University of Ruhuna
Faculty of Science
Matara, Sri Lanka

Course Unit Information

Student Handbook - 2024/2025

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University of Ruhuna

Faculty of Science

Student Handbook 2024/2025

(For SC/2024 Batch)

Vision of the University

To be the

prime intellectual

thrust of the

nation.

Mission of the University

To advance

knowledge and skills

through

teaching, research and services

to serve the society

Contents

1. Academic

1.1. Orientation Programme

The orientation programme is designed mainly to conduct an English Course (Intensive Course) to prepare students to follow lectures and practical classes in English medium. The English classes will be conducted by the English unit of the University during the morning hours of all working days in this period. Afternoon hours will be allocated for students to get familiarize with the facilities available in the University, register for course units through FOSMIS (Faculty of Science Management Information System), attend Special lectures/activities organized by the Career Guidance Unit of the University and the Faculty. The period of the programme depends on the time available between the registration of students by UGC and the commencement of the academic Programme of the Faculty.

1.2. Course Structure

In the faculty of science there are four main streams of study as given in Table 1 on the following page. In addition to the Course Units under subject areas given in the table.

Table 1:Main streams and courses offered by the faculty

Main streams and courses conducted by the Faculty of Science		
Stream	Subjects	Prefix
Biological Sciences	Botany	BOT
	Chemistry	CHE
	Physics	PHY
	Zoology	ZOO
Physical Sciences	Chemistry	CHE
	Computer Science	COM
	Mathematics	MAT
	Applied Mathematics	AMT
	Industrial Mathematics	IMT
	Physics	PHY
	Mathematics Honours	MSP
	Computer Science Honours	CSS
Computer Sciences	Computer Sciences Subjects	CSC
Financial Mathematics and Industrial Statistics	Industrial Statistics	MIS
	Financial Mathematics	MFM
	Mathematics/Finance/Computing	MSF

Several other Course units from different disciplines are also available as Optional course units. The prefixes of such Course Units begin with FSC.

For a degree programme, each student should select Course units from the relevant stream. Mathematics is a compulsory subject for the degrees offered under physical science streams. Students who follow Biological Science stream are strongly advised to follow Chemistry as a subject.

1.2.1. Course Units

A Course Unit is a selectively organized section of a subject. Course units are of two types, that are Core Course Units and Optional Course units. Core Course units are designed to cover basic and essential subject matter. Optional Course units contain specific areas which would provide a diverse knowledge on a particular subject. Theory Course units consist of lectures, assignments and tutorials. Practical course units are either laboratory based or field-based studies of a particular

subject. In addition, there are course Units which consist of project work and Combined Course units consist of both theory and practical components. Course units are organized at three Levels, namely, I, II and III for the General Degree.

Credit Framework Policy

Course units have credit values. A credit is a time-based quantitative measure used to determine the weightage of a particular Course unit as shown below.

Table 2:Course Units & Credit Values

Different types of Course units and Credit values		
Description		**Credit Value**
Theory Course Units:	15 contact hours	1
e.g.	30-hours Course Unit	2
	45-hours Course Unit	3
Practical Course Units:	30-45-hours Course Unit	1
	60-90-hours Course Unit	2
Projects:	30–45-hours Project	1
Combined Course Units: e.g.		
30 theory hours and 45 practical hours together		3
15 theory hours and 45 practical hours		2
30 theory hours and 22.5 practical hours		2.5

1.3. Selection of Course Units

- Subject Combination selection
  - 4 weeks prior to the commencement of academic programme
  - If changes are required, should be made within 2 weeks from the commencement of academic programme

**Note: Selection of students for Computer Science and Industrial Mathematics will be based on their Z scores.

- Course Unit Registration
  - Compulsory for both core and optional
  - One week within the commencement of academic programme
  - If changes are required for the selected optional courses should be made within one week
  - The optional courses which are relevant to the semester will be announced 2 weeks before the commencement of the semester.
  - For some optional course units there might be department specific conditions and procedures on selection of number of students.
  - For further information and inquiries, contact Assistant Registrar/Dean's office

In the registration procedure, students must pay attention to following

- Core course units- Compulsory for selected subject stream
- Optional course units-Discretion of the student and selection criteria prescribed by the faculty/department
- Registration of FSC courses maximum up to 6 credits
- For the completion of BSc General degree, students require to complete 90 credits.

1.3.1. Biological Science Stream

During the first two academic years, students in Biological Science stream must follow core course units offered by any three out of the Department of Chemistry, Zoology, Botany and Physics. Biological science students may choose to follow the optional course units offered by the Department of Physics in Level II and III. The Department of Physics offers core course units in Semester I of Level III, and students should follow these core course units if they have selected Physics as a subject area. All course units offered by the Department of Botany, Chemistry and Zoology in Level III are optional, and therefore students are free to select course units according to their choice depending on the availability of a place in the class. The course units offered by the Department of Chemistry and Physics in semester II of Level III are also optional, and as a result students have more choices during this semester. Different combinations of subject areas available for Biological Science students in the General Degree programme. Students who follow Chemistry, Zoology and/or Botany as a subject should select course units of at least four credits from Level III to fulfil the subject certification requirement.

1.3.2. Physical Science Stream

Physical Science students have the choice to select core course units offered by three departments out of the Departments of Chemistry, Computer Science, Mathematics and Physics. The Mathematics Department offers three subject areas, namely Mathematics, Applied Mathematics and Industrial Mathematics. Physical Science students must follow core course units within three subject areas of their choice including mathematics during the first two academic years and semester I of Level III. Students may choose to follow the optional course units offered by the Department of Physics starting Level II of their degree programme. During semester II of Level III, they have freedom to select course units from among optional course units available for Physical Science stream. Interdisciplinary course units (Unit codes starting with FSC) are also available as Optional course units for both biological science and Physical Science streams.

1.4. Identification of Course Units

An alphanumeric code is used to identify a unit. The code consists of four digits prefixed by a set of three letters denoting the subject/Course Unit as described by the example given below:

Table 3:Identification of Courses

Eg. ZOO3162		Description
ZOO (Course code)		Zoology
3	Level III	1: Level I, 2: Level II, 3: Level III, 4: Honours Degree
1	Semester I	1: Semester I, 2: Semester II, b: Offered during two Semesters
6	A number assigned by the relevant department	
2	Credit Value is 2	1, δ : 1.25, α : 1.5, 2, β : 2.5, 3, 4,..
Other Course codes		BOT: Botany, CHE: Chemistry, COM: Computer Science, PHY: Physics, MAT: Mathematics, AMT: Applied Mathematics, IMT: Industrial Mathematics, ZOO: Zoology, MIS: Industrial Statistics, MFM: Financial Mathematics, MSF: Statistical Finance, FSC: Supplementary Course Units, MSP: Mathematical Honours, CSS: Computer Science Honours

1.5. Honours Degree Programme

Honours Degree programmes are offered in Botany, Chemistry, Computer Science, Mathematics, Physics and Zoology. Students will be selected for these programmes based on their academic performance. Each Department of study will decide on the number of students to be enrolled into Honours Degree programme depending on its requirements, available facilities and student performances. All Honours Degree programmes shall be of four-year duration.

1.6. Course Unit Combinations - Biological Science Stream

Pathways available for Biological Science Streams (BS1, BS2, BS3 and BS4) are shown in the following Tables.

BS1 – Chemistry, Botany, Zoology

BS2- Chemistry, Zoology, Physics

BS3- Chemistry, Botany, Physics

BS4- Botany, Zoology, Physics

Table 4:Pathways available for Biological Science Stream for BSc Level I & II

Pathways available for Biological Science Stream for BSc Level I & II											
BSc Level I						BSc Level II					
Course Unit	BS1	BS2	BS3	BS4	Th/Pr	Course Unitt	BS1	BS2	BS3	BS4	Th/Pr
CHE1112	C	C	C		Th	CHE2112	C	C	C		Th
CHE1122	C	C	C		Th	CHE2122	C	C	C		Th
CHE1131	C	C	C		Pr	CHE2131	C	C	C		Pr
CHE1212	C	C	C		Th	CHE2212	C	C	C		Th
CHE1222	C	C	C		Th	CHE2222	C	C	C		Th
CHE1231	C	C	C		Pr	CHE2231	C	C	C		Pr
BOT1112	C		C		Th	BOT2112	C		C	C	Th
BOT1121	C		C	C	Th	BOT2121	C		C	C	Th
BOT1131	C		C	C	Th	BOT2131	C		C	C	Th
BOT1141	C		C	C	Pr	BOT2141	C		C	C	Pr
BOT1212	C		C	C	Th	BOT2212	C		C	C	Th
BOT1221	C		C	C	Th	BOT2221	C		C	C	Th
BOT1231	C		C	C	Th	BOT2231	C		C	C	Th
BOT1241	C		C	C	Pr	BOT2241	C		C	C	Pr
ZOO1102	C	C		C	Th	ZOO2102	C	C		C	Th
ZOO1112	C	C		C	Th	ZOO2112	C	C		C	Th
ZOO1121	C	C		C	Pr	ZOO2121	C	C		C	Pr
ZOO1202	C	C		C	Th	ZOO2202	C	C		C	Th
ZOO1212	C	C		C	Th	ZOO2212	C	C		C	Th
ZOO1221	C	C		C	Pr	ZOO2221	C	C		C	Pr
PHY1114		C	C	C	Th	PHY2114		C	C	C	Th
PHY1214		C	C	C	Th	PHY2b22		C	C	C	Pr
PHYIb22		C	C	C	Pr	PHY2214		C	C	C	Th
ICT1b13	C	C	C	C	Pr	FSC215a	O	O	O	O	Pr
MAT1142	C	C	C	C	Th	FSC224a	O	O	O	O	Th+Pr
						PHY2112	O	O	O	O	Th
						PHY2222	O	O	O	O	Pr
						ZOO2232	O	O	O	O	Th+Pr
						ZOO2142	O	O	O	O	Th+Pr
						ZOO2152	O	O	O	O	Th+Pr
O: Optional Course Units						ZOO2262	O	O	O	O	Th+Pr
C: Compulsory Course Units						ICT2b13	O	O	O	O	Pr
ICT2b13 (CCIT) - For selected students who passed ICT1b13 exam											

Table 5:Pathways available for Biological Science Stream for BSc Level III

Pathways available for Biological Science Stream for BSc Level III		
	Semester - I	Semester - II

Subjects	Course Unit	BS1	BS2	BS3	BS4	Th/Pr	Optional Course Units
Chemistry	CHE3112 CHE3122 CHE3132	O O O	O O O	O O O		Th+Pr Th+Pr Th+Pr	CHE3212, CHE3222, CHE3232
Physics	PHY3114 PHY3121		C C	C C	C C	Th Pr	PHY3232, PHY3242, PHY3282

Pathways available for Biological Science Stream for BSc Level III							
	Semester - I						Semester - II
Subjects	Course Unit	BS1	BS2	BS3	BS4	Th/Pr	Optional Course Units
Botany	BOT3112, BOT3122, BOT3132, BOT3151, BOT3162, BOT3172, BOT3182, BOT3191, BOT3142.						BOT3212, BOT3222, BOT3232, BOT3242, BOT3251, BOT3261, BOT3271, BOT3282, BOT3292.
Zoology	ZOO3112, ZOO3122, ZOO3133, ZOO3152, ZOO3162, ZOO3172, ZOO3182, ZOO3192.						ZOO3202, ZOO3211, ZOO3223, ZOO3232, ZOO3252, ZOO3272, ZOO3292.
Mathematics							MAT324β, MAT325β, MAT326β, IMT323β, IMT324β, AMT324β
Computer Science							COM3252, COM3232
FSC Course Units (Optional)	FSC3112, FSC3122, FSC3132, FSC3bP2,FSC3bP0						FSC3212,FSC3242,FSC3252
Any other Course Unit that may be approved by the faculty							

1.7. Course Unit Combinations - Physical Science Stream

Possible pathways available for Physical Science Streams (PS1, PS2, PS3, PS4, PS5, PS6 & PS7) are shown in the following Tables

PS1 - Mathematics, Industrial Mathematics, Chemistry
PS2 - Mathematics, Industrial Mathematics, Physics
PS3 - Mathematics, Chemistry, Physics
PS4 – Mathematics, Applied Mathematics, Chemistry
PS5 – Mathematics, Applied Mathematics, Physics
PS6 - Mathematics, Applied Mathematics, Computer Science
PS7 - Mathematics, Physics, Computer Science
PS8 – Mathematics, Chemistry, Computer Science

Table 6:Pathways available for Physical Science Stream for BSc Level I

Pathways available for Physical Science Stream for BSc Level I									
Semester - I & Semester - II									
Course Units	PS1	PS2	PS3	PS4	PS5	PS6	PS7	PS8	Theory/Practical
MAT111β MAT112δ	C C	C C	C C	C C	C C	C C	C C	C C	Th Th

MAT113δ	C	C	C	C	C	C	C	C	Th
MAT121β	C	C	C	C	C	C	C	C	Th
MAT122β	C	C	C	C	C	C	C	C	Th
IMT111β	C	C							Th
IMT121β	C	C							Th
IMT122β	C	C							Th
IMT1b2β	C	C							Project
AMT111β				C	C	C			Th
AMT112β				C	C	C			Th
AMT121β				C	C	C			Th
AMT122β				C	C	C			Th
CHE1112	C		C	C				C	Th
CHE1122	C		C	C				C	Th
CHE1131	C		C	C				C	Pr
CHE1212	C		C	C				C	Th
CHE1222	C		C	C				C	Th
CHE1231	C		C	C				C	Pr
PHY1114		C	C		C		C		Th
PHY1b22		C	C		C		C		Pr
PHY1214		C	C		C		C		Th
COM1112						C	C	C	Th
COM1123						C	C	C	Pr
COM1213						C	C	C	Th
COM1223						C	C	C	Pr
ICT1b13	C	C	C	C	C				Pr

Table 7:Pathways available for Physical Science Stream for BSc Level II

Pathways available for Physical Science Stream for BSc Level II									
Semester - I & Semester - II									
Course Unit	PS1	PS2	PS3	PS4	PS5	PS6	PS7	PS8	Theory/Practical
MAT211β	C	C	C	C	C	C	C	C	Th
MAT212β	C	C	C	C	C	C	C	C	Th
MAT221β	One Of these Options must be taken (c)								Th
MAT225β									Th
MAT222δ	C	C	C	C	C	C	C	C	Th
MAT224δ	C	C	C	C	C	C	C	C	Th
IMT211β	C	C							Th
IMT2b2β	C	C							Project
IMT221β	C	C							Th
IMT223β	One of these options must be taken (C)								Th
IMT224β									Th
AMT211β				C	C	C			Th
AMT212β				C	C	C			Th
AMT221β				C	C	C			Th
AMT223β				One of these options must be taken (C)					Th
AMT224β									Th
CHE2112	C		C	C				C	Th
CHE2122	C		C	C				C	Th

CHE2131	C		C	C				C	Pr
CHE2212	C		C	C				C	Th
CHE2222	C		C	C				C	Th
CHE2231	C		C	C				C	Pr
PHY2114		C	C		C		C		Th
PHY2b22		C	C		C		C		Pr
PHY2214		C	C		C		C		Th
COM2113						C	C	C	Pr
COM2122						O	O	O	Th
COM2213						C	C	C	Pr
COM2223						C	C	C	Th
*COM2122 is compulsory for the students who wish to follow BSC Hons (Comp SC) Degree programme									
FSC224α - Optional									Th+Pr
PHY2112 - Optional									Th
PHY2222 - Optional									Pr

Table 8:Pathways available for Physical Science Stream for BSc Level III

Pathways available for Physical Science Stream Level III - Semester I									
Course Unit	PS1	PS2	PS3	PS4	PS5	PS6	PS7	PS8	Th/Pr
MAT311β	C	C	C	C	C	C	C	C	Th
MAT312β MAT313β	One of these options must be taken(C)								Th Th
IMT3b1β	C	C							Project
IMT312β	One of these options must be taken (C)								Th
IMT313β									Th
AMT311β AMT312β				Only one of these options must be taken(C)					Th Th
AMT313β AMT314β				Only one of these options can be taken(C)					Th Th
COM3113						C	C	C	Th
COM3122						O	O	O	Th
COM3b33						C	C	C	Pr
COM3142						O	O	O	Th+Pr
COM3152						O	O	O	Th
COM3162						O	O	O	Th
CHE3112	O		O	O				O	Th+Pr
CHE3122	O		O	O				O	Th+Pr
CHE3132	O		O	O				O	Th+Pr
PHY3114		C	C		C		C		Th
PHY3121		C	C		C		C		Pr
FSC Course Units (Optional)									FSC3112 FSC3122 FSC3132 FSC3bP2 FSC3bP0

Any other Course Unit that may be approved by the faculty									
O: Optional, C: Compulsory									
Pathways available for Physical Science Stream Level III - Semester II									
Course Unit	PS1	PS2	PS3	PS4	PS5	PS6	PS7	PS8	Th/Pr
MAT321β	O	O	O	O	O	O	O	O	Th
MAT322β	O	O	O	O	O	O	O	O	Th
MAT323β	O	O	O	O	O	O	O	O	Th
MAT324β	O	O	O	O	O	O	O	O	Th
MAT325β	O	O	O	O	O	O	O	O	Th
MAT326β	O	O	O						Th
IMT321β	O	O	O	O	O	O	O	O	Th
IMT322β	O	O	O	O	O	O	O	O	Th
IMT323β	O	O	O	O	O				Th
IMT324β	O	O	O	O	O	O	O	O	Th
AMT321β	O	O	O	O	O	O	O	O	Th
AMT322β	O					O		O	Th
AMT323β	O	O	O	O	O	O	O	O	Th
AMT324β	O	O	O	O	O	O	O	O	Th
COM3213						O	O	O	Th+Pr
COM3222						O	O	O	Th
COM3232						O	O	O	Th+Pr
COM3252						O	O	O	Th
PHY3232	O	O	O	O	O	O	O	O	Th
PHY3242	O	O	O	O	O	O	O	O	Th+Pr
PHY3282	O	O	O	O	O	O	O	O	Th+pr
CHE3212	O		O	O				O	Th+Pr
CHE3222	O		O	O				O	Th=Pr
CHE3232	O	O	O	O	O	O	O	O	Th+Pr
FSC Course Units (Optional)									FSC3212 FSC3222 FSC3232
Any other Course Unit that may be approved by the Faculty									
Industrial Mathematics is not offered together with Applied Mathematics or Computer Science.									

2. Department of Botany

The Department of Botany conducts courses in all major fields of botany for undergraduate students registered for BSc General Degree and BSc Honors Degree Programs. In addition, research facilities are offered to those students seeking postgraduate qualifications such as MSc, MPhil and PhD degrees in botany and related fields. The Department has the following infrastructure facilities: one lecture theater, two large elementary laboratories to cater to up to 130 undergraduate students, two well-equipped research laboratories, a taxonomy laboratory with the departmental herbarium, well-equipped laboratories for molecular biology, algae culture, tissue culture and computer-based studies, three protected houses and a seminar presentation room.

2.1. Research Areas

Current research topics handled by the members of the Department of Botany are related to the fields of:

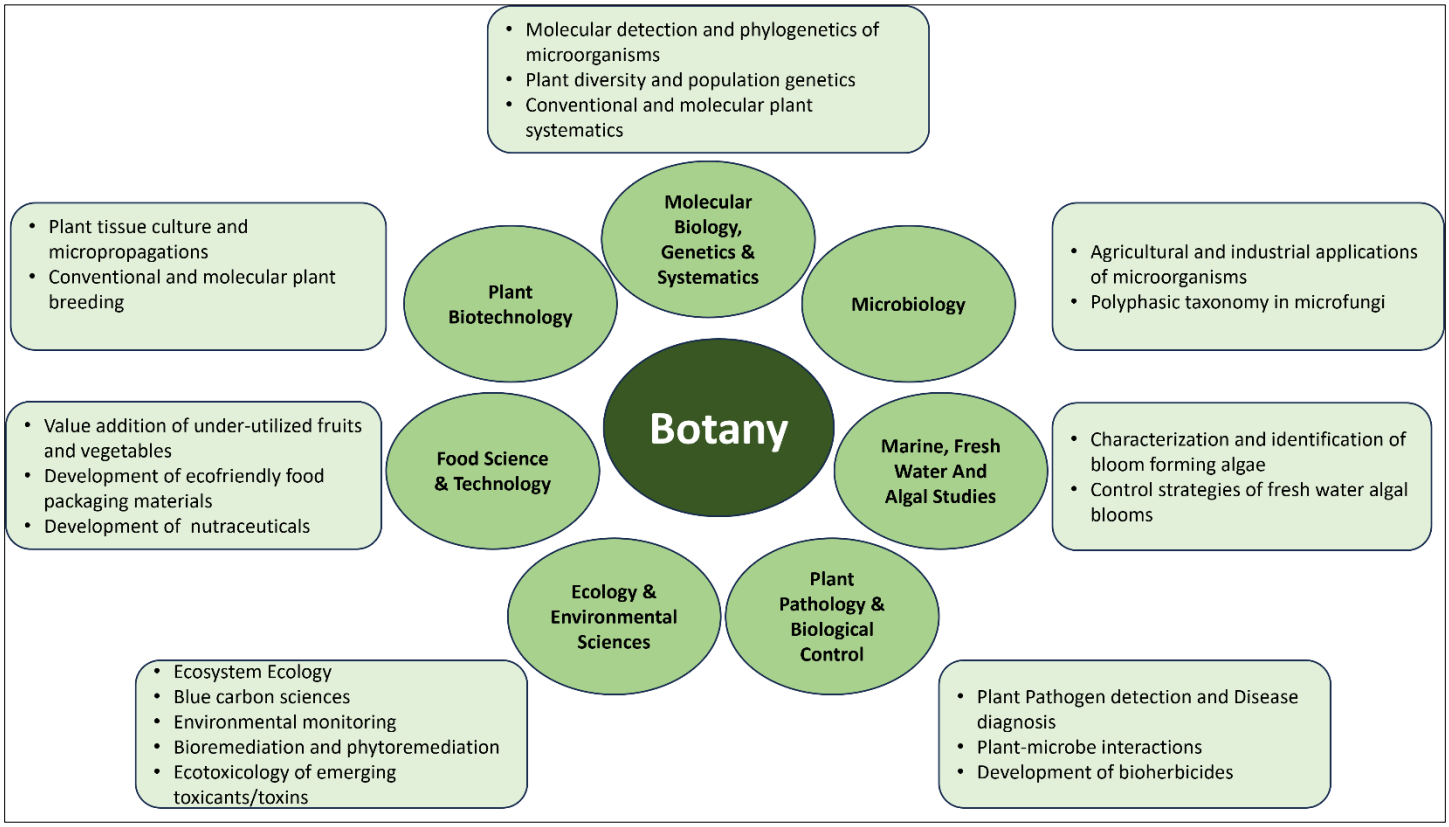


Figure 1:Research areas of Botany Department

2.2. Head of the Department

Prof. K. A. S Kodikara

BSc (Ruhuna, SL), MSc (VUB, Belgium), PhD (VUB, Belgium)

2.3. Members of the Academic Staff

Designation	Name	Specialization
Emeritus Professor	Senior Prof. L.P. Jayatissa BSc (Ruhuna, SL) PhD (Stirling, UK)	Toxic Cyanobacteria Ecotoxicology Coastal Ecology
Senior Professors	Senior Prof. S. Abeysinghe BSc (Ruhuna, SL) MSc (Wageningen, Netherlands)	Molecular Biology Crop Protection

	PhD (Brussels, Belgium)	
	Senior Prof. P. D. Abeysinghe BSc (Ruhuna, SL) MSc, PhD (VUB, Brussels, Belgium)	Molecular Biology Plant Systematics
Professors	Prof. K. Masakorala BSc (Ruhuna, SL) MSc (Plymouth, UK) PhD (USTB, Beijing, China)	Environmental Science Environmental Toxicology Bioremediation
	Prof. W. G. S. Manel Kumari BSc (Ruhuna, SL) MSc (Peradeniya, SL) MSc (Wageningen, Netherlands) PhD (Queensland, Australia)	Plant Virology Microbiology
	Prof. K. A. S. Kodikara BSc (Ruhuna, SL) MSc (VUB, Belgium) PhD (VUB, Belgium)	Plant Ecophysiology Coastal Plant Ecology
Senior Lecturers	Dr. T. G. Dayananda BSc (Ruhuna, SL) MSc, PhD (Kyushu, Japan)	Molecular Phylogeny Population Genetics
	Dr. K. K. G. U. Hemamali BSc (Ruhuna, SL) MSc, PhD (Kyushu, Japan)	Molecular Plant Breeding Population Genetics
	Dr. R. D. A. Gunasekara BSc (Ruhuna, SL) MSc (Ghent, Belgium) PhD (Peradeniya, Sri Lanka)	Phycology, Plant Ecology
	Dr. Jayani Perera BSc (Ruhuna, SL) MSc (Montpellier, France) PhD (Belfast, UK)	Plant Physiology Metal Toxicity in Plants
	Dr. S. M. B. C. Samarakoon BSc (Peradeniya, SL) PhD (Mae Fah Luang University, Thailand)	Mycology, Molecular Phylogenetics and Plant Pathology
Lecturers	Mr. D. D. N. Sripal BSc (Ruhuna, SL) MPhil (Peradeniya, SL)	Plant Taxonomy
Probationary Lecturers	Ms. S. Y. S. D. De Silva BSc (Colombo, SL) (Reading for PhD, University of Aberdeen, University of Sri Jayewardenepura)	Plant Biotechnology, Bioinformatics, Molecular Genetics
	Ms. D. M. H. R. Dissanayaka BSc (Peradeniya, SL) MPhil (Peradeniya, SL)	Molecular Plant Pathology

2.4. Course Units in Botany for BSc (General) Degree

BSc Level I - Semester I

BOT1112: Plant Diversity, Unity and Evolution (30 Lecture hrs.)

Eevolution of life on earth, Importance of the knowledge in plant diversity, History of taxonomy, Three Domain and six Kngdom classification, S Domain Bacteria : structure, types, and reproduction, morphological diversity of Cyanobacteria, Domain Archaea: Diversity and interesting features, Domain Eukarya: Vegetative and reproductive diversity of the algae, Structural and reproductive diversity in fungi, General characteristics, thallus organization, nutrition, and reproduction of Lichens, Vegetative and reproductive diversity in Bryophyta, Structure, life cycle and biological importance of Pteridophyta, Gymnospermae: Classification and specific features with special reference to structure and life history of Cycads, and Pinus and their affinities, Angiospermae: Introduction and distinguishing features, specific morphological and anatomical features of different groups; reproduction and life cycles in typical forms; evolutionary trends among the different groups.

Evaluation methods: End semester examination: 70% and Continuous assessments: 30%

BOT1121: Scientific Approach and Biometrics (15 Lecture hrs.)

Scientific method, Limitations of science, Pure science vs. applied science, Introduction to biometrics, Terminology, Descriptive statistics and inferential statistics, Sampling techniques, processing and presenting data, Measures of central tendency, Measures of dispersion, Normal distribution, Binomial distribution, Poisson distribution, The basis of statistical testing, Chi-squared tests, Correlation analysis, Regression analysis, Experimental design, Analysis of variance (ANOVA).

Evaluation methods: End semester examination: 70% and Continuous assessments: 30%

BOT1131: Plant Anatomy (15 Lecture hrs.)

Microscopy, Typical plant cell, Forms and functions of cells in the plant body, Specialized cells, Glands and secretory cells, Simple and complex tissues, Primary and secondary growth in stems and roots, Anomalous growth, Ecological anatomy, Anatomical identity of gymnosperms and angiosperms.

Evaluation methods: End semester examination: 70% and Continuous assessments: 30%

BOT1141: Botany Practicals I (45 hrs.)

Laboratory exercises and fieldwork on BOT1112, BOT1121 and BOT1131

Evaluation methods: End semester examination: 70% and Continuous assessments: 30%

BSc Level I - Semester II

BOT1212: Genetics (30 Lecture hrs.)

Introduction, Mendel's laws of genetics, Deviation of mendels laws, Gene linkage, Crossing over and gene mapping, Sex determination and sex linkage, Probability in Mendelian inheritance and pedigree analysis, Mutation (Mutagenic agents, chromosome aberration, euploids, aneuploids, autopolyploids and allopolyploids), Viral, Bacterial and fungal genetics, Genetics of fungi, Extra nuclear inheritance, Population genetics and Hardy Weinberg equilibrium

Evaluation methods: End semester examination: 70% and Continuous assessments: 30%

BOT1221: Plant Systematics (15 Lecture hrs.)

Historical background, General definitions and descriptions, Nomenclature, Identification, Classification, Taxonomic hierarchy, Species concept, Different classification systems, ICBN and phylocode system, Angiosperm Phylogeny Group (APG), Taxonomic data from different sources, Importance of plant systematics, Flora in Sri Lanka.

Evaluation methods: End semester examination: 70% and Continuous assessments: 30%

BOT1231: Plant Ecology (15 Lecture hrs.)

Introduction: Ecology vs. Environmental Science, Fundamentals of plant ecology: Terminology, Organizational levels from Individual to Biome & Biosphere, Different aspects of plant ecology: Autecology & synecology, Phytosociology, Paleoecology, Cytoecology, Ecosystem ecology, Conservation ecology or resource ecology, Habitat ecology, Population ecology, Production ecology, Comparative ecology, Descriptive ecology, Physical and biological space, Niche and habitat, Ecological footprint, Structure and functions of an ecosystem: Biotic and abiotic interactions, Materials and energy flow, Modes of nutrition in plants, Biotic-abiotic interactions, classification, form and functions of biomes, Climatic map and soil map of Sri Lanka, Extent, distribution, features, floral diversity of different ecosystems in Sri Lanka, Invasive flora in Sri Lanka & related environmental issues, Main threats on biodiversity, Conservation of biodiversity.

Evaluation methods: End semester examination: 70% and Continuous assessments: 30%

BOT1241: Botany Practicals II (45 hrs.)

Laboratory exercises and fieldwork on BOT1212, BOT1221 and BOT1231

Evaluation methods: End semester examination: 70% and Continuous assessments: 30%

BSc Level II - Semester I

BOT2112: General Microbiology (30 Lecture hrs.)

A brief history of microbiology, Microbes in our life, Observation of microorganisms through a microscope, Structure of prokaryotic cell, Classification of microorganisms, Microbial growth, Microbial metabolism, Control of microbial growth, Microorganisms and diseases, Introduction to environmental microbiology and industrial microbiology.

Evaluation methods: End semester examination: 70% and Continuous assessments: 30%

BOT2121: Plant Pathology (15 Lecture hrs.)

History of plant pathology, Types of pathogens and diseases, Infection and pathogenesis, Disease diagnosis, Koch's postulates, Plant disease resistance, Effects of diseases on plants, Postharvest diseases, Plant disease epidemiology, Important plant diseases of major crops in Sri Lanka, Plant disease control and management.

Evaluation methods: End semester examination: 70% and Continuous assessments: 30%

BOT2131: Molecular Biology (15 Lecture hrs.)

History of Molecular biology, Chemical basis of hereditary materials, Structures and properties of nucleic acids, Fine structure of genes, Gene expression and control of gene expression, Protein synthesis, Replication, Isolation of DNA, Quality and quantity assessment of biomolecules.

Evaluation methods: End semester examination: 70% and Continuous assessments: 30%

BOT2141: Botany Practicals III (45 hrs.)

Laboratory exercises on BOT2112, BOT2121 and BOT2131

Evaluation methods: End semester examination: 70%, Continuous assessments and practical records: 30%

BSc Level II - Semester II

BOT2212: Plant Physiology and Biochemistry (30 Lecture hrs.)

Plant and water; essentiality of water, cell water relations, Soil water relations, Water absorption and transport, Stomatal physiology, Mineral nutrition, Phloem translocation, Energy relations in cells and plants: Enzymes, respiration, photosynthesis, nitrogen metabolism, fatty acid metabolism, Plant growth and development: Plant growth and growth measurements, plant growth hormones and their applications, photoperiodic and vernalization.

Evaluation methods: End semester examination: 70% and Continuous assessments: 30%

BOT2221: Environmental Science (15 Lecture hrs.)

Fundamentals of environmental science, Natural resources & threats on natural resources, Environmental pollution and contamination, Major forms of pollution sources, impacts and control, Eutrophication, Special environmental problems in Sri Lanka, Global environmental issues (global warming, acid rain, ozone depletion) with special reference to Sri Lanka, Introduction to wastewater treatment methods giving special reference to biological methods.

Evaluation methods: End semester examination: 70% and Continuous assessments: 30%

BOT2231: Soil- Plant Relationships (15 Lecture hrs.)

Soil forming factors, Weathering processes, Soil profile, Physical and chemical characteristics of soil, Soil classification, Macro- and micronutrients in soil, Toxic elements in soil and Serpentine soils, Introduction to minerals, Factors affecting availability and uptake of nutrients, Soil organic matter and its dynamics (interactions between plants & microorganisms in the rhizosphere), Hydrophobic soils, Analysis of nutrients in the soil and in plants, Major soil types of Sri Lanka, Soil erosion, Soil conservation and sustainable management of soil.

Evaluation methods: End semester examination: 70% and Continuous assessments :30%

BOT2241: Botany Practicals IV (45 hrs.)

Laboratory exercises and field visits on BOT2212, BOT2221 and BOT2231

Evaluation methods: End semester examination: 70%, Continuous assessments and practical records: 30%

BSc Level III - Semester I

BOT3112: Advanced Plant Ecology (20 Lecture hrs. + 21 Practical hrs.) *Optional, Prerequisite: Botany core courses*

History of development of ecology, Introduction to quantitative plant ecology, Sampling methods and data collection, Quantitative measures and descriptive analysis, Multivariate analysis, Principal component analysis, Complex-model based analysis, Interpretation of results, Ecosystem valuation and environmental accounting, Indigenous knowledge on plant ecology in Sri Lanka.

Evaluation methods: End semester examination: 70%, Continuous assessments and practical records: 30%

BOT3122: Horticulture, Floriculture and Landscaping (20 Lecture hrs+21 Practical hrs.) *Optional for Biology Students*

Divisions of horticulture, Advantages and disadvantages of horticulture, Classification of horticultural plants, Plant propagation methods, Plant nurseries, Hydroponics and aquaponics, Floriculture, Landscaping: Designing, installing and maintenance, Post-planting immediate care for plants, Pruning and training of plants.

Evaluation methods: End semester examination: 70% and Continuous assessments: 30%

BOT3132: Advanced Microbiology (20 Lecture hrs+21 Practical hrs.) *Optiona,l Prerequisite: Botany core courses*

Instrumentation in Microbiology: Microscopes, spectrophotometry, centrifugation, sterilizers, Diversity in Domain Bacteria and Archaea, Acellular microorganisms, Microbial genetics: Structure of bacterial genome, regulation of bacterial gene expression, mutation, gene transfer and recombination, Microbial mechanisms of pathogenicity and defence: Portals of entry, penetration of host defences, damaging host cells, nonspecific and specific defences of the host, Microbial ecology: Microorganisms in terrestrial and aquatic environments, extremophiles, Environmental microbiology: Wastes as a resource, Industrial Microbiology: Industrial microorganisms, fermentation media and systems, Downstream processing, Product development, regulations and safety, Agricultural microbiology: biofertilizers, biopesticides, bioherbicides and other applications.

Evaluation methods: End semester examination: 70%, Continuous assessments and practical records: 30%

BOT3142: Advanced Plant Pathology (15 Lecture hrs. + 30 Practical hrs.) *Optional for Biology Students*

Molecular plant pathology, Genetics of host-pathogen interactions (gene-for-gene interaction, recognition and triggering resistance), Hypersensitive Reaction (HR), Induced resistance in plants (local and systemic), Putative signal transduction pathways towards systemic resistance, Biotechnology in plant protection), Ecological plant pathology, Epidemiology, Disease forecasting, Plant disease management (chemical, cultural, biological control and integrated approaches)

Evaluation methods: End semester examination: 70%, Continuous assessments and practical records: 30%

BOT3162: Forestry (20 Lecture hrs. + 15 Practical hrs.) Optional for Biology Students

Introduction to Forestry, History of Forestry, Biomes and Forest classification in Sri Lanka, Forest policy and laws in Sri Lanka, Forest mensuration and Inventory, Silviculture and different Silvicultural systems, Agroforestry and social forestry, Forest based industries.

Evaluation methods: End semester examination: 70%, Continuous assessments and Practical records: 30%

BOT3172: Food Science and Technology (20 Lecture hrs. + 21 Practical hrs.) *Optional for Biology Students*

History of food science & technology, Food spoilage, Food poisoning, Preservation methods of food, Postharvest technology, Food packaging and labelling, genetically modified/engineered food, Food safety.

Evaluation methods: End semester examination: 70%, Continuous assessments and practical records: 30%

BOT3182: Advanced Molecular Biology (20 Lecture hrs. + 21 Practical hrs.) *Optional Prerequisites: BOT2131*

Genome organization of prokaryotes and eukaryotes, Chromosome structure and function, organelle gene organization, Recombination, DNA repair, Gene expression, Post-transcriptional modifications, Mechanism of protein synthesis and protein structures, Transposons and their practical applications.

Evaluation methods: End semester examination: 70%, Continuous assessments: 30%

BOT3191: Weed Biology (12 Lecture hrs. + 06 Practical hrs.) *Optional for Biology students*

Characteristics of weeds, Classification of weeds, Spread and evolution, Impact of weeds, Usefulness of weeds, preventive methods, mechanical & chemical weed control, Herbicides (application, mechanisms of action, transformations in plants, persistence and behavior in soil), Invasive weed species, Allopathic effect of weeds, Paddy field and aquatic weeds

Evaluation methods: End semester examination: 70%, Continuous assessments and practical records: 30%

BSc Level III - Semester II

BOT3212: Wood Science (20 Lecture hrs. + 21 Practical hrs.) *Optional for Biology students*

Terminology, Structure of wood, Hardwood and softwood, Gross structure of wood, Planes of wood, Wood cell types, Cell inclusions, Wood moisture, Physical properties of wood, Mechanical properties of wood, Wood defects, Grading of woods/timber, Timber classification in Sri Lanka, Common and specific uses of woods, Wood seasoning, Wood preservation, Wood based industries

Evaluation methods: End semester examination: 70%, Continuous assessments and practical records: 30%

BOT3222: Plant Tissue Culture (20 Lecture hrs. + 21 Practical hrs.) *Optional for Biology students*

Cell theory/tot potency, History of plant tissue culture, In vitro methods in plant tissue culture, Steps involved in micro-propagation, Initiation and maintenance of callus, Suspension culture and in-vitro production of secondary metabolites, Different types of culture techniques, Soma clonal variation, Applications of tissue culture in Sri Lanka, Conservation, Cryopreservation, Structure of a plant tissue culture laboratory.

Evaluation methods: End semester examination: 70%, Continuous assessments and practical records: 30%

BOT3232: Advanced Plant Physiology (25 Lecture hrs. + 15 Practical hrs.) *Optional Prerequisite: Botany core courses*

Crop establishment and seedling growth, Crop photosynthesis and yield, Metabolic and structural factors influencing photosynthetic rate, Light distribution and canopy structure limitations of crop yield by weather and climate, Partitioning and remobilization of photosynthetic assimilates, Translocation and source sink relationship, Biochemical adaptations of plants to the environment, Biochemistry of C3 C4 intermediate species.

Evaluation methods: End semester examination: 70%, Continuous assessments and practical records: 30%

BOT3242: Advanced Environmental Science (20 Lecture hrs. + 21 Practical hrs.) *Optional Prerequisite: Botany core courses*

The global environment (population growth, decline of vital life support ecosystem, global atmospheric changes, loss of biodiversity), Strategic and integrative themes for sustainable future, Biogeochemical cycles, Solid waste management, Integrated solid waste management, Municipal Solid Waste (MSW), Mismanagement and side effects, Environmental monitoring, Bio indicators, Biomarkers, Biosensors, Bio indicators and biomonitoring, Bioremediation techniques, Environmental impact assessment (EIA).

Evaluation methods: End semester examination: 70%, Continuous assessments and practical records: 30%

BOT3251: Plant Virology (15 Lecture hrs.) *Optional for Biology students*

History of viruses and plant virology, Properties of viruses, Virus architecture, Virus genome, Plant virus infection process, Plant virus disease symptoms, Transmission of plant viruses, Plant virus disease control and diseases caused by viroids.

Evaluation methods: End semester examination: 70% and Continuous assessments: 30%

BOT3261: Economic Botany (15 Lecture hrs.) Optional for Biology students

Concepts of economics, Economic aspects of different categories of plants including mangroves, Medicinal plants, Plantation crops in Sri Lanka, Fruits and vegetables, Fiber and timber, Spices, Oils, Gums, Algae, Microorganisms, Plant based industries and entrepreneurships

Evaluation methods: End semester examination: 70% and Continuous assessment: 30%

BOT3271: Genetic Engineering and Biotechnology (15 Lecture hrs.) *Optional for Biology Students*

Introduction to genetic engineering, Concept of reverse genetics, Techniques in recombinant DNA technology (enzymes, vectors, cloning, library preparation, sequencing and transformation), transgenic plants and organisms, Ethics in genetic engineering and biotechnology.

Evaluation methods: End semester examination: 70% and practical records: 30%

BOT3282: Plant Breeding (25 Lecture hrs. + 15 Practical hrs.) Optional for Biology Students

History of plant breeding, Conventional breeding methods (mass selection, pure line selection, hybridization, single seed descent, backcross breeding, Recurrent selection methods, synthetic varieties), Modern plant breeding methods, Protoplast culture and other culture technique.

Evaluation methods: End semester examination: 70%, Continuous assessments and field visit report: 30%

BOT3292: Plant Ecophysiology (25 Lecture hrs. + 15 Practical hrs.) Optional for Biology students

Plant cell and its environment, Plant growth and plant growth analysis, Interactions between functions of plants and environmental parameters, Life and environmental parameters, Light environment of plants and measurements, Water status and water stress, Methods of assessing water status and water stress, Dendroclimatology, Stable carbon isotopes in plant ecophysiology studies

Evaluation methods: End semester examination: 70%, Continuous assessments and practical records: 30%

2.5. Course Units for BSc (Honours) Degree in Botany

BOT4012: Quantitative Plant Ecology (25 Lecture hrs. + 15 Practical hrs.)

Qualitative and Quantitative characteristics for community study, Quantitative description/measures of vegetation, Photographs, Sampling, Association between species, Plant communities, Classification, Multivariate analysis, Multivariate techniques, Ecological resemblance, Cluster analysis, Ordination (indirect and direct), Different ordination techniques, PCA, Pattern, Habitats and ecosystems of Sri Lanka

Evaluation methods: End semester examination: 70%, Continuous assessments and Practical records: 30%

BOT4022: Horticulture, Floriculture and Landscaping (25 Lecture hrs. + 15 Practical hrs.)

Divisions of horticulture, Advantages and disadvantages of horticulture, Classification of horticultural plants, Plant propagation methods, Cultivation of horticultural plants, Plant nurseries, Hydroponics and aquaponics, Floriculture, Landscaping: Designing, installing and maintenance, Site selection, Selection of plants, Post-planting immediate care, Pruning and training of plants, Art of Bonsai, Wildlife gardening, Protected Horticulture and Plant growth structures.

Evaluation methods: End semester examination: 70%, Continuous assessments and Practical records: 30%

BOT4032: Microbial Ecology (25 Lecture hrs. + 15 Practical hrs.)

Historical developments, Microbial evolution and biodiversity, Interactions among microbial population, Interactions between microorganisms and plants, Microbial interactions with animals, Development of microbial communities, Microorganisms in their natural habitats, Quantitative assessment of microbial populations, Physiological adaptations of microorganisms to environmental conditions, Biogeochemical cycling, Biotechnological aspects of microbial ecology**.**

Evaluation methods: End semester examination: 70%, Continuous assessments and Practical records: 30%

BOT4042: Applied Microbiology (30 Lecture hrs.)

Principles of industrial microbiology (properties of the ideal strain, fermentation media and systems, bioreactor designs, downstream processing, product development), Microbes as living factories: Biocatalysts of useful products, Organic synthesis, synthesis of optically pure drugs, antibiotics, polysaccharides and polyesters, microbial biomass, food additives, Microbial enzymes (production and application), Food and beverage fermentation, Microbes and energy, Biomass to fuels (ethanol, methane), Bacterial batteries, Environmental applications (Biodegradation and bioremediation, sewage and wastewater treatment, mineral recovery, bio-deterioration), Medical microbiology.

Evaluation methods: End semester examination: 70% and Continuous assessments: 30%

BOT4052: Advanced Plant Pathology (20 Lecture hrs. + 21 Practical hrs.)

Molecular plant pathology, Genetics of host-pathogen interactions (gene for gene interaction, recognition and triggering resistance), Hypersensitive reaction (oxidative burst, cell death), Induced resistance in plants (local and systemic), Putative signal transduction pathways towards systemic resistance, Biotechnology in plant protection, Diseases caused by proteins, Molecular tools used in plant pathology Ecological plant pathology, Disease assessment, Epidemiology, Disease forecasting, Plant disease management (chemical, cultural, biological control and integrated approaches)

Evaluation methods: End semester examination: 70%, Continuous assessments and Practical records: 30%

BOT4062: Advanced Molecular Biology (25 Lecture hrs. + 15 Practical hrs.)

Genome organization, Chromosome structure and function, Organelle gene organization and extra nuclear inheritance, recombination, DNA repair, Gene expression in prokaryotes and eukaryotes, Gene regulation at different stages, post-transcriptional modifications, Protein synthesis, structures and trafficking, Transposons and their practical applications, Human genome project, Seminars in molecular biology.

Evaluation methods: End semester examination: 70%, Continuous assessments and Practical records: 30%

BOT4072: Economic Botany and Entrepreneurship (30 Lecture hrs.)

Concepts of economics, Economic aspects of different plant categories including mangroves, and medicinal plants, Plantation crops in Sri Lanka, Fruits and vegetables, Fiber and Timber, Spices, Oils, Gums, Algae, Microorganisms, Plant based industries and concepts of entrepreneurship, Excursions.

Evaluation methods: End semester examination: 70% and Continuous assessments: 30%

BOT4082: Forestry and Forest Management (30 Lecture hrs. + 21 Practical hrs.)

Introduction to forestry, History of forestry, Biomes & forest classification in Sri Lanka, Forest policies & laws in Sri Lanka, Forest mensuration and inventory, Silviculture & different silviculture systems, Agroforestry & social forestry, Use of remote sensing and GIS in forestry, Forest management, Carbon stock & sequestration, REDD+ program.

Evaluation methods: End semester examination: 70%, Continuous assessments and Practical records: 30%

BOT4092: Food Science and Technology (25 Lecture hrs. + 15 Practical hrs.)

History of food science & technology, Food spoilage, Food poisoning, Food preservation methods, Postharvest technology, Food packaging and labelling, Genetically modified/engineered food, Food additives, Food Adulteration, Food sensory analysis, Fruit ripening, Microbes in food industry.

Evaluation methods: End semester examination: 70%, Continuous assessments and Practical records: 30%

BOT4102: Plant Cell and Tissue Culture (25 Lecture hrs. + 15 Practical hrs.)

In vitro methods in plant tissue culture, Micro propagation, Callus and suspension cultures, Organ cultures, Organogenesis, Embryogenesis, Haploid cultures, Protoplast cultures and their applications, Soma clonal variation and applications, In vitro production of secondary metabolites, Virus free plants and rejuvenation, Somatic embryogenesis and artificial seeds, Applications of tissue culture in Sri Lanka, Conservation, Cryopreservation, Structure of a plant tissue culture laboratory, Seminars in current topics in tissue culture.

Evaluation methods: End semester examination: 70%, Continuous assessments and Practical records: 30%

BOT4112: Weed Biology and Management (25 Lecture hrs. + 15 Practical hrs.)

Introduction, Characteristics of weeds, Weed spread and evolution, Problems and losses caused by weeds, Preventive, mechanical & chemical weed control: Herbicides (application, mechanisms of action, transformations in plants, persistence and behavior in soil, environmental fate of herbicides, herbicide behavior in plants, herbicide formulations, herbicide families and characteristics, developing a weed management program, herbicide Resistance), Organic weed management, Weed management in selected crops, Vegetables and Turf, Invasive species, Allopathic effect of weeds, Paddy field and aquatic weeds

Evaluation methods: End semester examination: 70%, Continuous assessments and Practical records: 30%

BOT4122: Genetic Engineering and Biotechnology (30 Lecture hrs.)

Introduction to genetic engineering, concept of reverse genetics, techniques in recombinant DNA technology (enzymes, vectors, cloning, library preparation, sequencing and transformation), methods of gene modification, genetic engineering of microorganisms and plants, popular genetically modified organisms in research, industry (food and pharmaceutical), agriculture, DNA fingerprinting, Disease diagnosis, Gene therapy and forensics, Ethics in genetic engineering and biotechnology.

Evaluation methods: End semester examination: 70% and Continuous assessments: 30%

BOT4132: Advanced Plant Physiology (25 Lecture hrs. + 15 Practical hrs.)

Crop photosynthesis and yield, Metabolic and structural factors influencing photosynthetic rate, Light distribution and canopy structure, Limitations of crop yield by weather and climate, Partitioning and re-mobilization of photosynthetic assimilates, Translocation and source sink relationship, Effects of water relations, mineral nutrition and plant growth regulators in crop production, Biochemical adaptations of plants to the environment, Biochemistry of C3 C4 intermediate species, Calcium in plants and its role of controlling stomatal function, Stress plant physiology types of stress, responses of plant to environmental stress), Antioxidant, Free radical and membrane stability under stress conditions.

Evaluation methods: End semester examination: 70%, Continuous assessments and Practical records: 30%

BOT4142: Advanced Environmental Science (25 Lecture hrs. + 15 Practical hrs.)

The global environment (population growth, decline of vital life support ecosystems, global atmospheric changes, loss of biodiversity), Sustainability, Solid waste management, Anaerobic digestion technology, Agriculture related environmental problems, Environmental monitoring, Bio indicators and bio-monitoring, Bioremediation, Bioremediation techniques, Phytoremediation, Uses of plants in air quality monitoring & urban greening, Principles of Environmental Impact Assessment (EIA), Legal aspects of EIA, Challenges of EIA, Legal aspects of environmental pollution in Sri Lanka, Some applications of environmental biotechnology.

Evaluation methods: End semester examination: 70%, Continuous assessments and Practical records: 30%

BOT4152: Advanced Plant Virology (20 Lecture hrs. + 21 Practical hrs.)

History of viruses and plant virology, properties of viruses, virus architecture, virus taxonomy, virus genome, virus genome replication, virus genome translation strategies, plant virus infection process, translocation of viruses in plants, plant virus disease symptoms, defense and counter defense mechanisms, transmission of plant viruses, plant virus disease control, plant virus disease diagnostics, and diseases caused by viroids.

Evaluation methods: End semester examination: 70%, Continuous assessments and Practical records: 30%

BOT4162: Wood Science and Technology (25 Lecture hrs. + 15 Practical hrs.)

Wood anatomy and structure of wood, Structure of wood, Physical properties of wood, Mechanical properties of wood, Identification of wood species, Defects of woods, Grading of woods/timber, Common and specific uses of wood, Wood seasoning, Wood preservation, Wood-based industries.

Evaluation methods: End semester examination: 70%, Continuous assessments and Practical records: 30%

BOT4172: Techniques in Plant Breeding (25 Lecture hrs. + 15 Practical hrs.)

History of plant breeding, Conventional breeding methods (mass selection, pure line selection, hybridization, single seed descent, backcross breeding, recurrent selection methods, synthetic varieties), Modern plant breeding methods (molecular markers, quantitative trait loci, gene mapping, selectable marker genes, protoplast culture techniques, another culture),

Evaluation methods: End semester examination: 70%, Continuous assessments and Field visit reports: 30%

BOT4182: Practical Skills in Botany I (75 Practical hrs.)

Plant Anatomy: Identification of different cell types, Simple and complex tissues in monocotyledon and dicotyledonous plants, Identification of plant type (monocot or dicot) by doing anatomical study by using given specimen, Check the anomalous growth in given plants, Plant histology protocols and their application, Taxonomic identity of plants and its uses, Plant diversity, Unity and evolution: Characterization of morphological and reproductive diversity of Cyanobacteria, Algae, Fungi, Bryophytes, Pteridophyta and seed plants, Herbarium Techniques: Proper use of herbarium collection, Collecting herbarium specimens (terrestrial and aquatic plants), Techniques in preparation of herbarium sheets and Techniques in herbarium preservation.

Evaluation methods: End semester practical examination: 50%, Hands-on skills: 10%, practical/field/industrial visit reports and Continuous assessments: 40%

BOT4192: Advanced Plant Systematics (25 Lecture hrs. + 15 Practical hrs.)

Species concept and speciation, Phenotypic plasticity, Nucleotide diversity and polymorphism, Plant systematics and molecular evolution, Forces of evolution, Botanical gardens, regulations and getting permission in plant collection, Preservation of plant materials and field techniques, applications of herbaria, Taxonomic evidence to classify and group plants, Molecular systematics, Analysis of data gathered from different sources, Population Genetics, Red list and conservation, IUCN, Seminars in related topics in Plant Systematics.

Evaluation methods: End semester examination: 70%, Continuous assessments and Seminar presentations: 30%

BOT4202: Ecotoxicology (25 Lecture hrs. + 15 Practical hrs.) *Optional for students following Honours Degree in Botany*

History, basic concepts and terminology, Toxicology and its branches, Classification of toxins/ toxicants, Use classes and exposure classes of toxicants, Toxicity and toxicity testing, Dose response relationship, Probity analysis, Factors affecting the toxicity, Toxicity of mixtures of toxicants, Toxic kinetics & toxic dynamics of toxicants, Ecological assessments, Phytotoxicity assessments, Cytotoxicity and Geno toxicity, Environmental fate of toxicants, Biotic and abiotic degradation, Bioaccumulation, Bio magnification, Bio indicators and biomarkers, Bio toxins with special reference to algal and cyanobacterial toxins.

Evaluation methods: End semester examination: 70%, Practical examination and Continuous assessments: 30%

BOT4212: Biostatistics (25 Lecture hrs. + 21 Practical hrs.)

Fundamental concepts in probability, Random variables, Means, Variance and Expected values, Classification and description of sample data, Sampling distributions, Estimations, Hypothesis testing, Regression analysis, Analysis of variance, Scientific applications, Exercises with applications of computer software for data analysis (10 exercises).

Evaluation methods: End semester examination: 70%, Practical examination and Continuous assessments: 30%

BOT4222: Molecular Evolution and Phylogenetics (25 Lecture hrs. + 15 Practical hrs.)

Molecular evolution, Gene substitution, Gene fixation, Multiple hits, Nucleotide polymorphisms and nucleotide diversity, DNA sequence alignment, Sequence analysis, Tajima's D statistics, Molecular clock, Molecular phylogeny, Phylogenetic trees, Species tree VS gene tree, Methods of phylogenetic tree building (Distance, Parsimony and Likelihood); UPGMA, NJ, ML, MP trees, Bootstrap analysis, Use of computer software for sequence alignment, editing and analysis, Genbank searching

Evaluation methods: End semester examination: 70%, Practical examination and Continuous assessments: 30%

BOT4232: Plant Ecophysiology (25 Lecture hrs. + 15 Practical hrs.) *Optional for students following Honours Degree in Botany*

Plant cell and its environment, Plant growth and plant growth analysis, Interactions between functions of plants and environmental parameters, Light environment of plants and measurements, Water status and water stress, Methods of assessing water status and water stress, Dendroclimatology, Stable carbon isotopes in plant ecophysiology studies, Dendroclimatology.

Evaluation methods: End semester examination: 70%, Continuous assessments and Practical records : 30%

BOT4242: Seed Physiology and Technology (20 Lecture hrs. + 21 Practical hrs.)

Seed morphology, Seed development, Orthodox and recalcitrant seeds, Planting value of seeds, Seed quality, Physical biochemical, performance and Stress tests for seed vigor, Soil health, Soil seed bank, Seed longevity, Seed processing, Seed treatment, Seed packaging & marketing, Seed deterioration, Storage of seeds, Seed dormancy

Evaluation methods: End semester examination: 70%, Continuous assessments and Practical records: 30%

BOT4252: Practical Skills in Botany II (75 Practical hrs.)

Microbiology: Isolation, enumeration and characterization of bacteria, actinomycetes, fungi, mycorrhizae and bacteriophage from soil and water, Microbial activities in soil, Effect of antimicrobial compounds and antibiotics on microbial growth, Plant pathology: Scientific approach in disease diagnosis, Isolation and identification of important plant pathogens, mechanisms of antagonism, physiological responses of plants to biotic elicitors, Plant systematics: Analysis of molecular data for taxonomic verification, Genetics: Gene linkage, Crossing over and mapping, Pedigree analysis in fungal genetics, Tetrad analysis in fungal genetics.

Evaluation methods: End semester practical examination 50%, Hands-on skills 10%, Practical/field/industrial visit reports and Continuous assessments: 40%

BOT4262: Scientific Writing Seminars and Industrial Training

Principles of effective writing, Understanding the writing process, structure & format of a research paper, Planning, writing, and editing a research paper, title and abstract. Peer review process, Ethical Issues in scientific writing (plagiarism, authorship, reproducible research, Predatory publications), Understanding how scientific journal and publication works. Writing for general audiences. Conducting seminars on given topics, Attending and writing reports on, industrial training

Evaluation methods: Continuous assessments: 70%, Evaluations of seminar presentations/industrial training report: 30%

BOT4276: Research Project

Each student will be required to conduct a research project related to his/her field of specialization during the fourth year. The project should be approved by the Department. Students are expected to complete the research during the last semester. The candidate must submit the results as a dissertation and present a seminar.

Evaluation methods: Defend the research proposal: 15%, Seminar presentations: 25%, Thesis: 60%

BOT4282: Bioinformatics (20 Lecture hrs. + 21 Practical hrs.)

Introduction to Bioinformatics, Genome and proteome databases, Sequence alignment (pairwise alignment, database similarity search, multiple sequence alignment, Hidden Markova Model, domain prediction), Phylogenetic tree, High throughput sequencing methods and data analysis, Genomics (genome/transcriptome mapping, assembly and annotation), Proteomics (protein structure, prediction and expression analysis), Applications of bioinformatics (functional genomics, metagenomics, genome editing).

Evaluation methods: End semester examination: 70% and continuous assessments: 30%

BOT4292: Practical Skills in Botany III (75 Practical hrs.)

Plant Physiology and Biochemistry: Water transportation in plants and stomatal physiology, Allelo chemicals in plants, Enzyme catalyzed reactions in plant cells, Plant responses to changing environment (physiological and anatomical responses and biochemical responses (different alleochemical profiles in plants), Properties of major organic compounds in plants, Application of plant hormones in agriculture, Environmental Science: Physicochemical and biological characterization of contaminated matrices; soil and water, biomonitoring methods (Palmer pollution index and atmospheric air pollution tolerance index), Toxicity characterization and risk assessment, Plant Ecology: Quantitative characters in the ecosystem and data collection methods, Importance of statistical packages in research/experimental data, Basic concepts in biodiversity and different calculation methods of biodiversity in ecosystems, Importance of world biomes, Eco zones and ecoregions, Effects of biodiversity, Conservation methods of biodiversity and ecosystem valuation and environmental accounting, Indigenous knowledge on plant ecology in Sri Lanka (case studies), Biostatistics: Hypothesis testing and ANOVA, Graphical presentation of data, Construction of correlation matrix, Multivariate techniques; Principle component analysis and Factor analysis, Statistical packages.

Evaluation methods: End semester practical examination: 50%, Hands-on skills: 10%, Practical/field/industrial visit reports and Continuous assessments: 40%

2.6. Credit Values

2.6.1. BSc General Degree

Course Unit	Duration (hrs.)		Credits		Total
	Theory	Practical	Theory	Practical	
BOT1112: Plant Diversity, Unity and Evolution	30		2		2
BOT1121: Scientific Approach and Biometrics	15		1		1
BOT1131: Plant Anatomy	15		1		1

BOT1141: Botany Practical I		45		1	1
BOT1212: Genetics	30		2		2
BOT1221: Plant Systematics	15		1		1
BOT1231: Plant Ecology	15		1		1
BOT1241: Botany Practical II		45		1	1
BOT2112: General Microbiology	30		2		2
BOT2121: Plant Pathology	15		1		1
BOT2131: Molecular Biology	15			1	1
BOT2141: Botany Practical III		45		1	1
BOT2212: Plant Physiology and Biochemistry	30		2		2
BOT2221: Environmental Science	15		1		1
BOT2231: Soil- Plant Relationships	15		1		1
BOT2241: Botany Practical IV		45		1	1
BOT3112: Advanced Plant Ecology	20	21	1.3	0.7	2
BOT3122: Horticulture, Floriculture and Landscaping	20	21	1.3	0.7	2
BOT3132: Advanced Microbiology	20	21	1.3	0.7	2
BOT3142: Advanced Plant Pathology	15	30	1	1	2
BOT3162: Forestry	20	15	1.5	0.5	2
BOT3172: Food Technology	20	21	1.3	0.7	2
BOT3182: Advanced Molecular Biology	20	21	1.3	0.7	2
BOT3191: Weed Biology	12	06	1.6	0.5	2
BOT3212: Wood Science	20	21	1.3	0.7	2
BOT3222: Plant Tissue Culture	20	21	1.3	0.7	2
BOT3232: Advanced Plant Physiology	25	15	1.5	0.5	2
BOT3242: Advanced Environmental Science	20	21	1.3	0.7	2
BOT3251: Plant Virology	15		1		1
BOT3261: Economic Botany	15		1		1
BOT3271: Genetic Engineering and Biotechnology	15		1		1
BOT3282: Plant Breeding	25	15	1.5	0.5	2
BOT3292: Plant Ecophysiology	25	15	1.5	0.5	2

2.6.2. BSc (Honours) Degree in Botany

Course Unit	Duration (hrs.)		Credits		Total
	Theory	Practical	Theory	Practical	
BOT4012: Quantitative Plant Ecology	25	15	1.5	0.5	2
BOT4022: Horticulture, Floriculture and Landscaping	25	15	1.5	0.5	2
BOT4032: Microbial Ecology	25	15	1.5	0.5	2
BOT4042: Applied Microbiology	30		2		2
BOT4052: Advanced Plant Pathology	20	21	1.3	0.7	2
BOT4062: Advanced Molecular Biology	25	15	1.5	0.5	2
BOT4072: Economic Botany & Entrepreneurship	30		2		2
BOT4082: Forestry & Forest Management	30	21	1.5	0.5	2
BOT4092: Food Technology	25	15	1.5	0.5	2
BOT4102: Plant Cell and Tissue Culture	25	15	1.5	0.5	2
BOT4112: Weed Biology and Management	25	15	1.5	0.5	2

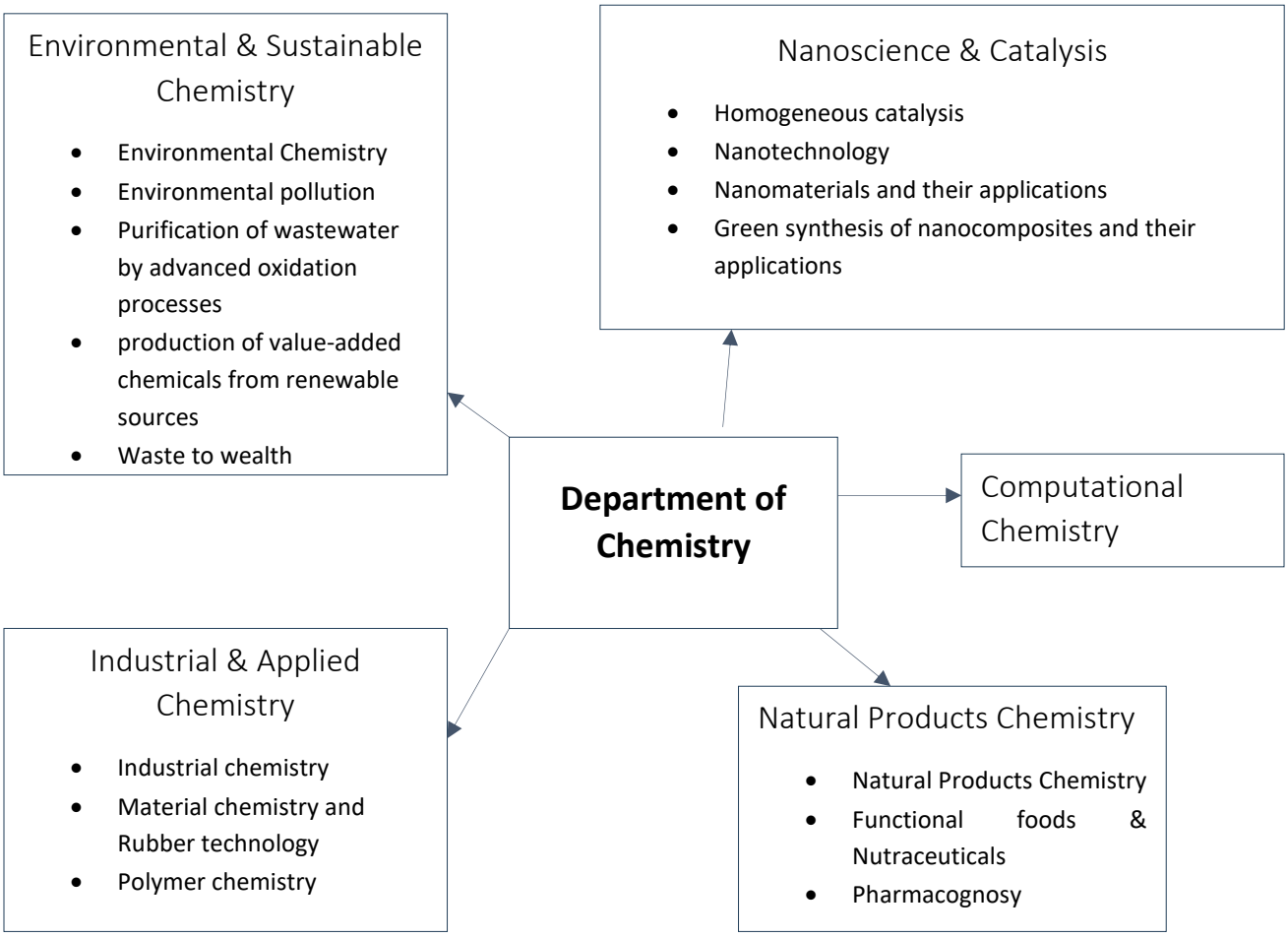
Course Unit	Duration (hrs.)		Credits		Total
	Theory	Practical	Theory	Practical	
BOT4122: Genetic Engineering & Biotechnology	30		2		2
BOT4132: Advanced Plant Physiology	25	15	1.5	0.5	2
BOT4142: Advanced Environmental Science	25	15	1.5	0.5	2
BOT4152: Advanced Plant Virology	20	21	1.3	0.7	2
BOT4162: Wood Science & Technology	25	15	1.5	0.5	2
BOT4172: Techniques in Plant Breeding	25	15	1.5	0.5	2
BOT4192: Advanced Plant Systematics	25	15	1.5	0.5	2
BOT4202: Ecotoxicology	25	15	1.5	0.5	2
BOT4212: Biostatistics	20	21	1.3	0.7	2
BOT4222: Molecular Evolution and Phylogenetic	25	15	1.5	0.5	2
BOT4232: Plant Ecophysiology	25	15	1.5	0.5	2
BOT4242: Seed Physiology and Technology	20	21	1.3	0.7	2
BOT4282: Bioinformatics	20	21	1.3	0.7	2
Total Theory Credits					48
Practical, Soft skills & Research					
BOT4182: Practical Skills in Botany I	75hrs				2
BOT4252: Practical Skills in Botany II	75hrs				2
BOT4292: Practical Skills in Botany III	75hrs				2
BOT4262: Scientific Report Writing, Seminars & Industrial Training					2
BOT4276: Research Project					6
Total Practical, Soft skills & Research Credits					14
Total Botany Credits					62
Total Required Credits from Special Degree Course					60

3. Department of Chemistry

The vision of the department is to produce graduates with a sound knowledge in chemistry having international recognition and the ability to fulfill chemistry based current needs of the country. Our academic programmes provide high quality BSc General and Honours Degrees and challenging learning opportunities in fundamental, advance, practical and applied Chemistry. Research facilities are also offered to students who are seeking postgraduate qualifications such as MPhil and PhD Degrees in Chemistry. The department is equipped with five elementary (teaching) laboratories with a total capacity of 240 to 300 undergraduates and two advanced laboratories for students reading for BSc Honours Degree and for postgraduate degrees in Chemistry. In addition to the above the department has a well-equipped equipment room (UV-vis, FTIR, GC, HPLC etc.) and two computer rooms with network facilities and a language laboratory. The computer facility is being used for computer-assisted learning in Chemistry. The department offers number of optional course units in Level III with an objective to enhance the employment opportunities of Chemistry graduates of University of Ruhuna.

3.1. Research Areas

Research activities in the following areas are carried out in the Department of Chemistry:



3.2. Head of the Department

Prof. Chinthaka S. Gangabadage
BSc (Ruhuna, SL), PhD (Radboud University Nijmegen, The Netherlands)

3.3. Members of the Academic Staff

Designation	Name	specialization
Emeritus Professor	Emeritus Professor H. M. K. K. Pathirana BSc (University of Sri Lanka, Vidyodaya) PhD(Aston in Bham, UK)	Inorganic Chemistry Organometallic Chemistry Environmental Chemistry Green Chemistry
Senior Professor	Senior Prof. V. P.Bulugahapitiya BSc (Ruhuna, SL) PhD(Fribourg, Switzerland)	Organic Chemistry
Professor	Prof. S. Wanniarachchi BSc (Ruhuna, SL), PhD(Marquette, USA)	Inorganic Chemistry
	Prof. W.S.Hemalika BSc (Ruhuna, SL), PhD (Marquette,USA)	Organic Chemistry
	Prof. N.K. Kalutharage BSc (Ruhuna, SL), PhD (Marquette,USA)	Inorganic Chemistry
	Prof. Chinthaka S. Gangabadage BSc (Ruhuna, SL), PhD (Radboud University Nijmegen, The Netherlands)	Biophysical Chemistry
Senior Lecturer Grade I	Dr. M. Edussuriya MSc, PhD (Moscow, Russia)	Physical Chemistry
	Dr. A.S. Ranaweera BSc (USJP, SL), PhD (MSU, USA)	Inorganic Chemistry
	Dr. Y.M.A.L.W. Yapa BSc (Ruhuna, SL), PhD (Toledo, USA)	Organic Chemistry
	Dr. H.J. Sampath BSc (Ruhuna, SL), PhD (Marquette,USA)	Inorganic Chemistry
	Dr. H.C. Manawadu BSc (Colombo, SL), PhD (KSU, USA)	Organic Chemistry
	Dr. H.D. Jayasekera BSc (Ruhuna, SL), PhD (Marquette,USA)	Organic Chemistry
	Dr. H.M.S. Wasana BSc (Ruhuna, SL) PhD (UOP, SL)	Analytical Chemistry Biochemistry

Designation	Name	specialization
Senior Lecturer Grade II	Dr. M.S. Kodikara BSc (Ruhuna, SL), PhD (ANU, Australia)	Physical Chemistry
	Dr. C.N. Rathnaweera BSc (Colombo, SL) PhD (MSU, USA)	Physical Chemistry
	Dr. W.K.K.D. Siriwardana BSc (Colombo, SL) PhD (MSU, USA)	Analytical Chemistry
	Dr. L.S.N.S. Lamahewage BSc (Kelaniya, SL) PhD (ISU, USA)	Analytical Chemistry
	Dr. S.D.M. Siddhiaratchi BSc (Colombo, SL) PhD (LSU, USA)	Inorganic Chemistry
Lecturer (Probationary)	Mr. Y.C.Y. Sudusinghe BSc (USJP, SL) (On Leave)	Reading for PhD in USA

3.4. Course Units in Chemistry for BSc (General) Degree

BSc Level I - Semester I

CHE1112: General Chemistry and Basic Concepts in Analytical Chemistry

General Chemistry: Atomic structure and subatomic particles, Atomic properties, Nuclear stability and nuclear reactions, Chemical bonding, VSEPR theory and molecular orbital theory.

Analytical chemistry: Significant figures, Statistical analysis of chemical data, Solubility and solubility product, Gravimetric, titrimetric (acid/base, redox, complexometric and precipitation).

Evaluation methods: Continuous Assessment: 30%, Semester End Examination: 70%

CHE1122: Fundamentals in Organic Chemistry

Basic concepts in organic chemistry, IUPAC nomenclature of organic compounds, Stereoisomerism conformational analysis, Reactive intermediates, Reactions of aliphatic compounds, Aromaticity and reactions of aromatic compounds.

Evaluation methods: Continuous Assessment: 30%, Semester End Examination: 70%

CHE1131: Practical Inorganic Chemistry-I

Safe laboratory practices, Basic laboratory techniques; Qualitative semi-micro analysis of inorganic samples/inorganic mixtures for basic cations and anions acid base titrations, Permanganometry, Iodometry, Dichromate titrations.

Evaluation methods: Continuous Assessment: 30%, Semester End Examination: 70%

BSc Level I - Semester II

CHE1212: Descriptive Inorganic Chemistry I

Chemistry of s and p block elements; Oxides, Sulphates, Nitrates, Carbonates, Allotropes, Three-centered bonding, Silicones, Chemistry of transition elements: General properties, Oxidation states, Color, Magnetic properties, Chemistry of some selected transition elements, Extraction, Reactions and applications, Coordination chemistry: Isomerism, Classification of ligands and coordination number, IUPAC nomenclature, Chelate effect, Valence Bond Theory and Crystal Field Theory, Jahn-Teller effect.

Evaluation methods: Continuous Assessment: 30%, Semester End Examination: 70%

CHE1222: Physical Chemistry I

State of matter: Macroscopic and microscopic approach to physical chemistry; Perfect gases; Kinetic molecular theory of gases, Collision frequency, Real gases and non-ideal behavior. Raoults law and ideal mixtures. Chemical thermodynamics and colligative properties: Thermodynamics and path properties, First law of thermodynamics, Carnot cycle, Second law of thermodynamics, Statistical basis of entropy, Free energy functions. Chemical kinetics: Rate and rate law of reactions, Differential and integrated rate laws, Half-life of reactions, Simple collision theory of gas phase reactions, Factors affecting the rate of reactions, Reaction coordinates and activation energy, Arrhenius equation, Reaction mechanism and steady state approximation, Theory of unimolecular reactions.

Evaluation methods: Continuous Assessment: 30%, Semester End Examination: 70%

CHE1231: Practical Organic Chemistry-I

Qualitative analysis; Elemental analysis, Functional groups analysis, Preparation of derivatives and recrystallization, Determination physical constants, Identification and separation of binary organic mixtures.

Evaluation methods: Continuous Assessment: 30%, Semester End Examination: 70%

BSc Level II - Semester I

CHE2112: Descriptive Organic Chemistry and Spectroscopy

Organic synthesis; Retro-synthetic Analysis, Synthesis of organic Compounds. Introductory Natural Product Chemistry; Chemistry of alkaloids, terpenoids and steroids, Extraction and phytochemical screening of Natural Products. UV-Vis, Infrared, Nuclear Magnetic Resonance (^{1}H–, ^{13}C–, ^{31}P–, ^{19}F–) and Mass spectroscopy; Interpretation of the spectra of organic compounds, Electron Spin Resonance.

Evaluation methods: Continuous Assessment: 30%, Semester End Examination :70%

CHE2122: Physical Chemistry II

Quantum Chemistry: Failure of classical physics and emergence of quantum mechanics for microscopic systems; Quantization and zero-point energy; Exact solutions and particle in a zero potential box.

Surface Chemistry: Surface phenomena and different surfaces and interfaces, Thermodynamics of surfaces and properties of colloids.

Molecular Spectroscopy: Electromagnetic radiation, Different components in molecular spectroscopy of diatomic molecules, Vibrational spectra of polyatomic molecules and Raman spectroscopy.

Photochemistry: Principles of photochemistry, Singlet states and triplet states, Franck-Condon Principle, Jablonski diagrams, Photochemical reactions and photosensitization.

Evaluation methods: Continuous Assessment: 30%, Semester End Examination :70%

CHE2131: Practical Inorganic and Organic Chemistry II

Laboratory techniques; use of analytical balance for accurate measurements, Preparation of standard solutions, EDTA titrations, Direct titrations, Back titration, Use of masking and damasking agents, Metal ion indicators, synthesis and analysis of transition metal complexes, Gravimetric determinations organic synthesis, Thin Layer and Paper Chromatography, Distillation methods, Sublimation, Extraction of Natural Products.

Evaluation methods: Continuous Assessment: 30%, Semester End Examination :70%

BSc Level II - Semester II

CHE2212: Descriptive Inorganic Chemistry II

Chemistry of lanthanides and actinides; Organometallic chemistry; Classification, 18- electron rule, Bonding and basic chemistry of metal carbonyls, Alkenes and cyclopentadienyl complexes. Inorganic reaction mechanisms; Ligand substitution reactions in octahedral and square planar complexes, Trans effect. Molecular symmetry and Point groups; Symmetry elements and operations, Determination of point groups. Electronic spectra of transition metal complexes; Russel Saunders couplings, Interpretation of electronic spectra of simple coordination complexes.

Evaluation methods: Continuous Assessment: 30%, Semester End Examination :70%

CHE2222: Physical and Analytical Chemistry

Electrolyte solutions; activities of ions in solution and significance of the mean ionic activity coefficient. Redox reactions and standard reduction potential; Conductometry, Strong and weak electrolytes and ionic mobility. Phases, Components, Degrees of freedom and the phase rule; Cooling curves, one, two, and three component systems and lever rule, Solubility of components; distillation of mixtures. Analytical chemistry: Instrumental analysis; Atomic Absorption Spectroscopy, Flame photometry and Calorimetry. Solvent extraction, Chromatography, A brief Introduction to Electroanalytical techniques.

Evaluation methods: Continuous Assessment: 30%, Semester End Examination :70%

CHE2231: Practical Physical Chemistry and Spectroscopy

Experiments in chemical kinetics, Thermodynamics, Spectrophotometry, Surface chemistry and electrochemistry, and viscometry. Interpretation of ^{1}H NMR, ^{13}C NMR, MS, FTIR and UV spectra of simple organic compounds.

Evaluation Method: In course Assessment in Physical Chemistry: 20%, Semester End Examination in Spectroscopy: 30%, Semester End Examination in Practical Physical Chemistry: 50%

BSc Level III - Semester I

CHE3112: Industrial Chemistry I

Theoretical interpretation of industrial process. Quality management, Food chemistry and technology, Chemistry related to food harvesting, storing, ackaging, spoilage, deterioration, processing and preservation, Dairy industry. Practical(s): Case studies in industrial concepts, Food technology and analysis.

Evaluation methods: Mid Semester Theory Examination: 20%, Semester End Theory Examination: 50%, Semester end Practical Assessment: 30%

CHE3122: Analytical Chemistry

Sampling methods, Chemometrics, Instrument performance characteristics. Atomic absorption, emission and inductively coupled plasma spectroscopy, Fluorescence spectroscopy. Electroanalytical chemistry, Potentiometric methods, Electrogravimetric methods, Coulometry, Voltammetry. Practical: Electroanalytical techniques.

Evaluation methods: Mid Semester Theory Examination: 20%, Semester End Theory Examination: 50%, Semester end Practical Assessment: 30%

CHE3132: Biochemistry

Amino acids, Peptides and proteins, Carbohydrates, Lipids, Nucleotides and nucleic acids, Enzymes, Coenzymes. Enzyme kinetics and inhibition, Bioinorganic chemistry; structure and function of proteins. Practical: Isolation, Purification, Quantitative and qualitative identification of biomolecules, Identify reducing sugars, polysaccharides, lipids, amino acids and proteins using diagnostic reagents.

Evaluation methods: Mid Semester Theory Examination: 20%, Semester End Theory Examination: 50%, Semester end Practical Assessment: 30%

BSc Level III - Semester II

CHE3212: Environmental Chemistry

Atmospheric, aquatic and soil chemistry, water quality parameters, treatment of water to produce potable water. Treatment methods for industrial waste, Case studies, Air quality analysis, Industrial pollution, Agrochemicals, Clinical waste, e-waste, Nuclear waste, Air pollution, Soil analysis, Solid waste treatment and practical related to above.

Evaluation methods: Mid Semester Theory Examination: 20%, Semester End Theory Examination: 50%, Semester end Practical Assessment: 30%

CHE3222: Industrial Polymer Chemistry

Industrial polymers, and polymer structures, Mechanisms and kinetics of polymerization, Molecular weight distributions, Methodologies of polymer synthesis, Physical and mechanical properties of polymers, Chemistry of rubber & related industries, Chemistry and technology of wood adhesives. **Practical**: Synthesis of polymers and adhesives; testing of viscosity, Mechanical and non-mechanical properties.

Evaluation methods: Mid Semester Theory Examination: 20%, Semester End Theory Examination: 50%, Semester end Practical Assessment: 30%

CHE3232: Pharmaceutical Chemistry

Drug categories, main process of drug in the body; administration, absorption, transportation, action and metabolism. Prodrugs, Drug specificity, Bioassay methods and Natural Product based leading compounds, inorganic pharmaceuticals and drug storage and drug deterioration. Drug safety, Quality assurance, Standardization related herbal drugs, Selected topics of drugs. Laboratory course on analysis of drugs preparation of electrolytes, Purification methods of drugs and test for purity, Drug synthesis and preparation of drug monograph.

Evaluation methods: Mid Semester Theory Examination: 20%, Semester End Theory Examination: 50%, Semester end Practical Assessment: 30%

NOTE: Students are required to earn 24 credits to claim the Chemistry subject. Continuous assessments are compulsory in all theory and practical course units, otherwise zero marks shall be carried on to the final marks.

For Optional Courses: Minimum number of students is 30.
(In Special circumstances, Department will decide the minimum number.)

3.5. Course Units in Chemistry for BSc (Honours) Degree

Note: Depending on the resources available, certain alterations in the syllabus will have to be made and those alterations will be informed from time to time.

CHE4114: Advanced Inorganic Chemistry-I (60 Lecture hrs.)

Molecular symmetry and Group theory(10L), Molecular orbital theory(10L), Advanced coordination chemistry(10L), Advanced organometallic chemistry-I (10L), Advanced inorganic reaction mechanisms (10L) Electronic spectra of transition metal complexes (10L).

Evaluation method: Continuous Assessments and /or End Semester Examination

CHE4123: Reactive Intermediates & Advanced Organic Reaction Mechanisms (45 Lecture hrs.)

Reactive intermediates (8L), Advanced organic reaction mechanisms (10L), Physical organic chemistry(10L), Organic photochemistry (9L), Pericyclic reactions (8L).

Evaluation method: Continuous Assessments and /or End Semester Examination

CHE4132: Quantum Chemistry and Molecular Spectroscopy (30 Lecture hrs.)

Quantum chemistry (12L), Molecular spectroscopy (10 L), Photochemistry (08L)

Evaluation method: Continuous Assessments and /or End Semester Examination

CHE4142: Laboratory and Quality Management (30 Lecture hrs.)

Chemometry (10 L), Quality control & Quality assurance (10L), Laboratory and Quality management (10L)

Evaluation method: Continuous Assessments and /or End Semester Examination

CHE4152: Laboratory Inorganic Chemistry (90 hrs.)

Semi micro qualitative analysis, Gravimetric analysis, Chromatography, Titrimetric analysis.

Evaluation method: Continuous Assessments and /or End Semester Examination

CHE4162: Laboratory Physical Chemistry (90 hrs.)

Phase equilibria (two and three component systems), Constant pressure and constant volume calorimetry, Chemical kinetics, Thermodynamics and Colligative properties, Refractometry, Spectrophotometry, Thermal differential analysis, Chemical Equilibria, Potentiometric, Potentiodynamic and Potentiostatic techniques

Evaluation method: Continuous Assessments 20%, Presentation 5%, Report 5% and End Semester Examination 70%

CHE4213: Advanced Organic Chemistry I (45 Lecture hrs.)

Structure determination of organic molecules using spectroscopy (20L), Natural Products Chemistry (25L).

Evaluation method: Continuous Assessments and /or End Semester Examination

CHE4223: Topics in Advanced Physical Chemistry (45 Lecture hrs.)

Advanced thermodynamics (11L), Statistical thermodynamics (12 L), Advanced kinetics (12L), Advanced electrochemistry (10L)

Evaluation method: Continuous Assessments and /or End Semester Examination

CHE4233: Advanced Analytical Chemistry-I (45 Lecture hrs.)

Principles of instrumentation (10L), Electroanalytical chemistry (20L), Chromatography (15L).

Evaluation method: Continuous Assessments and /or End Semester Examination

CHE4242: Advanced Analytical Chemistry II (30 Lecture hrs.)

Solvent extraction, Distillation (08L), Molecular absorption and Emission spectroscopy (07L), FTIR, CD spectroscopy (08L), Atomic absorption spectroscopy (07L).

Evaluation method: Continuous Assessments and /or End Semester Examination

CHE4252: Environmental Chemistry (30 Lecture hrs.)

Chemical concepts pertaining to environmental processes (02L), Aquatic chemistry (08L), Atmospheric chemistry (10L), Soil chemistry (10L).

Evaluation method: Continuous Assessments and /or End Semester Examination

CHE4262: Laboratory Organic Chemistry (90 hrs.)

Purification of organic mixtures using different methods (Crystallization and Distillation), Synthesis of organic compounds, Monitoring of organic synthesis using chromatography. Extraction and phytochemical analysis of Natural Products. Purification of Natural Products extracts using chromatography and characterization of Natural products. Structure elucidation of organic molecules using spectroscopy (UV, IR, Mass and NMR). Drug synthesis and drug analysis, Extraction of Oleoresin and analysis.

Evaluation method: Continuous Assessments 30% and End Semester Examination 70%

CHE4272: Laboratory Analytical Chemistry (90 hrs.)

Titrimetric & photometric analysis of synthesized inorganic complexes, Laboratory environmental chemistry, Laboratory in industrial based analysis.

Evaluation method: Continuous Assessments and /or End Semester Examination

CHE4314: Advanced Inorganic Chemistry-II (60 Lecture hrs.)

Physical methods in inorganic chemistry (IR, NMR, MASS, MOSSBUAR, EPR, Diffraction techniques) (15L), Bioinorganic chemistry (10L), Selected topics in inorganic chemistry (17L), Advanced organometallic chemistry II (08L), Supramolecular chemistry (10L).

Evaluation method: Continuous Assessments and /or End Semester Examination

CHE4323: Advanced Organic Chemistry-II (45 Lecture hrs.)
Advanced stereochemistry (08L), Organic synthesis (20L), Advanced heterocyclic chemistry (08L), Carbohydrate chemistry (09L).

Evaluation method: Continuous Assessments and /or End Semester Examination

CHE4333: Solid State and Surface Chemistry (45 Lecture hrs.)
Solid state chemistry (10L), Surface chemistry (12L), Heterogeneous catalysis (08L), Intermolecular forces and magnetic properties (08L), Nano chemistry (07L).
Evaluation method: Continuous Assessments and /or End Semester Examination

CHE4342: Advanced Biochemistry (30 Lecture hrs.)
Peptides, Proteins, Nucleic acids (15L), Metabolisms of biomolecules (08L), Enzymology, Mechanism of enzyme action (07L).
Evaluation method: Continuous Assessments and /or End Semester Examination

CHE4352: Computational Chemistry (23 Lecture hrs. + 15 Practical hrs.)
Comparative Introduction to Classical and Quantum simulation methods, Classical Simulation, Quantum simulations (23L) and relevant Laboratory (15Hr)
Evaluation method: Continuous Assessments and /or End Semester Examination

CHE4362: Industrial Chemistry and Technology (30 Lecture hrs.)
Concepts in chemical engineering & Industrial chemistry (12L), Polymer science and technology (08L), Industrial pollution, Waste treatment (05L), Mineral resources in Sri Lanka Chemistry and Industrial Applications (05L).
Evaluation method: Continuous Assessments and /or End Semester Examination

CHE4371: Laboratory Biochemistry (45hrs)
Practical biochemistry and practical food chemistry
Evaluation method: Continuous Assessments 30% and End Semester Examination 70%

CHE4411: Current Topics in Chemistry
Self-study on the current topic provided by the staff.
Evaluation method: End Semester Written Examination

CHE4422: Essay and Seminar
Essay: Self-study of a given essay topic to each student and writing an essay.
Assessment method: Evaluation of Essay report + Essay Presentation and viva-voce
Seminar: Self-study and presentation on review articles given by the staff (02 articles in Level-II: 01 article per student per semester)
Assessment method: Evaluation of the presentation and viva-voce

CHE4436: Research project
Research topic is given to each student at the beginning of Honours Level-II. Conducting research, Submission of dissertation and presentation.
Assessment method: Evaluation of the Dissertation, Presentation and viva voce at the end of semester-II

Special Topics in Chemistry

CHE4442: Forest Products and Textile Industry (30L)
Wood adhesion and adhesives (15L), Textile chemistry (15 L)
Evaluation method: Continuous Assessments and /or End Semester Examination

CHE4452: Bimolecular NMR (30 Lecture hrs.)

Instrumentation, Applications of NMR spectroscopy, NMR sample preparations of biomolecules, Isotopic labeling, Spin-echo experiment, Pulse field NMR, Homonuclear and heteronuclear correlation experiments, NMR observables, how to use NMR restraints to structure calculation, Structure validation, Difficulties.

Evaluation method: Continuous Assessments and /or End Semester Examination

CHE4462: Medicinal Chemistry and Drug Development (30 Lecture hrs.)

Introduction to medicinal chemistry, Biopharmaceutical properties of drug substances, Pharmacologic activity of drugs, Pathological state of various diseases and role of drugs in such diseases. Anti-cancer drugs, Antibiotics, Anti HIV drugs etc. Introduction to computer aided drug design.

Evaluation method: Continuous Assessments and /or End Semester Examination

CHE4472: Biological Chemistry (30 Lecture hrs.)

Biophysical chemistry (08 L), Reactive species in biology (07L), Food chemistry and technology (08L), Pharmaceutical chemistry(07L).

Evaluation method: Continuous Assessments and /or End Semester Examination

CHE4482: Selected Topics in Industrial Chemistry (30 Lecture hrs.)

Cleaner production & green chemistry (10L),Cleansing agents (05L), Rubber chemistry & technology (10L), Surface coatings (05L). **Evaluation method: Continuous Assessments and /or End Semester Examination**

3.6. Credit Values

3.6.1. BSc General Degree

Course Unit	Duration (hrs.)		Credits		Total
	Theory	Practical	Theory	Practical	
CHE1112: General Chemistry and Basic Concepts in Analytical Chemistry	30		2		2
CHE1122: Fundamentals in Organic Chemistry	30		2		2
CHE1131: Practical Inorganic Chemistry-I		45		1	1
CHE1212: Descriptive Inorganic Chemistry I	30		2		2
CHE1222: Physical Chemistry I	30		2		2
CHE1231: Practical Organic Chemistry-I		45		1	1
CHE2112: Descriptive Organic Chemistry and Spectroscopy	30		2		2
CHE2122: Physical Chemistry II	30		2		2
CHE2131: Practical Inorganic and Organic Chemistry II		45		1	1
CHE2212: Descriptive Inorganic Chemistry II	30		2		2
CHE2222: Physical and Analytical Chemistry	30		2		2
CHE2231: Practical Physical Chemistry and Spectroscopy		45		1	1
CHE3112: Industrial Chemistry I	20	21	1.3	0.7	2
CHE3122: Analytical Chemistry	20	21	1.3	0.7	2
CHE3132: Biochemistry	20	21	1.3	0.7	2
CHE3212: Environmental Chemistry	20	21	1.3	0.7	2
CHE3222: Industrial Polymer chemistry	20	21	1.3	0.7	2
CHE3232: Pharmaceutical Chemistry	20	21	1.3	0.7	2
Total					32

3.6.2. BSc Honours Degree in Chemistry

Course Unit	Duration (hrs.)		Credits		Total
	Theory	Practical	Theory	Practical	
CHE4114: Advanced Inorganic Chemistry- I	60		4		4
CHE4123: Reactive Intermediates & Advanced Organic Reaction Mechanisms	45		3		3
CHE4132: Quantum Chemistry & Molecular Spectroscopy	30		2		2
CHE4142: Laboratory and Quality Management	30		2		2
CHE4152: Laboratory Inorganic Chemistry		90		2	2
CHE4162: Laboratory Physical Chemistry		90		2	2
CHE4213: Advanced Organic Chemistry -I	45		3		3
CHE4223: Topics in Advanced Physical Chemistry	45		3		3
CHE4233: Advanced Analytical Chemistry-I	45		3		3
CHE4242: Advanced Analytical Chemistry-II	30		2		2
CHE4252: Environmental Chemistry	30		2		2
CHE4262: Laboratory Organic Chemistry		90		2	2
CHE4272: Laboratory Analytical Chemistry		90		2	2
CHE4314: Advanced Inorganic Chemistry-II	60		4		4
CHE4323: Advanced Organic Chemistry - II	45		3		3
CHE4333: Solid State and Surface Chemistry	45		3		3
CHE4342: Advanced Biochemistry	30		2		2
CHE4352: Computational Chemistry	23	15	1.5	0.5	2
CHE4362: Industrial Chemistry & Technology	30		2		2
CHE4371: Laboratory Biochemistry		45		1	1
CHE4411: Current Topics in Chemistry	Self-Study				1
CHE4422: Essay & Seminar	Self-Study				2
CHE4436: Research Project					6
Special Topics (CHE4442, CHE4452, CHE4462, CHE4472, CHE4482)	30		2		2
Industrial placement (4-6 weeks): This is a requirement for the completion of the degree					
Total					60

4. Department of Computer Science

The Department of Computer Science of the University of Ruhuna was established in 1997 fulfilling a long-standing need of the University. The department presently offers course units of 30 credits (1/3 of the BSc General Degree Programme) in Computer Science for the BSc (General) Degree Programme for a limited number of students per batch and offers BSc (Honours) Degree Programme in Computer Science. The Department of Computer Science commenced Bachelor of Computer Science (BCS) Degree in 2010. The main aim of the degree Programme is to prepare the undergraduates for a career in Computer Science and Information Technology, which is one of the major driving forces of the economic development of Sri Lanka. This degree Programme will cover all aspects of Computer Science including modern computer languages and systems.

4.1. Research Areas

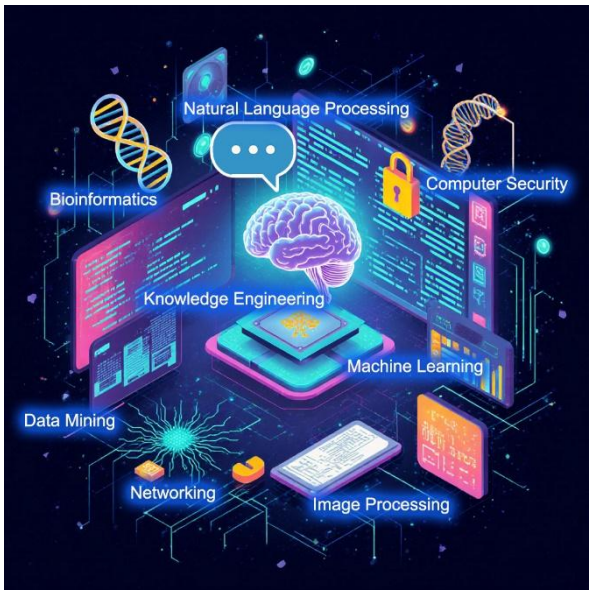


Figure 2:Research areas of Computer Science Department

4.2. Head of the Department

Dr. S. M. Vidanagamachchi
B.Sc. in Comp. Sci. (UCSC, SL) Ph.D. in Comp. Eng. (P'deniya, SL)

4.3. Members of Academic Staff

Designation	Name	Specialization
Professor	Prof. W. A. Indika BSc (Kelaniya, SL) MSc (Kelaniya, SL) PhD (UCSC, SL)	Knowledge Representation, Ontology, Semantic Web, Ontology Engineering, Mobile Applications

Senior Lecturer Grade I	Mr. S. A. S. Lorensuhewa BSc (Colombo, SL) MSc (Zhejiang, China)	Text Mining, Text Classification Data Mining, Machine Learning
	Dr. S. M. Vidanagamachchi, BSc in Comp. Sci. (UCSC, SL) PhD in Comp. Engineering(P'deniya, SL)	Embedded Systems, Reconfigurable Computing, Machine Learning, Bioinformatics, Cyber Security
Senior Lecturer Grade II	Mr. K.R. Wijeweera BSc (P'deniya, SL) MPhil (P'deniya, SL)	Computational Geometry
	Dr. K. D. C. G. Kapugama BCS (Ruhuna, SL) PhD (Monash, Australia)	Oracle Mining, Automated Software Repair, Automated Software Testing
Lecturer	Ms. M. A. L. Kalyani BSc (Colombo, SL) Ph.L. (Uppsala, Sweden)	Distributed Computing, Parallel Computing
Probationary Lecturer	Mr. L.L. Gihan Chathuranga BSc (Sabaragamuwa, SL)	Machine Learning, Artificial Neural Networks, Artificial Intelligence, Data mining
	Ms T.C. Weerakoon BSc (Special) (SUSL, SL) MSc (UCSC, SL) (On Study Leave)	Data Mining, Machine Learning, Computer Vision
	Ms. Binuri Raigamkorale BSc (Special) (Kelaniya, SL) MSc (Moratuwa, SL)	Deep Learning, Business Intelligence & Data Analytics
	Ms. M.S.H. Peiris BSc (Hons) in Computer Science (EUSL)	Machine Learning, Medical Image Processing
	Dr. S.W.A.M. Upamalika B.Sc. (Colombo, S.L.), PhD (Ruhuna, S.L.)	Bioinformatics Computational Systems Biology Reconfigurable Computing
	Ms. I. Nadisha Madhushanie BCS (Special) (Ruhuna, S.L.)	Block chain Technology Cyber Security
	Mr. Malaka Pathirana B.Sc (Hons) (KDU, S.L.), M.Sc (SLIIT, S.L.) - Reading	Cyber Security Networking

	Ms.W.M.N.W.B.Manike BSc (Special) in Computer Science (WUSL,SL)	Image Processing, Natural Language Processing, Machine Learning
	Mrs.M.M.A.H.Indumini BSc (Hons) in IT (RUSL,SL)	Machine Learning, Artificial Intelligence, Large Language Model, Natural Language Processing
	Ms. P.K.D.N.M.Alwis BSc (Special) (SUSL, SL)	Text Mining, Machine Learning, Natural Language Processing, Data Mining

4.4. Members of the Academic Support Staff

Academic Support Staff Members	
Designation	Name
Programmer Cum Systems Analyst	Mr. B.H. Saranapala BSc (Ruhuna, SL) , MSc (UCSC, SL)
	Mr. A. P. Luwishewa BSc (Ruhuna SL) , MSc (UCSC, SL)
Instructor in Computer Technology	Ms. P.B.N.K. De Silva BSc (Ruh, SL)
	Mr. U.V. Malawara Arachchi BSc (Ruhuna SL) , PG Dip IT (UCSC, SL) , MSc (SMU, South Korea)
	Ms. W.P. Priyanthi BSc (Ruhuna, SL)
	Mr. R. Wickramaratne BSc (Ruhuna, SL) , MSc (Moratuwa, SL)
	Mr. C.L. Wimalaratne BSc (Ruhuna, SL) , MSc(Moratuwa, SL)
	Ms. G.K. Mabula BSc (Ruhuna, SL) , MSc (UCSC, SL)
	Mr. L.W. Wellakkage BSc in Computer Engineering (NTUU-KPI, Ukraine) MSc in Computer Engineering (NTUU-KPI, Ukraine)
	Mr. G.M.T. Ranjana BSc (Ruhuna, SL)
	Ms. W.K. Shajith BSc (Ruhuna, SL), Postgraduate Dip. In ISM (Colombo,SL),MSc(Kelaniya ,SL)
	Ms. H.G.S. Priyangani BSc (Ruhuna, SL), MSc(Kelaniya SL)

4.5. Course Units in Computer Science for BSc (General) Degree

BSc Level I - Semester I

COM1112: Basic Concepts of Computer Science (30 Lecture hrs.) (Core)

Overview of computer systems (e.g.: evolution, classification and functions of computer systems), Basic components of the computer system (e.g.: processor, memory, secondary storage, I/O devices), Application of arithmetic operations of binary number system including conversions among number systems, Application of Boolean algebra and Kamp's to minimize Boolean expressions, Design logic circuits for given requirements and recognize the universality of NAND and NOR gates, Identify memory types, their specialties, and issues with system performance, Explain functionalities of CPU components and describe elements,

types of a CPU instruction and processing steps, Compare and contrast several addressing modes, Data communication and computer networks, The Internet, Communication over Internet, Computer security and maintenance

Evaluation Method: Continuous Assessment and/or End Semester Examination

COM1123: Programming Techniques (30 Lecture hrs. + 30 - 45 Practical hrs.) (Core)

Introduction to programming methodology and problem-solving strategies, Algorithm development using pseudo code, Basic program structure and the Integrated Development Environment, Essential program structure, Documentation and standard programming practices, Integrated development environment Editing, Compilation, Execution and Debugging, Program Development using a higher-level programming language , Basic input and output, variables and expressions, Library functions, Standard programming practices for variables and assignments, Decision structures, Loop structures, Input and output using files, Simple data structures. Introduction to the object-oriented approach, Practical assignments aligned with different lessons of the course

Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)

BSc Level I - Semester II

COM1213: Internet Programming and Web Technologies (30 Lecture hrs. + 30 - 45 Practical hrs.) (Core)

The basic principles of client/server computing, Distinguished characteristics of client/server systems and application areas, Comparison of two-tier versus three-tier client/server solutions, Web programming model, Interactive web, Benefits and limitations of client-side web programming, Byte code versus scripting, Basic concepts and development based on Java applet / JavaScript / dynamic HTML (DHTML), Approaches to server-side programming. Benefits and limitations of server-side web programming, Development framework for server-side programming based on PHP / Servlet / JSP, Web application development, Development of a web application using synchronous and asynchronous techniques, Web Development using PHP, MySQL, Sessions and Cookies, Practical assignments aligned with different lessons of the course

Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)

COM1223: File Organization & Database Management Systems (30 Lecture hrs. + 30 - 45 Practical hrs.) (Core)

Introduction to file organization, Storage devices, Disk parameters, Record structure and design, Indexes, Hashing, Introduction to database management systems & Definitions, DBMS Architecture, Data models, DBMS languages, ER model concepts, Relational model concepts, ER-to-relational mapping, Functional dependencies and normalization process, Relational algebra, Relational calculus, Database security and authorization, Practical using MySQL, Practical assignments aligned with different lessons of the course

Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)

BSc Level II - Semester I

COM2113: Object Oriented System Development (30 Lecture hrs. + 30 - 45 Practical hrs.) (Core)

Fundamental concepts in object orientation: introduction, class and object, generalization and practical uses of generalization, object interaction with message passing, polymorphism, origins of object orientation, object-oriented languages, Modelling: introduction to models and diagrams, difference between models and diagrams, introduction to UML, models in UML, Software development process: what is a development process, iterative and incremental software development, important artifacts developed in object oriented software development process, Process modeling with UML activity diagrams, Requirements and Use cases: Business and system use cases, documenting requirements by using use cases, brief and fully dressed formats in use case modeling, use case diagrams and notations, operation contracts, describing use cases using UML activity diagrams, Modelling structure: class diagrams, attributes and state of a class, links and associations, multiplicity, operations, identifying classes and developing class diagrams, Modelling behavior: interaction diagrams, communication and sequence diagrams, Modeling object

interaction using communication/sequence diagrams, Use case realization: realizing use cases by using communication/sequence diagrams and class diagrams, Practical assignments aligned with different lessons of the course

Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and the 30% from the practical paper)

COM2122: Software Engineering (30 Lecture hrs.) (*Optional)

Introduction to software engineering, Activities and characteristics of software processes, Software process models, Requirement analysis and specification, System modelling.

Evaluation Method: Continuous Assessment and/or End Semester Examination

* COM2122 is compulsory for the students who wish to follow BSc Hons (Comp SC) Degree programme.

BSc Level II - Semester II

COM2213: Data Communications and Computer Networks (30 Lecture hrs. + 30 - 45 Practical hrs.) (Core)

Introduction to Computer networks, Application of computer networks, Network hardware, Network software, OSI Model, Internet model, Transmission media, Wireless transmission, Communication satellites, High-speed digital access- DSL, Multiplexing- FDM, WDM, TDM), Data link layer design issue Framing, Error and flow control, Error detection and correction, Elementary data link protocols, Sliding window protocols, Medium access control (MAC) Sub layer (Multiple Access Protocols, LANs topologies and protocols, Ethernet, Wireless LANs, Data link layer Switching hubs, bridges, switches, routers, and gateways, Network layer design issues, Routing algorithms, Congestion control algorithm, Quality of service (QoS), Internetworking, Network layer in the Internet, Internet Transport Protocols TCP and UDP, Fundamentals of the session and presentation Layers, Domain name system (DNS), E-mail, File transfer protocol, WWW and Multimedia, Practical assignments aligned with different lessons of the course

Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and the 30% from the practical paper)

COM2223: Data Structures and Algorithms (30 Lecture hrs. + 30 - 45 Practical hrs.) (Core) Pre-requisite: COM1123

Simple numerical algorithms, Algorithm analysis, Sequential and binary search algorithms, sorting algorithms , Stacks and queues, Linked lists, Binary trees, Binary search trees, Common operations on binary search trees, Graphs and graph algorithms, Representations of graphs, Depth and breadth-first traversal, Hash tables, including strategies for avoiding and resolving collisions, Practical assignments aligned with different lessons of the course

Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and the 30% from the practical paper)

BSc Level III - Semester I

COM3113: Operating Systems (30 Lecture hrs. + 30 - 45 Practical hrs.) (Core)

Introduction and overview, Processes and threads, CPU scheduling, Deadlocks, Memory management, File system implementation, Practical assignments aligned with different lessons of the course.

Evaluation Method: Practical Examination and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and the 30% from the practical paper)

COM3122: Data Mining (30 Lecture hrs.) (Optional)

Basic concepts of data mining, Data pre-processing techniques, Classification, Prediction, Clustering, Association rules, Concept of data warehousing with special emphasis on architecture and design

Evaluation Method: Continuous Assessment and/or End Semester Examination

COM3b33: Computer Group Project (Core)

Project proposal preparation, Requirements gathering, System design and database design, Implementation, Testing and evaluation, Deployment/Present to the client, Final report preparation, Product presentation and demonstration

Evaluation Method: Evaluation is based on Attendance, Final presentation, Final product, Project report and Individual contribution

COM3142: Internet Services and Protocols (15 Lecture hrs. + 30 Practical hrs.) (Optional*)*

Introduction, Network and system administration, Internet protocols, Application services and how they are configured, maintained and repaired, Practical understanding of the services, Internet protocols, DNS server, Web server, Proxy server, Email server. Practical assignments aligned with different lessons of the course.

Evaluation Method: Continuous Assessments and/or End Semester Examination

COM3152: Professional Practices and Issues in IT (30 Lecture hrs.) (Optional)

Social context of computing, Growth and control of the Internet, Accessibility issues including legal requirements, Context-aware computing, Ethical argumentation theories and decision-making, Moral assumptions and values, The nature of professionalism including care, attention and discipline, fiduciary responsibility, and mentoring, Professional certification, codes of ethics, conduct, and practice, Accountability, Responsibility and liability, Intellectual property, privacy and civil liberties, Digital rights management, Copyrights, patents, trade secrets, trademarks and Plagiarism, Foundations of the open source movement, Philosophical foundations of privacy rights, Legal foundations of privacy protection and technology-based solutions for privacy protection, Professional written and verbal communication with stakeholders.

Evaluation Method: Continuous Assessments and/or End Semester Examination

COM3162: Human Computer Interaction (30 Lecture hrs.) (Optional)

Background and motivation for HCI, Human factors, Theoretical foundations: theories, models, principles, standards, guidelines, Interface design elements, Interface design: methods and principles, Interface design: data gathering and task analysis, Evaluating interfaces: heuristic evaluation, GOMS, Interaction styles, Evaluation data & Empirical data, Lo-fi Prototyping, Color, Vision & perception, Controls, widgets, icons & symbols, Usability and accessibility, Interaction devices, Future of HCI

Evaluation Method: Continuous Assessments and/or End Semester Examination

BSc Level III - Semester II

COM3213: Multimedia Technologies (30 Lecture hrs. & 30 - 45 Practical hrs.) (Optional)

Introduction to multimedia technologies, Audio and video basics, Multimedia compression techniques and standards, Multimedia Authoring tools, Multimedia advanced coding and media object production, Multimedia Integration and presentation, Practical assignments aligned with different lessons of the course.

Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and the 30% from the practical paper)

COM3222: Emerging Software Technologies (30 Lecture hrs.) (Optional)

Technology hype cycle (Gartner), Case study on a selected software technology with respect to hype cycle, Big data, Cloud computing, Edge computing, Virtual reality, Augmented reality, Block chain, IoT, Smart devices, Artificial Intelligence, Natural language processing, NoSQL databases, Comparing and contrasting parallel technologies such as cloud technologies with respect to their usability, pricing and proven track record of the corresponding proprietor, Career path guidance for different technological areas in the software industry.

Evaluation Method: Continuous Assessment and/or End Semester Examination

COM3232: Visual Programming (30 Lecture hrs.) (Optional)

Introduction to .NET, Conditional Logic, Loops, adding menus to forms, Debugging the code, Arrays, Events

Evaluation Method: Continuous Assessments and/or End Semester Examination

COM3252: E-Commerce (30 Lecture hrs.) (Optional)

Introduction to E-Commerce, E-Commerce Business models and concepts, E-Commerce payment types, Basic functions of an E Commerce site, E-Commerce site designing factors, Development life cycle, Client-server architecture, Web server hardware and software, Ecommerce software packages and suites, Usage analysis and site management, Security aspects on client computers and service computers, Security issues of E-Commerce.

Evaluation Method: Continuous Assessments and/or End Semester Examination

MAT225β: Mathematical Statistics I (*Optional)

Refer to course unit details under the Department of Mathematics.

* MAT225β is compulsory for the students who wish to follow BSC Hons (Comp SC) Degree Programme.

Note:

- The mode of delivery of the Computer Science Course Units in BSc (General) Degree: physical and/or virtual
- Evaluation mode for Computer Science Course Units in BSc (General) Degree: physical and/or virtual.

4.6. Course Units in BSc (Honours) Degree in Computer Science

A limited number of students are selected to follow the Bachelor of Science (Honours) Degree in Computer Science after completion of two academic years of Bachelor of Science (General Degree Programme). The selection of students is done according to their academic performance during Level I and Level II of the BSc (General) degree Programme.

Level III - Semester I

CSS3113: **Operating Systems (30 Lecture hrs. + 30 - 45bPractical hrs.) (Core)**

Introduction and overview, Processes and threads, CPU scheduling, Deadlocks, Memory management, File system implementation, Practical assignments aligned with different lessons of the course.

Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)

CSS3123: Computer Graphics (30 Lecture hrs. + 30 - 45 Practical hrs.) (Core) Prerequisite: COM1123

Computer graphics hardware, Introduction to computer graphics and OpenGL, Basic programming techniques using OpenGL, 2D graphics, Color systems and shading, 3D Graphics, Transformation and viewing, 3D Graphics , Objects modelling and visible surface detection, Lighting, Surface rendering, Basic ray tracing algorithms, Applying ray tracing techniques

Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)

CSS3132: Professional Practices and Issues in IT (30 Lecture hrs.) (Core)

Social context of computing, Growth and control of the Internet, Accessibility issues including legal requirements, Context-aware computing, Ethical argumentation theories and decision-making, Moral assumptions and values, The nature of professionalism including care, attention and discipline, fiduciary responsibility, and mentoring, Professional certification, codes of ethics, conduct, and practice, Accountability, responsibility and liability, Intellectual property, privacy and civil liberties, Digital rights management, Copyrights, patents, trade secrets, trademarks and Plagiarism, Foundations of the open source movement, Philosophical foundations of privacy rights, Legal foundations of privacy protection and technology-based solutions for privacy protection, Professional written and verbal communication with stakeholders.

Evaluation Method: Continuous Assessments and/or End Semester Examination

CSS3142: Advanced Software Engineering (30 Lecture hrs.) (Core) Pre-requisite: COM2122

Model-driven engineering and UML, Secure design principles and patterns in software design, Coding Practices and standards: techniques, idioms/patterns, mechanisms for building quality programs, Testing fundamentals and test-case generation, Building security into the software development lifecycle, Software quality assurance, Reuse-based software engineering, Component-based software engineering, Distributed software engineering, Cloud computing and aspect-oriented software engineering, Software maintenance, Software measurements and metrics, CASE tools, Software development team management

Evaluation Method: Continuous Assessments and/or End Semester Examination

CSS3152: Human Computer Interaction (30 Lecture hrs.)*(Core)*

Background and motivation for HCI, Human factors, Theoretical foundations: theories, models, principles, standards, guidelines, Interface design elements, Interface design: methods and principles, Interface design: data gathering and task analysis, Evaluating interfaces: heuristic evaluation, GOMS, Interaction styles, Evaluation Data & Empirical Data, Lo-fi Prototyping, Colour, Vision & Perception, Controls, widgets, icons & symbols, Usability and Accessibility, Interaction devices, Future of HCI

Evaluation Method: Continuous Assessments and/or End Semester Examination

CSS3162: Parallel and Distributed Systems (30 Lecture hrs.) *(Core)*

Shared and distributed memory architectures, Distributed system design, Distributed algorithms, Communication and synchronization, Distributed file systems, Fundamentals of parallelism, parallel decomposition, Parallel architectures, performance and scalability of parallel Systems

Evaluation Method: Continuous Assessments and/or End Semester Examination

CSS3172: Data Mining (30 Lecture hrs.) *(Optional)*

Basic concepts of data mining, Data pre-processing techniques, Classification, Prediction, Clustering, Association rules, Concept of data warehousing with special emphasis on architecture and design.

Evaluation Method: Continuous Assessments and/or End Semester Examination

CSS3182: E-Commerce (30 Lecture hrs.) *(Optional)*

Introduction to E-Commerce, E-Commerce business models and concepts, E-Commerce payment types, Basic functions of an E-Commerce site, E-Commerce site designing factors, Development life cycle, Client-server architecture, Web server hardware and software, Ecommerce software packages and suites, Usage analysis and site management, Security aspects on client computers and service computers, Security issues of E Commerce.

Evaluation Method: Continuous Assessment and/or End Semester Examination

CSS3192: Internet Services and Protocols (15 Lecture hrs. + 30 practical hrs.) *(Optional)* *Pre-requisite: COM2213*

Network and system administration, Internet protocols, Application services and how they are configured, maintained and repaired, Practical assignments aligned with different lessons of the course.

Evaluation Method: Continuous Assessment and/or End Semester Examination

MAT313*6*: **Mathematical Statistics II (30 Lecture hrs. + 15 Tutorial hrs.) *(Optional)*** *Pre-requisite: MAT225ϐ*

Refer to course unit details under the Department of Mathematics

MSP3193: Bayesian Inference and Decision Theory (45 Lecture hrs.) *(Optional)*

Refer course unit details under the Department of Mathematics

Level III - Semester II

CSS3212: Software Project Management (30 Lecture hrs.) *(Core)*

Introduction to Project management, Project management process for a project, Project scope management, Project time management, Project cost management, Project quality management, Project communication management, Project risk management, Group assignment evaluation, Project human resource management, Project procurement management, Project integration management.

Evaluation Method: Continuous Assessment and/or End Semester Examination

CSS3223: Software Development Project (*Core)*

Project proposal preparation, Requirements gathering, System design and database design, Implementation, Testing and evaluation, Deployment/Present to the client, Final report preparation, Presentation and demonstration to the internal panel.

Evaluation Method: Evaluation is based on Attendance, Final Presentation, Final Product, Project Report and Individual Contribution

CSS3232: Data and Network Security (30 Lecture hrs.) ***(****Core) Pre-requisite: COM2213*

Introduction to computer security and cryptography, Message authentication code, Symmetric key encryption, asymmetric key encryption, key distribution, Cryptography, Network security, Web security, Firewalls and intrusion detection systems, Virus and other malicious codes, Email and document security, Electronic payments

Evaluation Method: Continuous Assessment and/or End Semester Examination

CSS3242: Advanced Database Management (30 Lecture hrs.) *(Core) Pre-requisite: COM1223*

Introduction: File structures and organization, Indexing, B+ tree structure, Query processing, Query optimization, Transaction management, Database recovery, Concurrency control techniques, Transaction support

Evaluation Method: Continuous Assessments and/or End Semester Examination

CSS3252: Advanced Data Structures and Algorithms (30 Lecture hrs.) *(Core) Prerequisite:COM2223*

Advanced data structures, Balanced trees, String based data structures and algorithms, Network flows (Ford-Fulkerson algorithm), Linear Programming (simplex method, interior point algorithms), Number-theoretic algorithms, Geometric algorithms, Randomized algorithms, Stochastic algorithms, Approximation algorithms

Evaluation Method: Continuous Assessments and/or End Semester Examination

CSS3262: Digital Image Processing (15 Lecture hrs. + 30 - 45 Practical hrs.) ***(Optional)***

Introduction and digital image fundamentals, Image enhancement in the spatial domain, Image enhancement in the frequency domain, Colour image processing, Morphological image processing, Image segmentation, Representation and description, Mini-Group Project

Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)

CSS3272: Emerging Software Technologies (30 Lecture hrs.) ***(Optional)***

Technology hype cycle (Gartner), Case study on a selected software technology with respect to hype cycle, Big data, Cloud computing, Edge computing, Virtual reality, Augmented reality, Block chain, IoT, Smart devices, Artificial Intelligence, Natural language Processing, NoSQL databases, Comparing and contrasting parallel technologies such as cloud technologies with respect to their usability, pricing and proven track record of the corresponding proprietor, Career path guidance for different technological areas in the software industry

Evaluation Method: Continuous Assessments and/or End Semester Examination

IMT321β: Applied Algebra (Algebraic Data Encryption and Decryption Methods) (45 Lecture hrs.)*(Optional) Pre-requisite: MAT111β, MAT211β, MAT221β*

Refer course unit details under the Department of Mathematics

Level IV Semester I

CSS4112: Research Methodology (30 Lecture hrs.) *(Core)*

Introduction to scientific research, Reading and recording, Critiquing research papers, Planning and conducting research, The research process, Types of computing research and computing research methods, Research ethics and plagiarism, Data collection and analysis, Communicating research findings, Simple Latex for academic writing, Referencing and citation guides

Evaluation Method: Continuous Assessments

CSS4026: Individual Research Project *(Core)*

Preparation of Research Proposal, conducting literature survey, Preparation of Interim Report, carrying out the research, Compiling thesis, preparing a paper to publish in a local/international conferences or a journal

Evaluation Method: Evaluation is based on Project Proposal, Interim progress report, Publication, Project report and Presentation

CSS4132: High Performance Computing (30 Lecture hrs) *(Optional)*

Fundamentals of Parallelism, Parallel Decomposition, Parallel algorithm design, Parallel architectures, Parallel programming patterns, Programming shared-memory architectures, Programming distributed-memory architectures, Performance evaluation of parallel programs.

Evaluation Method: Continuous Assessment and/or End Semester Examination

CSS4143: Machine Learning (30 Lecture hrs. + 30 - 45 Practical hrs.) *(Optional)*

Introduction to machine learning, Linear regression with one variable, Linear regression with multiple variables, Linear algebra review, Logistic regression, Regularization, Neural networks: Representation and learning, Support vector machines, Supervised learning and unsupervised learning, Dimensionality reduction, Anomaly detection, Large scale machine learning, applications

Evaluation Method: Continuous Assessments and/or End Semester Examination

CSS4152: Enterprise Modelling (30 Lecture hrs.) *(Optional)*

Strategic role of enterprise modelling, enterprise modelling process and enterprise modelling perspectives, Goal modelling, available goal modelling techniques, Business motivation model as a goal modelling technique, Business rules, business rules and requirements, different expression levels, relationship between business rules model and other models (goal, process and concepts models), Concepts Model, relating concepts model to other models, Business modelling, business value networks, business modelling ontologies, business modelling using e 3 value modelling method, Process modelling, Process modelling languages, Process modelling using EPC, Methods for specification and verification of business processes, Basic workflow concepts, Workflow modelling using Petri nets, colored petri nets, petri nets with time, basic routing constructs in petri nets, Workflow analysis, symptoms of a problematic workflow, qualitative (reachability analysis) and quantitative analysis (Resource utilization, Number of cases in progress, Waiting time, System time).

Evaluation Method: Continuous Assessments and/or End Semester Examination

CSS4162: Computer Vision (30 Lecture hrs.) *(Optional) Pre-requisite: COM3133*

Geometric camera models and calibration, Light and shading, Color perception and representation, Linear filters, Image-based modelling and rendering, detecting objects in images, Tracking strategies, Segmentation and clustering, Image classification.

Evaluation Method: Continuous Assessments and/or End Semester Examination

Level IV Semester II

CSS4212: Research Seminar (30 Lecture hrs.) *(Core)*

Writing a Critique, Structure of a critique, Literature review: Selecting literature, Bibliographic management, Software tools, Studying literature, Objectives of literature review, Structure of a survey paper, Research communication: Scientific method and Communication Path, Templates for different scientific communication modes.

Evaluation Method: Continuous Assessments

CSS4222: Compilers and Automata Theory (30 Lecture hrs.)*(Core)*

Compiler design introduction, Phases of compiler, lexical analysis, syntax analysis, Regular expressions; Operations on Regular expressions, Finite automata and Regular expressions, Conversion from FA and regular expressions, Deterministic finite automata (DFA); Minimization of DFA, Non-Deterministic Finite Automata (NDFA), Equivalence of Deterministic and Non-Deterministic Finite automata, Equivalence between DFA,NFA, NFA-, Context free grammars, Parse trees; Ambiguity in grammars and languages, Standard forms; Chomsky normal forms, Greibach normal Forms, Minimization of CFGs

Evaluation Method: Continuous Assessments and/or End Semester Examination

CSS4232: Artificial Intelligence (30 Lecture hrs.) *(Optional)*

Introduction to artificial intelligence (AI), Agents and environment, Problem solving, Search algorithms, Hill climbing and genetic algorithms, Propositional logic, First order logic, Game playing, Natural language processing (NLP), Machine learning: Introduction and methods, Computer vision and Deep learning

Evaluation Method: Continuous Assessments and/or End Semester Examination

CSS4242: Service Oriented Computing (30 Lecture hrs.) *(Optional)*

Introduction to service oriented computing, Introduction to service oriented architecture, Principles of service oriented architecture, Service classification, Enterprise service bus, Introduction to web services, Web service architecture SOAP, WSDL, Web service description, SOA governance

Evaluation Method: Continuous Assessments and/or End Semester Examination

CSS4252: Formal Methods and Software Verification (30 Lecture hrs.) *(Optional)*

Review of sets, Relations, Functions and related matters, Review of propositional logic, and logical arguments, Introduction to predicate calculus, Concepts of programming language, Proof of correctness, Hoare logic, Formal methods, Use of Z-notation for various aspects of program constructs and Verification

Evaluation Method: Continuous Assessments and/or End Semester Examination

CSS4262: Reconfigurable Computing (30 Lecture hrs.) *(Optional)*

Introduction to reconfigurable computing, FPGA architecture and basic logic elements of FPGA, Hardware definition languages (AHDL, VHDL and Verilog), Concurrent, behavioural and structural description of FPGAs, Reconfigurable computing design methodologies, Sequential circuits, Finite state machines, Parametric coding, Application acceleration using reconfigurable computing, digital System design introduction and hardware software co-design, Heterogeneous computing.

Evaluation Method: Continuous Assessments and/or End Semester Examination

CSS4272: Knowledge Engineering (30 Lecture hrs.) *(Optional)*

Introduction to knowledge management, Knowledge representation using ontologies, Ontology design, Ontology implementation, Ontology validation and evaluation, Ontology maintenance, Semantic web (Ontologies in semantic web), Introduction to Protg, Design a small ontology to a real world problem in an application domain

Evaluation Method: Continuous Assessments 30% and Semester End Theory Examination 70%

CSS4282: Bioinformatics (30 Lecture hrs.) *(Optional)*

Introduction to bioinformatics, Archives and Information retrieval, Pairwise sequence alignment algorithms: Dot Plots. simple alignments, The Needleman and Wunsch algorithm, Introduction to semi- global alignments, local sequence alignments and algorithms, BLAST, FASTA algorithm, Multiple sequence alignment and algorithms: Introduction to multiple sequence alignments, Greedy approach, Star alignment approach and ClustalW algorithm, Hidden Markov models development and related algorithm development, Phylogenetic Trees: Introducing distance measures and distance based phylogenetic tree building algorithms: UPGMA, NJ, Introducing character based measures and character based phylogenetic tree building algorithms: maximum parsimony and maximum likelihood, Protein and RNA Structure Prediction and related algorithms: Secondary Structure, Tertiary and quaternary structure, Tools for modelling Protein folding, MicroRNA data and analysis methods/algorithms, Introduction to drug discovery and ligand docking algorithms.

Evaluation Method: Continuous Assessment 30% and Semester End Theory Examination 70%

CSS4296: Industrial Training/Industry Project *(Core)*

This training helps the students to get experience on issues related to industry. At the end of the training, the students should make a presentation of their findings and submit a report.

Evaluation Method: Report, Novation Diary and Presentation/Viva

*CSS4296: Non-GPA 6 credits and minimum 3 months required.

Note: The completion date of the degree Programme is the submission date of final report of CSS4296 (Industrial Training/ Industry Project)

4.7. Credit Values

4.7.1. BSc General Degree

Course Unit	Duration (hrs.)	Credits	Total

	Theory	Practical	Theory	Practical	
COM1112: Basic Concepts of Computer Science	30		2		2
COM1123: Programming Techniques	30	30 - 45	2	1	3
COM1213: Internet Programming and Web Technologies	30	30 - 45	2	1	3
COM1223: File Organization & Database Management Systems	30	30 - 45	2	1	3
COM2113: Object Oriented System Development	30	30 - 45	2	1	3
COM2122: Software Engineering	30		2		2
COM2213: Data Communications and Computer Networks	30	30 - 45	2	1	3
COM2223: Data Structures and Algorithms	30	30 - 45	2	1	3
COM3113: Operating Systems	30	30 - 45	2	1	3
COM3122: Data Mining	30		2		2
COM3b33: Computer Group Project				3	3
COM3142: Internet Services and Protocols	15	30	1	1	2
COM3152: Professional Practices and Issues in IT	30		2		2
COM3162: Human-Computer Interaction	30		2		2
COM3213: Multimedia Technologies	30	30 - 45	2	1	3
COM3222: Emerging Software Technologies	30		2		2
COM3232: Visual Programming	15	30	1	1	2
COM3252: E-Commerce	30		2		2

4.7.2. BSc (Honours) Degree in Computer Science

Course Unit	Duration (hrs.)		Credits		Total
	Theory	Practical	Theory	Practical	
COM1112: Basic Concepts of Computer Science Computer Science	30		2		2
COM1123: Programming Techniques	30	30 - 45	2	1	3
COM1213: Internet Programming and Web Technologies	30	30 - 45	2	1	3
COM1223: File Organization & Database Management Systems	30	30 - 45	2	1	3
COM2113: Object Oriented System Development	30	30 - 45	2	1	3
COM2122: Software Engineering	30		2		2
COM2213: Data Communications and Computer Networks	30	30 - 45	2	1	3
COM2223: Data Structures and Algorithms	30	30 - 45	2	1	3
CSS3113: Operating Systems	30	30 - 45	2	1	3
CSS3123: Computer Graphics	30	30 - 45	2	1	3

CSS3132: Professional Practices and Issues in IT	30		2		2
CSS3142: Advanced Software Engineering	30		2		2
CSS3152: Human-Computer Interaction	30		2		2
CSS3162: Parallel and Distributed Systems	30		2		2
CSS3172: Data Mining	30		2		2
CSS3182: E-Commerce	30		2		2
CSS3192: Internet Services and Protocols	15	30	1	1	2
MAT313β: Mathematical Statistics II	30	15	2.5		2.5
MSP3193: Bayesian Inference and Decision Theory	45		3		3
CSS3212: Software Project Management	30		2		2
CSS3223: Software Development Project					3
CSS3232: Data and Network Security	30		2		2
CSS3242: Advanced Database Management	30		2		2
CSS3252: Advanced Data Structures and Algorithms	30		2		2
CSS3262: Digital Image Processing	15	30	1	1	2
CSS3272: Emerging Software Technologies	30		2		2
IMT321β: Applied Algebra	30	15	2.5		2.5
CSS4112: Research Methodology	30		2		2
CSS4026: Individual Research Project					6
CSS4132: High-Performance Computing	30		2		2
CSS4143: Machine Learning	30	30	2	1	3
CSS4152: Enterprise Modelling	30		2		2
CSS4162: Computer Vision	30		2		2
CSS4212: Research Seminar	30		2		2
CSS4222: Compilers and Automata Theory	30		2		2
CSS4232: Artificial Intelligence	30		2		2
CSC4242: Service Oriented Computing	30		2		2
CSS4252: Formal Methods and Software Verification	30		2		2
CSS4262: Reconfigurable Computing	30		2		2
CSS4272: Knowledge Engineering	30		2		2
CSS4282: Bioinformatics	30		2		2
CSS4296: Industrial Training/Industry Project					Non GPA 6

[1]* COM2122 is compulsory for the students who wish to follow BSC Hons (Comp Sc) Degree Programme

4.8. ICT Course units of Bachelor of Science (General) Degree

The department conducts a Foundation Course in Information Technology (ICT1b13) for all the students, in the BSc degree Programme, who do not follow Computer Science as a subject. Based on their performance of the ICT1b13 course unit, a limited number of students are selected to follow a Certificate Course in Information Technology (ICT2b13/CCIT). The students who pass ICT1b13 and ICT2b13 course units are awarded certificates by the department.

ICT1b13: Foundation Course in Information Technology (30 Lecture hrs + 30 - 45 Practical hrs.)

Computer basics, Operating systems, Introduction to computer networks, Introduction to the internet, Word processing application, Spreadsheet application, Presentation application, Database (MS Access), Computer programming basics Note:

Students who do not follow computer science as one of the subjects for their degree Programme must pass the examinations of the Foundation Course in Information Technology (ICT1b13) in order to release the final results of the BSc Degree.

Evaluation Method: continuous Assessments and End Semester Examination

- Students are assessed based on three practical assessments in Level 1 Semester I. If a student completes all three assessments, only two assessments with best marks are counted towards the final grade of the course unit.

- If a student misses an assessment and fails to provide an acceptable reason zero mark is allocated for the particular assessment. If a student is unable to sit for the final examination or fails the final examination, marks earned for continuous assessments will be carried forward to the final grade of the repeat examination.
- Under any circumstances if a student is unable to earn 10 marks out of 40 marks (25%) from the continuous assessments component, he/she must do at least two continuous assessments in the following year.

ICT2b13: Certificate Course in Information Technology (CCIT) (30 Lecture hrs + 30 - 45 Practical hrs.)

Linux operating system, Database management system using SQL, Web development, Computer networks, Visual programming, Graphics and Multimedia.

Evaluation Method: End Semester Examination 70% and Practical Examination 30% (Student must obtain at least 35% from the theory paper and the 30% from the practical paper to obtain a C grade or above)

4.9. Bachelor of Computer Science (General) Degree

The Bachelor of Computer Science (BCS) degree program is an outcome of an enormous effort of the staff of the Department of Computer Science. One of the prime objectives of this degree Programme is to prepare the undergraduates for a career in Computer Science and Information Technology, which is one of the major driving forces of the economic development of Sri Lanka. Students admitted to the program will pursue a full-scale Computer Science Programme of three years leading to the degree of Bachelor of Computer Science (General). Based on the performance, a limited number of students will be selected to study an extra year leading to the degree of Bachelor of Computer Science (Honours). One of the prime objectives of the Honours degree is to offer in-depth knowledge in selected areas of computer science for those who wish to pursue an academic and/or research careers.

4.9.1. Course units for Bachelor of Computer Science (General) Degree (BCS)

Each student admitted to BCS degree program is expected to follow the following course units during their first, second and third years (six semesters). The curriculum of BCS degree consists of compulsory course units as well as elective /optional course units. All courses offered during the first three semesters in level I and level II are compulsory part of the BCS curriculum. The latter part of level II and both semesters of level III in BCS degree curriculum are mainly consist of optional courses. In addition to the elective optional courses, a limited number of compulsory courses are offered during this period. The availability of the optional course units will be announced at the beginning of each semester.

BCS Level I – Semester I

CSC1122: Computer Systems I (30 Lecture hrs.) *(Core)*

Overview of computer systems, Evolution of computers, Input and output, Storage, Expansion cards, System interfaces, Instruction sets, Addressing modes, Central processing unit, Instruction cycle, Assembly language

Evaluation Method: Continuous Assessment and/or End Semester Examination

CSC1113: Programming Techniques (30 Lecture hrs. + 30 – 45 Practical hrs.) *(Core)*

Fundamentals of computing, data concepts in C: Constants, Variables, Expressions, Operators, and operator precedence in C, Statements: Declarations, Input-Output Statements, Compound statements, Selection statements, Conditions, Logical

operators, Precedence, Repetitive statements, While construct, Do-while, Construct, For construct, Data types, Arrays. Strings. Multidimensional arrays and matrices, Pointers, Structures, File input-output

Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)

CSC113α: Internet Services and Web Development (15 Lecture hrs. + 15 Practical hrs.) *(core)*

Introduction to the Internet, Communication over Internet, The World Wide Web, HTML & XHTML, Cascading style sheets, Client side scripting - Java script.

Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)

CSC1142: System Analysis and Design (30 Lecture hrs.) *(Core)*

Software development life cycle, Generic phases in SDLC and important artifacts created in these phases, Business as a work system: work system principles, system and sub system, representing business as a system of integrated interacting set of components, importance of aligning business and IT, System stakeholders: major players of systems development such as system owners, users, business analysts, designers, programmers, systems analysts, project managers, etc., different roles of a systems analyst, skills required in a systems analyst, how systems analyst bridges communication gap between business and technical worlds, Project management; importance of project management and causes of failed projects, major aspects of project management such as planning, scheduling and controlling, Project management tools and techniques such as PERT and Gannet charts, developing work breakdown structure, System analysis and design approaches: traditional and modern approaches such as Object oriented, agile RAD, etc., Fact finding techniques: different fact finding techniques, using fact finding techniques to elicit requirements, requirements management, Elicit requirements using fact finding techniques, Data Flow Diagrams.concepts and notations for data flow modelling, modelling existing system using data flow diagrams, balancing of DFDs and information, determining legal and illegal data flows, developing data flow diagram for a given business case. Data modelling, Entities, Attributes, Relationships and multiplicity, Normalization

Evaluation Method: Continuous Assessment and/or End Semester Examination

CSC1153: Laboratory Assignments (15 Lecture hrs. & 60 Practical hrs.) *(Core)*

Operating systems (System utilities of Linux, Windows Installation, Advanced system utilities of Windows, Linux Installation), Word processing using Office and Latex, Data analytics using Open Office and (Basic) R/Python, Networking and applications, Computer security, Internet services and Google applications and CMS, Computer hardware and specifications, Image and video editing

Evaluation Method: Continuous Assessment and/or End Semester Examination

AMT112β: Mathematical Foundation of Computer Science (30 Lecture hrs. + 15 Tutorial hrs.) *(Core)*

Refer course unit details under the Department of Mathematics

MAT112δ Differential Equations (15 Lecture hrs. + 7 Tutorial hrs.) *(Core)*

Refer course unit details under the Department of Mathematics

MAT113δ: Introductory Statistics (15 Lecture hrs. + 8 Tutorial hrs.) *(Core)*

Refer course unit details under the Department of Mathematics

BCS Level I - Semester II

CSC1213: Database Management Systems (30 Lecture hrs. + 30 – 45 Practical hrs.) ***(Core)***

Introduction to DBMS, History of data models, Database system concepts and architecture, database design process, The Entity-Relationship (ER) Model, Database design - Mapping ERD to relational, Logical database design, Normalization, Extended entity relationship modeling, Logical database design, Mapping EERD to relational, Data manipulation using Relational algebra & Relational calculus, Managing databases using SQL, Data views and security, Introduction to data administration and database administration, Practical using MS Access and Oracle.

Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)

CSC1223: Data Structures and Algorithms (30 Lecture hrs. + 30 – 45 Practical hrs.) *(Core)*

Analysis of algorithms, Sorting algorithms, Searching algorithms, Stacks and queues, Lists, Linked lists, Trees, Binary trees, AVL trees and Red black trees, Graphs and Hash tables

Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)

CSC1233: Software Engineering (45 Lecture hrs.) *(Core)*

Introduction to Software engineering, Activities and characteristics Software processes, Software process models, Requirement analysis and specification, System modeling, Software design (Design principles and architectural design), Software testing, CASE tools, Software maintenance, measurements and metrics

Evaluation Method: Continuous Assessment and/or End Semester Examination

CSC1242: Object Oriented System Development (30 Lecture hrs.) ***(Core)***

Fundamental concepts in object orientation: introduction, class and object, generalization and practical uses of generalization, object interaction with message passing, polymorphism, origins of object-orientation, object-oriented languages, Modelling: introduction to models and diagrams, differences between models and diagrams, introduction to UML, models in UML, Software development process: what is a development process, iterative and incremental software development, Unified Process as an Object-oriented software development process, Key artifacts developed in the Unified Process: Use Cases, Class Diagrams and Sequence Diagrams, Requirements and Use cases: Business and system use cases, documenting requirements by using use cases, brief and fully dressed formats in use case modelling, use case diagrams and notations, operation contracts, describing use cases using UML activity diagrams, Modelling structure: class diagrams, attributes and state of a class, links and associations, multiplicity, operations, identifying classes and developing class diagrams, Modelling behavior: interaction diagrams, communication and sequence diagrams, Modelling object interaction using communication/sequence diagrams, Use case realization: realizing use cases by using communication/sequence diagrams and class diagrams

Evaluation Method: Continuous Assessment and/or End Semester Examination

CSC1251: Computer Laboratory (30 – 45 Lecture hrs.) *(Core)*

Working with matrices, Data input and output, Plotting and visualization, M-Files, Basic statistics and data analysis, working with Polynomials, Building graphical user interfaces

Evaluation Method: Continuous Assessment and/or End Semester Examination

MAT121β: Algebra (30 Lecture hrs. & 15 Tutorial hrs.) *(Core)*

Refer to course unit details under the Department of Mathematics

MAT122β: Calculus (30 Lecture hrs. + 15 Tutorial hrs.) *(Core)*

Refer to course unit details under the Department of Mathematics

BCS Level II - Semester I

CSC2113: Data Communication and Computer Networks (30 Lecture hrs. and 30 – 45 Practical hrs.) *(Core)*

Introduction to data communications and computer networks, network models, data and signals, data transmission, transmission, impairment, error detection and correction, multiplexing, logical addressing vs physical addressing, switching, routing, network and transport layer protocols, application layer, network security, Network Hardware, UTP cables, standards and structured cabling, IP addressing, subnet mask, default gateway, DNS server, Packet analysis and Network testing tools, Router and VLAN Configuration, DHCP, Remote login, Inter-VLAN Routing, ACL Configuration

Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)

CSC2123: Object Oriented Programming (30 Lecture hrs. + 30 - 45 Practical hrs.) *(Core)*

Fundamental of object-oriented design, Encapsulation, Polymorphism, Classes and objects, Information hiding, operator overloading, inheritance, overriding, delegation; Analyze problems: determine objects that are necessary to model the system, determine what attributes the objects need to have, determine what behaviors the objects need to exhibit, develop conceptual models, Modeling with UML, generate designs from the models, and implement the models.

Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)

CSC2133: Operating Systems (30 Lecture hrs. + 30 - 45 Practical hrs.) *(Core)*

Introduction and overview, Processes and threads, CPU Scheduling, Deadlocks, Memory management, File System implementation, Process synchronization, Virtual memory management, Protection and security, I/O systems

Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)

CSC2143: Computer Graphics and Image Processing (30 Lecture hrs. + 30 – 45 Practical hrs.) *(Core)*

Introduction and digital image fundamentals, Image enhancement in the spatial domain, Image enhancement in the frequency domain, Colour image processing, Morphological image processing, Image segmentation, Representation and description, Line drawing algorithms, Circle drawing algorithms, Geometric Transformations, Filling algorithms, Line clipping algorithms

Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)

AMT212β: Computational Mathematics (30 Lecture hrs. + 15 Tutorial hrs.) *(Core)*

Refer course unit details under the Department of Mathematics

MAT211β: Linear Algebra I (30 Lecture hrs. + 15 Tutorial hrs.) *(Core)*

Refer course unit details under the Department of Mathematics

PHY2112: Electronics (30 Lecture hrs.) (Core)

Refer course unit details under the Department of Physics

BCS Level II - Semester II

CSC2213: Rapid Application Development (30 Lecture hrs. + 30 – 45 Practical hrs.) *(Core)*

Introduction to rapid application development, Issues in rapid application development, Project estimation, Object oriented programming with C#, Introduction to design patterns, Decorator pattern, Proxy pattern, Factory method pattern, Singleton pattern

Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)

CSC2222: Computer System II (30 Lecture hrs.) *(Core)*

A top-level view of computer function and interconnection, Cache memory, Internal memory and External memory technology, Operating system support, Computer Arithmetic, Instruction sets, Processor structure and Functions, RISC Architecture, Parallel Processing, Multicore computers.

Evaluation Method: Continuous Assessments and/or End Semester Examination

CSC2233: Internet Programming (30 Lecture hrs. + 30 – 45 Practical hrs.) *(Core)*

Supporting the operation of organizations: Server-side scripting, PHP arrays, PHP functions, String manipulation functions, Forms & database, PHP MySQLi, Session & cookies, Web designing process, UI and UX, XML, JQuery & AJAX, Web development frameworks

Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)

CSC2242: Advanced Database Management (30 Lecture hrs.) ***(Core)***

Introduction: File structures and organization, Indexing, B+ tree structure, Query processing, Query optimization, Transaction management, Database recovery, Concurrency control techniques, Transaction support

Evaluation Method: Continuous Assessment and/or End Semester Examination

CSC2252: Project Management (30 Lecture hrs.) ***(Core)***

Introduction to Project management, Project management process for a project, Project scope management, Project time management, Project cost management, Project quality management, Project communication management, Project risk management, Group assignment Evaluation, Project HR management, Project procurement management, Project integration management.

Evaluation Method: Continuous Assessments and/or End Semester Examination

CSC2263: Multimedia and Video Production (30 Lecture hrs. + 30 - 45 Practical hrs.) ***(Optional)***

Introduction to multimedia technologies, Audio and video basics, Multimedia compression techniques and standards, Multimedia Authoring Tools, Multimedia advanced coding and media object production, Multimedia integration and presentation.

Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)

CSC2272: Data and Network Security (30 Lecture hrs.) ***(Optional)***

This course provides comprehensive knowledge in security requirements and cryptographic solutions in computer applications & networks.

Evaluation Method: Continuous Assessment and/or End Semester Examination

MAT225β: Mathematical Statistics I *(Core)*

Refer course unit details under the Department of Mathematics

PHY2222: Electronics (Optional)

Refer course unit details under the Department of Physics.

FSC224α: Physical Fitness and Health Management (Optional)

Refer course unit details under FSC course units.

BCS Level III - Semester I

CSC3113: Group Project (*Core)*

Project proposal preparation, Requirements gathering, System design and database design, Implementation, Testing and Evaluation, Deployment/Present to the client, Final report preparation, Presentation and demonstration of the project

Evaluation Method: Evaluation is based on Attendance, Presentation, Product, Project Report and Individual Contribution

CSC3122: e-Commerce and Professional Practice (30 Lecture hrs.) *(Optional)*

Supporting the operation of organizations, Motivation factors to e-Commerce, Classifying e-Commerce business types, Business models and e-Commerce, Business strategies, Technology infrastructure for e-commerce, Designing e-Commerce Web Site, Security in e-Commerce site, Legal and ethical Issues in e-Commerce, Professional practices

Evaluation Method: Continuous Assessments and/or End Semester Examination

CSC3132: Data Warehousing and Data mining (30 Lecture hrs.) *(Optional)*
Introduction to data mining and data warehousing, Basic concepts of data mining, Data pre-processing techniques, Classification, Prediction, Clustering, Association rules, Concept of data warehousing, Data warehousing: architecture and design.
Evaluation Method: Continuous Assessments and/or End Semester Examination

CSC3142: Internet Services and Protocols (15 Lecture hrs. + 30 Practical hrs.) *(Optional) Pre-requisite: CSC2113*

Introduction, the Internet, Internet protocols and Application services, Transport Protocols (TCP, UDP), Client Server computing, Packet and Protocol level Analysis, Email Service, SMTP, POP3, IMAP protocols, Email server and User Agent Configuration, World Wide Web, HTTP protocol and Web Server Configuration, Web caching, Proxy Servers and Cookies, Load Balancing and Proxy Server Configuration, Telnet, SSH and File Transfer Protocol, FTP server configuration, Voice over IP communication VOIP server configuration, Domain Name Service, DNS configuration, Server Performance and Tuning
Evaluation Method: Continuous Assessments and/or End Semester Examination

CSC3172: Distributed Systems (30 Lecture hrs.) *(Optional)*
Introduction to distributed systems, Communication in distributed systems, Synchronization in distributed systems: Clock synchronization, Mutual exclusion, Election algorithms, Deadlocks, Scheduling in distributed systems, Distributed file systems, P2P systems, Fault tolerance, Distributed systems in practice
Evaluation Method: Continuous Assessments and/or End Semester Examination

FSC3122: Accounting (30 Lecture hrs.) *(Optional)*
Refer to course unit details under FSC course units.

FSC3112 Management (30 Lecture hrs.) *(Optional)*
Refer to course unit details under FSC course units.

MAT313β: Mathematical Statistics II (30 Lecture hrs. + 15 Tutorial hrs.) *(Optional)*
Refer to course unit details under the Department of Mathematics.

BCS Level III - Semester II

CSC3216: Industrial Training (3 months) *(Core)*
This training helps the students to get experience on issues related to industry. At the end of the training, the students should make a presentation of their findings and submit a report.
Evaluation Method: Evaluation is based on Report, Novation Diary and Presentation/Viva

Note: The mode of delivery of the Course Units in BCS (General) Degree: physical and/or virtual. Evaluation mode for BCS (General) Degree: physical and/or virtual.

Bachelor of Computer Science (Honours) Degree - Semester I

CSC4112: Research Seminar (30 Lecture hrs.) *(Core)*
Writing a critique, Structure of a critique, Literature review: Selecting literature, Bibliographic management, Software tools, Studying literature, Objectives of literature review, Structure of a survey paper, Research communication: Scientific method and communication path, Templates for different scientific communication modes
Evaluation Method: Continuous Assessment

CSC4122: Research Methodology (30 Lecture hrs.) *(Core)*
Introduction to scientific research, Reading and recording, Critiquing research papers, Planning and conducting research, the research process, Types of computing research and computing research methods, Research ethics and plagiarism, Data collection and analysis, communicating research findings, Simple Latex for academic writing, Referencing and citation guides
Evaluation Method: Continuous Assessment

CSC4133: Neural Networks (45 Lecture hrs.) *(Core)*
Introduction to artificial neural networks, Multi-Layer perceptron, Back propagation algorithm, ANNs using tools, Pre-processing techniques, Feature extraction & Selection algorithms, Nave Bayes learning and Bayesian belief learning models, Unsupervised learning methods, Learning vector quantization methods, Self-organizing and Neural Gas Algorithms, Hierarchical learning models, Combining multiple classifier models, Measuring classifier performance.
Evaluation Method: Continuous Assessments and/or End Semester Examination

CSC4152: Enterprise Modelling (30 Lecture hrs.) *(Core)*
Strategic role of enterprise modelling, enterprise modelling process and enterprise modelling perspectives, Goal modelling, available goal modelling techniques, Business motivation model as a goal modelling technique, Business rules, Business rules and requirements, Different expression levels, Relationship between business rules model and other models (goal, process and concepts models), Business modelling, business value networks, Business modelling ontologies, Business modelling using e 3 value modelling method, Process modelling, Process modelling languages, Process modelling using EPC, Methods for specification and verification of business processes, Basic workflow concepts, Workflow modelling using Petri nets, Colored petri nets, Petri nets with time, Basic routing constructs in petri nets, Workflow analysis, Symptoms of a problematic workflow, Qualitative (reachability analysis) and quantitative analysis (Resource utilization, Number of cases in progress, Waiting time, System time).
Evaluation Method: Continuous Assessments and/or End Semester Examination

CSC4162 - Data Mining for Business Intelligence (30 Lecture hrs.) *(Core)* **Prerequisite: CSC3132** Introduction to Business intelligence, Introduction to data mining, Supervised and unsupervised learning, Classification and predictive techniques, Data partitioning, Dimension reduction using PCA, Classification methods: Classification techniques, Introduction to Bayes Theorem and Formula and, Naive Bays, K- nearest neighbor, Regression analysis, Clustering, Evaluate the performance classification and predictive methods
Evaluation Method: Continuous Assessments and/or End Semester Examination

CSC4172: High Performance Computing (30 Lecture hrs.) *(Core) Pre-requisite: CSC 3172*
Parallel algorithms: synchronous and asynchronous algorithms; parallel programming patterns, Introduction to HPC architectures: Flynn taxonomy, shared memory and distributed memory architectures: GPGPU, Parallel programming patterns, Programming shared-memory architectures with OpenMP, Programming distributed-memory architectures with MPI, Performance evaluation of parallel programs, scheduling and Load Balancing.
Evaluation Method: Continuous Assessment and/or End Semester Examination

CSC4182: Bioinformatics (30 Lecture hrs.) *(Optional)*
Introduction to Bioinformatics, Archives and Information Retrieval, Pairwise sequence Alignment algorithms: Dot Plots. Simple Alignments, The Needleman and Wunch Algorithm, Introduction to semi- global alignments, local sequence alignments and algorithms, BLAST, FASTA algorithm, Multiple sequence alignment and algorithms: Introduction to multiple sequence alignments, Greedy approach, Star alignment approach and ClustalW algorithm, Hidden Markov models development and related algorithms, Phylogenetic Trees: Introducing distance measures and distance based phylogenetic tree building algorithms: UPGMA, NJ, Introducing character based measures and character based phylogenetic tree building algorithms: maximum parsimony and maximum likelihood, Protein and RNA Structure Prediction and related algorithms: Secondary Structure, Tertiary and Quaternary Structure, looTs for Modelling Protein Folding, MicroRNA data and analysis methods/algorithms, Introduction to drug discovery and ligand docking algorithms.
Evaluation Method: Continuous Assessments and/or End Semester Examination

CSC4046: Individual Research project *(Core)*

This course provides an opportunity for the students carry out an individual research. The students will carry out an individual project and submit a dissertation. The students will also make a presentation of the project and face for a viva.

Evaluation Method: Evaluation is based on Project Proposal, Interim progress report, Manuscript, Project report and presentation/Viva

Bachelor of Computer Science (Honours) Degree - Semester II

CSC4212: Compilers and Theory of Computation (30 Lecture hrs.) *(Core)*

Compiler design introduction, Phases of compiler, lexical analysis, syntax analysis, Regular Expressions; Operations on Regular expressions, Finite Automata and Regular Expressions, Conversion from FA and regular expressions, Deterministic Finite Automata (DFA); Minimization of DFA, Non-Deterministic Finite Automata (NDFA). Equivalence of Deterministic and Non-Deterministic Finite Automata, Equivalence between DFA,NFA, NFA-, Context-free grammars, Parse trees; Ambiguity in grammars and languages, Standard forms; Chomsky normal forms, Greibach normal Forms, Minimization of CFGs, Pushdown automata (PDA), Deterministic and non-Deterministic (PDA); Formal definition of NPDA, Transition functions of NPDA; NPDA Execution, Accepting Strings with NPDA; Equivalence of PDAs and CFG, The Turing machine, Programming techniques for Turing Machines; Formal definition of TMs, Top-Down Parsing, LL(1) parse table, Recursive decent pars, Bottom-up parsing LR parsing, Abstract Syntax Trees, Lex & Flex, Yuck

Evaluation Method: Continuous Assessments and/or End Semester Examination

CSC4222: Service Oriented Computing (30 Lecture hrs.) ***(Core)***

Introduction to Service oriented computing, Introduction to service oriented architecture, Principles of service oriented architecture, Service classification, Enterprise service bus, Introduction to web services, Web service architecture SOAP, WSDL, Web service description, SOA Governance

Evaluation Method: Continuous Assessments and/or End Semester Examination

CSC 4232: Formal Methods and Software Verification (30 Lecture hrs.) ***(Optional)***

Review of sets, Relations, Functions and related matters, Review of propositional logic, and Logical arguments, Introduction to predicate calculus, Concepts of programming language and Proof of correctness, Hoare logic, Formal methods, Use of Z-notation for various aspects of program constructs and verification.

Evaluation Method: Continuous Assessments and/or End Semester Examination

CSC4242: Artificial Intelligence (30 Lecture hrs.) *(Core)*

Understanding multivariate Gaussian densities and projections, Implementing a linear classifier using the perceptron algorithm, Gaussian classifiers and Fisher linear discriminant analysis, ROC curves, Implementing linear regression and regularization techniques for predictive modeling, Comparative analysis of radial basis function models and Multi-Layer perceptron for regression and classification tasks, Reinforcement learning, Generative AI, Large language models (LLMs), Explainable AI (XAI), Responsible AI

Evaluation Method: Continuous Assessments and/or End Semester Examination

CSC4262: Selected Topics (30 Lecture hrs.) ***(Optional)***

Introduction to knowledge management, Knowledge representation using Ontologies, Ontology design, Ontology implementation, Ontology validation and evaluation, Ontology maintenance, Semantic web (Ontologies in Semantic Web), Introduction to Protag, Design a small ontology to a real world problem in an application domain

Evaluation Method: Continuous Assessments and/or End Semester Examination

CSC4282: Reconfigurable Computing (30 Lecture hrs.) (Optional)

Introduction to reconfigurable computing, FPGA architecture and basic logic elements of FPGA, Hardware definition languages (AHDL, VHDL and Verilog), Concurrent, behavioral and structural description of FPGAs, Reconfigurable computing design methodologies, Sequential circuits, Finite state machines, Parametric coding, Application acceleration using

reconfigurable computing, Digital system design introduction and hardware software Co-design, Heterogeneous computing.

Evaluation Method: Continuous Assessments and/or End Semester Examination

Note: The mode of delivery of the Course Units in BCS (Hons) Degree: physical and/or virtual. Evaluation mode for BCS Hons Degree: physical and/or virtual.

4.10. Credit Values

4.10.1. Bachelor of Computer Science (General) Degree (BCS)

Course Unit	Duration (hrs.)		Credits		Total
	Theory	Practical	Theory	Practical	
CSC1122: Computer Systems I	30		2		2
CSC1113: Programming Techniques	30	30 - 45	2	1	3
CSC113α: Internet Services and Web Development	15	**15**	1	0.5	1.5
CSC1142: System Analysis and Design	30		2		2
CSC1153: Laboratory Assignments	15	60	1	2	3
AMT112β: Mathematical Foundation of CS	30	15	2.5		2.5
MAT112δ: Differential Equations	15	7 T	1.25		1.25
MAT113δ: Introductory Statistics	15	8 T	1.25		1.25
CSC1213: Database Management Systems	30	30 - 45	2		2
CSC1223: Data Structures and Algorithms	30	30 - 45	2	1	3
CSC1233: Software Engineering	45		3		3
CSC1242: Object Oriented System Development	30		2		2
CSC1251: Computer Laboratory	15	15 - 30		1	1
MAT121β: Algebra	30	15	2.5		2.5
MAT122β: Calculus	30	15	2.5		2.5
CSC2113: Data Communication and Computer Networks	30	30 - 45	2	1	3
CSC2123: Object Oriented Programming	30	30 - 45	2	1	3
CSC2133: Operating Systems	30	30 - 45	2	1	3
CSC2143: Computer Graphics and Image Processing	30	30 - 45	2	1	3
AMT212β: Computational Mathematics	30	15	2.5		2.5
MAT211β: Linear Algebra I	30	15	2.5		2.5
PHY2112: Electronics	30		2		2
CSC2213: Rapid Application Development	30	30	2	1	3
CSC2222: Computer System II	30		2		2
CSC2233: Internet Programming	30	30 - 45	2	1	3
CSC2242: Advanced Database Management	30		2		2
CSC2252: Project Management	30		2		2
CSC2263: Multimedia and Video Production	30	30 - 45	2	1	3
CSC2272: Data and Network Security	30		2		2
MAT225β:Mathematical Statistics I	30	15	2.5		2.5
PHY2222: Electronics	30		2		2
FSC224α: Physical Fitness and Health Management					1.5
CSC3113: Group Project					3
CSC3122: e-Commerce and Professional Practice	30		2		2
CSC3132: Data Warehousing and Data mining	30		2		2
CSC3142: Internet Services and Protocols	15	30	1	1	2
CSC3172: Distributed Systems	30		2		2
FSC3122: Accounting	30		2		2

FSC3112: Management	30		2		2
MAT313β: Mathematical Statistics II	30	15	2.5		2.5
CSC3216: Industrial Training					6

T - Tutorials

4.10.2. BCS (Honours) Degree Programme

Course Unit	Duration (hrs.)		Credits		Total
	Theory	Practical	Theory	Practical	
CSC4112: Research Seminar	30		2		2
CSC4122: Research Methodology 3	30		2		2
CSC4133: Neural Networks	45		3		3
CSC4152: Enterprise Modelling	30		2		2
CSC4162: Data Mining for Business Intelligence	30		2		2
CSC4172: High-Performance Computing	30		2		2
CSC4182: Bioinformatics	30		2		2
CSC4046: Individual Research project					6
CSC4212: Compilers and Theory of Computation	30		2		2
CSC4222: Service-Oriented Computing	30		2		2
CSC4232: Formal Methods and Software Verification	30		2		2
CSC4242: Artificial Intelligence	30		2		2
CSC4262: Selected Topics	30		2		2
CSC4282:Reconfigurable Computing	30		2		2

Other Services to the University Community

The Department of Computer Science offers many Computer and Information Technology related services originally carried out by the computer unit of the Faculty of Science. Further, the department conducts courses and offers IT related services and consulting to the whole university community and other government and private sector organizations outside the university. Some of the core IT related services/activities carried out by the department are listed below.

- Conducting workshops and computer courses for academic and nun-academic members of the university community.
- Providing IT related technical supports and consultations for the Ruhuna University community.
- Working with individual students and staff on computer programmes.
- Conducting external computer courses
- Conducting IT Exhibitions.

5. Department of Mathematics

5.1. Introduction

A mathematics education has long been regarded as an exceptional training for the mind. Additionally, it is a crucial practical skill for those wishing to engage in shaping the future of our modern technological society. Advances in various fields such as computing, decision-making, medicine, pollution control, product design, space exploration, telecommunications, and weather forecasting all depend on the profound insights that mathematics offers. Individuals with a strong foundation in mathematics have numerous fascinating and rewarding career paths available to them and will always be held in high regard. Since the introduction of the course unit system in 2002, students have gained significant flexibility in choosing from the various streams available in the degree programs offered by the department. Currently, the department provides **Mathematics**, **Industrial Mathematics**, and **Applied Mathematics** as primary subjects for the BSc Degree Program. Each of these main subjects encompasses content from Pure Mathematics, Applied Mathematics, Statistics, and Mathematics as a whole. Further, the department of mathematics offers a **Financial Mathematics** and **Industrial Statistics** BSc (Honours) degree for a selected number of students.

5.2. Research Areas

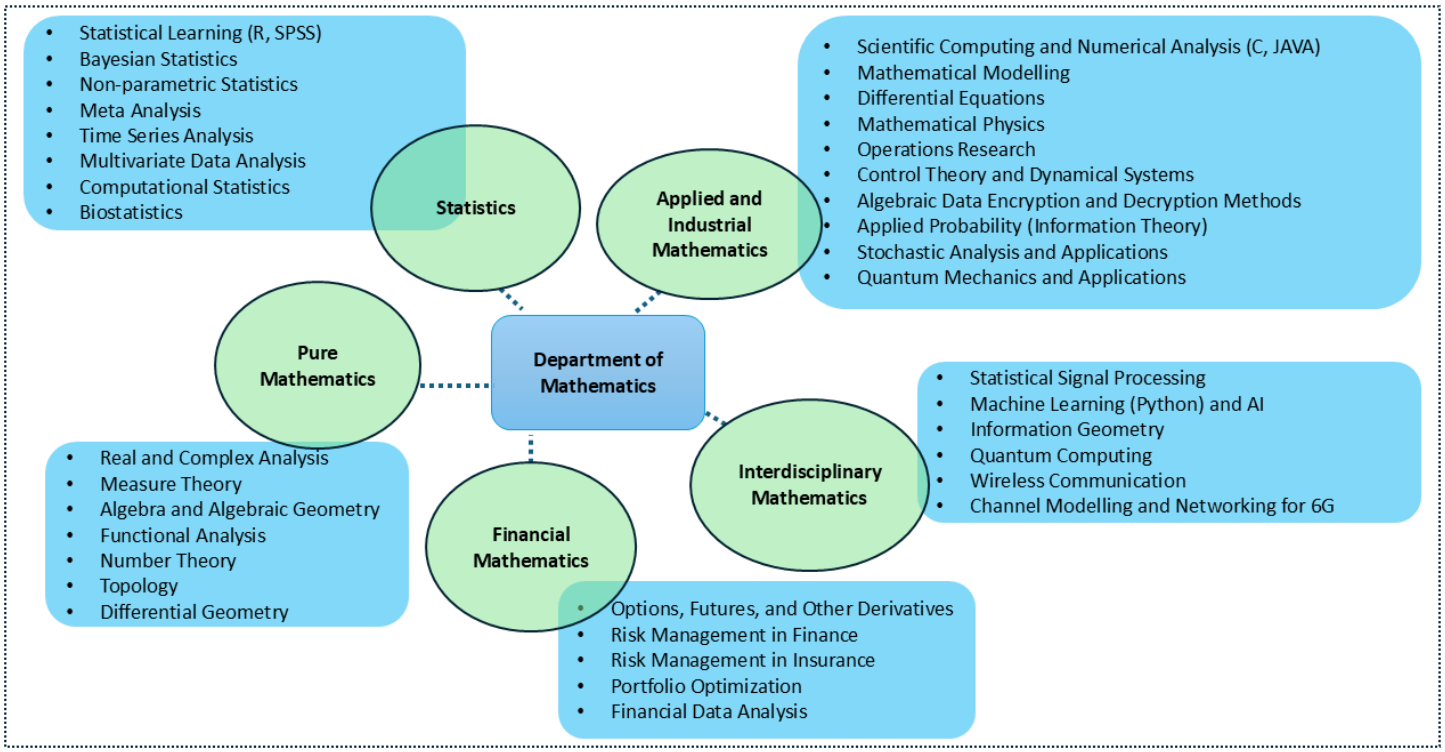


Figure 3:Department of Mathematics key research areas.

5.3. Head of the Department

Prof. B.G.S.A Pradeep
BSc (Ruhuna, SL) , MSc (Peradeniya, SL) , PhD (USTB, China)

5.4. Members of the Academic Staff

Designation	Name	Specialization
Senior Professor	Senior Professor L.A.L.W.Jayasekara BSc (Kelaniya, SL) MSc in Information Systems (Kyushu, Japan) PhD in Statistics (Kyushu, Japan)	Statistics
Professor Chair & Senior Professor	Senior Professor P.A. Jayantha BSc (Kelaniya, SL), MSc in Industrial Mathematics (Sri J'Pura, SL) PhD (QUT, Australia)	Numerical Methods for Partial Differential Equations, Computer Programming
Professor	Prof. B.G.S.A Pradeep BSc (Ruhuna, SL) MSc (Peradeniya, SL) PhD (USTB, China)	Mathematical Biology, Delay Differential Equations
Senior Lecturer Grade I	Mrs. K.C.N. Shanthidevi BSc (Sri J'Pura, SL), MSc (Hiroshima, Japan) (on leave)	Functional Analysis, Semigroup Theory and their Applications in Population Dynamics using Approximation Theory
	Dr. M.K. Abeyratne BSc (Kelaniya, SL) Dip. in Statistics (Sri J'Pura, SL) MSc in Industrial Mathematics (Kaiserslutern, Germany) PhD (Kaiserslutern, Germany)	Partial Differential Equations, Numerical Methods in PDEs, BVPs in Elasticity Theory, Finite Element Methods.
	Dr. L.W. Somathilake BSc (Kelaniya, SL), MPhil (Ruhuna, SL) PhD (Ruhuna, SL)	Nonlinear PDEs (reaction diffusion systems), Semigroup theory, Computational PDEs, Mathematical & Computational Biology
	Dr. N. Yapage, BSc (Ruhuna, SL) PhD (UEC, Tokyo, Japan) (on leave)	Mathematical Physics, Probability Theory Stochastic Analysis, Statistical Information Theory & Applications, Quantum Information and Computation, Differential Geometrical Methods in Statistics, Theory of Complex Systems and Networks
	Dr. W.A.R. De Mel BSc (Kelaniya, SL) MPhil (Ruhuna, SL) M.S. (SHSU, USA) M.S. (MST, USA) PhD (MST, USA) (on leave)	Parametric and Nonparametric Methods in Survival Analysis, Recurrent Events, Applied Stochastic Processes, Financial Mathematics, Financial Time Series and Actuarial Science
	Dr. K. D. Prasangika BSc (Ruhuna, SL) MPhil (Ruhuna, SL) PhD (CCNU, China)	Statistics, Categorical Data Analysis, Meta-Analysis, Time Series Analysis, Bayesian Inference
Senior	Dr. D. M. Samarathunga	Operations Research,

Lecturer Grade II	BSc (Peradeniya, SL). PhD (Wayne State, USA)	Mathematical Programming
	Dr. A.W.L. Pubudu Thilan BSc (Ruhuna, SL) BIT(Dip) (Colombo, SL) M.S. (MST, USA) MPhil (Ruhuna, SL) PhD (Queensland, Australia)	Optimal experimental design, Bayesian design, Ecological modelling Adaptive design, Bayesian computational algorithms
	Dr. E.J.K.P. Nandani BSc (Ruhuna, SL) MPhil (Ruhuna, SL) PhD (WIPM, UCAS, China)	Applied Mathematics Artificial Neural Networks Mathematical Physics
	Dr. H. L. Jayetileke BSc (Ruhuna, SL) MSc (Colombo, SL) PhD (Queensland, Australia) (on leave)	Regression Analysis, Longitudinal Data Analysis, Financial Mathematics, Bias Reduction Techniques, Machine Learning
	Mrs. K.G.P.Hansani BSc (Ruhuna, SL) MPhil (Ruhuna, SL)	Applied Mathematics Numerical Modeling and Simulation
	Mrs. S.D.M. Dilshani BSc (Ruhuna, SL) MSc (Moratuwa, SL) MPhil (Ruhuna, SL)	Categorical Data Analysis, Meta-Analysis
Probationary Lecturer	Dr. L.T. Wedage BSc (Ruhuna, SL) PhD (SETU, Ireland)	Statistics, 5G/6G Wireless Communication
	Ms. A.W.S.P. Karunarathne BSc (Kelaniya, SL) MSc (Moratuwa, SL) MPhil (Colombo, SL) (Reading)	Statistics, Actuarial Sciences
	Ms. A.D.W. Yapa BSc (Ruhuna, SL) MSc (Moratuwa, SL)(Reading)	Statistics, Financial Mathematics, Stochastic Processes
	Mr. S.M. Gayan Sanjeewa Bandara BSc (Ruhuna, SL) MSc (Moratuwa, SL)(Reading)	Statistics, Financial Mathematics
	Ms. S.R.T. Kulasekara BSc (Ruhuna, SL) MSc (USJ,SL)	Applied Statistics
	Ms. I.C. Liyanage BSc (Ruhuna, SL) BIT(Dip) (Colombo, SL) MPhil (UWU, SL)(Reading)	Statistics, Actuarial Sciences, Statistical Modelling
	Mr. A.V.R. Hansana BSc (USJ, SL) PhD (USJ, SL) (Reading)	Mathematical Epidemiology, Optimal Control Theory, Mathematical Modelling, Numerical Analysis, Spatial Statistics
	Mr. H. H. D. Kumara BSc (Kelaniya, SL) MPhil (Kelaniya, SL) (Reading)	Pure Mathematics, Applied Mathematics, Statistics, Financial Mathematics

	Ms. M.G.N. Yasara BSc (USJ, SL) MSc (USJ, SL)	Applied Statistics
	Ms. J. G. A. Gangadari BSc (Ruhuna, SL)	Mathematical Modeling, Queuing Theory

5.5. Course Units offered for BSc (General) Degree

Mathematics

BSc Level I - Semester I

MAT111β: Vector Analysis (30 Lecture hrs. + 15 Tutorial hrs.)

Vector Algebra: Definition of a vector, Addition and subtraction, Components, Physical examples. **Vector Products**: Scalar and vector products including a brief introduction to determinants, Triple products, Geometrical applications. Differentiation and integration of a vector functions. **Vector Analysis**: Scalar and vector fields, grad, div, curl, manipulation with combinations of these operators acting on combinations of fields. **Integral transformations:** Line, surface and volume integrals, The divergence theorem, Conservative and solenoidal fields, Green's theorem, Stokes' theorem (3-D) form. **General Co-ordinates**: Unit vectors in orthogonal curvilinear co-ordinates, elementary arc length and volume, curl, div, grad in curvilinear co-ordinates.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MAT112δ: Differential Equations (15 Lecture hrs. + 7 Tutorial hrs.)

Introduction, Equations of first order and first degree, Orthogonal trajectories, Clairant's form, Linear equations, Theory of operators, Euler's form, Simultaneous equations.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MAT113δ: Introductory Statistics (15 Lecture hrs. + 8 Tutorial hrs.)

Definition of probability, Conditional probability and the independence of events, , The law of total probability and Bayes' rule, Definition of random variables, Cumulative distribution function, Density functions for discrete random variables and continuous random variables, Expectations, Mean, Variance, Standard deviation, Expected value of a function of a random variable, Moments, Central moments, Moment generating function, Bernoulli and Binomial distributions, Hypergeometric distribution, Poisson distribution, Geometric distribution, Uniform distribution, Normal distribution, Exponential and Gamma distribution, Approximation: Binomial and Poisson by Normal.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MAT1142: Mathematics for Bio Science Students (30 Lecture hrs.) Only for students following Biological Science Stream - *(Not counted for the Degree)*

Basic algebra (including Complex Numbers), Logarithms, Trigonometric functions, Limits, The principle of differentiation, Differentiation of a Product, Quotient and a function of a function, Maxima and Minima, Partial differentiation, Total differentiation, Homogeneous functions and Euler's theorem on homogeneous functions, Integration as the converse of differentiation, Integration by parts, Exact differential equations, Definite integral, Vectors, Determinants, Matrices, Introduction to Group theory, Statistics for Chemistry (permutations, Configurations and Microstates, Molecular assemblies, and the Boltzmann distribution.)

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

BSc Level I - Semester II

MAT121β: Algebra (30 Lecture hrs. + 15 Tutorial hrs.)

Elementary set theory, Relations, Mappings and functions, Theory of polynomial equations in one variable including the statement of the fundamental theory, Newton's relations between roots, Solution of cubic and biquadratic equations, Determinants,

Solution of equations using determinants, n^{th} roots of unity, Elementary group theory, Rings and fields, Complex theory approach through fields.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MAT122β: Calculus (Real Analysis) (30 Lecture hrs. + 15 Tutorial hrs.)

Classical logic, Set theory, Field axioms, Real number system as a field, Functions and their properties, Real sequences, Continuity and Limits of functions, Differentiability.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

BSc Level II - Semester I

MAT211β: Linear Algebra (30 Lecture hrs. + 15 Tutorial hrs.)

Vector spaces and subspaces, Linear transformations, Dual spaces, Matrices, Operations on matrices, Rank, Elementary transformations, Elementary matrices, Normal forms, Solving systems of linear equations, Eigenvalues, Eigenvectors, Characteristic polynomial, Cayley-Hamilton theorem and applications, Minimum polynomial.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MAT212β: Real Analysis-I (30 Lecture hrs. + 15 Tutorial hrs.)

Theory of series: Lower limits and upper limits of sequences, Series, Test for convergence and divergence, Absolute convergence, Rearrangements, Cauchy products, Power series and radius of convergence. **Riemann Integration**: Upper and lower sums, Upper and lower Integral, The Riemann integral, Properties of Riemann integrals, Fundamental theory of calculus, Improper integrals, Integration by parts.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

BSc Level II - Semester II

MAT221β: Number Theory (30 Lecture hrs. + 15 Tutorial hrs.) Elective for students following Mathematics. Compulsory for students who wish to follow an honours degree in the Applied Mathematics stream.

Integers: Prime and irreducible, Division algorithm, Euclid's algorithm, Fundamental theorem of arithmetic, Integers mod n, Chinese remainder theorem, Euler's function. **Prime integers**: Sieve of Eratosthenes, Perfect numbers, Mersenne numbers, Fermat numbers, Infinite number of primes, The prime number theorem. **Gaussian integers Modular calculations:** Fermat's Little theorem, Wilson's theorem. Sums of squares, Fermat's Last theorem, Sums of 4 squares. **Primitive elements**: Roots of unity, Factors of Fermat primes, Roots of polynomial equations, The number of n^{th} roots of unity, The primitive element theorem. **Integer polynomials**: Hensel's lemma, Primitive elements mod n, Special Topics in Number Theory.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MAT222δ: Real Analysis-II (15 Lecture hrs. + 7 Tutorial hrs.)

Sequences and series of functions, Point-wise convergence of sequence of functions, Uniform convergence of sequence of functions, Convergence and Uniform convergence of series of functions, Integration and differentiation of series of functions.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MAT224δ: Geometry (15 Lecture hrs. + 8 Tutorial hrs.)

Plane: Various forms of the equation of a plane. Straight line, Various forms of the equation of a line. **Sphere**: Various forms of the equation of a sphere, Tangent line to a sphere, Tangent plane to a sphere, Condition of tangency, Intersection of two spheres. **The Central Conicoids**: Ellipsoid, Hyperboloid of one sheet, Hyperboloid of two sheets, Intersection of a conicoid and a line, Tangent Line to a conicoid, Tangent plane to a conicoid, Normal to a conicoid, Number of normal from a given point.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MAT225β: Mathematical Statistics-I (30 Lecture hrs. + 15 Tutorial hrs.) - *Prerequisite MAT113δ* **Elective for students following Mathematics. Compulsory for students who wish to follow an honours degree in the statistics stream.**

Joint density functions, Joint cumulative distribution function, Conditional distribution function, Independence, Covariance and correlation coefficient, Conditional expectations, Joint moment generating function and moments, Independence and expectation, Bivariate Normal distribution, Expectations of functions of random variables. **Distribution of Function of Random variables**: Cumulative distribution function technique, Moment generating function technique, Transformation technique. Population and samples, Random sample, Statistic, and Sample moments, Sample mean, Law of large numbers, Central limit theorem. **Sampling from the normal distribution**: Sample mean, Chi-square distribution, F distribution, Student-t Distribution.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

BSc Level III - Semester I

MAT311β: Group Theory (30 Lecture hrs. + 15 Tutorial hrs.)

Groups and subgroups: Groups, Subgroups/normal subgroups, Quotient groups, Cyclic groups, Cayley diagrams. **Permutations, cosets and direct products**: Groups of permutation, Orbits, Cycles and alternating groups, Cosets and the theorem of Lagrange, Direct product, Finite groups. **Homomorphism and factor groups**: Homomorphism factor group, Factor group computation and simple groups.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MAT312β: Real Analysis-III (30 Lecture hrs. + 15 Tutorial hrs.) Elective for students following Mathematics, *Prerequisite: MAT221β*

Non Linear Analysis: Functions from R^n to R^m, Open balls and open sets, limit points. Limit and continuity, The derivative of scalar field with respect to a vector. Directional derivatives and partial derivatives, Partial derivatives of higher order, Directional derivatives and continuity, The total derivative, The gradient of scalar field, A sufficient condition for differentiability, The chain rule for derivatives of scalar fields. Derivatives of vector fields, Differentiability implies continuity, The chain rule for derivatives of vector fields, Sufficient conditions for the equality of mixed partial derivatives, Derivatives of functions defined implicitly, Maximum, minimum and saddle points of multivariable functions, Extremes with constraints, Lagrange's Multipliers, Double integrals.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MAT313β: Mathematical Statistics-II (30 Lecture hrs. + 15 Tutorial hrs.) - **Elective for students following Mathematics***, Prerequisite: MAT225β*

Point estimation: The method of moments, The method of Maximum Likelihood, Properties of point estimation: Unbiasedness, Efficiency, Consistency, Sufficiency, Minimal sufficient statistics, Exponential family, Cramer-Rao inequality, Completeness.

Interval Estimation: Confidence interval for the mean and variance. Tests of hypotheses: Simple hypothesis, Composite hypothesis, Critical region, Types of error, Power function, Size of test, Simple Likelihood-ratio test, Most powerful test, Neyman-Pearson lemma, Generalized Likelihood-Ratio test, Uniformly most powerful test, Tests of hypotheses - Sampling from the Normal distribution.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

BSc Level III - Semester II

Refer the Optional course units offered by the Department of Mathematics for Level III- Semester II, for details. See more details in page 73.

Industrial Mathematics

A limited number of students are selected for the Industrial Mathematics stream based on their Z-scores from the Advanced Level examination.

BSc Level I - Semester I

IMT111β: Classical Mechanics-I (Dynamics) (30 Lecture hrs. + 15 Tutorial hrs.)
Frame of reference, Inertial frames, Forces, Velocity, Acceleration, Linear momentum, Angular velocity, Angular acceleration, Angular momentum, motion of a particle (Newton laws), Motion of a system particles, Rotating coordinate systems, Moments and products of inertia. Parallel axes theorem, Perpendicular axes theorem for moments and products of inertia. Principle axes and principle moments of inertia of a system of particles, Rotating coordinate systems, Infinitesimal rotation, Euler equations, Generalized coordinates, Lagrange's formulations, Hamiltonian functions, Theory of small oscillation, Impulsive motion.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

IMT1b2β: Mathematical Computing with C (15 Lecture hrs. + 60 Practical hrs.)
Introduction to computer systems and its historical development, Contribution from mathematicians (e.g. Leibnitz, Boole, Pascal, Babbage, Turing, von Neumann), Numerical computation and mechanical computing devices. General overview of: computer architecture, Hardware, Software and live ware, Programming languages, Application packages, The present day use of computers and its future. Introduction to Linux Operating System: Linux commands, Directory structure, Text editors, User accounts and file permissions, Text editors, Virtual terminals in text mode. Programming with C on Linux system - editing (with emacs), Compilation, Debugging. Formatted input-output, Control structures, Loops, C-functions, Pointers, File input/output, Command-line arguments (the above shall be discussed with mathematical applications); Introduction to Linux operating system**.**
Method of Evaluation: Available on page 75

BSc Level I - Semester II

IMT121β: Classical Mechanics-II (Statics) (30 Lecture hrs. + 15 Tutorial hrs.) *Prerequisite IMT111 β*
Theory of Forces and Couples: Force acting at a point, Resultant of a system of forces acting at a point, Condition for equilibrium of a system of forces acting at a point, Vector moment of a force, Couple, Moment of a couple, Resultant of a system of forces in 3D, Invariants, Wrench, Coplanar systems of forces, Varignon's theorem of moments, Parallel systems, Conjugate forces. **Bending of Beams**: Shear and bending moment in a beam, Relations among Load, Shear and bending moment, Thin elastic beams, Bernoulli-Euler Law, Macaulay's notation, Chaperon's equation for three moments. **The Catenary**: Flexibility, The common catenary, Parabolic chain, Suspension bridge, Catenary of uniform strength, General equations of equilibrium of a string in one plane under given forces, Strings on rough curves, Variable chain hanging under gravity.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

IMT122β: Mathematical Modelling-I (30 Lecture hrs. + 15 Tutorial hrs.) - *Prerequisite MAT112δ*
Introduction: General introduction to modelling, Concepts of system identification, Deterministic vs stochastic, Classification of models. **Modelling via First Order Differential Equations**: Modelling through first order and simple higher order differential Equations, Linear Differential Equations (LDEs), Systems of Ordinary Differential Equations (ODEs). **Analysis of Solutions**: Existence and uniqueness of solutions, Continuation of solutions, Dependence on initial conditions and parameters, Linear systems of equations with constant and variable coefficients, Autonomous systems, Phase space and stability, Interpretation of solutions in modelling. **Applications**: Population ecology, Chemical kinetics, Traffic dynamics, Mechanics, Biology and medicine, Pharm kinetics, Economics, Engineering, and Special topics in modelling.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

BSc Level II - Semester I

IMT211β: Classical Mechanics-III (Fluid Dynamics) (30 Lecture hrs. + 15 Tutorial hrs.) *Prerequisite IMT121β*
Equations of stream lines, Equations of vortex lines, Differentiation following the motion of a fluid. Equations of continuity, Euler's and Bernoulli's equations, Irrotational motion, uniqueness theorem, Kinetic energy, Sources and sinks, Images, Potential flow, Complex potential.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

IMT2b2β: Mathematical Computing with JAVA (15 Lecture hrs. + 60 Practical hrs.)

MATLAB workplace: Overview of MATLAB features and workplace, MATLAB command window as a Scientific calculator, Handling variables, Saving variables in files with extension mat, Formatting output, Arrays, Matrices, Matrix functions. **Script and functions**: Simple MATLAB codes for matrix manipulations, Finding roots, Evaluating polynomials, Structural programing, for-loop, while-loop, if, else if, 2D and 3D Plots, MATLAB for solving nonlinear equations, Numerical differentiation and integration, Solving linear systems, Solving ordinary differential equations, Solving and plotting numerical solutions of system of differential equations, MATLAB codes construction for curve fittings.

Method of Evaluation: Available on page 75

BSc Level II - Semester II

IMT221β: Mathematical Modelling-II (30 Lecture hrs. + 15 Tutorial hrs.) - *Prerequisite IMT122β*

Introductory numerical solutions of differential equations, Mathematical modelling through difference equations, Further study on systems of differential equations with matrices. Modelling with Partial Differential Equations (PDEs): The concept of a PDE, Method of separation of variables, Mass-Balance equation (The first method of obtaining PDE models), Momentum-Balance equation (The second method of obtaining PDE models), Variational principles (The third method of obtaining PDE models), Probability generating functions (The fourth method of obtaining PDE models), Nature of PDEs initial and boundary conditions.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

IMT223β: Applied Probability (Information Theory) (30 Lecture hrs. + 15 Tutorial hrs.) - Elective for students following Industrial Mathematics*, Prerequisite MAT221β*

Event spaces, Probability measure, Probability space, Sample space, Continuity of a probability measure, Defining random variables on probability spaces and their functions, Partition theorem, Conditional probabilities, Distribution functions, The law of large numbers, Introduction to information theory and Claude Shannon's remarkable work on mathematical formulation of the central problem in telecommunication channels, Error correcting codes for binary symmetric channel and their performances, Shannon's noisy channel coding theorem, Probability and entropy, Entropy and mutual information, Convex functions and Jensen's inequality, The data processing theorem, Discrete memoryless channels and their capacity-cost functions, Measuring the information content of an ensemble, The Source-Channel Coding Theorem for the Binary symmetric channel.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

IMT224β: Applied Statistics-I (30 Lecture hrs. + 15 Tutorial hrs.) - Elective for students following Industrial Mathematics*, Prerequisite MAT225β*

Collecting and Summarizing data: Constructing tables and graphs, Measures of center of a set of observations, Median, Arithmetic mean, Mode. **Samples and Populations**: Methods of choosing a sample, Measures of variability: Range, Mean deviation, Variance and standard deviation, Semi-interquartile range, Five number summaries, Box and Whisker plots, Stem and leaf plots. **Joint distributions of data**: The scatter diagram, The concept of a statistical relation, Quantitative description of a statistical relation, Covariance, Correlation coefficient. **Linear regression**: Regression equation, Prediction and error, Interpreting regression. **Statistical Applications with probability models:** Bernoulli, Binomial, Poisson, Normal approximations, Statistical software packages.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

BSc Level III - Semester I

IMT3b1β: Mathematical Computing (15 Lecture hrs. + 60 Practical hrs.)

Introduction to programming, Variables and expressions, Basic inputs and outputs, Control flow, Arrays, Exception handling in Java, Introduction to Object-Oriented Programming (OOP), Advanced OOP concepts, Java swing and Graphical User Interfaces (GUI). This includes a real-world problem-solving task, using mathematical (modelling) techniques and computational tools that the student has learnt in Level I, II and III.

Method of Evaluation: Available on page 75

IMT312β: Mathematical Modelling-III (30 Lecture hrs. + 15 Tutorial hrs.) - *Elective for students following Industrial Mathematics, Prerequisite IMT221β and IMT223β*

Solution of linear differential equations by Laplace transforms, Mathematical modelling through graphs, Mathematical modelling through calculus of variations and dynamic programming or special topics and/or project, Stochastic modelling, A survey on ancient Sri Lankan science and technological methods, Topics in mathematical modelling of life-environmental relationships.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

IMT313β: Applied Statistics-II (30 Lecture hrs. + 15 Tutorial hrs.) - *Elective for students following Industrial Mathematics, Prerequisite IMT224β*

Testing hypotheses about many population means: Introduction to analysis of variance, Linear model for analysis of variance, variability as sum of squares, Test statistics and rejection rules. **The population regression**: Formulating hypotheses about regression, Analysis of variance for regression. **Nonparametric tests**: Chi-square test, Contingency tables (test for independence), Kolmogorov-Smirnov test, the sign test, The Rank test (Mann-Whitney U-test), Runs test (one-sample runs test, two-sample runs test), Kruskal-Wallis H-test.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

BSc Level III - Semester II

Refer to the Optional course units offered by the Department of Mathematics for Level III- Semester II, for details available on page 73.

Applied Mathematics

BSc Level I - Semester I

AMT111β: Classical Mechanics-I (Dynamics) (30 Lecture hrs. + 15 Tutorial hrs.)

Refer IMT111β under Industrial Mathematics for details.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

AMT112β: Mathematical Foundation of Computer Science (30 Lecture hrs. + 15 Tutorial hrs.)

Logic syllogisms, Propositional logic, Propositions, Arguments, Predicates and quantifiers, Logic programming. **Number Systems**: Number systems (decimal, Roman), Binary number system, Octal system, Binary arithmetic (including complement methods). **Boolean algebra and logic circuits**: Boolean algebra, Switching circuits, Logic circuits.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

BSc Level I - Semester II

AMT121β: Classical Mechanics-II (Statics) (30 Lecture hrs. + 15 Tutorial hrs.) *Prerequisite AMT111 β*

Refer IMT121β under Industrial Mathematics for details.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

AMT122β: Mathematical Modelling-I (30 Lecture hrs. + 15 Tutorial hrs.) *Prerequisite MAT112 δ*

Refer IMT122β under Industrial Mathematics for details.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

BSc Level II - Semester I

AMT211β: Classical Mechanics-III (Fluid Dynamics) (30 Lecture hrs. + 15 Tutorial hrs.) *Prerequisite AMT121*
Refer IMT211β under Industrial Mathematics for details.

AMT212β: Computational Mathematics (30 Lecture hrs. + 15 Tutorial hrs.)
Numerical computing and computers: Introduction, Computer for numerical analysis, Computer arithmetic and errors. **Solving Non-Linear equations**: Bisection method, Newton's method, Fixed point Iteration x = g(x) method, Secant method, Regula-Falsi method. **Interpolation and Curve Fitting**: Interpolation, Lagrange polynomials, Divided differences, Interpolating with a Cubic Spline, Least-Square approximation. **Numerical Differentiation and numerical Integration**: Getting derivatives and integrals numerically, Trapezoidal rule (composite formula), Simpson's rules, Applications of cubic splines.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

BSc Level II - Semester II
All the course units in Level III semester II are optional, which are offered by the department based on the availability of staff members with expertise in the field and based on the availability of resources.

AMT221β: Mathematical Modelling-II (30 Lecture hrs. + 15 Tutorial hrs.) *Prerequisite AMT122 β*
Refer to IMT221β under Industrial Mathematics for details.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

AMT223β: Applied Probability (Information Theory) (30 Lecture hrs. + 15 Tutorial hrs.) *Elective for students following Applied Mathematics, Prerequisite MAT221β*
Refer to IMT223β under Industrial Mathematics for details.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

AMT224β: Applied Statistics-I (30 Lecture hrs. + 15 Tutorial hrs.) *Elective for students following Applied Mathematics, Prerequisite MAT225 β*
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

BSc Level III - Semester I

AMT311β: Numerical Analysis (30 Lecture hrs. + 15 Tutorial hrs.);
Elective for students following Applied Mathematics, and not allowed with AMT312β
Solving Linear Systems: Matrix notation, Direct methods, Gauss-Jordan, Aitken method, etc. Iterative methods: Jacobi, Gauss-Seidel, SOR method. **Numerical solutions of ordinary differential equations**: Euler and modified Euler methods, Runge-Kutta method, Convergence criteria, Errors and error propagation. **Numerical solutions of partial differential equations**: Parabolic type, Elliptic type, Hyperbolic type.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

AMT312β: Mathematical Modelling III (30 Lecture hrs. + 15 Tutorial hrs.);
*Elective for students following Applied Mathematics and not allowed with AMT311***β,** *Prerequisite AMT223β*
Refer to IMT312β under Industrial Mathematics for details.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

AMT313β: Mathematical Methods in Physics and Engineering-I (30 Lecture hrs. + 15 Tutorial hrs.);
Prerequisite AMT223β /IMT221β
Laplace transformations, Inverse Laplace transformations, Gamma, Beta and Bessel functions, Applications in solving the wave equation and the heat equation, Fourier series.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

AMT314β: Applied Statistics-II (30 lecture hrs. + 15 Tutorial hrs.);
Elective for students following Applied Mathematics Prerequisite AMT224β
Refer IMT313β under Industrial Mathematics for details.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

BSc Level III - Semester II

The following course units are optional for the students

MAT321β: Functional Analysis (30 Lecture hrs. + 15 Tutorial hrs.), Optional *Prerequisite MAT211β*
Metric spaces: Definition and examples, Open set, Closed set, Neighborhood, Convergence, Cauchy sequence, Complete linear, Completion of metric spaces, Banach's fixed point theorem. **Normed spaces**: Linear space, Normed space, Banach space, Finite-dimensional normed spaces and subspaces, Compactness and finite dimensions, Linear operators, Bounded and continuous linear operators, Linear operators and functionals on finite-dimensional spaces, Normed spaces of operators, Dual space, Inner product space, Hilbert spaces. **Fundamental Theorems for Normed and Banach spaces:** Zorn's lemma, Hann-Banach theorems, Reflexive spaces, Strong and weak convergence, Numerical integration and weak convergence.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MAT322β: Complex Variables (30 Lecture hrs. + 15 Tutorial her) Optional
Theory of complex variables: Complex functions, Complex differentiability, Cauchy-Riemann equations, Analytic functions, Cauchy's theorem, Cauchy's integral formula, Taylor's and Laurent's theorem, Classification of singularities, Laurent expansions, Contour integration, Cauchy's residue theorem, Integration of rational and trigonometric functions using residue theorem.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MAT323β: Differential Geometry and Tensor Analysis (30 Lecture hrs. + 15 Tutorial hrs.) .) Optional
Differential Geometry: Unit tangent vector, Principal normal, Binomial vector and curvature of a curve, Surfaces, Parametric curves, Surfaces of revolution, Metric, Directional ratios and coefficients, Gauss and mean curvature, Orthogonal trajectories, Families of dual curves, Geodesics. **Tensor Analysis**: Transformation of coordinates, Summation convention, The Kronecker-Delta, Contravariant and covariant vectors, Contravariant, Covariant and mixed tensors, Symmetric and skew-symmetric tensors, Tensor algebra, Metric tensor, Conjugate metric tensor, Christoffel's symbols of first and second kind, Covariant derivatives.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MAT324β: Mathematical Models in Ecology (30 Lecture hrs. + 15 Tutorial hrs.) Optional
Introduction to Modelling: Basic description of mathematical modelling, Introduction to dynamical systems, Ecological models. **Linear Dynamical Systems:** Analysis of dynamical systems, Equilibrium, Stability, Ratios and proportional change. **Nonlinear Dynamical Systems**: Introduction, Stability, Web analysis. **Population Dynamics**: Introduction to population growth, Logistic model, Nonlinear growth rates, Graphical approach to harvesting, Analytic approach to harvesting, Economics of harvesting. **Genetics:** Introduction to population genetics, Mutation, Selection.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MAT325β: Introductory Econometrics (30 Lecture hrs. + 15 Tutorial hrs.), Optional
Prerequisite MAT211β
Matrix algebra: Definition of matrices, Rules of matrix algebra, Determinants, Ranks, Inverses and solutions, Cramer's rule, Quadratic forms, Matrix deficiency. **Applications:** Solutions of multi-equation models, Input-output analysis. **Optimization**: Unconstrained optimization in the n-variable case, Second-order conditions and Hessian matrices. Constrained optimization in the n-variable case, Multiple constraint cases and bordered Hessian matrices. **Applications**: Maximization and minimization of various economic magnitudes in multi-variable settings. **An Introduction to inequality-constrained optimization**: Profit maximization, Non-negativity constraints. **Difference equations**: Introduction to dynamics, applications: The cobweb pricing model, Macroeconomic trade cycles.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MAT326β: Mathematical Foundation of Computer Science (30 Lecture hrs. + 15 Tutorial hrs.), *Optional for Students who **do not** follow Applied Mathematics or Computer Science*

Logic: Syllogisms, Propositional logic, Propositions, Arguments, Predicates and quantifiers, Logic programming. **Number Systems:** Number systems (decimal, Roman), Binary number system, Octal system, Binary arithmetic (including complement methods). **Boolean Algebra and Logic circuits**: Boolean algebra, Switching circuits, Logic circuits.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MAT327β: Introduction to Financial Mathematics (30 Lecture hrs. + 15 Tutorial hrs.) Optional

Introduction: Time value of money, Compound interest, Simple interest, Present value, Future value, Accumulation function, Discount rate, Continuous interest, Force of interest, and Equation of value. **Annuities:** Immediate, Due, Time Lines, Perpetuities, Continuous annuities, Variable annuities, and Reinvestment problems. **Loan Repayment:** Amortization, Prospective/Retrospective methods, Instalment loan, Sinking funds, Net interest, and Capitalization of interest. **Bonds**: Face value, Par value, Coupon rate, Redemption value, Bond price, Makehams formula, Amortization of premium/discount, Callable bond, Price-plus accrued, Market price, and True price. **Yield Structure of Interest Rate**: Internal rate of return, Cash flows, Borrowing projects, Time/Dollar weighted rates, Portfolio method, and Net present value. **Term Structure Interest Rates**: Term structure of interest rates, Risk-free rates, Yield curve, and Forward rate. **Asset Liability Management, Duration and Immunization**: Assets, Liabilities management, Duration, Convexity, Immunization, Stocks, Dividends, and Mutual Funds.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

IMT321β: Applied Algebra (Algebraic Data Encryption & Decryption Methods) (30 Lecture hrs. + 15 Tutorial hrs.), Optional *Prerequisites MAT111β, MAT211β, MAT221β*

Introduction to the RSA Encryption Scheme: Raising integers to large powers to a given modulus, "Egyptian exponentiation", Discussion of primality testing, The Little Fermat and Rabin tests, Implications for the RSA system, Verifying authenticity. **Topics in Rings and Fields**: GF(p), Polynomials over a ring, The primitive element theorem, Recurrent sequences, Shift registers, The ideal and minimal polynomial of a sequence, Indexing polynomials, Congruence modulo a polynomial, Construction of finite fields, Construction of indexing polynomials, Cyclotomic polynomials, Factorizing polynomials over finite fields. **Error detection and correction in telecommunication**: ISBN codes, The Hamming metric, The minimum distance of a code, Elementary bounds on the minimum distance of a code, Equivalence of codes, Parity checks, The sphere-packing bound, Reed-Muller codes, Linear codes, Dual codes, The parity check matrix of a linear code syndrome decoding, The Hamming codes, Cyclic codes, Generator polynomials and check polynomials, Construction of binary Hamming codes as cyclic codes, The BCH codes, and the Golay code.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

IMT322β: Computational Fluid Dynamics (30 Lecture hrs. + 15 Tutorial hrs.) Optional *Prerequisites IMT121β **IMT211β***

Basic Concepts of Fluid Flow: Introduction, Conservation principles, Dimensionless form of a flow equation. **Simplified Mathematical Models for Fluid Flows**: Incompressible flow, Inviscid (Euler), Stokes (Creeping) flow. **Mathematical Classification of Flows**: Hyperbolic flows, Parabolic flows, Elliptic flows, Introduction to the Naiver-Stokes equation. **Introduction to Numerical Methods**: Approaches to fluid dynamical problems, what is CFD? possibilities and limitations of numerical methods. **Components of a Numerical Solution Process**: Mathematical model, Discretization method, Numerical grid, Finite approximation, Solution process, Convergence criteria, Properties of numerical schemes. **Discretization Approaches**: Finite difference methods, Application of finite difference methods to different types of models, Idea of finite volume and finite element methods with motivating examples.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

IMT323β: Theory and Applications of Neural Networks (30 Lecture hrs. + 15 Tutorial hrs.), Optional *Prerequisite: IMT2b2β or Level I and Level II of ICT2b13 (CCIT) course*

Biological computers and their capabilities over digital computers, Problem of classification and recognition, Biological neurons, Artificial neural networks, Mathematics of single-layer neural networks, Perceptron, Learning and training, Learning rate, Perceptron training algorithm, Introducing Mathematica, Methods to adjust the learning rate, Convergence of solutions, Basins of attractions, Bayesian inference methods. Types of neural networks (feed-forward, back-propagation) and algorithms for implementation. Monte-Carlo methods, Hopfield network for optimization problems, e.g., Traveling salesman problem, Applications in forecasting problems in finance, Meteorology, Particle physics.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

IMT324β: Statistics with Computer Applications (30 Lecture hrs. + 15 Tutorial hrs.), Optional *Prerequisite MAT225β, MAT313β, AMT314β/IMT313β*

Introduction to statistical packages, Data analysis using a computer package, Descriptive statistics, Graphical representation of data, Estimation, Hypothesis testing, Regression, Analysis of variance, Non-parametric methods.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

AMT321β: Electro-magnetic Theory (30 Lecture hrs. + 15 Tutorial hrs.), Optional

Electrostatic field equations, Electrostatic potential, Boundary value problems, Magnetostatic field equations, Boundary value problems, Vector potential, Maxwell's equations, Lorentz condition and gauge transformations, Electromagnetic waves in non-conducting media, Electromagnetic waves in conductors.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

AMT322β: Theory of Special Relativity (30 Lecture hrs. + 15 Tutorial hrs.), *Optional for students not following Physics*

Introduction (Inadequacy of Newtonian mechanics and the need of a new mechanics), The Space-time continuum and separation between events, Events and particles, Space-time, world lines and space-time diagrams, The motion of a material particle, The light-cone, The fundamental quadratic form, Space-time as a Riemannian space, Proper time and speed of light, Minkowskian coordinates, The Lorentz transformations, Length contraction, The time dilation, Composition of velocities, The velocity 4-vector and acceleration 4- vector, The expanding universe in S. R., The red-shift, Particles and mass, Equation of motion, Motion under a constant relative force.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

AMT323β: Mathematical Quantum Mechanics (30 Lecture hrs. + 15 Tutorial hrs.) *Optional for students not following Physics*

The failure of Newtonian mechanics to explain phenomena at microscopic level, Problem of separation of observable from the observer. Quantum states, representation of quantum states by state (column) vectors, Observables as Hermitian Matrices, Mean values and correspondence principle, The angular momentum of a photon, Uncertainty. Equations of motion, Quantum particles in one and three dimensions. The Spin of the electron, Quantum particles in a spherically symmetric potential. The bound states of the hydrogen atom, The Dirac notation. Fourier transform, Applications to wave-packets, Basic ideas of Hilbert space theory, Theory of linear operators in Hilbert Spaces, Cauchy-Schwarz and Bessel inequalities, Completeness. Special topics in quantum mechanics and applications: The EPR paradox and entanglement, Quantum effects in the computer-chip, Introduction to quantum computer.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

AMT324β: Basic Statistics and Data Analysis (30 Lecture hrs. + 15 Tutorial hrs.), *Optional Only for Bio Science Students*

Fundamental concepts in probability, Random variables, Mean, Variance and expected values, Classification and description of sample data, Sampling distributions, Estimations, Hypothesis testing, Regression analysis, Analysis of variance and scientific applications.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

Examination Criteria on Mathematical Computing Course Units (IMT1b1β, IMT2b2β and IMT3b1β) in Industrial Mathematics

A student who follows Industrial Mathematics as a subject must pass all IMT1b1β, IMT2b2β and IMT3b1β to earn the BSc (General) Degree. These course units consist of learning a mathematical software/programming language in the Semester I and carrying out a project work in the Semester II.

1. Final mark of these course units will be calculated as follows:
   Method of Evaluation: Throughout Semester I: (Learning mathematical software/programming language)
   (M1) Practical Exam 70% and Continuous Assessment 30%: Marks out of 100
   Throughout Semester II: (Project Work)
   (M2) Project Report: Marks out of 100

(M3) Oral Exam and Presentation: Marks out of 100

Final Mark = M1 × 35% + M2 × 30% + M3 × 35%

2. A student can continue with the project work in the semester II irrespective of results of the practical examination of the relevant mathematical software/programming language at the end of Semester I in the relevant Level. If a student fails in that practical examination, his/her final result of that particular course unit will be withheld until he/she gets 40 marks for the practical examination in the relevant level at a subsequent attempt. The maximum mark a student can obtain for practical examination is 40 marks if he/she fails the practical examination at the first attempt.

PS1 - Mathematics, Industrial Mathematics, Chemistry
PS2 - Mathematics, Industrial Mathematics, Physics
PS3 - Mathematics, Chemistry, Physics
PS4 – Mathematics, Applied Mathematics, Chemistry
PS5 – Mathematics, Applied Mathematics, Physics
PS6 - Mathematics, Applied Mathematics, Computer Science
PS7 - Mathematics, Physics, Computer Science
PS8 – Mathematics, Chemistry, Computer Science

Table 9:Pathways available for the students who follow Mathematics with Industrial Mathematics or Applied Mathematics to complete the B.Sc. general degree in Physical Science

Level	**Semester**	**PS1/PS2 Mathematics and Industrial Mathematics**		**PS4/PS5/PS6 Mathematics and Applied Mathematics**		**PS3/PS7/PS8 Mathematics**	
Level I	**Semester I**	MAT111β IMT111β MAT112δ IMT1b2β MAT113δ		MAT111β AMT111β MAT112δ AMT112β MAT113δ		MAT111β MAT112δ MAT113δ	
	Semester II	MAT121β IMT121β MAT122β IMT122β		MAT121β AMT121β MAT122β AMT122β		MAT121β MAT122β	
Level II	**Semester I**	MAT211β IMT211β MAT212β IMT2b2β		MAT211β AMT211β MAT212β AMT212β		MAT211β MAT212β	
	Semester II	**MAT221β** MAT222δ MAT224δ **IMT223β** IMT221β	**MAT225β** MAT222δ MAT224δ **IMT224β** IMT221β	**MAT221β** MAT222δ MAT224δ **AMT223β** AMT221β	**MAT225β** MAT222δ MAT224δ **AMT224β** AMT221β	**MAT221β** MAT222δ MAT224δ	**MAT225β** MAT222δ MAT224δ
Applicable for **Mathematics Honours Degree** in		the **Applied stream**	the **Statistics stream**	the **Applied stream**	the **Statistics stream**	Can not apply	Can not apply
Level III	**Semester I**	**MAT312β** MAT311β **IMT312β** IMT3b1β	**MAT313β** MAT311β **IMT313β** IMT3b1β	**MAT312β** MAT311β **AMT313β** **(AMT311β or AMT312β)**	**MAT313β** MAT311β **AMT311β** **AMT314β**	**MAT312β** MAT311β	**MAT313β** MAT311β
	Semester II	Selected Optional Courses	Selected Optional Courses	Selected Optional Courses	Selected Optional Courses	Selected Optional Courses	Selected Optional Courses

5.6. BSc (Honours) Degree Programmes in Mathematics

Introduction

The department offers two streams in the BSc Honours Degree Programme - namely,

- Mathematics and Applied Mathematics (Math & AM) and
- Mathematics and Statistics (Math & Stat).

The duration of the Honours degree course is four academic years (eight semesters), inclusive of Levels I and II of the General Degree and Levels I and II of the Honours Degree Programme.

During the Levels I and II of the Honours Degree Programme, a student shall follow a minimum of 52 credits of course units from the subject of Specialization. Furthermore, an Honours degree student should carry out a research/study project, should acquire additional skills (seminar, essay, etc.) and may undergo practical/industrial training as specified by the department.

5.6.1. Course Units offered for BSc Honours Degree in Mathematics

Level I - Semester I

MSP311β: Group Theory (30 Lecture hrs. + 15 Tutorial hrs.)

Groups and subgroups: Groups, Subgroups, Normal subgroups, Quotient groups, Cyclic groups, Cayley diagrams. **Permutations, cosets and direct products**: Groups of permutations, Orbits, Cycles and alternating groups, Cosets and the theorem of Lagrange, Direct product, Finite groups. **Homomorphism and factor groups**: Homomorphism, Factor group, Factor group computation and Simple groups.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP312β: Real Analysis-III (30 Lecture hrs. + 15 Tutorial hrs.)

Non-Linear Analysis: Functions from R^n to R^m, Open balls and open sets, Limit points. Limit and continuity, The derivative of scalar field with respect to a vector. Directional derivatives and partial derivatives, Partial derivatives of higher order, Directional derivatives and continuity, The total derivative, The gradient of scalar field, A sufficient condition for differentiability, The chain rule for derivatives of scalar fields. Derivatives of vector fields, Differentiability implies continuity, The chain rule for derivatives of vector fields, Sufficient conditions for the equality of mixed partial derivatives. Derivatives of functions defined implicitly, Maximum, Minimum and saddle points of multivariable functions, Extremes with constraints, Lagrange's multipliers, Double integrals.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP313β: Mathematical Statistics-II (30 Lecture hrs. + 15 Tutorial hrs.)

Point estimation: The method of moments, The method of maximum Likelihood, Properties of point estimation: Unbiasedness, Efficiency, Consistency, Sufficiency, Minimal Sufficient Statistics, Exponential family, Cramer-Rao inequality, Completeness. **Interval Estimation**: Confidence interval for the mean and variance. **Tests of Hypotheses**: Simple hypothesis, Composite hypothesis, Critical region, Types of error, Power function, Size of test, Simple Likelihood-ratio test, Most powerful test, Neyman-Pearson lemma, Generalized Likelihood-Ratio test, Uniformly most powerful test, Tests of hypotheses-Sampling from the Normal distribution.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP3144: Mathematical Methods in Physics and Engineering-II (60 Lecture hrs.)

Laplace transformations**,** Inverse Laplace transformations, Gamma, Beta and Bessel functions, Applications in solving the wave equation and the heat equation, Fourier series. Applications of Laplace transforms to differential equations, Fourier transforms, Legendre functions, Hermit equation, Functions and polynomials, Laguerre equation and polynomials, Riccati's differential equation, and the Dirac-Delta function.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP316β: Applied Statistics-II (30 Lecture hrs. + 15 Tutorial hrs.)

Testing hypotheses about many population means: Introduction to analysis of variance, Linear model for analysis of variance, Variability as sum of squares, Test statistics and rejection rules. **The population regression**: Formulating hypotheses about regression, Analysis of variance for regression. **Nonparametric tests:** Chi-square test, Contingency tables (test for independence), Kolmogorov-Smirnov test, The sign test, The Rank test (Mann-Whitney U-test), Runs test (one-sample runs test, two-sample runs test), Kruskal-Wallis H-test.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP3174: Topology (60 hrs.)

Topological spaces, Basis for a topology, The subspace topology, Closed sets, Limit points, Continuous functions, The product topology, The metric topology, Connected spaces, Compact spaces.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP3254: Numerical Methods with Applications (60 hrs.)

Solving Linear Systems: Matrix notation, Direct methods, Gauss, Jordan, Aitken method. **Iterative methods**: Jacobi, Gauss-Seidel, SOR method. **Numerical Solutions of Ordinary Differential Equations**: Euler and modified Euler methods and Runge-Kutta methods, Convergence criteria, Errors and error propagation. **Numerical Solutions of Partial Differential Equations**: Parabolic type, Elliptic type and Hyperbolic type.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP3193: Bayesian Inference and Decision Theory (45 hrs.)

Fundamentals of the Bayesian theory of inference, Probability as a representation for degrees of belief, The Likelihood principle, The use of Bayes-rule to revise beliefs based on evidence, Conjugate prior distributions for common statistical models, Methods for approximating the posterior distribution, Graphical models for representing complex probability and decision models by specifying modular components, Concepts in decision analysis, Influence diagrams, Decision trees, and utility theory or/and special topics in advanced Bayesian inference and decision theory.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP3b9β Mathematical Computing (90 Project hrs.)

MATLAB workplace: Overview of MATLAB features and workplace, MATLAB command window for scientific calculations, Handling variables, Saving variables in MATLAB files, Formatting output, Arrays, Matrices, Matrix functions. **Script and functions**: Simple MATLAB codes for matrix manipulations, Finding roots, Evaluating polynomials, Structural programing, Loops and conditions, 2D and 3D Plots, Solving nonlinear equations, Numerical differentiation and integration, Solving linear systems, Solving ordinary differential equations, Solving and plotting numerical solutions of system of differential equations, MATLAB codes construction for curve fittings.

Method of Evaluation: See subsection 14.2.4

Level I - Semester II

MSP321α: Advanced Group Theory (23 hrs.)

Isomorphism Theorems, Series of groups, Sylow theorems, Applications of the Sylow theorem, Free groups.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP322α: Real Analysis-IV (23 hrs.)

More on double and triple integrals: Iterated integrals and Fubini's theorem, Integrals over type I and Type II regions, Changing order of integrations, Change of variables in double integrals, Applications on double and triple integrals. **Implicit functions:** Definition, Derivative of implicit functions, Implicit function theorem, Applications of implicit function theorem. **Calculus of variation:** Functionals and their extremization, Derivation of Euler-Lagrange equation, **Applications:** Shortest distance, Brachistochrone problem, Minimal surface of revolution.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP323β: Complex Variables (30 Lecture hrs. + 15 Tutorial hrs.)
Theory of Complex Variables: Complex functions, Complex differentiability, The Cauchy-Riemann equations, Analytic functions, Cauchy's theorem, Cauchy's integral formula, Taylor's and Laurent's theorem, Classification of singularities, Laurent expansions, Contour Integration, The Cauchy's residue theorem, Integration of rational and trigonometric functions using residue theorem.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP324α: Complex Analysis (23 hrs.)
Review of elementary complex analysis topics from vector analysis: Morea's theorem, Liouville's theorem, Rouche's theorem, Winding numbers, The generalized version of Cauchy's theorem, Morera's theorem, The fundamental theorem of algebra, The identity theorem, The Riemann sphere and Weierstrass-Casorati theorem, Meromorphic functions, Rouche's theorem, integration by residues, Conformal mappings and its physical applications.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP3184: Measure Theory with Applications (60 hrs.)
Borel-Algebra, Borel subsets, Lebesgue outer measure, Lebesgue measurable subsets, Lebesgue measure, Lebesgue measurable functions, Properties that hold almost everywhere, Lebesgue integral, Lebesgue integrable functions, Monotone convergence theorem, Dominated convergence theorem, Fatuous lemma, Relation of Riemann and Lebesgue integrals, Modes of convergence (topics are discussed with applications, for example, probability theory), Introduction to martingales.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP3263: Regression Analysis (45 hrs.)
Introduction: Regression and model building, Use of regression, Role of the computer. **Simple Linear Regression**: Simple linear regression model, Least-square estimation of the parameters, Hypothesis testing on the slop and intercept, Interval estimation in simple linear regression, Prediction of new observations, Coefficient of determination, Estimation by maximum Likelihood. **Multiple Linear Regression**: Multiple linear regression models, Estimation of the parameters, Hypothesis testing in multiple linear regression, Confidence interval in multiple regression, Prediction of new observations, Multicollinearity. **Model Adequacy Checking:** Residual analysis, Lack of fit of the regression model, Indicator variables, Variable selection and Model building, Introduction to nonlinear regression, Introduction to generalized linear models.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP3274 Differential Geometry and Tensor Analysis (**60 hrs**.)
Unit tangent vector, Principal normal, Binormal vector and curvature of a curve, Serrate-ferret formula, Surfaces, Parametric curves, Surfaces of revolution, Metric, Directional ratios and coefficients, Gauss and Mean curvature, Orthogonal trajectories, Families of dual curves, Geodesics. Transformation of coordinates, Summation convention, The Kronecker-Delta, Contravariant and covariant vectors, Contravariant, Covariant and mixed tensors, Symmetric and skew- symmetric tensors, tensor algebra, metric tensor, conjugate metric tensor, Christoffel's symbols of first and second kind, Covariant derivatives, Riemann and Ricci tensors. Theory of Manifolds, Commutators or Lie derivatives, Forms and dual bases, The wedge product, Exterior and covariant differentiation, First and second Carton equations, The Ricci tensor and the Einstein tensor.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP3283 Statistical laboratory (45 hrs.) *Analyzing data with Computers using 'R' software package*.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP3292: Applied Statistics III (30 hrs.)
One-Factor Experiments: Analysis of Variance (ANOVA) techniques, One-Way ANOVA, Completely randomized design, Two-way ANOVA, Randomized block design. **Chi-squared Tests**: Goodness of Fit test, Categorical data, Test for independence, Test for homogeneity, **Nonparametric Tests**: Sign test, Signed-Rank test, Rank-Sum test, Kruskal-Wallis H-test, Runs test, Rank Correlation Coefficient. **Applied Nonparametric Regression**: Introduction, Basic idea of smoothing, Smoothing techniques, Choosing the smoothing parameter.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

Level II - Semester I

MSP4114- Ring & Field Theory (60 hrs.)

Ring and fields: Rings and fields, Integral domain, Characteristic of a ring, Subrings and subfields, Ideals, Maximal ideals and prime ideals. **Isomorphism**: Quotient rings, Homomorphism, Imbedding of rings and more on ideals. **Isomorphism theorems, Euclidean and factorization domains**: Euclidean domains, Prime and irreducible elements, Polynomial rings, Unique factorization domains. **Extension fields**: Introduction to extension fields, Algebraic extension, Roots of polynomials, Splitting fields, Ruler and compass constructions, Prime subfields, Separable extension. **Galois theory**: Normal extension, Automorphism of field extension, Fundamental theorem of Galois theory, Galoi's extension, Finite fields.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP4b26 Seminars and Research/Study Project-Mathematics/Statistics

Every Honours degree student is required to conduct a supervised investigation on a research topic assigned at the beginning of Semester I and is required to submit a dissertation at the end of Semester II.

Method of Evaluation: (M1) Seminar/Presentation to defend the Research Proposal (Semester I): Marks out of 100
(M2) Interim Progress Report/Presentation: Marks out of 100
(M3) Final Report, Oral Exam and Presentation: Marks out of 100

Final Mark = M1 × 15% + M2 × 25% + M3 × 60%

MSP4134 Functional Analysis (60 hrs.)

Metric spaces, Limit and continuity, Connectedness, Completeness and compactness, Completion of metric spaces, Normed vector spaces, Normed Spaces, Finite dimensional Normed spaces, Linear subspaces of Normed spaces, Banach spaces, Fundamental theorems for Normed and Banach Spaces, Inner product spaces, Hilbert spaces, Orthogonal expansions, Separable Hilbert spaces, Linear operators and functionals, Liner transformations on Hilbert spaces, Spectrum of a linear operators.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP4144 Time Series Analysis (60 hrs.)

Introduction to basic concepts of time series analysis such as auto-regression, Moving averages, Integration, ARIMA, Autocorrelation, and trends and volatility. Stationarity, testing for unit roots, Structural change different formulations of lags, and causality. Time series forecasting, Time series modelling (e.g. multi-equation models, Cointegration and error-correction models) or/and Special topics in advanced time series analysis.

Method of Evaluation: Continuous Assessments: 20%, Practical Examination: 20% and End of Semester Examination: 60%

MSP4153: Special topics in Statistics (e.g. Multivariate Data Analysis) (60 hrs.)

Multivariate data and multivariate statistics: Introduction, Types of data, Basic multivariate statistics, The aims of multivariate analysis. **Exploring multivariate data graphically**: Scatterplot, Scatterplot matrix, Checking distributional assumptions using probability plots. Cluster analysis, Principal component analysis, Log linear and logistic models for categorical multivariate data, Models for multivariate response models, Discriminant analysis and Factor analysis.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP4164: Analytical and Numerical Methods for PDEs (60 hrs.)

Analytical methods for Partial Differential Equations: Introduction to Elliptic, Parabolic and Hyperbolic PDEs, Initial and boundary value problems, Superposition principle of solutions, Fourier series, Separation of variables, Homogeneous and non-homogeneous problems, Time dependent and independent non-homogeneous problems, Sturm-Liouville's systems, Eigenvalues and Eigen functions, Finite Fourier transforms and non-homogeneous problems, Problems in infinite spatial domains, Fourier transforms, Fourier transforms method for PDEs, Laplace transforms methods for PDEs. **Numerical Methods for Partial Differential Equations**: Approximation of partial derivatives using finite differences, Finite-difference methods for parabolic, hyperbolic and elliptic equations, Heat equation, Wave equation and Poisson equation as examples, Convergence and stability, Finite-element methods for PDEs in one-dimensional space.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

Semester II

MSP4214: Mathematical Foundations of Quantum Mechanics / Special Topics in Mathematical Physics (60 hrs.)
(This module shall be offered as a teaching module or a reading module.)
Physical background, Dynamics, Observables, The uncertainty principle, Spectral theory, Scattering States, Special Cases (e.g. infinite well, potential well etc.), Many-particle systems, Density matrices, Survey of modern philosophy of quantum theory/quantum computing, Introduction to quantum information theory, Course contents of special topics in Applied Mathematics will depend on the availability of staff members.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP4224: Introduction to Stochastic Analysis (60 hrs.) *Prerequisites - MSP3184: Measure Theory with Applications*
Basic stochastic processes, Brownian Motion, Calculus, Stochastic differential equations, Diffusion processes, Martingales, Calculus for semi martingales, Pure Jump processes, Change of probability measure, Applications in Finance, Biology, Engineering, Physics and other areas, Computational solutions, Special topics in stochastic modelling.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP4234: Topics in Applied Mathematics I (60 hrs.)
Topics such as dynamical Systems and control theory will be discussed under this course unit. However, the course contents of Special Topics in Applied Mathematics will depend on the availability of staff members and shall be announced at the beginning of the academic year.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP4244: Topics in Applied Mathematics II (60 hrs.)
Topics such as Geo-mathematics, Relativity theory, Electromagnetic theory, and Computational Fluid Dynamics will be discussed under this course unit. However, the course contents of Special Topics in Applied Mathematics will depend on the availability of staff members and shall be announced at the beginning of the academic year.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP4254: Special Topics in Applied Mathematics (60 hrs.)
Course contents will depend on the availability of staff members and shall be announced at the beginning of the academic year.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP4263: Design and Analysis of Experiments/Operations Research (45 hrs.)
Introduction to the design of experiments, Analysis of variance, One-factor experiments, Randomized complete blocks, Latin squares, Comparisons among treatments, Factorial experiments (Two or more factors), The 2^K-factorial experiments design, Confounding, Fractional factorial experiments, Higher fractions and Screening designs, Taguchi's robust parameter design, Control and noise variables.
Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP4273: Special Topics in Statistics (45 hrs.) (Categorical Data Analysis (22.5 hrs.) + Sampling Theory (22.5 hrs.))
Introduction to Distributions and Inference for Categorical Data: Categorical response data, Distributions for categorical data, Statistical inference for categorical data. **Describing Contingency Tables**: Probability structure for contingency tables, Comparing two proportions, Partial association in stratified 2 × 2 tables, Extensions for I × J tables. **Inference for Contingency Tables:** Confidence intervals for association parameters, Testing independence in two-way contingency tables, Two-way tables with ordered classifications, Small-sample tests of independence. **Logistic Regression**: Interpreting parameters in logistic regression, Inference for logistic regression, Multiple logistic regression, Fitting logistic regression models. Building and applying logistic regression models, Log-linear models for contingency tables and building of log-linear models. **Sample Survey:** Introduction, Sample versus complete enumeration, Planning and execution of sample surveys, Designing a questionnaire. **Sampling Theory**: Probability and non-probability sampling, Formation of estimators, Biased estimators, Unbiased estimators, Precision of estimators, Confidence intervals, and Costs. **Sampling Techniques:** 1. **Simple random**

sampling (SRS): Introduction, Estimation of population mean, Total and proportion, Selecting the sample size, Comparing estimates, Variances of estimates. Confidence intervals for parameters. 2. **Stratified random sampling:** Introduction, Formation of strata allocation of sample - Proportional allocation, Equal allocation, Optimum allocation, Neymann allocation, Estimation of population means, Totals and proportions, Variances of estimates, Confidence intervals for parameters. 3. **Systematic sampling:** Introduction, Linear and circular systematic samples, Estimation of population mean, Total and proportion, Variances of estimates, Confidence intervals for parameters. 4. **Cluster sampling:** Introduction, Estimation of population means and total of clusters of equal size. 5. **Two stage cluster sampling:** Introduction, Estimation of population means, Totals and proportions, Variances of estimates, Confidence intervals for parameters. 6. **Other sampling techniques:** Quota sampling, Convenience sampling, Purposive sampling.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP4283: Introduction to Stochastic Processes (45 hrs.)

Discrete and continuous Markov chains, Point processes, Random walks, Branching processes and the analysis of their limiting behavior, Renewal theory, Brownian motion, Gaussian processes and martingales.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSP4293: Medical statistics (45 hrs.)

Clinical Trials: Basic Concepts and designs, Controlled and uncontrolled clinical trials, Historical controls, Protocol, Placebo, Randomization, Blind and double-blind trials, Ethical issues. **Multiplicity and meta-analysis**: Intern-analysis, Multi-center trials, Combining trials, Cross-over trials, Binary response data, Analysis of cohort and case-control studies

Survival Data Analysis:

Basic concepts: Survival function, Hazard function, censoring. **Single sample methods:** Life-tables, Kaplan-Meier survival curve, Parametric models. **Two sample methods**: Log-rank test, Parametric comparisons. **Regression model:** Inclusion of covariates, Cox's proportional hazards model, Competing risks.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

5.7. Credit Values

5.7.1. BSc General Degree

L - Lectures and T – Tutorial

Course Unit	Duration (hrs.)		Credits		Total
	Theory	Practical	Theory	Practical	
MAT111β: Vector Analysis	30L + 15T		2.5		2.5
MAT112δ: Differential Equations	15L + 7T		1.25		1.25
MAT113δ: Introductory Statistics	15L + 8T		1.25		1.25
MAT1142: Mathematics for Bio Science Students	30		2		2
IMT111β: Classical Mechanics-I	30L + 15T		2.5		2.5
IMT1b2β: Mathematical Computing with C	15	60		2.5	2.5
AMT111β : Classical Mechanics-I (Dynamics)	30L + 15T		2.5		2.5
AMT112β: Mathematical Foundation of Computer Science	30L + 15T		2.5		2.5
MAT121β : Algebra	30L + 15T		2.5		2.5
MAT122β: Calculus (Real Analysis)	30L + 15T		2		2.5
IMT121β: Classical Mechanics-II (Statics)	30L + 15T		2.5		2.5
IMT122β: Mathematical Modelling-I	30L + 15T		2.5		2.5
AMT121β: Classical Mechanics-II(Statics)	30L + 15T		2.5		2.5
AMT122β: Mathematical Modelling-I	30L + 15T		2.5		2.5
MAT211β: Linear Algebra	30L + 15T		2.5		2.5

MAT212β: Real Analysis-I	30L + 15T		2.5		2.5
AMT211β /IMT211β: Classical Mechanics-III (Fluid Dynamics)	30L + 15T		2.5		2.5
IMT2b2β: Mathematical Computing with JAVA	15	60		2.5	2.5
AMT212β: Computational Mathematics	30l + 15T		2.5		2.5
MAT221β: Number Theory	30L + 15T		2.5		
MAT222δ: Real Analysis-II	15L + 7T		1.25		1.25
MAT224δ: Geometry	15L + 8T		1.25		1.25
MAT225β: Mathematical Statistics-	30L + 15T		2.5		2.5
IMT221β/AMT221β: Mathematical Modelling-II	30L + 15T		2.5		2.5
IMT223β/ AMT223β: Applied Probability (Information Theory)	30L + 15T		2.5		2.5
IMT224β/ AMT224β: Applied Statistics-I	30L + 15T		2.5		2.5
MAT311β: Group Theory	30L + 15T		2.5		2.5
MAT312β: Real Analysis-III	30L + 15T		2.5		2.5
MAT313β: Mathematical Statistics-II	30L + 15T		2.5		2.5
IMT3b1β: Mathematical Computing	15	60		2.5	2.5
IMT312β/ AMT312β: Mathematical Modelling-III	30L + 15T		2.5		2.5
IMT313β/ AMT314β: Applied Statistics-II	30L + 15T		2.5		2.5
AMT311β: Numerical Analysis	30L + 15T		2.5		2.5
AMT313β: Mathematical Methods in Physics and Engineering-I	30L + 15T		2.5		2.5
MAT321β: Functional Analysis	30L + 15T		2.5		2.5
MAT322β: Complex Variables	30L + 15T		2.5		2.5
MAT325β: Introductory Econometrics	30L + 15T		2.5		2.5
MAT326β: Mathematical Foundation of Computer Science	30L + 15T		2.5		2.5
MAT327β: Introduction to Financial Mathematics	30L + 15T		2.5		2.5
IMT321β: Applied Algebra (Algebraic Data Encryption & Decryption Methods) &	30L + 15T		2.5		2.5
IMT322β: Computational Fluid Dynamics	30L + 15T		2.5		2.5
IMT323β: Theory and Applications of Neural Networks	30L + 15T		2.5		2.5
IMT324β: Statistics with Computer Applications	30L + 15T		2.5		2.5
AMT321β: Electro-magnetic Theory	30L + 15T		2.5		2.5
AMT322β: Theory of Special Relativity	30L + 15T		2.5		2.5
AMT323β: Mathematical Quantum Mechanics	30L + 15T		2.5		2.5

AMT324β: Basic Statistics and Data Analysis	30L + 15T		2.5		2.5

5.7.2. BSc (Honours) Degree in Mathematics

Course Unit	Duration (hrs.)		Credits		Total
	Theory	Practical	Theory	Practical	
MSP311β: Group Theory (MAT311β)	30L + 15T		2.5		2.5
MSP312β: Real Analysis-III (MAT312β)	30L + 15T		2.5		2.5
MSP313β: Mathematical Statistics-II (MAT313β)	15L + 8T		1.25		1.25
MSP3144: Mathematical Methods in Physics and Engineering-II (AMT313β)	60		2		2
MSP316β: Applied Statistics-II (IMT313β)	30L + 15T		2.5		2.5
MSP3174: Topology	60		4		4
MSP3184: Measure Theory with Applications	60		4		4
MSP3193 Bayesian Inference and Decision Theory	45		3		3
MSP3b9β: Mathematical Computing (IMT2b2β)	15	60		2.5	2.5
MSP321α: Advanced Group Theory	23		1.5		1.5
MSP322α: Real Analysis-IV	23		1.5		1.5
MSP323β: Complex Variables (MAT322β)	30L + 15T		2.5		2.5
MSP324α: Complex Analysis	23		1.5		1.5
MSP3254: Numerical Methods with Applications	60		4		4
MSP3263: Regression Analysis	45		3		3
MSP3274: Differential Geometry and Tensor Analysis	60		4		4
MSP3283: Statistical laboratory	30		2		2
MSP3292: Applied Statistics-III	30		2		2
MSP4114: Ring & Field Theory	60		4		4
MSP4b26:Seminars and Research/Study Project-Mathematics/Statistics			6		6
MSP4134: Functional Analysis	60		4		4
MSP4144: Time Series Analysis	60		4		4
MSP4153: Special topics in Statistics	60		4		4
MSP4164: Analytical and Numerical Methods for PDEs	60		4		4
MSP4214:Mathematical Foundations of Quantum Mechanics / Special Topics in Mathematical	60		4		4
MSP4224: Introduction to Stochastic Analysis	60		4		4
MSP4234: Topics in Applied Mathematics I	60		4		4
MSP4244: Topics in Applied Mathematics II	60		4		4
MSP4254:Special Topics in Applied Mathematics	60		4		4
MSP4263:Design and Analysis of Experiments/ Operations Research	45		3		3
MSP4273: Special Topics in Statistics	45		3		3

MSP4283: Introduction to Stochastic Processes	45		3		3
MSP4293: Medical statistics	45		3		3

5.8. BSc Honours Degree Programmes in Financial Mathematics and Industrial Statistics

5.8.1. Introduction

Modern financial markets are quickly developing not only as a result of technological advancements, but also, and probably more importantly, as a result of the seamless integration of mathematical and statistical techniques into problem-solving. The Sri Lankan financial market is also growing at a rate comparable to international markets; thus, higher educational institutions are expected to offer more academic and research programs in related fields that will produce intellectual force capable of making optimal decisions and solving problems in related areas. As the only government University in the Southern region, we have understood our responsibility to cater to the needs of the country in the fast-developing fields of Finance and Insurance. Accordingly, the Department of Mathematics offers a new four-year undergraduate Honours Degree Programme in **Financial Mathematics and Industrial Statistics**.

5.8.2. Detailed Syllabus for Financial Mathematics & Industrial Statistics

BSc Level I -Semester I

MIS1112: Basic Statistics in Industry (20 Lecture hrs. + 20 Practical hrs.)

Introduction to Statistics: Population and sample, Types of data, Sources of data, Descriptive statistics, Inferential statistics. **Descriptive Statistics:** 1. **Organizing and summarizing univariate data**: Displaying data with tables and graphs, Displaying numerical data, Summarizing data with statistics, Describing a distribution. 2**. Summarizing relationships between variables**: Scatterplots, Correlation, Least squares regression, and Relationships among categorical data. Minitab statistical software.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MIS1122: Introduction to Probability and Distributions (30 hrs.)

Introduction to Statistics: Brief introduction of population, Sample, Descriptive statistics, Probability theory, Inferential statistics; **Probability**: Probability definitions, Counting rules, Permutations and combinations, Finite sample space, Events, Probability rules, Conditional probability, Independence, Multiplication rule, Bayes theorem; **One dimensional random variables**: Probability density function and probability (mass) function, Cumulative distribution function, Expected value, Variance, Associated theorems, and Moment-Generating function, Distribution of functions of random variables; **Discrete distributions**: Uniform, Bernoulli, Binomial, Poisson, Hypergeometric, Negative Binomial and their applications; **Continuous distributions**: Uniform, Exponential, Normal and their Applications; Central limit theorem (without proof) and applications.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MFM1112: Computing for Finance 1 (60 hrs.)

Introduction: Overview, Common excel errors, Systematic design methods, Auditing; Data organization, Data analysis, Data formatting, Data collaboration, Data management, Basic financial arithmetic and cash flows, Basic statistics.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MSF1113: Calculus I (45 hrs.)

Elementary Logic: Mathematical logic including logical equivalences and quantifiers, Methods of mathematical proofs. **Set Theory and Functions:** Basic set theory, Injective, Surjective, Bijective functions. **The Real Number System:** Extend axiom, Field axioms, Order axiom, Modulus, Inequalities, Upper and Lower bounds, Least upper bound (supremum) and Greatest lower bound (infimum), Completeness axiom. **Sequences:** Introducing sequences, Convergence of sequences and related theorems, Subsequences and related results, Monotone sequences, Monotone convergence theorem. **Limits and Continuity of Functions**: Limit of functions, Epsilon terminology, Related theorems, Continuity of functions at a point and in an interval, Basic consequences of continuity. **Differentiability and Applications**: Differentiable functions, Rules of differentiation,

Related theorems, Rolle's theorem, Mean value theorems and consequences, Maxima, Minima and Critical points of real valued functions, L'Hôpital's Rule, Applications in Business and Economics.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MFM1122: Operational Research I (25 Lecture hrs. + 10 Practical hrs.)

Linear Programming: Examples and modelling with LP, Geometric View of LP; **The Simplex Method**: Simplex algorithm, Revised simplex algorithm, Two-Phase simplex method; **Duality in LP**: Dual linear programs, Properties and applications of duality, Dual simplex algorithm; **LP Models in Finance:** Asset/Liability cash flow matching, Asset pricing and arbitrage. **Integer Linear Programming**: Integer programming models, Formulating integer programs, Cutting plane algorithms, Branch and Bound algorithm; **ILP Models in Finance**: Constructing an index fund practical component: A few modelling computation tools and software: Excel Solver, AMPL, and MATLAB will be introduced.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MFM1132: Financial Management (30 hrs.)

Introduction to financial management, Time value of money, Cost of capital and valuation of capital, Capital investment decisions, Risk, Return and portfolio theory, Working capital management, Capital structure theories, Dividend theories and policies, Financial and operating leverage, Emerging issues in financial management.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MSF1123: Programming Techniques (30 Lecture hrs. + 30 Practical hrs.)

Introduction to programming methodology and problem solving strategies, Algorithm development using pseudo code, Basic program structure and the Integrated Development Environment (Essential program structure, Documentation and standard programming practices, Integrated development environment (IDE) Editing, Compilation, Execution and Debugging), Program development using a higher level programming language such as C, Basic input and output, Variables and Expressions, Library functions, Standard programming practices for variables and assignments, Decision structures, Loop structures, Input and output using files, Simple data structures, Functions, Introduction to the Object Oriented (OO) approach.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

BSc Level I - Semester II

MIS1213: Mathematical Statistics (45 hrs.)

Joint Distributions: Joint probability distributions, Joint cumulative distribution functions, Conditional distribution functions, Independence, Expectation and Variance of linear functions of random variables, Joint Moment-Generating functions and Joint moments, Covariance and correlation coefficients. **Distribution of functions of random variables:** Cumulative distribution function technique, Moment-Generating functions technique, Transformation technique**. Order Statistics, Sampling distributions:** Random sample, Statistic, Sample moment, Sample mean, Sample variance, Sampling distributions related to the Normal distribution. The distribution of the sample mean, Laws of Large numbers. Central limit theorem and its applications**. Other distributions:** Chi-square distribution, F distribution, Student-t-distribution.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MIS1222: Statistical Computing (R or Python software) (60 hrs.)

Summarizing, analyzing, and representing univariate, bivariate and multivariate data sets with computers using 'R'

Method of Evaluation: Continuous Assessments: 50% and End of Semester Examination: 50%

MFM1213: Financial Mathematics I (45 hrs.)

Introduction: Time value of money, Compound interest, Simple interest, Present value, Future value, Accumulation function, Discount rate, Continuous interest, Force of interest, and Equation of value. **Annuities:** Immediate, Due, Time lines, Perpetuities, Continuous annuities, Variable annuities, and Reinvestment problems. **Loan Repayment:** Amortization, Prospective/Retrospective methods, Instalment loan, Sinking funds, Net interest, and Capitalization of interest. **Bonds:** Face value, Par value, Coupon rate, Redemption value, Bond price, Makeham's formula, Amortization of Premium/Discount, Callable bond, Price-Plus accrued, Market price, and True price. **Yield Structure of Interest Rate:** Internal rate of return, Cash flows, Borrowing projects, Time/Dollar weighted rates, Portfolio method, and Net present value. **Term Structure Interest**

Rates: Term structure of interest rates, Risk-Free rates, Yield curve, and Forward rate. **Asset Liability Management, Duration and Immunization:** Assets, Liabilities management, Duration, Convexity, Immunization, Stocks, Dividends, and Mutual funds.
Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MFM1222: Introduction to Economics (30 hrs.)

Theory of production, Production in the Long-run, Theory of cost, Derivation of supply and demand, Elasticity of demand and supply, Determination of market price in perfect competition, Determination of output, Revenue and profit, Perfect competition, Macroeconomics: The business cycle and national income, Inflation and taxation, Introduction to factor market, Basic concepts of project appraisals.
Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MSF1212: Numerical Analysis I (20 Lecture hrs. + 20 Practical hrs.)

Introduction to MATLAB, Matrices and vectors and their manipulations, Basics of plotting using MATLAB, MATLAB script and function files using loops, Conditions and Cases, if-then-else statements, Logical operations, Call functions, Arrays/vectors/matrices, Plotting and visualization of data, Use of MATLAB programming in solving problems numerically. Numerical methods in solving nonlinear equations of one variable: Methods of bisection, Newton's, and fixed-point iteration, Including error estimates, Implementation of each method using MATLAB. Curve fittings. Interpolation: Newton, Lagrange and their error bounds cubic splines, Study of implementations via available MATLAB commands. Approximations, Least squared methods (both linear and quadratic), and Implementations. Numerical differentiation and Integration: Numerical quadrature, Trapezoidal and Simpson's rule with their composite forms, Newton-Cotes formulae, Error analysis, Study of available MATLAB codes for each, and writing new codes.
Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MSF1222: Operational Research II (30 hrs.)

Goal Programming: Examples and modelling with goal programming, Goal programming algorithms; The weights method, The pre-emptive method, Goal programming applications in financial management. **Game Theory:** Two person zero-sum games, The Maximin and Minimax principle, Games with and without saddle points, Dominance property, Graphical and Algebraic methods for Solving Games, Fundamental theorem of game theory, and Game theory models in finance.
Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MSF1233: File organization & Database Management Systems (30 Lecture hrs. + 30 Practical hrs.)

File organization: Introduction to file organization, Storage devices, Disk parameters, Record structure and design, Indexes hashing database.
Management Systems: Introduction & Definitions, DBMS Architecture, Data models, DBMS languages, ER model concepts, Relational model concepts, ER-to-relational mapping, Functional dependencies and normalization process, Relational algebra, Relational calculus, Database security and authorization, Practical using MySQL.
Method of Evaluation: End of Semester Examination: 100%

BSc Level II - Semester I

MIS2113: Inferential Statistics (45 hrs.)

Point estimation: The method of moments, The method of Maximum-Likelihood, Properties of point estimation: Unbiasedness, Efficiency, Consistency, Sufficiency; Exponential family, Cramer-Rao inequality, Rao-Blackwell theorem., Minimum variance unbiased estimation. **Interval Estimation:** Confidence Intervals for the mean and variance, **Test of Hypotheses:** Introduction, Simple hypothesis, Composite hypothesis, Critical region, Types of error, Power function, Size of test, Simple Likelihood-Ratio test, Most powerful test, Neyman-Pearson lemma, Generalized Likelihood-ratio test, Uniformly most powerful test. **Hypothesis testing for the mean and variance of the normal population.**
Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MIS2122: Sampling Techniques and Survey Designs (20 Lecture hrs. + 20 Practical hrs.) Planning of a survey, Questionnaire design, Problems arising in execution of a survey, Census and samples, The principal steps in a sample survey, The role of sampling theory. The probability and non-probability sampling. The simple random sample, Estimating population mean, Variance, Total and proportion, Variances of estimates, The finite population correction, Confidence limits, Estimation

of a ratio, Sample size determination, Stratified random sampling, Properties of estimates, Proportional allocation, Neyman allocation, Optimum allocation of cost. Relative precision of stratified random and simple random sampling. Systematic sampling, Linear systematic sampling and circular systematic sampling. Quata sampling, Cluster sampling, and multistage sampling.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MSF2112: Calculus II (30 hrs.)

Infinite series: Infinite series with positive terms, Alternating series, and their convergence. Convergence of series of functions, Power series, Taylor series. **Integration:** Application of integration, Areas, Volumes, Arc length, and Surfaces of revolution. Integration of transcendental functions and applications of the force of interest and the force of death. Construction and properties of the Riemann integral.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MFM2112: Mathematical Economics (30 hrs.)

Relationship between Mathematics and Economics, Introduction to linear and non-linear functions, Equilibrium analysis, The derivatives and rules of differentiation, Economics applications of derivatives, Integrations, Economics applications of integrations, The fundamentals of matrices and their use in Economics.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MSF2122: Research Methodology (30 hrs.)

Research paradigm and methodology: Searching the literature, Research designs, Data collection, Quantitative data analysis, Qualitative data analysis, Writing up the research, Making presentation, Research ethics.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MSF2132: Linear Algebra (30 hrs.)

Matrices and determinants: Definitions, Operations on matrices, Properties and criterion for a matrix to be invertible. **Systems of linear equations:** Operations on system of linear equations. Echelon form, Rank, Consistency, Homogeneous and non-homogeneous systems, Elimination and iterative methods. **Vector spaces:** Linearly independent and spanning sets, bases, Dimension, Subspaces. **Linear transformations:** Definition, Kernel and image of a linear transformation. Matrix of a linear transformation, Change of basis. **Diagonalization:** Eigenvalues and eigenvectors, Invariant spaces, Matrix diagonalization. **Bilinear forms:** Inner products, Norms, Cauchy-Schwarz inequality. **Orthonormal systems:** The Gram-Schmidt process.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MFM2123: Financial Mathematics II (45 hrs.)

Derivative security, Hedging, Bid-ask spread, Short sale of stock, Long position in stock, Forward contract, Spot price, Stock index, Cash settlement, Long, Short and payoff, Profit for forward, Zero coupon bond profit, Call and put option, In the money, At the money, Out of the money option, Options in insurance floor strategy, Cap strategy, Covered call, Put-Call parity, Synthetic forward, Spread, Bull spread, Bear spread, Collar, hedging with zero cost collar, Straddle, Strangle prepaid forward price, Arbitrage pricing, Forward contract on stock, Pricing forward premium, Synthetic stock, Cost of carry, Lease rate, Futures contracts, Market to market, S&P 500 future contract, Margin spot rate, Forward interest rate, Zero-coupon bonds, Implied forward rate swap. Oil, Swap payment, Dealer as swap counterparty, Swap rate R, Swap curve

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

BSc Level II – Semester II

MIS2213: Regression Analysis (40 Lecture hrs. + 10 Practical hrs.)

Introduction: Correlation analysis, Regression and model building, Use of regression, Role of the computer. **Correlation analysis**: Population correlation coefficient and sample correlation coefficient. Hypothesis testing for population correlation coefficient**. Simple linear regression:** Simple linear regression model, Least-square estimation of the parameters, Hypothesis testing on the slope and intercept, Interval estimation in simple linear regression, Prediction of new observations, Coefficient of determination, Estimation by maximum likelihood. **Multiple linear regression:** Multiple linear regression models,

Estimation of the parameters, Hypothesis testing in multiple linear regression, Confidence interval in multiple regression, Prediction of new observations. **Model adequacy checking:** Residual analysis, Lack of fit of the regression model. **Indicator variables, Variable selection and model building, Introduction to nonlinear regression, Introduction to generalized linear models.**

Method of Evaluation: Continuous Assessments: 50% and End of Semester Examination: 50%

MIS2223: Survival Analysis (40 Lecture hrs. + 10 Practical hrs.)

Introduction, Right censoring, Distribution of time to event, Survival function, Mean survival time, Median survival time, Quantiles of survival time, Mean residual life time, Hazard function, Cumulative hazard function, Common parametric models in survival analysis, Exponential, Weibull, and Gamma distributions. Right censoring, Calendar time, Patient time, Life table or actuarial estimator of distribution of time to event, Delta method, Estimate of the variance of life table estimator, Nelson-Aalen estimator of cumulative hazard function, Kaplan Meier estimation for distribution of time to event, Greenwood's formula for the variance of the life-table estimator, Asymptotic distributions of Nelson-Aalen estimator and Kaplan Meier estimator, Confidence intervals for above two estimators, Other types of censoring, Likelihood and censored survival data, Review of parametric maximum likelihood estimation, Score equation, Fisher information matrix and observed information matrix, Wald test, Likelihood ratio test, Likelihood and likelihood estimation for censoring survival data, R codes for estimation and plotting Kaplan Meier estimator.

Method of Evaluation: Continuous assessments: 50% and End of Semester Examination: 50%

MFM2213: Financial Mathematics III (Market Models and Risk Management in Discrete Time) (45 hrs.) **Review:** Stocks and stock indices, Dividends, Prepaid forward prices and forward prices, Arbitrage opportunities, Call and put options, Put-Call parity for European options. **Risk-neutral valuation in discrete-time:** One-period binomial tree, Arbitraging a mispriced option, Risk-neutral probabilities, Multi-period binomial tree, Risk-neutral formula based on a two-period binomial tree, Pricing American options, Constructing a binomial tree with known volatility, Options on stock indexes, Currencies, futures contracts, True probabilities, Pricing with true probabilities, State prices, Pricing using state prices, Trinomial tree model, The relation between state prices and other valuation methods. **Greek letters and elasticity:** Delta, Gamma and theta, Properties of Greek letters, the approximations related to Greek letters, Greek letters of a portfolio of derivatives, Vega, Rho and Psi, Mean return and volatility of a derivative, Elasticity of a derivative, Financial interpretation of elasticity, Option elasticity of a portfolio, Greek letters for binomial trees.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MSF2212: Calculus III (30 hrs.)

Multidimensional Spaces: Closed sets, Open sets, Limit points in R^n. Functions in multidimensional spaces, Limits and continuity. **Vector valued functions:** Differentiation and integration, Tangent and normal vectors, Arc length and curvature. **Functions of several variables:** Limits and continuity, Partial derivatives and differentiability, Chain rule, Directional derivatives and gradients, Extrema of functions of two variables and applications, Lagrange multipliers. **Multiple integration:** Double integrals and volumes. Change of variable and polar coordinates, Triple integrals. **Vector analysis:** Vector fields, Line integrals, Conservative vector fields, Greens theorem, Surface integrals, Divergence theorem, Stokes theorem.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MFM2222: Computing for Finance II (30 Lecture hrs. + 40 Practical hrs.)

Swaps: Definition, How swaps save money, Advantages of swaps, Terminating interest rate swaps, Implicit credit risk, Valuation, Cross currency swap, Worked example, Swaptions. **Forward interest rates:** Definitions, Example forward rates, Hedging principles, Forward rate agreement, Yield curves. **Futures:** Benefits, Clearinghouse operation, Bond futures, Hedging mechanisms, Hedging examples. **Foreign exchange:** Risk, Spot rates, Longer dates, Equivalence, Comparisons and arbitrage. **Options:** Underlying asset, Call and put options, Covered call, Insurance using a stock and a long put, Pricing models, Greeks.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MSF2223: Numerical Analysis II (30 Lecture hrs. + 30 Practical hrs.)

Solving Linear systems: Matrix notation, Direct methods, Gauss and Jordan eliminations, LU decomposition techniques. Iterative methods - Theorems related to convergence of iterative sequences and convergence criteria, Jacobi, Gauss-Seidel. Implement the numerical solution for solving large linear systems of equations using existing MATLAB functions/codes. **Numerical solutions of ordinary differential equations (ODE):** Numerical methods for initial value problems, Euler (explicit

and implicit) and Modified Euler methods, Runge-Kutta method. Higher-order Taylor expansion for solving ordinary differential equations and higher-order differential equations. Implement numerical solution algorithms in MATLAB to solve initial value problems using the available functions in MATLAB. **Numerical solutions of partial differential equations:** Parabolic type, Elliptic type, Hyperbolic type using finite difference methods. Implementations of finite difference schemes via MATLAB for boundary value problems associated to partial differential equations.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MIS2231: Case Study I (10 Lecture hrs. + 20 Practical hrs. + 45 Independent Learning hrs.)

Students will be provided with opportunities to learn about statistics-based research projects as real-world applications with proper guidance. Guide the students to practice solving real-world problems using statistics as a tool, report writing, and presentation.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

BSc Level III - Semester I

MFM3113: Financial Time Series (30 Lecture hrs. + 30 Practical hrs.)

Financial time series and their characteristics: Asset returns, Distributional properties of returns. Linear time series and its applications: Stationary, Correlation and autocorrelation function, White noise and linear time series, Simple autoregressive models, Simple moving-average models, Simple ARMA models, Unit-root nonstationarity, Seasonal models. Conditional heteroscedastic models: Characteristics of volatility, Structure of a model, The ARCH model, The GARCH models, The integrated and the exponential GARCH models, The Stochastic volatility model. Nonlinear models and their applications: Nonlinear models, Nonlinear tests, Modelling and forecasting. Continuous-time Models and their applications: Some continuous-time stochastic processes, Black-Scholes formulas, Stochastic integrals. Extreme values, Quantile estimation, and Value at risk: Value at risk, Risk metrics, An econometric approach to VaR calculation, Quantile estimation, Extreme value approach to VaR.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MIS3113: Design and Analysis of Experiments (30 Lecture hrs. + 30 Practical hrs.)

Experimental principles and basic statistics, Analysis of variance (ANOVA), Completely Randomized Design (CRD) and Randomized Complete Block (RCB) design, Latin Square (LS) and factorial experiments, Comparison of multiple treatment means and other mean comparisons, Power and sample size, Assumptions and data transformation, Missing values, Comparing regression lines and analysis of covariance, Analysis of counts non-parametric methods, Random effects models, Mixed models and nested effects, Split plot designs and repeated measures designs.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MFM3123: Life Insurance (45 hrs.)

The economics of insurance: Introduction, Utility theory, Insurance and utility, Elements of insurance, Optimal insurance. **The Individual risk models for a short term:** Models for individual claim random variables, Sums of independent random variables, Applications to insurance. **Survival distribution and life table:** Probability for the age-at-death, The survival function, Time-until-death for a person age x, Curtate-future-lifetimes, Force of mortality, Life tables, other life table characteristics, Assumptions for fractional ages. **Life insurance:** Insurances payable at the moment of death-level benefit, Endowment, Deferred, Varying benefit insurance, Insurances payable at the end of the year of death, Relationships between Insurances payable at the moment of death and the end of the year of death. **Life annuities:** Continuous and discrete life annuities, Life annuity with m-thly payments. **Benefit premiums:** Fully continuous and discrete premiums, True m-thly Premiums, Apportionable premiums, Accumulation-type benefits. Benefit reserves: Fully continuous and discrete reserves, Other formulas for fully continuous benefit reserves, Benefit reserves based on a semi-continuous basis and true m-thly benefits.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MFM3133: Financial Mathematics IV (Market Models and Risk Management in Continuous Time) (45 hrs.)

Review: The random walk model, Standard Brownian motion, Arithmetic Brownian motion, Geometric Brownian motion, Stochastic differential equations, Ito's Lemma, An integral representation, Differentiation rule for stochastic integrals,

Solutions of three SDES, Variations of Brownian motions. **Modelling stock price dynamics:** A review of the lognormal distribution, Modelling stock prices with GBM, Stock prices dynamics under the Black-Scholes framework, Log normality of stock prices. **Introduction to the Black-Scholes formula:** Binary options, The Black-Scholes formulas for options, Applying the pricing formula for other assets, Options on stock with discrete dividends. **Risk management technique:** Delta hedging a portfolio, Understanding the profit from a hedged portfolio, Self-financing delta-hedged portfolio, Rebalancing the hedge Portfolio, The Boyle-Emanuel formula, Gamma neutrality, Risk-neutral valuation. **General properties of options:** Different Strike prices, Bounds for Option Prices, Different times to Expiration, Early Exercise for American Options.

method of evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MFM3142: Operational research III (30 hrs.)

Nonlinear Programming: Single-variable optimization: Optimality criteria, Direct search methods algorithms, Gradient-based methods algorithms. **Multivariable optimization:** Optimality criteria, Direct search methods algorithms, Gradient-based methods algorithms. **Constrained optimization:** Kuhn-Tucker conditions, Transformation methods, Direct search and linearized search techniques. **Quadratic programming**: Optimality conditions, Interior point methods. **NLP and QP models in finance.**

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MIS3122: Non-Parametric Statistics (20 Lecture hrs. + 20 Practical hrs.)

Non-parametric tests: Kolmogorov-Smirnov tests, One-sample sign test, One-sample runs test, Two-sample runs test, Mann-Whitney U test, Two-sample sign test, Wilcoxon matched-pairs signed rank test, Kruskal-Wallis H test, Friedman rank sum test. The normal approximations for these tests. **Chi-square tests:** Goodness of fit test, Contingency tables for testing independence.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MSF3112: Decision Theory (30 hrs.)

Arguments with Sets and Venn diagrams: Sets, Venn diagrams, Data analysis; **Decision theory and group decisions:** Under uncertainty - various views and the study of risk. Utility theory introduction: Uncertainty, Expected utility, Interference curve, Indifference curves and risk aversion, Utility functions, Pratts risk aversion measurement; **Utility maximization:** The budget constraint, Maximization using Lagrangian multiplier, Cobb-Douglas utility function, Expenditure function.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MFM3151: Case Study II (10 Lecture hrs. + 20 Practical hrs.)

Students will be provided the opportunities to learn about statistics-based research projects as real-world applications with proper guidance. Guide the students to practice solving real-world problems using Financial Mathematics as a tool, and report writing and presentation.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

BSc Level III - Semester II

MIS3212: Bayesian Inference (25 Lecture hrs. + 10 Practical hrs.)

Fundamentals of the Bayesian theory of inference, Probability as a representation for degrees of belief, The likelihood principle, The use of Bayes' rule to revise beliefs based on evidence, Conjugate prior distributions for common statistical models, and Methods for approximating the posterior distribution. Graphical models for representing complex probability and decision models by specifying modular components.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MIS3222: Multivariate Data Analysis (20 Lecture hrs. + 20 Practical hrs.)

Multivariate data and multivariate statistics: Introduction, Types of data, Basic multivariate statistics, The aims of multivariate analysis. Bivariate normal distribution and density, Multivariate normal distribution: Mean vector and variance covariance matrix, Correlation matrix, Outliers, Multivariate plots, Checking for multivariate normality. Two independent

samples, Paired samples, Profile analysis, MANOVA, Repeated measurements. Cluster analysis, Principal component analysis, Discriminant analysis, and factor analysis.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MFM3213: Non-Life Insurance (45 hrs.)

Limited and Excess-Loss Random Variables: Left censoring and limiting of distributions, the limited loss variable, Limited loss random variable with limit u, the left-censoring and shifted variable, The excess loss random Variable. **Policy limits:** Severity and frequency distributions, Policy limit unlimited loss random variable with policy limit u, Cost per loss, Expected cost per loss. **Policy deductible:** Expected cost per loss, Expected cost per payment, Franchise deductible, The mean residual lifetime, Loss elimination ratio, Combine policy limit and deductible, Modelling bonus payments, Graphical representation of expected cost per loss. **Additional policy adjustments:** Coinsurance factor, Maximum covered loss u in combination with u and coinsurance, Inflation, Inflation factor in insurance policy, Policy adjustments for parametric distributions models for the number of claims, Frequency: Severity distributions, Collective risk model, Individual risk model, Models for the number claims, The (a, b, 0) class of discrete distributions. **Models for aggregate losses:** The collective or compound model for aggregate claims, Modification of the severity distribution.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MFM3222: Computing for Finance III (10 Lecture hrs. + 40 Practical hrs.)

Some applications in MFM2123 and MFM3123 using excel.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MFM3232: Business Proposals and Report Writing (30 hrs.) optional

Communication in the business environment with emphasis on written reports: Communication process and role of communication in organizations, Audience adaptation, Basic language and writing techniques with emphasis on style, Tone, and situation considerations: Coherence, Credibility, Readability, Bias (e.g., gender, racial, and ethnic), Clarity, Conciseness, and accuracy. Short, Informal reports: Functions and objectives of reports; Short, Informal reports of various types, Format and style of short reports. Formal reports: Collecting primary and secondary data; Analyzing, Organizing, and summarizing data; Evaluating and interpreting data; Drawing and supporting conclusions and recommendations; Formatting formal reports. Visual aids (including computer graphics), Oral presentation.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSF3212: Fundamentals of Management (30 hrs.)

Introduction to management, the challenges of management, Pioneering ideas in management, Business environment, Social responsibility, Ethics and culture, Functions of management, Managerial decision-making, Current issues in the business world.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSF3222: Scientific Writing and Communication (30 Lecture hrs. + 30 Practical hrs.) optional

Scientific writing and communication, Types of written communication, Use proper techniques in the English language for precise writing, Components of a scientific paper, Presenting statistics, Writing a structured scientific article, Oral and poster presentations, Ethics in publishing, Tools for effective literature search.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MIS3232: Stochastic Processes (30 hrs.)

Probability theory a brief review. Probability spaces, Random variables and vectors, Convergence of a sequence of random variables, Limit theorems etc., Lognormal and bivariate Gaussian distributions. **Discrete-time stochastic processes.** A first look at martingales, Stochastic processes - discrete in time, Markov chains in discrete time, The Poisson process etc., Conditional expectations, Random walks, Change of probabilities, Martingales, Martingale representation theorem. **Continuous time processes and their connection to PDE.** Markov processes in continuous time, Brownian motion, Brownian bridge, Brownian motion with drift and Wiener processes, Geometric Brownian motion, Stochastic integration, Stochastic differential equations and Ito's lemma.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

BSc Level IV - Semester I

MIS4122: Statistical Quality Control (20 Lecture hrs. + 20 Practical hrs.) *Optional*

Quality improvement and statistics: Statistical quality control, Statistical process control; **Introduction to control charts:** Basic principles, Design of a control chart, Analysis of control charts; Control charts for measurements ($\bar{X}$ and R or S control charts) ; Control charts for attributes (P chart , U chart, C chart) ; Process capability analysis; Cumulative sum control chart, Exponentially weighted moving average control chart; Acceptance-sampling: Single-sampling plans for attributes, OC curve, Double, Multiple, and sequential sampling.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MIS4122: Reliability Theory (20 Lecture hrs. + 20 Practical hrs.) *Optional*

Reliability concepts and reliability data: Examples of reliability data, General models for reliability data, Repairable systems and nonrepairable Units, Strategy for data collection, Modelling and analysis. **Models, Censoring, and likelihood for failure-time data**: Models for continuous failure-time processes, Models for discrete data from continuous process, Censoring, Likelihood. **Nonparametric estimation:** Estimation from singly censored interval data, Basic idea of statistical inference, Confidence intervals from complete or singly censored data. **Location-scale-based parametric distributions:** Quantities of interest in reliability applications, Location-scale and log-location scale distributions, Parameters and parameterization.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MIS4132: Categorical Data Analysis (25 Lecture hrs. + 10 Practical hrs.) *Optional*

Introduction to distributions and inference for categorical data: Categorical response data, Distributions for categorical data, statistical inference for categorical data. Describing contingency tables: Probability structure for contingency tables, comparing two proportions, Partial association in stratified 2 × 2 tables, Extensions for $I \times J$ tables. Inference for contingency Tables: Confidence intervals for association parameters, Testing independence in two-way contingency tables, Two-way tables with ordered classification, Small-sample tests of independence. Logistic regression: Interpreting parameters in logistic regression, Inference for logistic regression, Multiple logistic regression, Fitting logistic regression models. Building and applying logistic regression models, Log-linear models for contingency tables and building of log-linear models.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MFM4112: Credibility (30 hrs.) *Optional*

Limited Fluctuation Credibility: Introductory comments of credibility theory, the limited fluctuation credibility theory, Standard for full credibility, Full credibility applied to a frequency distribution and a Poisson random variables, Review of compound distributions, Partial credibility. **Bayesian probability estimates on a discrete prior distributions:** Prior distributions, Likelihood or data, Posterior distributions, Basic examples of Bayesian analysis with discrete priors, Predictive expectation-The Bayesian premium, Bayesian credibility questions, **Bayesian credibility with continuous priors:** Predictive distributions, The Bayesian structure, Some examples, The double expectation rule applied to Bayesian credibility, The Gamma-Poisson credibility model, Some additional comments on Bayesian estimators.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MFM4122: Computing for Finance IV (15 Lecture hrs. + 30 Practical hrs.)

Computational techniques for solving mathematical problems arising in finance. Numerical solution of parabolic partial differential equations, Basic schemes, General theory, Relation to binomial and trinomial trees, Boundary conditions for American options, Computation of sensitivities, Application to one factor and multi factor models. Stochastic simulation and Monte Carlo. Pseudo-random number generators, Generating random variables with specified distributions, Statistical analysis of simulation data and error bars. Numerical solution of stochastic differential equations. Higher order Taylor expansion for solving ordinary differential equations and higher order differential equations.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MFM4132: Stochastic Processes in Finance (30 hrs.) *Optional*

Probability theory a brief review. Probability spaces, Random variables and vectors, Convergence of a sequence of random variables, Limit theorems etc., Lognormal and bivariate Gaussian distributions. **Motivating example-derivatives.** What is a

derivative security? Types of derivatives, the basic problem: How much should I pay for an option? Fair price, Expectation pricing, Arbitrage and no arbitrage. The simple case of futures. Arbitrage arguments, The arbitrage theorem, Arbitrage pricing and hedging. **Discrete time stochastic processes and pricing models.** Binomial methods, Arbitrage and reassigning probabilities, A first look at martingales, Stochastic processes - discrete in time, Markov chains in discrete time, The Poisson process etc., Conditional expectations, Random walks, Change of probabilities, Martingales, Martingale representation theorem, Pricing a derivative and hedging portfolios, Martingale approach to dynamic asset allocation. **Continuous time processes and their connection to PDE**. Markov processes in continuous time, Brownian motion, Brownian bridge, Brownian motion with drift and Wiener processes, Stochastic integration, Stochastic differential equations and Ito's lemma, Black-Scholes model, Derivation of the Black-Scholes partial differential equation, Solving the Black Scholes equation, Comparison with martingale method, Optimal portfolio selection.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MFM4142: Measure-theoretic Probability with Applications in Finance (30 hrs.) *Optional*

Definitions: Sigma-algebra, Measure, Measurable space, Measure space, Set functions, Measurable functions etc. **Probability space**: Countable case, General case, Lebesgue measure and cantor set, Probability measures, Borel-Cantelli lemma. **Random variables:** Measure theoretic point of view, Probabilistic approach. Expectation: Definition, Elementary convergence theorems (Fatou's lemma, Monotone convergence theorem, Dominated convergence theorem), Product measures and Fubini's theorem, Elementary inequalities (Chebysheff, Jensen's, Holder's, Minkowski's) **Conditional expectation and independence:** Conditioning with respect to an event, Independence, Conditioning with respect to a partition, Radon-Nikodym theorem, Conditioning with respect to a sigma-algebra. Simple numerical calculations and applications of above concepts in financial mathematics.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MIS4141: Statistical Consulting (15 Practical hrs)

Introduction to statistical consulting, Verbal, Written, and presentation communications, Negotiating a satisfactory exchange, Dealing with difficult situations, Methodological aspects of statistical consulting, Grant proposals and manuscripts, Anatomy of a study.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MFM4152: Introduction to Information Theory & Information Geometry with Applications to Finance (30 hrs.) *Optional*

Introduction to information storage and information transmission as two basic problems in information theory and role of differential geometry in statistics. **How to quantify information** -Shannon's information measures: Entropy, Joint entropy, Conditional entropy, Relative entropy, Mutual information. **Basic inequalities** - Convex / concave functions, Jensen's inequality and its consequences, Log sum inequality and its applications, Data processing inequality. **Communication channels** - How to model a communication channel, Channel capacity: For example, Noiseless binary channel, Binary Symmetric Channel (BSC), etc. Shannon's noiseless & noisy coding theorems, Asymptotic Equipartition Property (AEP), Information theoretical version of the Law of Large Numbers (LLN), **Information measures for continuous random variables** - differential entropy, relative entropy, mutual information, etc. **Basic concepts of information geometry** - Manifolds of Probability distributions/densities, Riemannian metric, Fisher information as the unique Riemannian metric, parallel transport, sub manifolds, geodesics, exponential and mixture families etc. **Applications** - Information theory and information geometry of financial market, interest rate theory, portfolio theory, etc.

Method of Evaluation: Continuous Assessments: 40% and End of Semester Examination: 60%

MSF4112: Human Resources Management (30 hrs) *Optional*

Introduction to human resource management, Job design and job analysis and human resource planning, Recruitment and selection placement and induction, Employee training and development, Employee performance evaluation, Employee compensation, Employee health and safety management, Employee discipline and employee grievances handling, Labour-management relations, Human resource information systems.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

MSF4126: Research Project

Students will be provided the opportunities to learn about statistics-based research projects as real world applications with proper guidance. Guide the students to practice for solving real world problems using the Financial Mathematics as a tool and report writing and presentation.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

Please refer to the document (NAITA: SIT/PL/01/01) recommended by the Department of Mathematics for more information.

Note: MFM3232 and MSF3222 are elective, but one of these courses must be taken as a core course.

BSc Level IV - Semester II

MSF4216: Industrial Training (Whole Semester) *Non - GPA*

Students will be provided with opportunities to learn about statistics-based research projects as real-world applications with proper guidance. Guide the students to practice solving real-world problems using Financial Mathematics as a tool, and report writing and presentation.

Method of Evaluation: Continuous Assessments: 30% and End of Semester Examination: 70%

B.Sc. (Hons.) Financial Mathematics & Industrial Statistics Degree Programme C- Core, O-Optional, E-Elective Th-Theory, Pr-Practical							
Level	**Semester**	**Course Code**	**Course Unit**	**C / O / E**	**Considered for Degree as**	**Examination Mode Th / Pr**	**Credit Value**
1	1	MIS1112	Basic statistics in industry	C	Th	Th+Pr	2
		MIS1122	Introduction to Probability and Distributions	C	Th	Th	2
		MFM1112	Computing for Finance 1	C	Pr	Pr	2
		MSF1113	Calculus I	C	Th	Th	3
		MFM1122	Operational Research I	C	Th	Th+Pr	2
		MFM1132	Financial Management	C	Th	Th	2
		MSF1123	Programming Techniques	C	Th	Th+Pr	3
	2	MIS1213	Mathematical Statistics	C	Th	Th	3
		MIS1222	Statistical Computing (R and Python software)	C	Pr	Pr	2
		MFM1213	Financial Mathematics I	C	Th	Th	3
		MFM1222	Introduction to Economics	C	Th	Th	2
		MSF1212	Numerical Analysis I	C	Th	Th	2
		MSF1222	Operational Research II	C	Th	Th	2
		MSF1233	File organization and DBMS	C	Th	Th+Pr	3
2	1	MIS2113	Inferential Statistics	C	Th	Th	3
		MIS2122	Sampling Techniques and survey designs	C	Th	Th+Pr	2
		MSF2112	Calculus II	C	Th	Th	2
		MFM2112	Mathematical Economics	C	Th	Th	2
		MSF2122	Research Methodology	C	Th	Th	2
		MSF2132	Linear Algebra	C	Th	Th	2
		MFM2123	Financial Mathematics II	C	Th	Th	3
	2	MIS2213	Regression Analysis	C	Th	Th+Pr	3
		MIS2223	Survival Analysis	C	Th	Th+Pr	3
		MFM2213	Financial Mathematics III (Market Models and Risk Management in Discrete Time)	C	Th	Th	3
		MSF2212	Calculus III	C	Th	Th	2
		MFM2222	Computing for Finance II	C	Pr	Th+Pr	2
		MSF2223	Numerical Analysis II	C	Th	Th+Pr	3
		MIS2231	Case Study I	C	Pr	Th+Pr	1
3	1	MFM3113	Financial Time Series	C	Th	Th+Pr	3

		MIS3113	Design and Analysis of Experiment	C	Th	Th+Pr	3
		MFM3123	Life Insurance	C	Th	Th	3
		MFM3133	Financial Mathematics IV (Market Models and Risk Management in Continuous Time)	C	Th	Th	3
		MFM3142	Operational Research III	C	Th	Th	2
		MIS3122	Non-Parametric Statistics	C	Th	Th+Pr	2
		MSF3112	Decision Theory	C	Th	Th	2
		MFM3151	Case Study II	C	Pr	Th+Pr	1
	2	MIS3212	Bayesian Inference	C	Th	Th+Pr	2
		MIS3222	Multivariate Data Analysis	C	Th	Th+Pr	2
		MFM3213	Non-Life Insurance	C	Th	Th	3
		MFM3222	Computing for Finance III	C	Pr	Th+Pr	2
		MFM3232*	Business Proposals and Report Writing	C (E)	Th	Th	2
		MSF3212	Fundamentals of Management	C	Th	Th	2
		MSF3222*	Scientific Writing and Communication	C (E)	Th	Th+Pr	2
		MIS3232	Stochastic Processes	C	Th	Th	2
4	**1**	MIS4112**	Statistical Quality Control	O	Th	Th+Pr	2
		MIS4122	Reliability Theory	O	Th	Th+Pr	2
		MIS4132**	Categorical Data Analysis	O	Th	Th+Pr	2
		MFM4112**	Credibility	O	Th	Th	2
		MFM4122	Computing for Finance IV	C	Pr	Th+Pr	2
		MFM4132	Stochastic Processes in Finance	O	Th	Th	2
		MFM4142	Measure-theoretic Probability with Applications in Finance	O	Th	Th	2
		MSF4112	Human Resource Management	O	Th	Th	2
		MIS4141	Statistical Consulting	C	Pr	Pr	1
		MFM4152	Introduction to Information Theory& Information Geometry with Applications to Finance	O	Th	Th	2
		MSF4126	Research Project	C			6
	2	MSF4216	Industrial Training	C (Non GPA)			6

MFM3232* and MSF3222* are Elective (E) , but one of these options must be taken as C, ** Currently offering Optional courses.

6. Department of Physics

The major commitment of the Department of Physics is to provide up-to-date Physics knowledge to undergraduate and graduate students through coursework, practical sessions, research projects, and industrial trainings. The Department has facilities to offer BSc General (three-year course) and BSc Honours (four-year course) degrees for undergraduates, and research-based MPhil and PhD Degrees for graduate students. Physics is offered as a subject to students in the Biology stream as well. In addition to standard Physics courses, the Department offers optional course units on Electronics, Astronomy, Computational Physics, and Miscellaneous Topics. Sufficient laboratory space (for 200 students each year), including modern computerized laboratory experiments and computer facilities, are available for teaching and research.

6.1. Research Areas

Senior academic staff members continue research in their fields of specialization, which are indicated in the table under "Staff". The Department has laboratory and computing facilities to carry out post-graduate studies leading to MPhil and PhD Degrees. Current major research areas are:

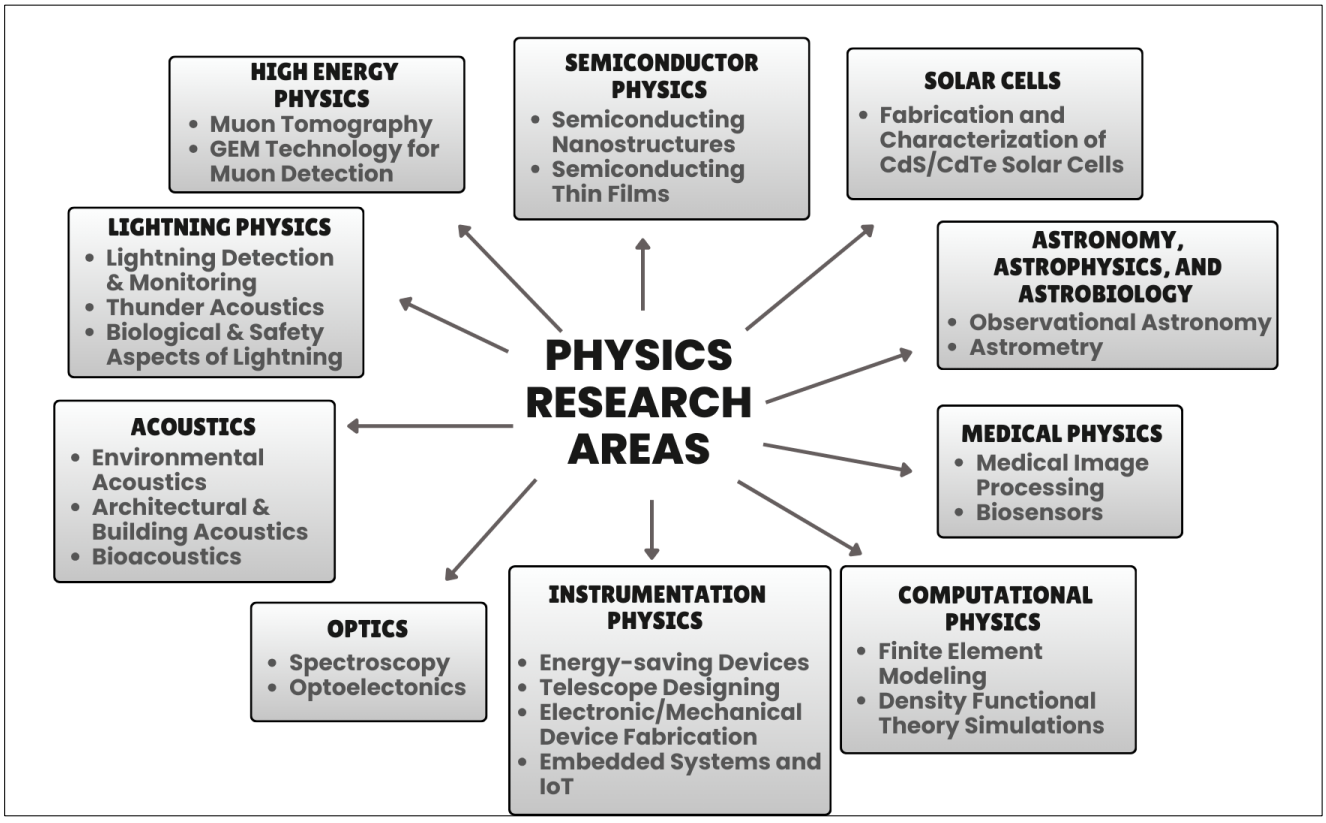


Figure 4:Research areas of Physics Department

6.2. Head of the Department

Dr. J. A. P. Bodhika
BSc (Ruhuna, SL), MSc, PhD (Colombo, SL)

6.3. Members of the Academic Staff

Designation	Name	Specialization
Emeritus Professors	Emeritus Professor W.G.D. Dharmaratna BSc (Peradeniya, SL) MSc, PhD (Tufts, U.S.A.)	Theoretical Particle Physics, High Energy Physics (CERN-CMS), Noise Pollution
Professors	Professor. G. D. K. Mahanama BSc (Ruhuna, SL) PhD (London South Bank University, UK)	Solid State Physics, Solar Cells, Astronomy
Senior Lecturers (Grade I)	Dr. K. P. S. Jayatilleke BSc (Kelaniya, SL) MSc, PhD (Cincinnati, U.S.A.)	Experimental Particle Physics Computational Physics
	Dr. J. A. P. Bodhika BSc (Ruhuna, SL) MSc, PhD (Colombo, SL)	Lightning and Thunder, Acoustics: Noise pollution, Sound Absorption Properties of Organic materials
	Dr. E. M. Ranatunga BSc (Ruhuna, SL), MPhil (Ruhuna, SL), PhD (Ruhuna, SL)	Instrumentational Physics, Solar Thermal Energy
	Dr. H. A. D. S. D. Perera BSc (Ruhuna, SL) MSc, PhD (Cincinnati, U.S.A.)	Semiconducting Nanowires, Heterostructures, Optical Spectroscopy
Senior Lecturers (Grade II)	Dr. (Ms) N. T. Wickramasuriya BSc (Ruhuna, SL) MSc, PhD (Cincinnati, U.S.A.)	Characterization of Semiconductor Nanowires, Nanowire Device Fabrication
	Dr. W. M. K. De Silva BSc (Ruhuna, SL) MSc, PhD (Cincinnati, U.S.A.)	Magnetic Resonance Imaging
Lecturers (Confirmed)	Mr. S. S. Abeywickrama BSc (Ruhuna, SL), B.Tech.Eng. (OUSL) MSc in Applied Electronics (Colombo) (Reading for MPhil at Univ. of Colombo)	Electronics and Communication Engineering
	Mr. K. A. S. Lakshan BSc (Colombo, SL) MS (NDSU, USA)	Electronics, Electromagnetism, Biosensors
Probationary Lecturers	Dr. K. M. Liyanage BSc (Ruhuna, SL) PhD (Ruhuna, SL)	Experimental High Energy Physics (CERN-CMS)

6.4. Course Units in Physics for BSc (General) Degree

BSc Level I - Semester I

PHY1114: General Physics I (60 Lecture hrs)

Classical Mechanics I: Particle dynamics; Motion of a system of particles; Conservation of linear momentum, Inertial and non-inertial frames of reference, Rotation in space, Conservation of angular momentum, Centrifugal and Coriolis forces, Precession, Work-Energy; Conservative forces, Equilibrium and potential energy, Bernoulli's equation, Collisions and reactions; Impulse, Center of mass reference frame, Elastic and inelastic collisions and their conservation laws, Reaction threshold, Gravitation; Planetary motion.

Wave Motion and Acoustics Mechanical Systems: Executing simple harmonic motion; Wave motion, Wave propagation in stretched strings, gases and solids, Resonance phenomena; Ear and hearing; Intensity and characteristics of sound, Doppler effect and its applications; Ultrasound, Shock waves.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

PHY1b22: Elementary Physics Practical I (45 hrs × 2)

A three-hour laboratory class will be conducted each week. A minimum of 12 distinct relevant introductory experiments will be offered in each semester. Students are expected to submit a report for each experiment. The course runs through both semesters. Examination is held at the end of semester II.

Evaluation methods: Continuous Assessment: 25%, Practical Assessment Test: 10%, End Semester Examination: 65%

BSc Level I - Semester II

PHY1214: General Physics II (60 Lecture hrs)

Electricity and Magnetism I: **Electricity:** Electrostatics, Electric force, Electric field, Gauss' law, Electric potential, Equipotential surfaces, Electric dipole, Capacitors, Dielectrics, Polarization, Susceptibility, Electric energy density, Electric force on charged surfaces. Current electricity; Electric current, Drift velocity, Conductivity, Network theorems; Kirchhoff's law, Maxwell's cyclic law, Superposition theorem, Thevenin theorem, Reciprocity theorem, Delta(δ) and Y circuits. **Magnetism**: Magnetic field, Biot-Savart law, Ampere's law, Gauss' law, Lorentz force, Force on a current element, EM induction, Self and mutual induction, Transformers, Magnetic materials, Magnetic energy density, Moving coil galvanometer and its applications, DC and AC circuits.

Geometrical and Physical Optics: Defects of images, Dispersion, Principle of superposition, Electromagnetic wave aspect of light, Huygens principle, Interference, Diffraction, Experimental methods of demonstrating interference and diffraction, Resolving power, Polarization, Optics of crystals, Lasers and their applications, Holography, Fiber optics.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

BSc Level II - Semester I

PHY2114: General Physics III (60 Lecture hrs)

Thermal Physics: Heat transfer, Kinetic theory of gases, Real gases, Equation of state, First and second law of thermodynamics, Heat engines, Entropy, Enthalpy, Application of principles of thermodynamics to special systems, e.g. Latent heat equations, Specific heats, Maxwell's relations, Joule-Kelvin effect, Liquefaction of gases, Blackbody radiation.

Classical Mechanics II: Lagrangian formulation, Lagrange's equations and their application to simple systems, Small oscillations, Coupled oscillations and normal modes of vibrations, Damped vibrations, Forced vibrations, Transient and steady state solutions. Motion under a central force, Effective potential.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

PHY2b22: General Physics Practical I (45 hrs x 2)

A three-hour laboratory class will be conducted in each week. A minimum of 12 distinct relevant general experiments will be offered in each semester. Students are expected to submit a report for each experiment. The course runs through both semesters. The examination is held at the end of semester II.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

PHY2112: Electronics (30 Lecture hrs) *Optional. (This course unit is a pre-requisite for those students who wish to follow the Honours Degree in Physics)*

Signals, Electronic components, Voltage and power transfer, Semiconductors, Junction diodes and their characteristics, Rectifier circuits, DC power suppliers, Smoothing circuits, Filters, LED display circuits, Bipolar junction transistors, Transistor characteristics and modes of operations, Equivalent circuits, Field effect transistors, Amplifiers; Tuned, Power and feedback amplifiers, Oscillators, Operational amplifiers, Inverting and non-Inverting amplifiers. Digital electronics: Numerical representations, Binary arithmetic, Use of Boolean algebra, Logic gates, Truth tables, Combinational logic circuits, Sequential logic circuits, Flip-Flops and their simple applications.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

BSc Level II - Semester II

PHY2214: General Physics IV (60 Lecture hrs)

Electricity and Magnetism II: Mathematical formulation of electrostatics, Magneto-statics and electromagnetic induction, Boundary value problems, Maxwell's equations, Plane electromagnetic waves in free space.

Atomic and Nuclear Physics: Quantum theory of radiation, Particle properties of light, Photoelectric and Compton effects, Wave properties of material particles, de Broglie postulate and its experimental verification, Rutherford scattering, Structure of the Atom, Bohr theory, Atomic spectra, X-rays, X-ray diffraction. Radioactivity, Properties and stability of nuclei, Structure of the nucleus, Nuclear force, Nuclear reactions, Fission and Fusion, Nuclear power, Elementary particles, Cosmic rays, Quarks, Applications in medical physics.

Special Theory of Relativity: Galilean transformation, Michelson-Morley experiment, Einstein's postulates, Lorentz transformation, Length contraction, Time dilation and Twin paradox, Velocity transformation, Space-time diagrams, Minkowski space, Four vectors and tensors, Conservation of four-momentum, Relativistic dynamics.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

PHY2222: Electronics Practical (45 hrs) *Optional.* ***Prerequisite: PHY2112*** *(This course unit is a pre-requisite for those students who wish to follow the Honours Degree in Physics)*

A minimum of 10 distinct electronic experiments will be offered. In addition, four modules relevant to electronics circuit prototyping have to be completed. The examination is held at the end of semester II**.**

Evaluation methods: Continuous Assessment: 25%, Electronic Circuit Prototyping Modules: 25%, End Semester Examination: 50%

BSc Level III - Semester I

PHY3114: General Physics V (60 Lecture hrs)

Quantum Mechanics: Failures of classical physics, Heisenberg uncertainty principle, Schrodinger equation, Probability interpretation of the wave function, Solution of the Schrodinger equation for piecewise constant potentials, Operators, Expectation values and Eigen value problems, Angular momentum, Hydrogen atom.

Statistical Physics: Basic probability concepts; Binomial, Gaussian and Poisson distributions, Canonical ensemble, Partition function, Maxwell velocity distribution, Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein distributions and their applications to simple systems.

Solid State Physics: Introduction to crystallography; Crystal structures, Crystal defects, X-ray diffraction, Free and nearly free electron theories, Electron specific heat, Band theory of solids, metals, semiconductors and insulators, p-n junction and its applications.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

PHY3121: General Physics Practical II (45 hrs)

A three-hour laboratory class will be conducted each week. A minimum of 12 distinct relevant general experiments will be offered during the semester I. Students are expected to submit a report for each experiment. The examination is held at the end of the semester I.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

BSc Level III - Semester II

PHY3232: Astronomy (30 Lecture hrs) *Optional*
Solar system and Stars: The Earth, The Moon and Planets, Other bodies of the Solar system, Comets, Asteroids. Classification, formation and evolution of Stars, Red Giants, White Dwarfs, Neutron Stars, Pulsars, Binary Stars and Black Holes. Nature of the Universe: The Milky Way Galaxy, The Interstellar medium, Formation, evolution and classification of Galaxies, Radio Galaxies, Quasars, Cosmological models, Big-Bang theory
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

PHY3242: Computational Physics I (15 Lecture hrs + 30 hrs of Computer Laboratory Classes) *Optional*
Computer arithmetic, Error and uncertainties in computation, Numerical differentiation: first order and second-order derivatives, 2-point, 3-point and 5-point formulae; Numerical integration: Trapezoidal and Simpson's rules, composite and recursive formulae; Solving non-linear equations: Bisection, Newton's and Secant methods; Interpolation: Lagrange, linear, polynomial, divided difference and cubic spline interpolation, Neville algorithm, least-square fitting, Goodness of fit estimator, Maximum likelihood method.
Evaluation methods: Continuous Assessment: 30%, End Semester Practical Examination: 30%, End Semester Written Examination: 40%

PHY3272: Computational Physics II (15 Lecture hrs + 30 hrs of Computer Laboratory Classes)
Optional Prerequisite: PHY3242
Solving systems of linear Equations: Gaussian elimination, Triangular factorization, Jacobi and GaussSeidel iterative methods; Numerical solution to ordinary differential equations: Euler, Euler-Cromer, Improved Euler, Taylor series and fourth order RungeKutta methods; Carlo methods: Uniform and non-uniform random number generation, Evaluation of multi-dimensional integration, Random walk, Simulation applications; Solution of partial differential equations: heat, wave and Laplace equations.
Evaluation methods: Continuous Assessment: 30%, End Semester Practical Examination: 30%, Semester End Written Examination: 40%

PHY3282: Microcontrollers and Applications. (15 Lecture hrs + 30 Electronic Laboratory Classes)
Optional. Prerequisite: PHY2112 and PHY2222
Introduction to microcontrollers, CISC and RISC architectures, Microchip PIC microcontrollers, Hardware configuration, Memory organization, Instruction set, Assembly language programming, Programming tools, Development boards, I/O ports, Basic I/O programming, Software delays, Lookup tables, Interrupts programming, Timers & counters, Data manipulating built-in EEPROM, Microcontrollers programming in High-level languages, A/D conversion, D/A conversions, Communications (USART based serial communication, SPI and I2C), External EEPROMs, Interfacing the sensors and transducers, Keyboards, LCDs, PWM, Capture, Compare, Sound generation, Embedded system development.
Evaluation methods: Continuous Assessment: 50%, End Semester Examination: 50%

Note:
The details of optional course units that are offered during each semester will be announced before the registration period - please consult the Head of the Department before registration for any further clarification.

6.5. Course Units in Physics for BSc (Honours) Degree

PHY4014: Mathematical Methods for Physics (60 Lecture hrs)
Complex variables, Analytic functions, Residue theorem, Contour integration and conformal mapping, Special functions, Legendre polynomials and recursion relations, Bessel functions, Hankel functions, Hermit polynomials, Orthogonal properties, Partial differential equations and boundary value problems, Laplace's equation, Integral transforms, Fourier series, Fourier transforms, Calculus of variations, Euler-Lagrange equations, Matrices, Eigen value problems, Integral equations, Degenerate Kernel, Introduction to group theory.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

PHY4024: Classical Mechanics & Special Relativity (60 Lecture hrs)
Lagrangian formulation, Variational principles, Hamilton's equations, Small oscillations, Rigid dynamics, Hamilton-Jacobi theory, Poisson brackets, Introduction to classical theory of fields, Relationship between classical and quantum mechanics. Space-Time, Lorentz transformations, Velocity transformations, Minkowski space, 4-Vectors, Relativistic invariance, Propagation 4-Vector for waves, Relativistic Doppler effect, Relativistic dynamics, Conservation of 4-Momentum, Covariant equation of motion, Introduction to general theory of relativity.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

PHY4034: Quantum Mechanics (60 Lecture hrs)
Failures of classical physics, Heisenberg uncertainty principle, Schrodinger equation, Wave function, Piecewise constant potentials, Operators, Eigen values and Eigen functions, Angular momentum, Hydrogen atom, Harmonic oscillator, Electron spin, Time independent perturbation theory, Variational method, Matrix formulation of Quantum mechanics, Dirac Bra-Ket notation, Transformation theory, Pictures, Time-dependent perturbation theory, Transition probabilities, Laser physics.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

PHY4044: Electromagnetic Theory (60 Lecture hrs)
Conservation of charge, Scalar and vector potentials, Lorentz condition, Wave equations, Maxwell's equations, Electromagnetic waves in free space, in non-conductors, in conductors and in low pressure ionized gases, Reflection of electromagnetic waves; Snell's law, Fresnel's equations, Reflection at air/dielectric interface, Reflection at air/good conductor interface, Reflection by an ionized gas, Wave guides; Modes of propagation, Critical frequency, Phase velocity, Group velocity, Energy transmission, Transmission lines; Equation of telegraphy, Characteristic impedance, Current and voltage distribution, Impedance matching, Electro-magnetic Radiation; Retarded potentials, Electric and magnetic dipole radiation, Antennas.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

PHY4053: Special Physics Practical I (90 hours)
Students are expected to submit a report for each experiment. A three-hour practical examination will be held at the end of semester I. **Course content**: General Physics Practical II (PHY3121), and advanced physics experiments.
Evaluation methods: Continuous Assessment & Lab Reports: 30%, End Semester Examination: 70%

PHY4063: Special Physics Practical II (90 hours)
Students must submit reports for at least four advanced physics experiments. A three-hour practical examination will be held at the end of semester II.
Evaluation methods: Continuous Assessment & Lab Reports: 30%, End Semester Examination: 70%

PHY4084: Nuclear and Particle Physics (60 Lecture hrs)
Properties of nuclei including size, shape, spin, electric and magnetic moments, The deuteron, Nuclear reactions; Q valve; Threshold energy, The compound nucleus; Direct reactions, Stripping reactions, Nuclear models; Liquid drop model, Semi-empirical mass formula, Fission, Alpha decay, Beta decay, Shell model; Energy of shells, Angular momentum and magnetic dipole moment of the nucleus, Barrier penetration, Collective model, Discovery of Particles; Electrons to quarks, Classification of particles: Leptons, Mesons and Baryons, Interaction of particles: Strong, Electromagnetic, Weak and Gravity, Symmetry and conservation Laws: Energy, Linear momentum, Total angular momentum (J = L+S), Lepton number, Baryon number, Isospin, Strangeness, Parity, Charge conjugation, Time reversal, CP and CPT.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

PHY4094: Statistical Mechanics (60 Lecture hrs.)
Statistical description of systems of particles, Postulates of statistical mechanics, Probability calculations, Behavior of states, Interactions between macroscopic systems, Quasi-static process, Exact and inexact differentiations, Equilibrium conditions and constraints, Reversible and irreversible process, Thermal and general interactions between microscopic systems, Gibbs paradox, Equipartition theorem, Maxwell velocity distribution, Formation of statistical problem, Microcanonical and Canonical ensembles, Grand canonical ensemble, Classical ideal gases; the Partition function; Boltzmann, Fermi and Bose distributions, Fermi and Bose gases, Blackbody radiation.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

PHY4104: Solid State Physics (60 Lecture hrs.)

Crystal structure, Bravais cells, Lattice operations, Bragg law, Miller indices, Reciprocal lattice vectors, Scattering amplitude, Brillouin zone, Thermal properties of solids, Lattice vibrations and phonons, Thermal energy and heat capacity of solids, Density of states, Debye model, Electrons in crystals, Fermi-Dirac distribution, Fermi energy, Electrical conductivity, Semiconductors, Energy gap, Conduction and valence bands, Direct and indirect Photon absorptions, Holes, Intrinsic carrier concentration, Donor and acceptor extrinsic semiconductors, Magnetic and dielectric materials, Optical phenomena in solids, Superconductivity, Meissner effect, London's equation, Coherence length, Formation of Cooper pairs.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

PHY4112: Electronics II (30 Lecture hrs)

Number systems and codes, BCD and ASCII codes. Designing of combinational logic circuits, Minimization of logic expressions using algebraic and Karnaugh map methods, Construction of a full adder, Decoders, Encoders, Multiplexes, Demultiplexes, and their applications, Characteristics of TTL, ECL, PMOS, NMOS and CMOS gates, Open collector devices, Sequential logic circuits, Flip-Flops as a memory element, S-R, J, K, and Master-Slave Flip-Flops, D and T Flip-Flops, Applications of Flip-Flops, Asynchronous circuits, Registers, Shift registers, Serial and parallel data transfer (SISO, SIPO, PISO, and PIPO), Frequency division and counting, Asynchronous (ripple) counters, Counters with Mod numbers, Up counters, Down counters, Up/Down counters, IC asynchronous counters, Digital arithmetic in the 2'S complement system, Parallel binary adder, Complete parallel adder with registers, Integrated Logic circuits families, TTL series, Tristate TTL devices, Bus-oriented devices, MOSFET and CMOS series, Analysis and synthesis of synchronous circuits, Memory systems, and Digital data communication.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

PHY4124: Astronomy and Cosmology (60 Lecture hrs)

Astronomy: Stars, Energy production in Stars, Classification of Stars and Black-Holes, Multiple Star systems, Star Clusters, Galaxies and their classification, Active Galaxies, Groups, Clusters, and superclusters of Galaxies. **Cosmology:** Issues in Cosmology, Cosmic distance scales, Expansion of the Universe, The Hubble law, The age of the Universe, Gravitation and the general theory of relativity, The principle of equivalence, The geometry of the Universe, The cosmological principle, Solutions of the Einstein equations, The hot Big-Bang, The cosmic background radiation, Matter in the Universe, Dark matter, Dark energy, Gamma-Ray bursts, The inflationary Universe, Growth of large-scale structure, The Planck era.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

PHY4132: Miscellaneous Topics I (30 Lecture hrs)

Topics of current interest (Eg: Remote sensing, Thin film deposition, Solar energy, Nanotechnology, Atmospheric Physics, Medical Physics, etc.) will be announced at the beginning of each semester.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

PHY4144: Computational Physics (30 Lecture hrs + 60 Practical hours)

Computer Arithmetic, Error and uncertainties in computation, Numerical differentiation: first order and second order derivatives, 2-point, 3-point and 5-point formulas, Numerical integration: Trapezoidal and Simpson's rules, Composite and recursive formulas, Solving non-linear equations: Bisection, Newton's and Secant methods. Interpolation: Lagrange, linear, polynomial, divided difference and cubic spline interpolation, Solving systems of linear equations: Gaussian elimination, Triangular factorization, Jacobi and Gauss-Seidel iterative methods; Numerical solution to ordinary differential equations: Euler, Euler-Cormer, Improved Euler, Taylor Series and fourth order RungeKutta methods, Monte Carlo methods. Uniform and non-uniform random number generation, Evaluation of multidimensional integration, Random walks, Fourier methods, Simulation applications: Solution of partial differential equations: Heat, wave and Laplace equations.

Evaluation methods: Continuous Assessment: 30%, End Semester Practical Examination: 30%, End Semester Written Examination: 40%

PHY4151: Learning Skills

This course unit assesses learning skills through two main components: **seminar presentations** and **industrial training performance evaluation**. Seminar topics are provided at the beginning of the Level I, Second Semester. Students are required to carry out independent study under the guidance of a supervisor, with evaluation conducted through presentations and viva voce examinations. Industrial training will be arranged after the final examinations in Level II, with a minimum duration of one month.

Final assessment will be based on a viva voce examination and performance evaluations conducted jointly by internal and external supervisors.

Assessment method: Presentations and viva voce at the end of semester

PHY4166: Research Project

Honours degree level II student's research projects (including project report and presentation). Projects are assigned at the start of Level II. The report must be submitted by the end of the academic year.

Assessment method: Evaluation of the Dissertation, Presentation and viva voce at the end of semester-II

PHY4173: Special Physics Practical III (90 hrs)

Students must submit reports for at least four advanced physics experiments. Students' accumulated knowledge from theory and practical courses is tested in a three-hour practical examination held at the end of semester I of Level II.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

PHY4183: Special Physics Practical IV (90 hrs)

Students must submit reports for advanced physics experiments. Student's accumulated knowledge from theory and practical courses are tested in a six-hour practical examination held at the end of semester II of Level II.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

PHY4192: Fundamentals of Engineering Workshop Practices (15 Lecture hrs + 39 Practical hours)

Introduction to workshop practices: Historical background, Conventional machining techniques, Safety measures: Safety equipment, Safety measures to be incorporated inside the workshop, Metrology: Uses of devices such as calipers, micrometers, thread gauges, etc. for accurate and precise measurements, Machining: Introduction, Single and multi-point cutting tools, Tool geometry and tool materials, Lathe operations, Drilling operation, Milling operations, Shaping operation, Work holding devices, Welding: Introduction, Arc and gas welding, Welding equipment. Project: Operation of conventional machines to fabricate simple mechanical components and assemblies.

Evaluation methods: Continuous Assessment: 50%, End Semester Examination: 50%

6.6. Credit Values

6.6.1. BSc General Degree

Course Unit	Duration (hrs)		Credits		Total
	Theory	Practical	Theory	Practical	
PHY1114: General Physics I	60		4		4
PHY1214: General Physics II	60		4		4
PHY1b22: Elementary Physics Practical I		90		2	2
PHY2114: General Physics III	60		4		4
PHY2112: Electronics	30		2		2
PHY2214: General Physics IV	60		4		4
PHY2222: Electronics Practical		60		2	2
PHY2b22: General Physics Practical I		90		2	2
PHY3114: General Physics V	60		4		4
PHY3121: General Physics Practical II		45		1	1
PHY3232: Astronomy	30		2		2
PHY3242: Computational Physics I	15	30	1	1	2
PHY3272: Computational Physics II	15	30	1	1	2
PHY3282: Microcontrollers & Applications	15	30	1	1	2

6.6.2. BSc (Honours) Degree in Physics

Course Unit	Duration (hrs)		Credits		Total
	Theory	Practical	Theory	Practical	
PHY4014: Mathematical Methods for Physics	60		4		4
PHY4024: Classical Mechanics & Special Relativity	60		4		4
PHY4034: Quantum Mechanics	60		4		4
PHY4044: Electromagnetic Theory	60		4		4
PHY4053: Special Physics Practical I		90		3	3
PHY4063: Special Physics Practical II		90		3	3
PHY4084: Nuclear and Particle Physics	60		4		4
PHY4094: Statistical Mechanics	60		4		4
PHY4104: Solid State Physics	60		4		4
PHY4112: Electronics II	30		2		2
PHY4124: Astronomy and Cosmology	60			4	4
PHY4132: Miscellaneous Topics I	30		2		2
PHY4144: Computational Physics	30	60	2	2	4
PHY4151: Learning Skills					1
PHY4166: Research Projects					6
PHY4173: Special Practical III		90		3	3
PHY4183: Special Practical IV		90		3	3
PHY4192: Fundamentals of Engineering Workshop Practices	15	30	1	1	2

7. Department of Zoology

The Department of Zoology conducts courses covering basic and applied fields of Zoology for undergraduate students registered for BSc General Degree and BSc Honours Degree Programs. The department has the following infrastructure facilities for undergraduate students: one lecture theater, two elementary laboratories to cater for about 120 students, and two research laboratories. The department has well equipped research laboratories, instrument room, animal house, and indoor/ outdoor fishponds and a computer room to facilitate full time or part-time postgraduate studies leading to M. Phil and/or PhD. The department has academics Specialized in various fields including Aquatic Ecology, Fish Biology and Fisheries, Entomology, Environmental Science, Animal physiology, Genetics & Molecular Biology and Environmental Toxicology.

7.1. Research Areas

Current research activities of the department are in the following areas:

- Animal Ecology, Parasitology & Physiology
- Aquaculture and fish nutrition
- Aquatic Ecology
- Biodiversity & Conservation
- Biological effects of pollutants on animals
- Chronic Kidney Disease
- Conservation Genetics & Biology
- Environmental Biology of fishes
- Environmental Toxicology
- Fish taxonomy, biology & fisheries
- Insect eco-physiology
- Insect taxonomy and diversity
- Mammalian Reproductive Biology
- Molecular Genetics
- Ornithology
- Plant nematology
- Vector-borne & Zoonotic Diseases

7.2. Head of the Department

Senior Prof. (Mrs.) W.T.S.D. Premachandra
BSc (Ruhuna, SL), MSc (Hanover, Germany) PhD (Hanover, Germany)

7.3. Members of Academic Staff

Designation	Name	Specialization
Emeritus Professor	Prof. (Mrs.) N. J. De S. Amarasinghe BSc (Colombo, SL) D. Sc. (Namur, Belgium) M. I. Biol., Chartered Biologist	Fish population dynamics & Fisheries, Limnology, Bio indicators of water quality
Senior Professors	Snr. Prof. (Mrs.) W.T.S.D. Premachandra BSc (Ruhuna, SL) MSc (Hanover, Germany) PhD (Hanover, Germany)	Entomology, Plant Nematology, Entomopathogenic nematodes
	Snr. Prof. P.M.C.S. De Silva BSc (Ruhuna, SL) M. Phil (Bergen, Norway) PhD (Amsterdam, The Netherlands)	Environmental Toxicology
Chair Professor	Snr. Prof. (Mrs.) K.B.S. Gunawickrama BSc (Ruhuna, SL) MPhil (Bergen, Norway)	Conservation Genetics, Biodiversity Research

	PhD (Bergen, Norway)	
Professors	Prof. (Mrs.) D.H.N. Munasinghe BSc (Ruhuna, SL) PhD (Deakin, Australia)	Fisheries and Molecular Genetics
	Prof. (Mrs.) M.P.K.S.K. de Silva BSc (Kelaniya, SL) MSc (Vrije Universiteit Brussel, Belgium) PhD (Ruhuna, SL)	Aquaculture, Fisheries Biology and Molecular Biology
Professor	Prof. (Mrs.) H.C.E. Wegiriya BSc (Kelaniya, SL) PhD (Reading, UK)	Animal Biology, Entomology and Psychology
Senior Lecturer (Grade I)	Dr. W.A.H.P. Guruge BSc (Ruhuna, SL) MSc (Chiangmai, Thailand) PhD (Ruhuna, SL)	Fish Biology, Environmental Risk Assessment
	Dr. (Mrs.) K.A.M. Sudarshanie BSc (Ruhuna, SL) MSc (Bremen, Germany) MPhil (Ruhuna, SL) PhD (Ruhuna, SL)	Entomology, Parasitology, Animal reproductive Biology, Aquatic Ecology
Senior Lecturer (Grade II)	Dr. W.M.C.D. Wijekoon BSc (Ruhuna, SL) MPhil (Ruhuna, SL)	Entomology, Physiology
Lecturer	Mrs. W. P. S. N. Wijeweera BSc (Ruhuna, SL) MPhil (Ruhuna, SL) (On Study Leave)	Entomology
	Dr. W.G.D. Chathuranga BSc, PhD (Peradeniya, SL)	Ornithology, Veterinary Medical Entomology, Vector-borne & Zoonotic Diseases
	Ms. K. G. D. D. Thilakarathne BSc (Peradeniya, SL) MPhil (Peradeniya, SL) (On Study Leave)	Wildlife and Conservation biology, Biodiversity and animal ecology, Malacology

7.4. Course Units in Zoology for BSc (General) Degree

BSc Level I - Semester I

ZOO1102: Core Zoology (30 Lecture hrs)

Origin of life, Evolution, and Animal Cell Biology: Theories of origin of life on earth; Chemical evolution; Origin of cellular organisms; Concept of evolution; Theories of evolution and evidence; Role of natural selection and variation; Patterns of evolution; Modern synthesis of evolution. Animal cell biology - prokaryotic and eukaryotic organization; Structure, function and organization at subcellular level; Transmembrane transport processes; Cell division and cell cycle; DNA as the genetic material; Gene expression; Protein trafficking; Cancer; Integration of cells into tissues. **Animal Histology and Development**: Tissues: covering epithelial tissues, glandular epithelia, nerve and muscle, connective tissues; Embryology: Oogenesis, Vitellogenesis, Fertilization; Cleavage; Cell movements; Gastrulation; Neurulation; Embryogenesis of a bird and a mammal.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO1112: Invertebrate Diversity I (30 Lecture hrs)
Introduction to Taxonomy of animals; Geological time scale and evolutionary organization of animals; General classification of animals; Major phyla of Kingdom Animalia. Invertebrate diversity: General invertebrate features, morphological and functional diversity, ecological importance and evolutionary trends in phyla Protozoa, Porifera, Cnidaria, Platyhelminthes, Nematode, Annelida and minor phyla.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO1121: General Zoology Practical I (45 Practical hrs)
Basic laboratory techniques in biology: microscopic methods, tissue preparation for light microscopy, different staining techniques; Study of the components of animal cells; Study of different types of tissues;
Embryology of amphibians (frog) and birds (chick) and mammal/ rabbit; Invertebrates: taxonomy, morphology, functional adaptations, ecology and evolutionary trends of diverse examples in phyla Protozoa, Porifera, Coelenterate, Platyhelminthes, Nematoda, Annelida and minor phyla.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

BSc Level I - Semester II

ZOO1202: Invertebrate Diversity II (30 Lecture hrs)
Taxonomy, morphology, biology, diversity, and ecological, economic/medical importance, and evolutionary trends in Phyla- Mollusca, Arthropoda, and Echinodermata; Origin & Evolution of chordates, protochordates.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO1212: Chordate Organization and Diversity (30 Lecture hrs)
Classification and diversity of vertebrates - Pisces: earliest fishes and adaptive radiation of modern fishes; Evolution of terrestrial vertebrates; Origin and radiation of tetrapods; Amphibia: as transitional stage of terrestrial vertebrates, Reptilia: origin and diversity and Specialization of reptiles; Endothermic vertebrates - Aves: origin and evolution of birds, flight mechanisms, ecology and behavior of birds.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO1221: General Zoology Practical II (45 Practical hrs)
Taxonomy, morphology, biology, ecology, importance, adaptations and evolutionary trends of diverse examples in Phyla- Mollusca, Arthropoda, and Echinodermata; Study of evolution, diversity, functional adaptations, ecology and life habits of chordates: protochordates, early and modern fishes, amphibians, reptilians, aves.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

BSc Level II - Semester I

ZOO2102: Mammalian Organization and Diversity (30 Lecture hrs)
Evolution and classification of mammals, Prototherian and metatherian mammals, adaptive radiation of eutherian mammals and their success, Diversity of major eutherian orders: Insectivora, Chiroptera (flying mammals), Carnivora, Proboscidea, ungulates, Primata; aquatic mammals; Ecology and sociality of terrestrial mammals, Continental Drift and distribution of fauna with special reference to the mammalian distribution.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO2112: Comparative Animal Physiology (30 Lecture hrs)
Homeostasis, Nervous system: structure and function; Sensory receptors and the basic mechanisms of action; Respiratory system and function; Circulatory system: structural components and function; Excretory system: structure and function; Muscular system: functional anatomy; Animal Nutrition: feeding, digestion and nutrition; Endocrinology: Function of other regulatory chemicals (Prostaglandins & Pheromones); Animal reproduction: reproductive systems and function, pregnancy and lactation, fetal and neonatal physiology.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO2121: General Zoology Practical III (45 Practical hrs)

Diversity and characteristics of major mammalian groups and their functional adaptations; comparative animal physiology laboratory exercises: analysis of digestive enzymes in vertebrates; action of nerve and muscle coordination using frog models, features of muscular activity - cardiac muscle & smooth muscles; circulatory system: constituents of blood and hematological analysis; respiration: Human Oxygen Consumption Levels; analysis of excretory products; mammalian reproductive systems and function, control methods of human reproduction (contraception).

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO2142: Conservation and Management of Biological Resources (20 Lecture hrs, 20 Practical hrs) *Optional/ Open for all students; a prerequisite for Honours degree students in Zoology*

Introduction to Biological Resources (BR) & biodiversity; Species diversity; Genetic diversity; Ecosystem diversity; Ecological perspective of biodiversity: Alpha, Beta and Gamma diversity; Diversity and area relationships; BR diversity patterns; Determinants of BR diversity patterns: environmental factors, speciation and extinction, geographical factors, endemism and correlations; Importance of BR, significant causes for

loss of BR, Loss of BR in Sri Lanka, Impact of the loss of concepts of conservation and management; Biological resources; Management of protected natural areas; IUCN functional categories of protected areas, management of rare and endangered species: introduction, re-introduction, translocation; In-situ conservation, captive breeding. **Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%**

ZOO2152: Evolution and Zoogeography (20 Lecture hrs, 15 Practical hrs) *Optional/ Open for Biology students* Process of evolution and factors responsible for it; Zoogeography and factors responsible for distribution of fauna: historical and vicariance events, glaciations, long distance dispersal, extinction and speciation; Phylogeography and cladistics approach; Ecological zoogeography and eco-geography rules; Pattern of faunal distribution: cosmopolitan, provincialism, endemism and disjunct distribution; Reconstructing fauna distribution pattern using morphological, genetic and fossil data; Faunal distribution in Sri Lanka with Special reference to Western Ghats region.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

BSc Level II - Semester II

ZOO2202: Human Biology & Genetics (30 Lecture hrs)

Origin and evolution of humans, human anatomy and uniqueness of man, human races and their variability and adaptability, cultural evolution, human behavior; man and the environment: human impact on the environment and health hazards, interaction between microbes and man.

Mendilian and non-mendelian inheritance; Interaction of genes; Multiple allele inheritance: human blood groups; Lethal genes; Holandric inheritance; Genetic balance theory; Mutations; Extrachromosomal inheritance; Population genetics; Genetic engineering; Molecular genetics; Genetic basis of various human genetic disorders.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO2212: Animal Ecology (30 Lecture hrs)

Population and community ecology: Introduction to population ecology, population growth and size; Population growth curves; Survivorship curves; Life table analysis; Population regulation; Intraspecific and interspecific competition; Methods of population estimation. Introduction to community ecology: aquatic, coastal, and wetland communities; Niche theory; Diversity indices; Species distribution; Island biogeography

Ecosystem structure and function: Ecosystem structure; terrestrial ecology, freshwater ecology, estuarine ecology, shore ecology; Functionary units of ecosystems, Biogeochemical cycles (gaseous type, sedimentary type), Human influences on biogeochemical cycles (greenhouse effects, acid rains, air pollution, ozone depletion); Energy flow in different ecosystems, trophic structure.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO2221: General Zoology Practical IV (45 Practical hrs)

Study of human anatomy and other unique features of man, human races and their variability and adaptability; Population genetic problems; Population growth and size, Life table analysis, Intraspecific and interspecific competition; Different sampling

techniques used in population estimations; Field and laboratory exercises related to aquatic communities: freshwater communities, coastal communities - shore and estuaries, wetland communities; Niche theory, diversity indices.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO2232: Research Methodology (20 Lecture, 20 Practical hrs) *Optional/Open for all students **; a prerequisite for Honours degree students***
Introduction to scientific research methodology - terminologies and overview of the scientific method; Types of scientific research methods; Steps of the scientific method - Problem identification; Literature search for background knowledge; Formulation of hypotheses and defining objectives; Different types of experimentation; Methods of data collection, processing, and presentation; Analysis of data and importance of statistical methods for testing hypotheses; Interpretation of results and drawing conclusions; Dissemination of results and importance of technical writing; Problem of plagiarism; IMRAD format for scientific writing; Critical appraisal of research papers; Ethical considerations in research.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO2262: Molecular Genetics & Biotechnology (20 Lecture hrs, 20 Practical hrs) *Optional/ Open for Biology students; a prerequisite for Honours degree students*
Molecular properties of genes and genome structure; Traits and genetic variation; Molecular tools and their use in individual and population genetic analysis, Applications of protein and DNA markers in various fields: agriculture, conservation and management of biological resources, forensic and parentage testing; Molecular diagnosis of human diseases; Biotechnology: Recombinant DNA technology; Genetic engineering for human benefit: pharmaceutical farming, gene therapy; Genetically modified organisms; Animal cloning; Ethics, policies and regulations in biotechnology; Biotechnology industry and research in the world and Sri Lanka, Laboratory exercises on various genetic markers and use of bioinformatics.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

BSc Level III - Semester I

ZOO3112: Basic Entomology (20 Lecture hrs, 20 Practical hrs) *Optional/ Open for Biology students*
Insects and the environment; Insect morphology and classification; Structural diversity of insects related to their modes of life; Morphological adaptations of insects; Basic physiological adaptations of insects: development, nutritional biology, insect behavior; Insect ecology: Insect diversity and the tropic relationships; Role of insects in ecosystems; Sampling techniques for terrestrial and aquatic insects; Collecting and preserving insects for taxonomic studies.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70% (Theory & Practical)

ZOO3122: Applied Entomology (20 Lecture hrs, 20 Practical hrs) *Optional/ Open for Biology students* Concepts of Applied Entomology, Identification of insect pests; Parasites and predators of major insect pests of agricultural and medical importance; Criteria for determination of pest status; Major insect pests of rice, coconut, tea, vegetables, fruits and stored products and their management strategies: Commercial utilization of insects: apiculture and sericulture; medically important insects, vector biology, management strategies of insect vector borne diseases.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70% (Theory & Practical)

ZOO3133: Wetlands & Aquatic Ecosystems (30 Lecture hrs, 30 Practical hrs) *Optional/ Open for Biology students*
Hydrosphere and major types of aquatic ecosystems, Water as a medium of life' Physico-chemical and biological properties of water, Freshwater ecosystems; classification; characteristics of lotic and lentic ecosystems; Biota of lakes and rivers; energy flow in lotic ecosystem (River continuum concept), Marine and coastal ecosystems; salient features of marine ecosystems; Life zones of oceans; Shore Ecology, Biota of oceans; Coastal zone and coastal habitats; Classification, formation and characteristics of estuaries and lagoons; Biota of estuaries and lagoons, threats to aquatic ecosystems and their conservation, Definition, Introduction and classification of wetlands; RAMSAR convention and IUCN wetland categories; Wetland dynamics and hydrology, Evolution of wetlands and succession, Uses, functions and attributes; Wetlands in Sri Lanka, Wetland management strategies, Problems in wetland conservation.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70% (Theory & Practical)

ZOO3152: Parasitology (20 Lecture hrs, 20 Practical hrs) *Optional/ Open for Biology students*

Introduction to parasitism and other animal associations; Parasitism in animals; Morphology, biology, pathogenicity and control of widely known parasites of human importance and of livestock: Protozoan parasites, Helminth parasites (flukes, tapeworms and Nematodes), Parasitic arthropods; Arthropod parasites with respect to vector-borne diseases, Plant parasitic Nematodes, Parasites of fishes and crustacean of economic importance; Immunity to parasites.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70% (Theory & Practical)

ZOO3162: Immunology (20 Lecture hrs, 20 Practical hrs) *Optional/ Open for Biology students*

Introduction to immune system; Immune system as a defense system in human, key processes of immune system, terminology used in immunology, innate and acquired immunity; cells, molecules and organs of the immune system; antibodies; structure and functions, antigen processing and presentation; humeral immunity and cellular immunity; immuno- suppressive and autoimmune diseases; vaccines and immunization.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70% (Theory & Practical)

ZOO3172: Ornithology (20 Lecture hrs, 20 Practical hrs) *Optional/ Open for all students*

Introduction; Bird flight mechanisms and adaptive features; Anatomy and physiology of birds: food, feeding and digestion, circulatory and respiratory systems, energy balance and thermoregulation, brain and senses; Vocal communication; Territorial and colonial behavior; Mating systems; Avian reproduction - nesting, incubation, hatching and parental care, bird migration; Basic identification characters of birds; Birds of Sri Lanka; Avifaunal zones of Sri Lanka; Endemic, indigenous and migratory birds; Significance of the location of Sri Lanka for birds migration; Habitat-oriented birds' distribution; Ecological relationship of habitats and availability of resources; Nests of birds and nest ecology; Conservation practices; Classification of birds.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70% (Theory & Practical)

ZOO3182: Animal Behaviour (20 Lecture hrs, 20 Practical hrs) *Optional/ Open for all students*

Introduction and Course Overview: The Science of Animal Behavior (Historical Pathways) : Ethology: Historical Background: Ethologists and their Work: Animal Behavior (An Evolutionary Approach): Ethological Concepts (Stimulus-Response Concept, Reflexes, Motivation or Drive): Patterns of Behavior (Feeding, Predation, Agonistic, Dominance hierarchies, Reproduction, Epimelectic Behavior, Social Behavior: Learning, Habituation, Classical; Conditioning, Imprinting, Rhythmic Behavior and Biological Clocks): The Behaviour Diversity (Instincts and learning: Kin Discrimination: Special Features of all Forms of Learning: Biased Learning): Methods of Studying Behavior: Genes, Genetics and Behavior: Brain Nerve Cells and Behavior: Communication Among Animals: Orientation: Migration: Social Organization in Primates: Human Behavior: Animal Behavior and Wild Life Management.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70% (Theory & Practical)

ZOO3192: Biological Psychology I (25 Lecture hrs, 10 Practical hrs) *Optional/ Open for all students*

Biological and other psychological theories, fields in Psychology, Mind- Brain relationship, Learning theories, Nerve cells and nerve impulses, Synapses and hormones, Development and plasticity of brain, sensory systems and perception, Stress, Stress management, Rhythms of wakefulness and sleep, biological clocks, Regulation of internal body state, Temperature, taste and hunger regulation. Motivation. Theories in motivation.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70% (Practical & Theory)

BSc Level III - Semester II

ZOO3202: Biological Psychology II (25 Lecture hrs, 10 Practical hrs) *Optional/ Open for all students*.

Emotional behaviors; abnormal behaviors, mood disorders and Psychotic disorders and therapies, Human psycho A social development; prenatal, postnatal, infantile, childhood, adolescence, Biology of learning and memory; learning theories, Personality theories, counselling skills and techniques.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70% (Practical & Theory)

ZOO3211: Bioethics (15 Lecture hrs) *Optional/ Open for all students*

Ethical theories, Ethical principles in different societies, Bioethics and ethics of science and technology, Environmental ethics, Neurosciences, Genetics and Social ethics, Professional ethics.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70% (Theory & Practical)

ZOO3222: Fisheries & Aquaculture (20 Lecture hrs, 20 Practical hrs) *Optional/ Open for Biology students*
Status of global trends in fisheries and aquaculture, Capture, culture and culture-based fisheries Types of fishing gears and fishing methods, estimation of population size, age determination & growth of fishes; Aquaculture systems and farming strategies, Hatchery management: brood-stock management induced breeding and seed production, Diet formulation and fish nutrition and application of feeds, Shrimp and molluscan culture, Health management in aquaculture. Evaluation methods: Continuous **Assessment: 30%, End Semester Examination: 70% (Theory & Practical**)

ZOO3232: Principles of Pest Management (20 Lecture hrs, 20 Practical hrs) *Optional/ Open for Biology Students*
Host plant interaction; Concept of pest; Insect pests of vegetables, rice, coconut, tea and stored products; Pathogens, parasitic nematodes and weeds of agriculture importance; Pest Management strategies: cultural, biological, physical, chemical methods and genetically resistant cultivars and bio pesticides; Concept of Integrated Pest Management (IPM).
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70% (Theory & Practical)

ZOO3252: Environmental Impact Assessment (20 Lecture hours, 20 Practical hours) *Optional/ Open for all students*
Definition and objectives of an EIA; Authorities/persons involved in an EIA; Important principles in managing an EIA; Component/process of an International EIA; EIA procedures in Sri Lanka; Project cycle and place of EIA in project cycle; Sequential stages of EIA; Methods used in EIA; Assessor's tools; Desirable properties of EIA methods; Resources available to the assessor; A conceptual framework for an EIA; Types of projects requiring EIA's in Sri Lanka. **Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70% (Theory & Practical)**

ZOO3272: Environmental Pollution and Toxicology (20 Lecture hrs, 20 Practical hrs) *Optional/ Open for all students*
Introduction: pollution and pollutants; Types and properties of pollutants; Sources of pollution: agricultural and industrial practices, solid waste; Eutrophication; Air pollution; Water pollution; Pollution of oceans: waste dumping, oil spills, heavy metals, synthetic organic chemicals; Monitoring of environmental pollution; Effects of pollution on ecosystem: habitat destruction, atmospheric changes - ozone layer depletion, global warming, acid rains; Environmental Toxicology: effects of pollution on animals and humans, bioaccumulation, xenobiotics and biotransformation of xenobiotics, mechanisms of toxin action, Genotoxicity.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70% (Theory & Practical)

ZOO3292: Human Health (25 Lecture hrs, 10 Practical hrs) *Optional/ Open for all students*
Elements of human health, Physical health, mental health and social health, factors which affect human health, Human diseases and disorders, Human growth and psycho-social development, nutritional and reproductive health, occupational and environmental health problems, challenges for well-being and protection.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70% (Theory & Practical)

7.5. Course Units in Zoology for BSc (Honours) Degree

Students are advised to follow relevant course units conducted in BSc General Degree Level III.

ZOO4013: Entomology (30 Lecture hrs, 30 Practical hrs)
Insect taxonomy, morphology and physiology; Morphological and functional adaptations of insects; Insect Behaviour; Insect Ecology; Insect diversity and the tropic relationship; Major insect groups of agricultural, medical and veterinary importance; Biology of beneficial insects.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO4023: Parasitology (30 Lecture hrs, 30 Practical hrs)
Animal associations; Parasitism; Parasites on human, livestock, fishes and crustaceans of economic importance; Arthropod parasites and vector borne diseases; Parasites of Plant parasites; Nutrition, adaptations and host specificity of parasites; Parasitic transmission; Parasitic zoonoses.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO4034: Ecosystem Structure and Function (45 Lecture hrs, 30 Practical hrs)
Terrestrial and aerial ecosystems: Composition and structure of the terrestrial and aerial ecosystems; Atmospheric circulations, air pollution, greenhouse effects, global warming, ozone depletion & acid rains, quality indices of the air; Soil and its contents, soil

organisms and their importance to the environment; Drivers that affect on the transformation of terrestrial ecosystems; Impact of transformation of terrestrial ecosystems, urbanization, agriculture, industrialization, etc. Freshwater, brackish water and marine ecosystems: Energy flow and community structure in aquatic ecosystems; Primary productivity in oceans further; Adaptations of various life forms in aquatic habitats; Marine resources; Anthropogenic impacts on ecosystems.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO4051: Practical Course in Invertebrate Biology (45 Practical hrs)

Comparative study on the external morphology, internal anatomy, diversity and evolutionary trends in invertebrate fauna.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO4061: Laboratory Techniques in Biology I (45 Practical hrs)

Principles of staining techniques; Automated tissue processing & staining; Types of Microscopes and Staging; Micrometry; Taxidermy; Transparency techniques; Skeleton preparation; Slide preparation; Animal embryo preparation; Animal breeding techniques.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO4073: Animal Behaviour (30 Lecture hrs, 30 Practical hrs)

Sexual selection and mating systems; Parental Care; Group Living: Costs and Benefits; Dominance; Territoriality. Communication among animals: mechanisms; Conflict and game theory in animal behaviour; Genes, Genetics and Behaviour: Neural circuits and behaviour Laboratory and field methods in animal behaviour; Animal behaviour and animal management (Domestic and Wild Life).

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO4083: Ornithology (30 Lecture hrs, 30 Practical hrs)

Anatomy and physiology of birds: Food and feeding, Bird flight mechanisms and adaptive features, Avian reproduction: Reproductive behaviour, nesting, incubation, hatching and parental care, Classification of birds, Birds of Sri Lanka, Avifaunal zones, Indigenous and migratory birds, Bird conservation and Management.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO4092: Conservation and Management of Biological Resources (20 Lecture hrs, 20 Practical hrs) Conservation practices of threatened animals-turtles & Whales; Human-elephant conflict in Sri Lanka and mitigation measures; Applications of traditional knowledge in biodiversity conservation; Eco-tourism; Issues of bio piracy and bioprospecting related to biodiversity conservation.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO4103: Immunology and Animal Pathology (30 Lecture hrs, 30 Practical hrs)

Immune system as a defense system in human, key processes of immune system; terminology used in immunology; innate and acquired immunity; cells, molecules and organs of the immune system; classes of antibodies; their structure and functions, genetic basis of antibody diversity, monoclonal antibodies, antigen processing and presentation; humeral immunity and cellular immunity; immuno- suppressive and autoimmune diseases; hypersensitivity; vaccines and immunization. Microorganisms and man; infectious diseases of man, world distribution, life cycle, pathology, symptoms prevention and control of the pathogen, host defenses to infectious disease, parasitic adaptations to avoid the immune system; Immunological techniques and their use in disease diagnosis.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO4121: Practical Course in Vertebrate Biology (45 Practical hrs)

Comparative study on the morphology and diversity and evolutionary trends in vertebrate fauna Study on laboratory techniques in vertebrate anatomy; Comparative study on the structure and functions of major organ systems of animals with Special reference to man.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO4133: Subject Specialization (30 Lecture hrs, 30 Practical hrs)

Students who are following a Zoology Honours Degree should select a discipline based on their choice (Eg: Molecular Biology, Environmental Science, Entomology, Parasitology, Nematology, etc.) to gain further knowledge in that particular field. Fields available for Specialization may change in each academic year; Field of Specializations for such selection will be granted on the availability of staff Specialized in said field.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO4144: Molecular Biology and Genetics (45 Lecture hrs, 30 Practical hrs)

Genome organization; Structure of DNA molecule; Prokaryotic and eukaryotic gene organization- operons and interrupted genes; RNA types and structures, gene duplication and pseudogenes; non-genic DNA elements, tandem and non-tandem repeats, transposable elements; nuclear genome and cytoplasmic genomes. Prokaryote and Eukaryote gene expression and transcription, Molecular basis of Protein synthesis, Regulation of Prokaryote and Eukaryote Gene expression, Post translational processes of proteins, protein trafficking. Recombinant DNA and stem cell technology and its applications, Genome projects. Molecular genetic techniques and their applications; DNA and protein markers, bioinformatics and its applications in molecular genetic studies, industrial applications of biotechnology, regulations and policies.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO4152: Evolutionary Biogeography (20 Lecture hrs, 20 Practical hrs)

Basic concepts of Biogeography, Ecological and historical biogeography, Evolutionary biogeography; Biogeographic components; Zoogeography and Phytogeography, Cladistics and pan biogeography, areas of endemism; Testing relationships among biotic components: morphological, paleontological and genetic approaches; Regionalization: realms, provinces, transition zones and biogeographic lines; Relevant case studies.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO4164: Conservation and Management of Environment (45 Lecture hrs, 30 Practical hrs) Management and conservation of terrestrial ecosystem - factors affecting degradation of terrestrial ecosystem, mitigations and remedies to restore degraded terrestrial habitats; Management and conservation of aquatic ecosystems; Watershed as a functional unit, watershed management, Human impacts on aquatic ecosystems, Classification and significance of wetlands Wetland management and conservation; Environmental Impact Assessment (EIA).

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO4172: Selected Topics in Biology (Self Learning; Equivalent to 30 hrs)

Topics are given to ameliorate the knowledge of students in different study areas of Zoology, and to assess their essay writing abilities (Each student should write and submit three essays as continuous assessment which equals to 30% of the final grade).

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO4183: Basic biostatistics and applications (30 Lecture hrs, 30 Practical hrs)

Basic concepts in biostatistics: types of data and variables, sources of data, population and sample, Descriptive statistical methods in organizing, summarizing and displaying univariate data, Probability and non-probability sampling, Probability distributions: binomial distribution, Poisson and normal distribution, Measures of central tendency and dispersion for numerical data, Statistical inference and hypothesis testing for single population and multiple populations of data: calculation of sample size, level of significance, null hypothesis, indices of variability, Experimental designs and data analysis: Single factor designs- completely randomized design, randomized complete block design, Latin square design, Factorial designs, Parametric statistical methods: paired and non-paired t-test, analysis of variance (ANOVA), repeated measures ANOVA, Z-test, F-test, Statistical relationships between variables: correlation analysis, linear regression model and inferences, Nonparametric methods: Rank and categorical data analysis and test statistics, Chi-square tests of independence and homogeneity, Practical use of statistical software for data analysis.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO4192: Animal Rearing (Terrestrial) (20 Lecture hrs, 20 Practical hrs)

Rearing animals for pleasure, recreation activities and experimental purposes; Animal rearing techniques, Invertebrates and vertebrates of commercial value, breeding techniques, Impacts of commercial animal rearing on the environment, rearing animals for conservation.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO4203: Fisheries Biology and Aquaculture (40 Lecture hrs, 21 Practical hrs + field visits)
Fishery resource management; Fish population dynamics; Fishing gears; Fish nutrition; Fish health management; Principals of aquaculture; Shellfish culture; aquaculture design processes; Impacts of aquaculture.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO4213: Principles of Pest Management (30 Lecture hrs, 30 Practical hrs)
Concept of pest; Criteria for determination of pest status, Insect pests and other animal pests of agriculture importance, Pest Management strategies: cultural, biological, physical and chemical methods of pest control; Agrochemicals and their environmental impacts; Principles of Integrated Pest Management (IPM); Designing of IPM for selected Agro ecosystems.
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO4221: Laboratory Techniques in Biology II (45 Practical hrs)
Analysis of geospatial data; Advance techniques used in ecological surveys; Calibration and cleaning of scientific equipment; Preparation of stock solutions, dilution series and pipetting; Advanced microbiological techniques; Nutrient analysis in samples (Lipids, carbohydrates, proteins and enzymes); Study the principles and usage of Analytical instruments (hematology analyzer, chromatography, ICP-MS, HPLC, GC-MS, FTIR and XFR).
Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

ZOO4236: Research Project
Each student will be required to conduct a research project related to his/her field of Specialization and complete within one semester. The candidate must submit the results as a dissertation and present a seminar.
Evaluation methods: Defend the research proposal: 15%, Seminar presentations: 25%, Thesis: 60%

ZOO4242: Assessment of Key Skills
A student has to present a minimum of four seminars (45 minutes' duration each) on given topics. Senior academics of the department will evaluate the presentation and communication skills of the presenter and marks will be given accordingly. Teams of students are required to carry out investigations in field and/or laboratory either in the University or any other recognized institutions and should present their teamwork as standard scientific reports. Based on these reports, teamwork, analytical ability, originality and other key skills of the students will be assessed.
Evaluation methods: Continuous Assessment: 100%

7.6. Credit Values

7.6.1. BSc General Degree

Course Unit	Duration (hrs)		Credits		Total
	Theory	Practical	Theory	Practical	
ZOO1102: Core Zoology	30		2		2
ZOO1112: Invertebrate Diversity I	30		2		2
ZOO1121: General Zoology Practical I		45		1	1
ZOO1202: Invertebrate Diversity II	30		2		2
ZOO1212: Chordate Organization and Diversity	30		2		2
ZOO1221: General Zoology Practical II		45		1	1
ZOO2102: Mammalian Organization and Diversity	30		2		2
ZOO2112: Comparative Animal Physiology	30		2		2
ZOO2121: General Zoology Practical III		45		1	1
ZOO2142: Conservation and Management of Biological Resources	20	20	1.3	0.7	2

ZOO2152: Evolution and Zoogeography	20	20	1.3	0.7	2
ZOO2202: Human Biology & Genetics	30		2		2
ZOO2212: Animal Ecology	30		2		2
ZOO2221: General Zoology Practical IV		45		1	1
ZOO2232: Research Methodology	20	20	1.3	0.7	2
ZOO2262: Molecular Genetics & Biotechnology	20	20	1.3	0.7	2
ZOO3112: Basic Entomology	20	20	1.3	0.7	2
ZOO3122: Applied Entomology	20	20	1.3	0.7	2
ZOO3133: Wetlands & Aquatic Ecosystem	30	30	2	1	3
ZOO3152: Parasitology	20	20	1.3	0.7	2
ZOO3162: Immunology	20	20	1.3	0.7	2
ZOO3172: Ornithology	20	20	1.3	0.7	2
ZOO3182: Animal Behaviour	20	20	1.3	0.7	2
ZOO3192: Biological Psychology I	25	10	1.7	0.3	2
ZOO3202: Biological Psychology II	25	10	1.7	0.3	2
ZOO3211: Bioethics	15		1		1
ZOO3222: Fisheries & Aquaculture	20	20	1.3	0.7	2
ZOO3232: Principles of Pest Management	20	20	1.3	0.7	2
ZOO3252: Environmental Impact Assessment	20	20	1.3	0.7	2
ZOO3272: Environmental Pollution & Toxicology	20	20	1.3	0.7	2
ZOO3292: Human Health	25	10	1.7	0.3	2

7.6.2. BSc Honours Degree

Course Unit	Duration (hrs)		Credits		Total
	Theory	Practical	Theory	Practical	
ZOO4013: Entomology	30	30	2	1	3
ZOO4023: Parasitology	30	30	2	1	3
ZOO4034: Ecosystem Structure & Function	45	30	3	1	4
ZOO4051: Practical Course in Invertebrate Biology		45		1	1
ZOO4061: Laboratory Techniques in Biology I		45		1	1
ZOO4073: Animal Behaviour	30	30	2	1	3
ZOO4083: Ornithology	30	30	2	1	3
ZOO4092: Conservation and Management of Biological Resources	20	20	1.3	0.7	2
ZOO4103: Immunology and Animal Pathology	30	30	2	1	3
ZOO4121: Practical Course in Vertebrate Biology		45		1	1
ZOO4133: Subject Specialization	30	30	2	1	3
ZOO4144: Molecular Biology and Genetics	45	30	3	1	4
ZOO4152: Evolutionary Biogeography	20	20	1.3	0.7	2
ZOO4164: Conservation and Management of Environment	45	30	3	1	4
ZOO4172: Selected Topics in Biology	30		2		2
ZOO4183: Basic biostatistics and applications	30	30	2	1	3
ZOO4192: Animal Rearing (Terrestrial)	20	20	1.3	0.7	2
ZOO4203: Fisheries Biology & Aquaculture	40	21	2	1	3

ZOO4213: Principles of Pest Management	30	30	2	1	3
ZOO4221: Laboratory Techniques in Biology II		45		1	1
ZOO4236: Research Project					6
ZOO4242: Assessment of Key Skills					2
Total number of credits					60

8. Optional Course Units (or FSCs) offered by the Faculty

The undergraduate programme in the Faculty of Science comprises of a large number of course units offered by individual departments. In addition to the course units under the subject areas, several other course units from different disciplines (for example management, sports, personnel development etc.) are also available as optional course units. These course units are offered by faculty of science and the denotations of such course units begin with FSC. These interdisciplinary course units offered for both bioscience and physical science students. Course units are organized at two levels, namely level II and level III for the general degree. Theory course units consist of lectures, assignments and tutorials. Combined course units consist of both theory and practical components. In addition, students are also given the opportunity to conduct research projects in an area/problem of his/her interest under a particular course unit. Lectures and practical classes of FSC course units are conducted from 4.00 p.m. to 6.00 p.m. on week days. Course units can be selected at the discretion of the student according to the selection criteria prescribed by the faculty.

8.1. Core / Optional Course Units offered in Semester I

FSC2122 Active Citizenship
FSC3112 Management
FSC3122 Accounting
FSC3132 Speech Communication skills
FSC3bP2 Research Project
FSC3bP0 Industrial project/internship

FSC2122: Active Citizenship (32 Lecture hrs)

Introduction to Active Citizens, Me: Identity and culture, self-awareness, how identities and cultures form, Me and You: Intercultural dialogue, learn and share through dialogue, we together: Local and global communities, Interplay of culture, community and society, Citizen rights and responsibilities, Skills in social action project planning, management and delivery, identify problems and approaches to bringing solutions

Evaluation methods: Continuous Assessment: 50%, End Semester Examination: 50%

FSC3112: Management

Introduction to Management, Evolution of Management Thoughts, Organizational Culture and Environment, Managing corporate social responsibility and ethics, Managerial decision making, Planning, Organizing, Leading: motivation, leadership, and communication, Controlling, Contemporary issues in management.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

FSC3122: Accounting

Introduction to Basic Accounting, Process of recording and preparing accounts, Preparation of final accounts introducing minor adjustment, Bank transactions and related accounting work, Manufacturing Accounts, Accounts of non- trading concerns, Petty cash procedures, Accounting Concepts.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

FSC3132: Speech Communication (30 Lecture hrs + 25 Practical hrs)

Introduction to the theory of speaking, Foundations of speaking, making choices about what to speak, Organizing the speech, Face to face interaction, Verbal materials, Persuasion, Speaking and Listening, Listener, Language and purpose, Identifying, Personal and Social goals, Speech Preparation for Special Occasions, Types of public speaking, Group communication, Research in communication.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

FSC3bP2: Research Project

A student may undertake an individual or group research project under the guidance of a chosen supervisor or supervisors.

Students must register for the FSC 3bP2 course unit in both the first and second semesters. During the first semester, they are required to submit a project proposal and begin preliminary work. The main research must be conducted during the second semester.

Evaluation: Each student must submit an individual project report, and a presentation or viva will be conducted at the end of the second semester.

Prerequisites : ZOO2232 – Research Methodology

FSC 3bP0 – Industrial project/internship

A zero credit course. A student may undertake industrial training or industrial research over a three-month (part-time) period at a relevant industry. Need to register only for one semester.

Evaluation:

Each student is required to submit an activity log detailing the work carried out, signed by the industrial supervisor. In addition, students must deliver a presentation based on their experience during the training period.

8.2. Optional Course Units offered in Semester II

FSC225α Health related physical fitness and wellness
FSC2212 Active Citizen Community Project
FSC3212 Marketing Management
FSC3242 Human Resource Management
FSC3252 Scientific writing and communication (Compulsory for BSc Honours Degree Students)

FSC225α: Health Related Physical Fitness and Wellness (30 Practical hrs)

Benefits of regular physical activity/exercise (e.g., prevention of disease), Use of weight training to increase muscle strength and endurance, Use of aerobic activities (e.g., running, fitness walking, aerobics) to improve cardio-respiratory function, Use of range-of-motion exercises to improve flexibility and prevent injury, Use of physical activity/exercise to improve body composition. Practical schedule:

Students will have access to the training facility at the gymnasium. They are required to maintain an exercise/activity/weight-lifting chart.

Evaluation methods: Continuous Assessment: 30%, Final Practical Examination: 70%

FSC2212: Active Citizen Community Project (60 Practical hrs) Needs assessment, planning the project, project proposal submission, proposal revision, approval of the project, implementation, project presentation, Evaluation.

Evaluation methods: Continuous Assessment: 50%, Report and Presentation: 50%

Note: This course is offered to Level II students who follow FSC2122 (Active Citizenship).

FSC3212: Marketing Management Understanding the Critical Role of Marketing, Creating and Capturing Customer Value, Analyzing the Marketing Environment, Consumer Markets and Consumer Buying Behaviour, Business Markets and Business Buying Behaviour, Managing Marketing Information to Gain Customer Insights Marketing information system (MIS), Customer-Driven Marketing Strategy, Products, Services, and Branding Strategy Product and Services Decisions Branding Strategy, New-Product Development and Product Life-Cycle Strategies New-Product Development Process Product Life-Cycle Strategies, Pricing Strategies Internal and External Considerations Affecting Price Decisions New-Product, Product Mix and Price Adjustment Strategies, Marketing Channels, The Nature and Importance of Marketing Channels, The Role of Retailing and Wholesaling, Integrated Marketing Communications Strategy, The Promotion Mix Advertising, Sales Promotion, Personal Selling, Public Relations, Direct and Online Marketing, The Communications Process, Creating Competitive Advantage Competitor Analysis Competitive Strategies, Ethics and Social Responsibility in Marketing.

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

FSC3242: Human Resource Management Introduction to Human Resource Management, Iob Design and Iob Analysis, Human Resource Planning, Recruitment & Selection, Hiring & Employee, Induction, Human Resource Development, Employee Performance Evaluation, Career Management, Employee Compensation & welfare Management, Employee and Labor Relations, Employee Movements, Employee Health and Safety Management, Employee Discipline Management, Employee Grievances Handling

Evaluation methods: Continuous Assessment: 30%, End Semester Examination: 70%

FSC3252: Scientific writing and communication (20 Lecture hrs + 30 Practical hrs).

Communicating science; The ABC of science communication, Types of written communication (i.e. memo, report, letter, manual, description, popular article, thesis, scientific paper), Scientific and popular writing, Precise writing and Language (i.e. coherence, choice of words, active and tight writing, parallel structure, transitions to link ideas), Components of the scientific paper, Presenting statistics, Designing effective tables and figures, Writing abstracts, Literature search and referencing, Tools for effective search (i.e. ISI web, Scopus and journal data bases), Planning and preparing oral presentations, Performing oral presentation, Designing an effective poster, Poster presentations, Ethics in publishing (i.e. fabrication, falsification and plagiarism), Ownership and authorship of data, Journal selection, Indexing and journal impact factors, Publication process.

Assessment method: Students will be evaluated on writing (50%) and communication (50%) skills. Writing assessment(s) may include writing a small review in their subject Specialties or case studies based on critical evaluation/ analysis of published abstracts and scientific papers. Communication skills will be evaluated through oral/ poster presentations.

Note: Target group: BSc Honours Degree student (Level I/ compulsory), BSc General Degree student (Level III/ optional).

9. English Language Programmes

The Faculty of Science with the assistance of the Department of English Language Teaching (DELT), offers academic programmes aimed at developing the English language skills of the undergraduates.

9.1. Staff attached to the Faculty of Science

Name	Educational / Professional Qualifications
Ms .J. L. Kavindya	BA in TESL (Hons) Kelaniya MA in TESL (OUSL, Reading) MA in Linguistics (Kelaniya, Reading)

9.2. English Language Courses offered by Faculty of Science

- **Intensive Course in English**
  The Faculty of Science offers an Intensive Course in English for university entrants prior to the commencement of the first academic year depending on the time available. The duration of this course depends on the time permitted before the commencement of the academic prgramme.

- **Courses offered during academic years Introduction:**
  The Faculty of Science offers a three-year compulsory programme of English for the BSc undergraduates in three levels. In this programme, the students are provided with handouts prepared by the staff members attached to the Dean's office of the Faculty of Science. The lessons are meant to boost the four major skills of communication identified as reading, writing, listening, and speaking and student-centered interactive teaching and learning is considered the main mechanism applied in classroom management.

– Level I - ENG1b10 (60 Lecture hrs.)

Self-Description: Life in three stages, Language through literature I, Introduction to presentation skills, Giving directions, Giving instructions, Describing graphs and charts, General conversations(Small Talk), Language through literature II, Informal writing (letters, e-mails), Comparisons, Report writing, Note taking, Impromptu speeches,Reading strategies (skimming, scanning and inferring), Lateral thinking.

Method of Evaluation: Continuous Assessments: 40% and Final Examination: 60%

– Level II ENG2b10 (60 Lecture hrs.)

Exploitation of comprehensive language, Introduction to academic essay writing, Language through literature III, Extensive reading, Paraphrasing and summarizing, Toning, Report writing II (lab report), Public speaking, Formal/Business correspondence, Report writing III (project report)

Method of Evaluation: Continuous Assessments: 40% and Final Examination: 60%

– **Level III ENG3b10 (60 Lecture hrs.)**

Discussions and Debates, Academic writing (argumentative essays), Self-branding, Writing a CV, writing a cover letter, Interview Etiquette, expressing ideas on controversial topics, Writing short reports on surveys, experiments and research, presenting a theory, Abstract writing, Writing a short research proposal, Presentation skills, organizing an event (preparation of agenda, invitations, welcome address, vote of thanks)

Method of Evaluation: Continuous Assessments: 40% and Final Examination: 60%

– **Requirement of English language for obtaining the BSc Degree:**

In order to obtain the BSc (General) Degree, it is compulsory that students pass Level I and Level II examinations in English. In the case of Bachelor of Science (Honours) Degree, in addition to the above levels, they should also obtain a pass in Level III examination.

9.3. Credit Values

Course Unit	Duration (hrs)		Credits
	Semester I	Semester II	
ENG 1b10	30	30	-
ENG 2b10	30	30	-
ENG 3b10	30	30	-