semesters (4 academic years)
Minimum Credit Requirement : 120
Medium of Instruction : English

4. COURSE REQUIREMENTS

As per the UGC/SLQF requirement, a student has to complete successfully a total of minimum 120 credits in four academic years excluding enhancement/auxiliary courses of which a minimum of 60 credits should be from the Botany. Students have the option of selecting course units as indicated in the following table.

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

Level	Number of credits						
	Biology (General)	**Botany**	**Other main subject (X)**	**Compulsory Courses[1]**	**Elective Courses[2]**	**Auxiliary Courses[3]**	**Total (except auxiliary courses)**
1	08 (08*)	-	18	02	01-03	02	**29-31**
2	09 (06*)	-	18	-	03-04	03	**30-31**
3	05$ (05*)	24	-	-	02-03#	01	**31-32**
4		24 06 (Research project)	-	-	-	-	**30**
Total	**22 (19*)**	**54**	**36**	**02**	**06-10**	**06**	**120-124**

* Numbers in brackets indicate the number of botany-related credits in the general degree programme.

$ Students are required to follow only the biology course units of the semester-I of the general degree programme.

Students should select the elective courses in consultation with the Department.

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.

5. ELIGIBILITY REQUIREMENTS TO FOLLOW THE HONOURS PROGRAMME IN BOTANY

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 Botany 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 as those from principal subjects.

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 BOTANY

To be eligible for the Bachelor of Science Honours in Botany, a student should have completed at least a total of **120 credits**, excluding enhancement /auxiliary courses and of this a **minimum of 72 credits must be in Botany** and fulfilling the following requirements:

(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.

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.

8. 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 (2)	22	24
BLM 32032	Aquaculture	2	22	24
BLM 32042	Applied Parasitology	2	23	21
	Total Credits	**26 (19)**		

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

Table 3: Course units (of level 3 and 4) offered for the honours programme in Botany

Level	Semester	Code	Title	Credit value	Notional hours			Teaching learning methods *
					Lecture	Lab/field	self	
III or IV	I or II	BTS 00012	Plant Morphology and Anatomy	02	22	24	54	1,2,3,4,6
		BTS 00022	Plant Systematics	02	15	30	55	1,2,3,4,6,9
		BTS 00032	Algal Diversity	02	15	30	55	1,2,4,9
		BTS 00042	Embryophyte Diversity	02	15	30	55	1,2,4,5,9
		BTS 00052	Fungal Diversity and Biology	02	22	24	54	1,2,3,4,6
		BTS 00062	Evolutionary Biology	02	30	-	70	1,2,3,6,7,9
		BTS 00073	Plant Pathology	03	30	45	75	1,2,4,6,8,10,11
		BTS 00082	Advanced Plant Physiology	02	22	24	54	1,2,4,6,7
		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 00182	Economic Botany	02	22	16	62	1,2,4,5,6,9
		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
		BTS 00261	Seminar – Botany	01	-	-	50	6,8,10,11
		BTS 00262	Integrated Pest Management #	02	22	24	54	1,2,3,4,5,9
		BTS 00522	Industrial Training – Botany #	02	-	-	200	5,6,9,10,11
		BTS 00536	Research Project-Botany	06	-	-	600	6,9,10,11
Total number of credits				**56**				
Minimum number of credits required				**54**				

*** 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.

Optional

09. DETAILED SYLLABI

BTS 00012 - PLANT MORPHOLOGY AND ANATOMY

Course Code Course Title Credits Compulsory/optional	BTS 00012 Plant Morphology and Anatomy 2 Credits Compulsory
Aims	1. To develop an in-depth knowledge on organisation and construction of plant body. 2. To provide insight into various morphological and anatomical adaptations. 3. To develop skills on observing and reporting morphological and anatomical features of plants.
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 the basic components of plant cell. 2. Describe the types of tissues and tissue systems in plant body and relate with their functions. 3. Describe and recognize the primary and secondary structure of Root and Stem. 4. Explain the anatomy, morphology, metamorphosis and modifications of leaf. 5. Classify types of inflorescence and fruits. 6. Explain structure, development, embryogenesis and dispersal of seeds. 7. Identify and illustrate morphology, anatomy and modifications of different plant organs.
Course Content	Basic terminology, components of a plant cell; cell wall, cell membrane, cell organelles, cytoplasm and cell inclusions; Classification of tissues, Primary structure ,secondary structure, morphology and anatomy of branching of Root and Stem; Anatomy, morphology, metamorphosis and modifications of leaf, stem and root; floral morphology; Structure, , embryogenesis and development of seed; Structure, development, classification and placentation of fruit. Laboratory exercises based on the above.
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended texts:

1. S. Chand and B.P. Pandey (2012) Plant anatomy, S. Chand Publishing.
2. Charles .B. Beck (2008), An introduction to plant structure and development.Timber press Portland London.

BTS 00022 - PLANT SYSTEMATICS

Course Code Course Title Credits Compulsory/optional Prerequisites	BTS 00022 Plant Systematics 2 Credits Compulsory BTS 00012
Aims	1. To introduce the concepts of and historical development of systematics 2. To equip with knowledge on the principles, rules and regulations in plant nomenclature and classification. 3. To introduce the phylogenetic relationships among plant groups.
Work load (notional hrs.)	15 hrs lectures, 30 hrs laboratory and 55 self work
Learning outcome	On successful completion of the course the students will be able to; 1. Justify main mile stones in history of plant systematics. 2. Describe principles and processes in plant taxonomy. 3. Apply knowledge from other fields of botany for systematics. 4. Describe vegetative and floral characteristics of selected families of Angiosperms. 5. Explain Morphology of Angiosperms. 6. Able to identify plants using keys and construct taxonomic keys. 7. Give taxonomic descriptions of plants
Course Content	Introduction, terminology, objectives and process of plant taxonomy, taxonomic heirachy; approaches of botanical classification: empirical and interpretative, history and recent classification systems of: Engler and Prantl, Bessey, Hutchinson and Cronquist; Nomenclature: common and scientific names, rules and regulations; Taxonomic evidences: morphological, anatomical, palynological, embryological and chemical; numerical taxonomy; Taxonomy of selected angiosperm families. Laboratory exercises based on above.
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended texts:

1. N. S. Subrahmanyum (2001) Modern Plant Taxonomy. Vikas Publishing House (Pvt) Ltd.
2. O.P.Sharma, (1993) Plant taxonomy. BookVistas.
3. M. P. Sing, S. B. Chaudhary and H.B. Sahu (2005) A Text Book of Practical Botany – Part II. Daya Publishing House

BTS 00032 - ALGAL DIVERSITY

Course Code Course Title Credits Compulsory/optional	BTS 00032 Algal Diversity 2 Credits Compulsory
Aims	To provide an insight into the diversity of algae, their role in nature and environmental, industrial and economic importance.
Work load (notional hrs.)	15 hrs lectures, 30 hrs laboratory and 55 hrs self work
Learning outcome	On successful completion of the course the students will be able to; 1. Describe how algae differ from other plants. 2. Describe the main morphological forms with in an algal group or among groups, with reference to named examples. 3. Describe the economic importance of algae 4. Describe, illustrate, compare and contrast, structural, morphological, reproductive features/structures and life cycles of different species/taxa. 5. Relate/compare/discuss and organize species/taxa plants according to structural, morphological, reproductive tendencies. 6. Describe importance of algae in environment, industry and agriculture 7. Describe methods of culturing economically important algae. 8. Identify algae using appropriate techniques and report.
Course Content	General characteristics, ecology and distribution, classification, major groups, diversity with respect to morphology/thallus organization, reproduction and life cycles with reference to selected examples from the major algal groups: chlorophyta, phaeophyta, xanthophyta and rhodophyta; role of algae in environmental health, industry and agriculture and culturing algae. Laboratory exercises based on the above.
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended texts:

1. A.V.S.S. Sambamurty (2017) Textbook of Algae, I. K. International Pvt Ltd,
2. H.D. Kumar and H. N. Singh (1995) A text book on algae, 4th Edn. Affiliated East-West Press Pvt Ltd
3. P.R. Bell and A.R. Hemsley (2000) Green plants: Their Origin and Diversity, 2nd Edn. Cambridge University Press.
4. C. Van Den Hoek et al., (1998) Algae: An introduction to phycology, Cambridge Univ. Press.
5. G.M. Smith (1938) Cryptogamic botany Vol-I, McGraw-Hill Book Co., Inc.

BTS 00042 - EMBRYOPHYTE DIVERSITY

Course Code Course Title Credits Compulsory/optional	BTS 00042 Embryophyte Diversity 2 Credits Compulsory
Aims	To provide in-depth knowledge of the diversity of land plants, their evolutionary trends and provide insight into application of systematic and their ecological and economic roles.
Work load (notional hrs.)	15 hrs lectures, 30 hrs laboratory and 55 hrs self work
Learning outcome	On successful completion of the course the students will be able to; 1. Discuss the vegetative/reproductive challenges to plant life on land 2. Describe/discuss the adaptations that allowed plants to colonize the land 3. Describe, illustrate, compare and contrast, structural, morphological, reproductive features/structures and life cycles of different species/taxa. 4. Relate/compare/discuss and organize species/taxa plants according to structural, morphological, reproductive and evolutionary tendencies. 5. Discuss ecological roles of embryophytes. 6. Recognise, identify and report relevant morphological, vegetative and reproductive structures of embryophytes for the purposes of classification, identification and beneficial applications
Course Content	Introduction to and classification of embryopytes; Bryophytes: General characteristics, characteristics common to other groups of plants; morphology, anatomy, reproduction and life cycle of *Sphagnum*, *Marchnatia* and *Anthoceros*; Ecological and economical role of bryophytes; Pteridophytes: General characteristics; morphology, anatomy, reproduction and life cycles of *Psilotum*, *Selaginella*, *Equisetum*, *Ophioglossum*, *Angiopteris* and true ferns; evolutionary trends, heterospory and seed habit development; Gymnosperms: General characteristics; morphology, anatomy, reproduction and life cycles of *Cycas*, *Pinus* and *Gnetum*; Laboratory exercises based on above.
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended texts:

1. P.R. Bell and A.R. Hemsley (2000) Green plants: their origin and diversity, 2nd Edn. Cambridge University Press.
2. Evert, Ray F., Eichhorn, Susan E. (2012) Raven Biology of Plants 8th Edn. Pub.: W.H. Freeman
3. SN Pandey, SP Misra and PS Triveli (2000) A text book of Botany vol II, Vikas Publishimg House Pvt. Ltd.
4. G.M. Smith, (1938) Cryptogamic botany Vol-II, McGraw-Hill Book Co., Inc.

BTS 00052 FUNGAL DIVERSITY AND BIOLOGY

Course Code Course Title Credits Compulsory/ Optional	BTS 00052 Fungal Diversity and Biology 2 Credits Compulsory

Aims	To provide an overview of the biology, diversity, ecology; their impacts on environment, other organisms including humans and their exploitation for economic and ecological benefits.
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. Describe taxonomical and phylogenic aspects of fungal classification. 2. Describe/compare/discuss various biological/reproductive aspects of fungi. 3. Illustrate morphological characteristics of different taxa. 4. Isolate, identify, culture and store selected species. 5. Describe/discuss the roles of fungi in the ecosystem and their beneficial uses
Course content	Introduction, general characteristics, classification, major groups: Chytridiomycota, Oomycota Zygomycota, Ascomycota, Deuteromycetes, Basidiomycota; morphology, reproduction and life cycles with reference to selected examples from different groups; fungal communities, mutualistic interactions (mycorrhizae and lichens) and parasitic interactions with other organisms (plant and animal pathogens), role of fungi as decomposers and fungi in industry and as foods. Laboratory exercises based on the above.
Continuous assessment End semester examination	30% 70%

Recommended Texts:

Alexopolus, C.J. (2007) Introductory Mycology, Wiley India Pvt. Limited,

BLM 00062: EVOLUTIONARY BIOLOGY

Course Code Course Title Credits Compulsory/optional	BLM 00062 Evolutionary Biology 2 Credits Compulsory
Aims	1. To introduce the theories and concepts of evolution, biochemical and molecular process involved in evolution, and the evolutionary process that led to speciation. 2. To introduce the relationships between living organisms 3. To develop understanding on the extinction and evolution of species 4. To enable to explore the functioning of ecosystems and how ganisms live, interact and disperse on earth
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. Describe the fundamental processes that cause or prevent adaptive evolution, speciation and extinction 2. Describe the basic methods that are used to reconstruct the evolutionary histories of, and relationships among groups of organisms 3. Predict how differences in population size, natural selection and gene flow will affect genetic variation and future adaptability of populations 4. Describe extinction and evolution of species 5. Apply knowledge of evolution to generate solutions for problems faced by the human population and to the preservation of

	biodiversity
Course Content	An introduction to the processes of evolution including symbiogenesis, the outcomes of evolution, and the field of ecology. Processes of evolution include understanding natural selection, genetic drift, molecular evolution and general evolutionary theory; Outcomes of evolution include speciation, hybridization, building phylogenetic trees to understand the diversity of life, especially vertebrate evolution; Fundamentals of population ecology, Spatial and time series models: Drivers of ecological change including global element cycles and climate change. Laboratory exercises based on above.
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended texts:

1. De Salle, R. and A. V. Z. Brower (1997) Process partitions, congruence and the independence of characters: inferring relationships among closely-related Hawaiian *Drosophila* from multiple gene regions. Syst. Biol. 46: 751-764.
2. Faith, D. P. (1996) Conservation priorities and phylogenetic pattern. Conserv. Biol. 10: 1286-1289.
3. Lipscomb, D. L. (1992). Parsimony, homology and the analysis of multistate characters. Cladistics 8: 45-65.
4. Mayr, E. (1957) Species concepts and definitions. pp. 1-22. *In* E. Mayr (ed). The Species Problem. Washington, D. C., Amer. Assn. Adv. Sci.
5. O'Hara, R. J. (1991) Representations of the Natural System in the Nineteenth Century. Biology and Philosophy 6:255-274.
6. Panchen, A. L. (1992) Classification, evolution and the nature of biology. Cambridge, Cambridge University Press, pp. 10-61.
7. Pleijel, F. (1995) On character coding for phylogeny reconstruction. Cladistics 11: 309-315.
8. Ridley, M. (2003) Evolution. Blackwell Science.
9. Townsend, C. R., Begon, M. and Harper, J. (2002) Essentials of Ecology. Blackwell Science.
10. Francisco Carrapico, (2015) Can we understand evolution without symbiogenesis? Kairo Jour. Philosophy& Science 17: 47-53.

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 00082 - ADVANCED PLANT PHYSIOLOGY

Course Code Course Title Credits Compulsory/optional Prerequisites	BTS 00082 Advanced Plant Physiology 2 Credits Compulsory BLM 21012
Aims	To give in-depth knowledge of metabolism, physiology and structure of plants together with a better understanding of regulation of growth and development and influence of environment.
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. Analyze the importance of nutrient mineral elements for plant. 2. State the importance of photosynthesis, factors affecting photosynthesis, the photosynthetic pigment, and describe the biochemistry of photosynthesis; 3. Define and understand biotic and abiotic stress, different types of stresses 4. List and describe the function of plant growth substances and hormone phototrophic transduction. 5. Comprehend the role of plant secondary metabolites.
Course Content	Plant metabolism (catabolism and anabolism), plant nutrition; photosynthesis; different types of stress (heat, cold, oxidative, hypoxia, drought etc.) and plant responses; plant hormones and their effects on growth and development; secondary metabolism, secondary metabolites and importance; advanced topics such as photo-protectioin, cavitation and embolism etc. Laboratory exercises based on above.
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended Texts

1. Lincoln Taiz and Eduardo Zeiger (2012) Plant Physiology 5th Edn. Sinauer Associates Inc.
2. I William G. Hopkins and Norman P. (2008) Introduction to Plant Physiology 4th Edn., Hüner Wiley.
3. V.K. Jain. (1999) Fundamentals of Plant Physiology: For Degree and Post Graduate, S Chand & Co.
4. Frank B. Salisbury (1991) Plant physiology, 4th Edition. Wadsworth Publishing Company, Belmont, California.
5. S. Mukherji; A.K. Ghosh (2000) Plant physiology 3rd revised edition, New Central Book Agency.

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 End-semester examination	 30% 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	**BTS 00112**
Course Title	Analytical techniques
Credits	2 Credits
Compulsory/ Optional	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	1. To impart knowledge on scientific principles and applications in the area of restoration ecology 2. 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 000182: ECONOMIC BOTANY

Course Code Course Title Credits Compulsory/ Optional	BTS 000182 Economic Botany 2 Credits Compulsory
Aims	1. To develop awareness on the diversity of the plant products and plants of economical importance 2. To develop scientific insights into the development of economic uses of plant products
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. Appreciate the taxonomic diversity of important families of useful plants. 2. Describe/discuss the economic uses of plants in modern society. 3. Describe the botany and origin of important food, medicinal and economically important plants. 4. Identify/describe/discuss the impact of economical use of plants on environment. 5. Explain the scientific basis into the development of many plant products.
Course content	A brief botanical description of economically important plants of selected cereals, vegetables, fruits and nuts, spices and condiments, medicinal plants, fibre crops, forage crops, ornamental plants, invasive plants, weeds, beverages, industrial products and some processing techniques; Structure and properties of wood, factors affecting the strength of timber, timber processing technology, agents of destruction of wood and wood preservation; manufactured products of wood and their applications. Economic importance of conifers, algae and cyanobacteria. Laboratory exercises based on the above.
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended texts:

1. S. L. Kochhar (2016) Economic Botany: A Comprehensive Study 5th Edition, Cambridge University Press
2. Simpson, B.B. Ogorzaly, M. C. (1995) Economic Botany: Plants in Our World. McGraw-Hill, Inc.
3. Samba Murthy, A.V.S.S. & Subrahmanayam, N.S. (1998). A Text Book of Economic Botany, Wiley Eastern Ltd.
4. Desch, H. E. & Dinwoodies, JM. (1998). Timber- structure, properties, conversion and use. Macmillan Press.
5. Tisseverasinghe, A.E.K. (1971). A manual of timber utilization for Ceylon. Forest Department, Sri Lanka.

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.

BTS 00261: SEMINAR - BOTANY

Course Code Course Title Credits Compulsory/optional	BTS 00261 Seminar - Botany 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%

BTS 00262 - INTEGRATED PEST MANAGEMENT

Course Code Course Title Credits Compulsory/optional Prerequisites	BTS 00262 Integrated Pest Management 2 Credits Optional BLM 31022
Aims	1) To provide an overview of various concepts of IPM, how the concept of pest control has been replaced with pest management, the principles and different IPM approaches across different geographical regions, including from an international perspective. 2) To provide insight into implementation. and relevant issues.
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 major weeds, pest insects, and diseases of agricultural and horticultural crops in the area. 2) Describe the biological, cultural and other non-chemical means of pest control 3) Determine appropriate prevention and integrated pest management techniques for major pests. 4) Integrate the principles of pest management into the environmentally sound management of cropping systems and other ecosystems. 5) Utilize critical thinking principles for pest management decision-making. 6) Apply current pest management principles to crop production and situations where pest management is critical.
Course Content	History of Integrated Pest Management, Introduction and IPM overview, Definition of Pest concept/ Economic injury levels, pest management and IPM; IPM Philosophy, Pest management options (cultural, mechanical, biological, chemical); Ecological basics for pest management; Identifying the pest problems; Different type of pests and control measures with examples; Evolution of IPM; Three components of IPM; Principles of IPM program; Strategies and tactics of IPM; Advantages and disadvantages of IPM, Environmental Issues Related to IPM, IPM in Sri Lanka.
Assessment criteria Continuous assessment End-semester examination	 30% 70%

Recommended texts:

1. Dhaliwal. G. S., Ramesh Arora (2001) Integrated pest management: Concepts and Approaches, Kalyani publishers.
2. Dharam P Abrol Uma Shankar (2012) Integrated Pest Management: Principles and Practice, CABI
3. Howard, R.J. et al. (eds.), (1994) Diseases and Pests of Vegetable Crops in Canada, Can. Phytopathol. Soc. And Entomol. Soc. Canada.
4. Barbara Ohlendorf (1991) Integrated Pest Management for Apples and Pears, Univ. of Calif. Publ. Agriculture & Natural Resources.
5. (1985) Integrated Pest Management for Cole Crops and Lettuce, Univ. of Calif.
6. Mengech, Annalee (1995) Integrated pest management in the tropics: current status and future prospects. John Wiley and Sons.
7. Pedigo, L. P., and M. E. Rice. (2009) Entomology and Pest Management. 6th Edn. Prentice Hall.

8. M. Flint and R. van den Bosch Introduction to Integrated Management.
9. Uma Shankar, Satya Priya and Deepak (2008) Vegetable pest management Guide for farmers International book distributing company.
10. R. Cranston, Weed Control: An Introductory Manual.

BTS 00522 INDUSTRIAL TRAINING - BOTANY

Course Code Course Title Credits Compulsory/optional	BTS 00522 Industrial Training - Botany 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%

BTS 00536: RESEARCH PROJECT- BOTANY

Course Code Course Title Credits Compulsory/optional	BTS 00536 Research Project - Botany 6 Credits Compulsory
Aims	To develop skills in research and scientific communication.
Work load (notional hrs.)	600 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%