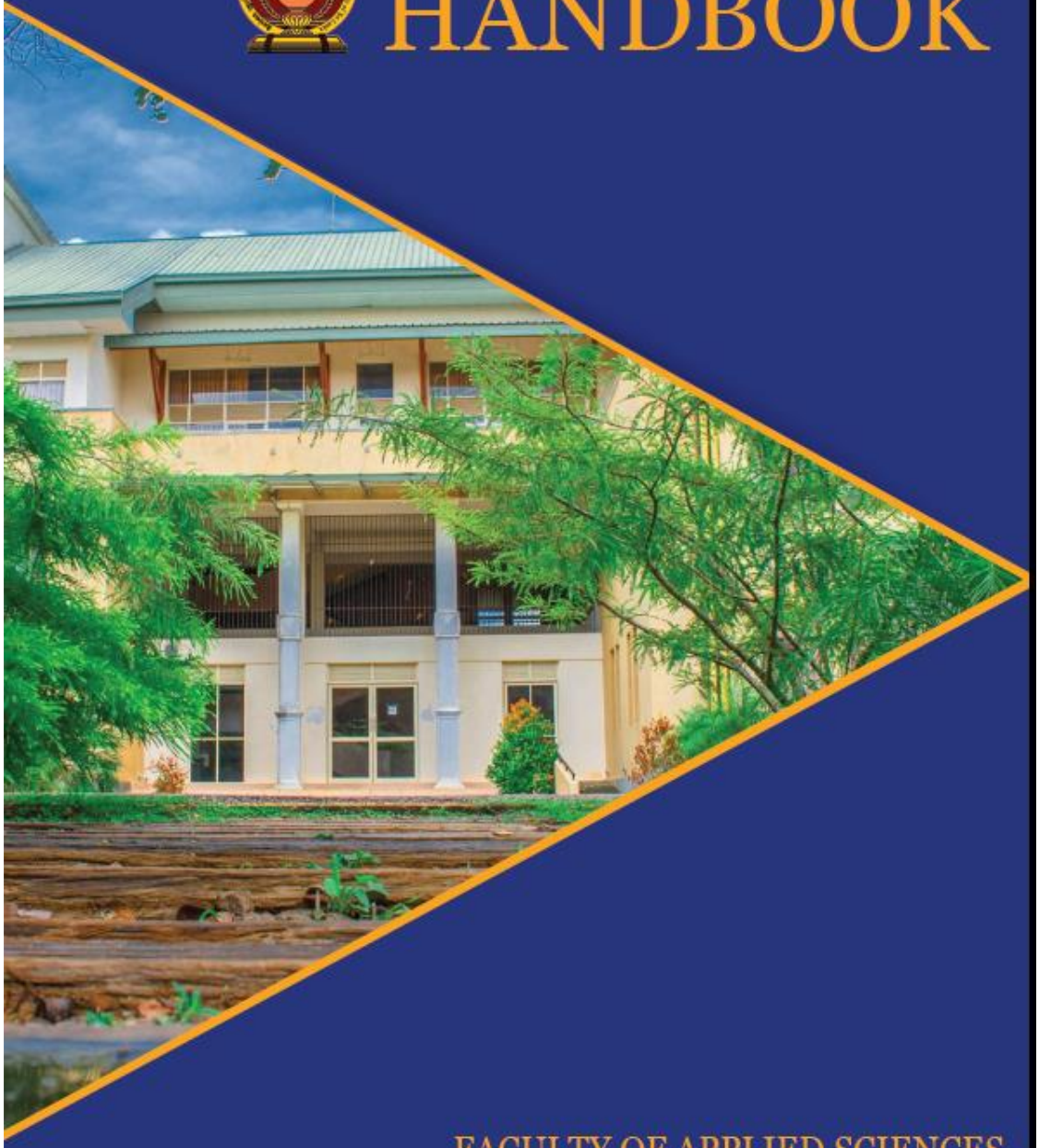
B.Sc. External Degree Programs

HANDBOOK



FACULTY OF APPLIED SCIENCES

RAJARATA UNIVERSITY OF SRI LANKA

B.Sc. EXTERNAL DEGREE PROGRAMMES

STUDENT HANDBOOK

FACULTY OF APPLIED SCIENCES
RAJARATA UNIVERSITY OF SRILANKA

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FACULTY OF APPLIED SCIENCES
RAJARATA UNIVERSITY OF SRI LANKA

1 INTRODUCTION

1.1 BACKGROUND OF THE FACULTY

The Rajarata University of Sri Lanka (RUSL) was established in November 1995 by the Gazette Notification No: 896/2 of 7th November 1995 in the Administrative District of Anuradhapura. The Central Province Affiliated University College (CPAUC) in Polgolla, located at a distance of 140 km from the main campus at Mihintale was amalgamated to the RUSL as its Faculty of Applied Sciences (FASc). The immediate task of the FASc at that time was to upgrade all the students of the CPAUC who had successfully completed their Diploma requirements, to the graduate level. On this task the FASc was inaugurated on 10thJanuary, 1997 to commence the third year degree programme with a batch of 102 students, who subsequently graduated in 1998. The first batch of students who were directly sent by the UGC to follow the degree programme was enrolled in November 1997. After functioning for nearly 10 years at Polgolla, the Faculty was finally established in the premises of the main campus at Mihintale, on 16th January 2006.

1.2 PRESENT STATUS

The FASc, consists of five departments viz: Biological Sciences, Physical Sciences, Health Promotion, Computing and Chemical Sciences. The Department of Biological Sciences offers courses in the fields of study/subjects/disciplines of Botany, Zoology and Biology. The Department of Physical Sciences offers Physics, Pure Mathematics and Applied Mathematics. The Department of Health Promotion offers courses in Health promotion and the Department of Computing offers courses in Computer Science and Information Technology. The Department of Chemical Sciences offers courses in Chemistry. All courses are offered in English medium. From its inception, the Faculty follows the course unit system.

1.3 DEGREE PROGRAMMES OFFERED BY THE FACULTY OF APPLIED SCIENCES

At present, the following degree programmes are offered by the FASc.

1. Bachelor of Science in Applied Sciences
2. Bachelor of Science Honours in Applied Sciences
3. Bachelor of Science Honours in Industrial Mathematics
4. Bachelor of Science Honours in Biology and Physics
5. Bachelor of Science Honours in Chemistry and Physics
6. Bachelor of Science Honours in Applied Biology in Biodiversity Conservation
7. Bachelor of Science Honours in Applied Biology in Fisheries and Aquaculture Management
8. Bachelor of Science Honours in Applied Biology in Microbiology
9. Bachelor of Science Honours in Chemistry
10. Bachelor of Science in Health Promotion
11. Bachelor of Science Honours in Health Promotion
12. Bachelor of Science in Information Technology
13. Bachelor of Science Honours in Information Technology

1.4 VISION AND MISSION

Vision

The FASc of Rajarata University of Sri Lanka envisions to be a dynamic, innovative and renowned centre of excellence in learning, research, training and consultancy with emphasis on national relevance and international recognition in different disciplines of Applied Sciences.

Mission

To promote learning, research and training among all members of the university, industry and community and to help individuals achieve their full potential through development of the whole person with a view to making significant contributions to the regional, national and global needs.

2 B.Sc. (EXTERNAL) DEGREE PROGRAMMES

Bachelor of Science (B.Sc.) (External) Degree Programmes were proposed and launched at FASc in year 2008.

- Bachelor of Science (External) in Biological Sciences
- Bachelor of Science (External) in Physical Sciences

The distance learning adopts a blended mode of delivery viz. online and face to face sessions. Each degree program comprises a total of six levels and offered 90 credits.

2.1 AIMS AND OBJECTIVES OF THE B.Sc. EXTERNAL DEGREE PROGRAMMES

- To provide opportunities for youth of the country to seek global and national employment by providing proficiency in a wide range of skills and techniques suitable for their careers in the fields of Botany, Zoology, Mathematics, Statistics, Physics and Information Technology.

- To make opportunities available for learning and to train a large pool of geographically dispersed students in Biological and Physical Sciences.

- To provide a high quality, interactive and a flexible learning programme so that students can learn at their own time, pace and place.

- To provide a well-trained workforce that establishes a quality culture in the country.

- To provide access to high quality study material in a stimulating and supportive environment.

- To provide opportunities for professionals to update their knowledge and develop their skills on the latest technologies and teaching methods.

2.2 TEACHING PANEL OF B.Sc. (EXTERNAL) DEGREE PROGRAMMES IN BIOLOGICAL SCIENCES / PHYSICAL SCIENCES

2.2.1 BOTANY

Prof. Sanath Hettiarachchi,
B.Sc. (Hons) (Kelaniya), M.Sc., Ph.D. (VUB, Brussels)

Dr. (Mrs.) P. L. Hettiarachchi
B.Sc. (Hons)(Colombo), M.Sc., Ph.D. (VUB, Brussels), C.Biol.(Sri Lanka), F.I.Biol.(Sri Lanka)

Dr. T.C. Bamunuarachchige
B.Sc. (Hons) (OUSL), Ph.D. (Perad.)

Dr. (Mrs.) P.N. Yapa
B.Sc.(Hons) (Perad.), M.Sc. (Perad.), M.Sc. (Reading, UK), M.Phil. (Perad.), Ph.D. (RUSL)

Dr. E. Y. Fernando
B.Sc. (Hons) (Westminster, UK), Ph.D. (Westminster, UK)

Dr. Malaka M. Wijayasinghe
B.Sc. (Hons) (Perad.), Ph.D. (Pavia, Italy)

Dr. W.M.G.A.S.T.B. Wijetunga
B.Sc. (OUSL), M.Sc. (Perad.), Ph.D. (Vienna)

2.2.2 ZOOLOGY

Prof. (Mrs.) Sriyani Wickramasinghe
B.Sc. (Hons) (Colombo), M.Sc. (Colombo), Ph.D. (AIT, Thailand)

Prof. (Mrs.) T. V. Sundarabarathy
B.Sc. (Hons) (SJP), M.Sc. (Perad.), SEDA (UK), Ph.D. (Perad.)

Dr. Rajnish Vandercone
B.Sc. (Hons) (Perad.), Ph.D. (Washu-St Louis, USA)

Dr. K.D.B. Ukuwela
B.Sc. (Hons) (Perad.), Ph.D. (Adelaide, Australia)

Dr. Ravindra L. Jayaratne
B.Sc. (Hons) (RUSL), M.Sc. (Perad.), Ph.D (Colombo)

Dr.(Mrs.) D. K. Hettiarachchi
B.Sc. (Hons) (RUSL), M.Sc. (Perad.), Ph.D (Lincoln, NZ)

Dr. (Mrs.) Theja Abayarathna
B.Sc. (Hons) (SJP), M.Phil. (SJP) Ph.D. (UTS, Sydney)

2.2.3 PHYSICS

Dr. U. Dahanayake
B.Sc. (Hons) (Perad.), Ph.D. (Perad.), C. Phy.

Dr. (Ms.) Harshani O. Wijewardane
B.Sc. (Hons) (Colombo), Ph.D. (Missouri, USA), C. Phy.

Dr. (Mrs.). P. Kaushlya Premachandra
B.Sc. (Perad.), M.Sc., Ph.D. (Missouri-St Louis, USA)

Dr. C.A.Thotawatthage,
B.Sc. (Hons) (Perad.), M.Sc.(Perad.), Ph.D. (Perad)

Dr. K.G.P.B. Jayathilaka
B.Sc. (Hons) (Perad.), Ph.D (South Florida)

2.2.4 INFORMATION TECHNOLOGY

Dr. K.A.S.H. Kulathilake
B.Sc. (Hons) (SLIIT), MCS (Colombo), SEDA (UK), M.Phil. (Moratuwa)
PhD (UM, Malyasia), SEDA (UK)

Mrs. T.C. Irugalbandara
B.Sc. (Hons) (RUSL), M.Phil.(RUSL)

Ms. T. M. A. U. Gunathilaka
B.Sc. (Hons) (RUSL), M.Phil.(RUSL)

Mr. P.S. Palliyaguruge
B.Sc. (Hons) (Perad.), M.Sc. (Perad.)

Mr. N.M.A.P.B. Nilwakke
B.Sc. (Hons) (Perad.), M.Sc. (Perad.)

Ms. I. Hewarathne
B.Sc. (Hons) (Perad.)

Mr. W.A. Wiraj Udara Wickramaarachchi
B.Sc. (Hons) (Sabaragamuwa), M.Eng. (Wuhan, China)

2.2.5 STATISTICS AND MATHEMATICS

Prof. W.B. Daundasekera
B.Sc. (Hons) (Perad.), M.Sc. (USA), Ph.D. (USA)

Mr. K.K.W.A. Sarath Kumara
B.Sc. (Colombo), M. Phil (USJP)

Mr. E. M. U. S. B. Ekanayake
B.Sc. (Hons) (Perad.), M. Phil. (Gunma, Japan)

Mr. W. A. Gunarathna
BSc (Hons) (Perad), M.Phil (Perad.)

Mr. D. M. R. B. N. Dissanayake
B.Sc. (Hons) (RUSL), M.Sc. (Alaska Fairbanks, USA)

Mr. M. K. D. D. Sandaruwan
B.Sc. (Hons) (RUSL), M.Phil.(Perad.)

Mr. M. A. M. Mohammed
BSc (Hons) (Perad.), MSc (India)

2.3 ADMISSION REQUIREMENTS

Students admission to the B.Sc. External Degree programmes are carried out on the basis of the admission policy laid down by the Faculty Board and the University Senate.

In order to be eligible for admission to the program, a candidate should have offered at least two of the following subjects at the G.C.E. (A/L) examination.

Physics	Chemistry
Biology	Agriculture
Advanced Mathematics	Mathematics / Combined Mathematics

In addition, candidates must also fulfill the following requirements:

1) Satisfy the minimum requirements for admission to the university as stipulated by the University Grants Commission

2) Have at least a **Credit Pass (C)** in English at the G.C.E.(O/L) Examination

2.4 RECORD BOOK / IDENTITY CARD

Each student will be issued a record book/identity card on admission to the University. This should always be carried by the student and be produced when required.

2.5 APPLICATION FOR REGISTRATION

Application for registration for the B.Sc. (External) Degree Programme in Biological Sciences / Physical Sciences shall be invited by notice in the Newspapers.

- A person who wishes to become a candidate for the B.Sc. (External) Degree programme in Biological Sciences / Physical Sciences shall make an application to the Senior Assistant Registrar (SAR)/ Assistant Registrar of the Centre for Distance and Continuing Education (CDCE), when the programme is advertised.

- The application shall be on the prescribed form providing the information as he/she may be required to submit, including her/his qualifications for undertaking the courses of study.

2.6 REGISTRATION

On acceptance by the Boards of Study of Biological Sciences and Physical Sciences (BoS), Faculty Board and Senate, a person shall register as a student of the University upon payment of prescribed registration and other fees. The minimum period of registration for the B.Sc. (External) Degree programme shall be one academic year. Registration shall be renewed each academic year. Maximum period shall not exceed nine years. The period of registration shall be reckoned from the date of commencement of the programme.

The registration for B.Sc. (External) Degree in Biological Sciences / Physical Sciences shall be deemed to have lapsed at the expiry of its period of validity. A candidate whose registration has lapsed may renew his/her registration for a further period, provided that he/she is considered eligible for such registration by the faculty. However, no registration shall be renewed after the expiry of nine academic years from the first date of commencement of the programme.

The University has the right to cancel the registration of a candidate at any time.

If the number of persons who have applied and / or who are registered for the programme in any given year is not sufficient and financially not viable in the opinion of the Faculty and BoS reserves the right to not conduct the programme, subject to the University refunding any fees that may have been received.

Any undergraduate student who is accepted as a candidate for the B.Sc. (External) degree programme in Biological Sciences / Physical Sciences shall devote his/her time to his/her studies at this University. No such student shall keep away from scheduled classes or withdraw from examinations or any other aspect of evaluation without prior approval of the Faculty.

2.7 FEE STRUCTURE

a) The fees for application, registration, tuition and examination shall be determined from time to time by the Council of the University on the recommendation of the BoS and Faculty Board. The fees paid shall under no circumstances be refunded.

b) There will be additional fees charged from referred and / or failed candidates as determined by the Council on the recommendation of the BoS, depending on the expenses to be incurred by the University to service their repeat attempts in the B.Sc. examination process.

c) The fees payable for a certificate or statement of results or a transcript, shall be determined by the Council of the University on the recommendation of the BoS. Transcripts of examination results shall only be submitted to another academic institution.

d) If a late application is to be accepted an additional fee of 50% of the prescribed fee shall be charged, provided the application is received within fourteen days of the due date for the receipt of applications. An additional fee of 100% of the prescribed fee shall be charged, if the application is made after fourteen days, but within twenty days of the due date. No application shall be entertained

unless in exceptional circumstances after the lapse of twenty days from the due date.

e) Fees shall be charged for replacement of the student's lost record book/identity card or damaged university properties at rates determined by the Council.

3 COURSES OF STUDY

The programme of study shall include courses and syllabi conducted in any one of the six levels within three academic years. An academic year will consist of two levels of study and one level of study will be of 6 months duration.

The titles of courses offered shall be as those set out in the program schedule and the Senate shall have the discretion on the recommendation of the BoS to amend the sequence of the list of courses, the syllabi and the number of question papers thereof.

The medium of instruction and examination is English.

The three year B.Sc. (External) Degree Programmes comprise a total of six levels (semesters). The programs consist of a combination of courses drawn from the fields of Physics, Information Technology, Mathematics, Statistics, Botany and Zoology. Each course is a module of study normally completed within a level. A student enrolled for the degree programme may select courses from any combination of three fields of study, provided that he/she offers an average of 30 credits per year (10 credits per subject). On this basis the student has the flexibility of formulating his/her own programme of study and is expected to offer a minimum of 90 credits in order to be eligible to obtain the B.Sc. (External) Degree in Biological / Physical Sciences.

3.1 CREDIT RATING

The credit rating is an expression used to denote the "academic value" of a course. A course whose academic value is one credit is equivalent to the amount of work designed for a total of 15 hours of lectures of that course.

Course Code Notation: Each course is assigned a course code (e.g.: BOT 1121) which consists of seven alphanumeric characters as follows.

- **First three letters:** Field of study

BOT - Botany **MAT** – Mathematics

ZOO - Zoology **STA** – Statistics
PHY - Physics
INT - Information Technology

First digit (4th character) : Year of study within the degree programme
Second digit (5th character): Level/Semester
Third digit (6th character) : The credit
Fourth digit (7th character): The serial number of the course

e.g. The course code **BOT 1121** would mean:

BOT => Botany; **1** => 1st year; **1** => Level I;

2 => Credit rating of two; **1** => Serial number of the course

3.2 AVAILABLE COURSES FOR DEGREE PROGRAMME IN BIOLOGICAL SCIENCES/ PHYSICAL SCIENCES

Table 3.2.1 COMPULSORY COURSE FOR THE B.Sc. (EXTERNAL) DEGREE PROGRAMME IN BIOLOGY SCIENCES

Year	Level	Credit Rating	Course Code	Course Title
1	1	0	CMP 1101	Basic Mathematics for Biological Sciences

Table 3.2.2 COURSES OFFERED UNDER THE FIELD OF STUDY BOTANY FOR THE B.Sc. DEGREE PROGRAMME IN BIOLOGICAL SCIENCES

Year	Level	Credit Rating	Course Code	Course Title
1	1	2	BOT 1121	Plant Diversity – I
	2	2	BOT 1222	Plant Diversity – II
		2	BOT 1223	Plant Physiology
		2	BOT 1224	Plant Anatomy
2	3	2	BOT 2321	Economic Botany
		2	BOT 2322	Plant Systematics
	4	2	BOT 2423	General Microbiology
		1	BOT 2414	Molecular Biology
		2	BOT 2425	Statistics for Biology
3	5	2	BOT 3521	Plant Pathology
		2	BOT 3522	Postharvest Technology of Plant Products
		1	BOT 3513	Nitrogen Fixation
	6	2	BOT 3624	Soil Microbiology
		2	BOT 3625	Bioinformatics
		2	BOT 3626	Molecular Biotechnology
		2	BOT 3627	Industrial Microbiology
TOTAL = 30 CREDITS				

Table 3.2.3 COURSES OFFERED UNDER THE FIELD OF STUDY ZOOLOGY FOR THE B.Sc. DEGREE PROGRAMME IN BIOLOGICAL SCIENCES

Year	Level	Credit Rating	Course Code	Course Title
1	1	2	ZOO 1121	Invertebrate Diversity
		1	ZOO 1112	Animal Histology
		2	ZOO 1123	Cell Biology and Biochemistry
		2	ZOO 1124	Genetics and Evolution
	2	2	ZOO 1225	Vertebrate Diversity
		2	ZOO 1226	Animal Physiology
		2	ZOO 1227	Developmental Biology
2	3	2	ZOO 2321	Fish Biology
		2	ZOO 2322	Animal Behavior
	4	1	ZOO 2413	General Entomology
		2	ZOO 2424	Ecology
3	5	2	ZOO 3521	Medical Entomology
		2	ZOO 3522	Biodiversity and Principles of Conservation
		2	ZOO 3523	Environmental Pollution
	6	2	ZOO 3624	Fisheries and Aquaculture Management
		2	ZOO 3625	Environmental Impact Assessment
TOTAL = 30 CREDITS				

Table 3.2.4 COURSES OFFERED UNDER THE FIELD OF STUDY PHYSICS FOR THE B.Sc. DEGREE PROGRAMME IN BIOLOGICAL SCIENCES/PHYSICAL SCIENCES

Year	Level	Credit rating	Course code	Course title
1	1	3	PHY 1131	General and Thermal Physics
		1	PHY 1112	Waves and Vibrations
		2	PHY 1123	Practical Unit I
	2	2	PHY 1224	Modern Physics
		2	PHY 1225	Fundamentals of Electromagnetism
2	3	1	PHY 2311	Thermodynamics and Radiation
		1	PHY 2312	Electromagnetism
		2	PHY 2323	Electronics
		1	PHY 2314	Quantum Mechanics
	4	2	PHY 2425	Physical Optics
		1	PHY 2416	Atomic and Nuclear Physics
		2	PHY 2427	Practical Unit II
3	5	2	PHY 3521	Energy Resources
		3	PHY 3532	Structure and Properties of Materials
	6	2	PHY 3623	Physical Oceanography
		1	PHY 3614	Physical Geology
		2	PHY 3627	Medical Physics
TOTAL = 30 CREDITS				

Table 3.2.5 COURSES OFFERED UNDER THE FIELD OF STUDY INFORMATION TECHNOLOGY FOR THE B.Sc. DEGREE PROGRAMME IN BIOLOGICAL SCIENCES/ PHYSICAL SCIENCES

Year	Level	Credit rating	Course code	Course title
1	1	2	INT 1121	Programming Concepts
		2	INT 1122	Introduction to Databases
	2	2	INT 1223	Introduction to Operating Systems
		2	INT 1224	Introduction to Computer Architecture
		2	INT 1225	Implementation of Database Applications
2	3	2	INT 2321	Data Structures and Algorithms
		4	INT 2342	Data Communications and Computer Networks
	4	2	INT 2423	Introduction to Simulation
		2	INT 2424	Image Processing and Analysis
3	5	3	INT 3531	Artificial Intelligence
		2	INT 3522	Document Markup Languages
	6	3	INT 3633	Human Computer Interactions
		2	INT 3624	Web page Construction
TOTAL = 30 CREDITS				

TABLE 3.2.6 COURSES OFFERED UNDER THE FIELD OF STUDY STATISTICS FOR THE B.Sc. DEGREE PROGRAMME IN BIOLOGICAL SCIENCES/ PHYSICAL SCIENCES

	Level	Credit Rating	Course code	Course title
1	1	2	STA 1121	Introduction to probability theory
		3	STA 1132	Introduction to statistics
	2	3	STA 1233	Applied statistics
		2	STA 1224	Introduction to statistical software
2	3	3	STA 2331	Statistical inference
		2	STA 2322	Data analysis using statistical packages
	4	3	STA 2433	Analysis of variance and design of experiments
		2	STA 2424	Non-parametric methods
3	5	2	STA 3521	Regression analysis
		3	STA 3532	Statistical quality control
	6	3	STA 3633	Stochastic process and applications
		2	STA 3624	Time series analysis and forecasting
TOTAL = 30 CREDITS				

TABLE 3.2.7 COURSES OFFERED UNDER THE FIELD OF STUDY MATHEMATICS FOR THE B.Sc. DEGREE PROGRAMME IN PHYSICAL SCIENCES

Year	Level	Credit rating	Course code	Course title
1	1	3	MAT 1131	Abstract Algebra I
		2	MAT 1122	Differential Equations I
	2	2	MAT 1223	Linear Programming
		3	MAT 1234	Mathematical Analysis
2	3	3	MAT 2331	Abstract Algebra II
		2	MAT 2322	Modern Applied Mathematics
	4	3	MAT 2433	Discrete Mathematics
		2	MAT 2424	Computational Mathematics
3	5	3	MAT 3531	Differential Equations II
		2	MAT 3522	Spread Sheet Modelling
	6	3	MAT 3633	Advanced Computational Mathematics
		2	MAT 3624	Complex Analysis
TOTAL = 30 CREDITS				

3.3 ASSESSMENT

3.3.1 METHODS OF COURSE ASSESSMENT

Knowledge and skills of students will be evaluated by

- Continuous assessments
- End semester examination

Weightage given to each assessment will be notified at the beginning of the course.

Continuous assessments

Continuous assessments may include mid semester examination, tutorials, spot tests, practical sessions, assignments, quizzes, records, reports, presentations, etc. Marks obtained for continuous assessments will be considered when determining the final grade.

End semester examination

A student will be assessed at the end of each semester either by a theory paper or a practical examination or both, depending on the course. The minimum duration of end semester theory examination based on credit value is as follows.

- One credit - one hour
- Two credits - two hours
- Three credits - two and a half hours
- More than three credits -three hours or two papers of two hours each

The duration of each end semester practical examination will be notified by the respective department at the beginning of the semester.

IMPORTANT

Students are only allowed to sit the end semester examinations in semesters that they have initially enrolled *during* course *registration*. No student will be allowed to sit examinations offered in semesters other than the intended semester. For example, if a student has enrolled for a course in semester I in the year 2019 he/she should sit the examinations in that semester and not in any other semester or year. If a student does not sit the final examination of the intended semester without proper consent from the BoS, an E grade will be issued.

If circumstances beyond control of the student prevent from sitting the final examination, he/she can apply for special consideration from the BoS to sit the same examination later.

The special consideration is subject to approval from BoS.

If a student obtains consent from the BoS, the student must sit the examination offered in the next immediately available level/semester.

3.3.2 GRADING SYSTEM

Grade	Grade Point Value
A^+	4.0
A	4.0
A^-	3.7
B^+	3.3
B	3.0
B^-	2.7
C^+	2.3
C	2.0
C^-	1.7
D^+	1.3
D	1.0
E	0.0

3.3.3 GRADE POINT AVERAGE

Grade Point Average (GPA) is the credit-weighted arithmetic mean of grade point values. The GPA is calculated by dividing the total credit-weighted grade point value by the total number of credits.

$$GPA = \frac{\sum(\text{Grade point value of a course} \times \text{number of course credts})}{\text{Total number of credits}}$$

For example, a student who completed three courses of three credits each, two courses of two credits each and two courses of one credit each with grades A^+, B, D, C^+, E, B^+ and C respectively would obtain a GPA of

$$\frac{(4.0 \times 3) + (3.0 \times 3) + (1.0 \times 3) + (2.3 \times 2) + (0.0 \times 2) + (3.3 \times 1) + (2.0 \times 1)}{3 + 3 + 3 + 2 + 2 + 1 + 1}$$

$$= \frac{33.9}{15} = 2.26$$

(Truncated to two decimal places without rounding)

3.3.4 REFERRED STUDENTS

Students who receive a grade below C may re-sit the examination to improve the grade. However, in subsequent attempts the highest grade achievable is a C grade. If a student is unsuccessful in obtaining a C grade in subsequent attempts, the best grade obtained will be considered.

3.4 DEGREE AWARDING CRITERIA

3.4.1 B.Sc. (EXTERNAL) IN BIOLOGICAL SCIENCES / B.Sc. (EXTERNAL) IN PHYSICAL SCIENCES

To be eligible to receive the B.Sc.(External) Degree in Biological Sciences/Physical Sciences, a student should attain a minimum of **90 credits**, with at least **26 credits** per each academic year.

In addition, a student must

i. obtain a minimum **GPA** of **2.00**,
ii. obtain C grades or higher in specified courses equivalent to a minimum of **69 credits** with **at least 22 credits per each academic year** and at least a **D grade** in the remaining courses,
iii. obtain at least a **C grade** for the CMP 1101 – Basic Mathematics for Biological Sciences and
iv. complete the relevant requirements within a period of nine academic years from the first registration.

Award of Classes

A student must complete all requirements given in section 3.4.1. to be considered for the award of a Class.

First Class

To be awarded a First Class a student must,

i. obtain a minimum GPA of 3.70 and
ii. obtain C grades or higher in specified courses equivalent to at least 90 credits within three academic years.

Second Class (Upper Division)

To be awarded a Second Class (Upper Division) a student must,

i. obtain a minimum GPA of **3.30** and
ii. obtain C grades or higher in specified courses equivalent to at least **85 credits** and at least a D grade in the remaining courses within three academic years.

Second Class (Lower Division)

To be awarded a Second Class (Lower Division) a student must,

i. obtain a minimum GPA of **3.00** and
ii. obtain C grades or better in the specified courses equivalent to at least **80 credits** and at least a D grade in remaining courses within four academic years.

4 COURSES

4.1 OUTLINE OF THE COURSES

4.1.1 FIRST YEAR PROGRAMME OF STUDY

4.1.1.1 LEVEL I

4.1.1.1.1 COMPULSORY COURSE

CMP 1101 - BASIC MATHEMATICS FOR BIOLOGICAL SCIENCES

Sets and inequalities, Linear equations, Quadratic equations, Functions and Graphs, Trignometric functions, Limits, Derivatives (Differentiation), Curve sketching, Maximum-Minimum problems, Exponential and logarithmic functions, Techniques of Integration, Areas and volumes, Tangent and Normal, Partial derivatives, Matrices and determinants. Introduction to vectors, Linear combinations, Linear dependence and independence, Bases and dimensions, Scalar product, Vector Product, Triple scalar product, Triple vector product. Solutions of vector equations involving products, Cylindrical polar coordinates, Spherical polar coordinates. Introduction to statistics.

4.1.1.1.2 BOTANY

BOT 1121 – PLANT DIVERSITY I

Viruses, Bacteria, Cyanobacteria , Algae (Chlorophyta, Pheophyta, Rodophyta, Euglenophyta), Fungi (Myxomycota, Zygomycota, Ascomycota and Basidiomycota),

4.1.1.1.3 ZOOLOGY

ZOO 1121 - INVERTEBRATE DIVERSITY

Animal body plans, Diversity of major invertebrate phyla: Protozoan groups and Phyla Porifera, Cnidaria, Ctenophora, Platyhelminthes, Nematoda, Mollusca, Annelida, Onychophora, Arthropods, minor invertebrate phyla, Echinodermata.

ZOO 1112 – ANIMAL HISTOLOGY

Study of Vertebrate Tissues: To show modifications for particular functions – Epithelial, Glandular, Connective, Muscular, Nervous tissues. **Study of Vertebrate Organs :** Structure in relation to function – Alimentary canal and associated organs (stomach, small intestine, liver, pancreas), Urogenital organs (ovary, testis**,** kidney**)**, Respiratory tract and lung, Skin.

ZOO 1123 - CELL BIOLOGY AND BIOCHEMISTRY

Biomolecules and Molecular Organization: Inorganic ions, Carbohydrates, Lipids, Proteins, Nucleic acids, Identification of Biomolecules, DNA Replication, Transcription and translation of genetic information; **Cytology:** Cell ultra- structure, Cell Division; Biological membranes: Structure and functions; **Enzymes:** General properties and mechanism of action; Enzyme kinetics, Bioenergitics.

ZOO 1124 - GENETICS AND EVOLUTION

Heredity: Early ideas on heredity, **Mendelian and non-Mendelian patterns of inheritance**, Population genetics, Genetic disorders and genetic counseling, Mutations and cancer, Barr bodies and sex determination, Determination of blood groups, Karyotyping, Translocation and behavior of chromosomes in meiosis, History of evolutionary biology, Concepts in microevolution, Concepts in macroevolution, Human evolution.

4.1.1.1.4 PHYSICS

PHY 1131 - GENERAL AND THERMAL PHYSICS

Forces of Nature: The principle of inertia, Inertial frames, Newton's principles of relativity, Accelerating frames and inertial forces; Gravitational mass, Accelerating frames and gravity, Gravitation, Kepler's laws of planetary motion, Newton's laws of gravitation, Determination of the value of g, Weightlessness, Collisions and conservation laws, Conservation of liner momentum, Action, reaction and impulse, Motion of a rocket. **Rotational Dynamics:** Angular momentum and its conservation, Moment of inertia, Gyroscopic motion and precession. **Fluids, their flow and properties:** Stream line flow, Equation of continuity, Bernoulli's theorem, Air lift and drag, Viscous forces and viscosity, Poiseuille's formula and corrections, Methods of determination of viscosity, Surface energy and surface tension, Methods of determination of surface tension. **Kinetic Theory:** Basis and assumptions. Derivations of an expression for gas laws, First law of thermodynamics, Equipartition of energy, Specific heats at constant volume and pressure, Mean free path, Adiabatic and isothermal processes, Molecular phenomena, Distribution of molecular velocity.

PHY 1112 - WAVES AND VIBRATIONS

Simple Harmonic Vibrations: Composition of simple harmonic vibration (a) at right angles; Lissajous figures, (b) in the same straight line, Same period, Using amplitude phase diagram (c) in the same straight line, Different periods. Huygens' Principle and **Applications:** Laws of reflection and refraction for plane wave at plane surface, Doppler Effect. **Wave Motion:** Simple harmonic and a harmonic oscillators, Damped harmonic oscillators, Fourier analysis, Wave equation, longitudinal waves, Transverse waves, Energy consideration of waves, Reflection and refraction of waves, Helmholtz resonator, Group velocity and phase velocity**.** **Musical Sounds and Instruments:** Vibrations in strings, Air columns, Plates and rods, Kundt's tube.

PHY 1123 - PRACTICAL UNIT I

Introduction to apparatus and equipment. Handling techniques, Selection of measuring instruments and methods, Entering and calculations, some selected practical related to first year lectures.

4.1.1.1.5 INFORMATION TECHNOLOGY

INT 1121- PROGRAMMING CONCEPTS

What is a program?, natural languages vs computer programming languages, compilers, interpreters, role of a compiler, syntax and semantic of a computer programming language, design a program, flow chart basics, variables, data types, expressions, statements, assignments, operators, control structures, functions, arrays, string handling, pointers, files

INT 1122 - INTRODUCTION TO DATABASES

Basic Database Concept; Communication with Database System; Introduction to Database Management System, **Relational Database Model;** Structured Query Language; Relational Database Design and Normalization; Transaction processing, Database Indexing and sorting.

4.1.1.1.6 STATISTICS

STA 1121 - INTRODUCTION TO PROBABILITY THEORY

Counting Techniques: Combinations, Permutations, Set partitions, **Elements of Probability:** Experiments, Events, Sample space, Laws of Probability, Bayes' Theorem, Independence of events. **Random variables:** Discrete and continuous r.v.'s, Probability mass function, Probability density function, Cumulative distribution function, Functions of a random variable, Expectation, Moments, Mean and variance, Moment Generating function. **Probability inequalities:** Chebyshev's and Markov's etc. **Distributions:** Discrete: Uniform, Bernoulli & Binomial, Poisson, Geometric, Negative Binomial, Hypergeometic, **Multinomial, Continuous:** Uniform, Normal, Gamma, Exponential, Properties and applications of distributions, Probability Generating functions. Approximation to Binomial using Poisson, Binomial using Normal, and Poisson using Normal.

STA 1132 - INTRODUCTION TO STATISTICS

Basic ideas in Statistics: Representation of data, Histogram, Frequency polygon, Ogive. **Measures of Location :** Various Means (AM, GM, HM, TM), Median, Mode, Quantiles, Deciles, Percentiles. **Measures of Dispersion:** Range, Interquartile range, Variance, Standard deviation, Chebyshev's rule for sample, Shepperd's correction for variance, Coefficient of variance, Moments of higher order, Skewness, Kurtosis.Representation of data using Stem-Leaf diagrams and Box plots. **Regression and Correlation:** Scatter diagrams, Linear Regression, Method of

least squares, Correlation, Coefficient of correlation, Rank correlation, Spearman's rank correlation coefficient. **Index numbers:** Introduction, Price Relatives, Quantity Relatives and Value Relatives. Link and Chain Relatives, Cost of living Index Numbers, Methods of construction of Index Numbers, Quantity Index Numbers, Tests for Index numbers.

4.1.1.1.7. MATHEMATICS

MAT 1131 - ABSTRACT ALGEBRA I

Number Theory: Euclid's Algorithm, Greatest common divisor and least common multiple and their relationship, Solution of Linear Diophantine equations in two variables, Linear congruences, Systems of linear Congruences having the same modulus, Chinese Remainder Theorem. **Relations, Functions and Binary Operations:** Equivalence relation. Partitions, Orbits and transversals functions a subset of relations, bijective functions, inverse of a function. **Permutations:** Theorems on the product of disjoin cycles, Transpositions and the uses, parity and signature of a permutation. **Group Theory:** Group Tables, Subgroups, Elementary properties of Cyclic groups, Dihedral group of order 2n and its properties, Symmetric and Alternating group: Direct product of two groups, Identification of non-isomorphic groups of order up to 10.

MAT 1122 - DIFFERENTIAL EQUATIONS I

Dimensions and Units, Scaling, Approximation and reasonableness of answers, Linear and quadratic models, Polynomial and rational models, Traffic flow models, Exponential models, Catastrophe theory, Usage of differential equations and Bifurcation Economic Functions: supply; Demand; TC; TR; AC; AR; MC and MR. Elasticity, Cosumer’s Surplus, Producer’s Surplus, Income determination model, Cobweb model, Harod model, Equilibrium in Economic Resources, Economies, Attainable states, Private ownership, Fixed point theory, Continuous-time systems, Controllability, Liner feedback, Discrete-time systems, Stability theory, Optimal controls.

4.1.1.2 LEVEL II

4.1.1.2.1 BOTANY

BOT 1222 - PLANT DIVERSITY II

Symbiotic associations, Bryophyts (liverworts, hornworts, mosses), Pteridophytes, Ferns, Gymnosperms, Conifers, Seed plants

BOT 1223 - PLANT PHYSIOLOGY

Soil plant atmosphere continuum, components of water potential, challenges in ecohydrology and plant–water relations, mechanisms of stomatal movements, essential mineral nutrients, mechanisms of nutrient absorption, photosynthesis, C3, C4 and cam pathways, source sink relationship, subcellular transport of metabolites, oxidative phosphorylation and electron transport chain mechanisms, proton pumping, inhibitors of ATP synthesis, energetic of the TCA cycle and glucose oxidation, plant growth regulators and movements, signal perception and transduction, phytochromes and phytotrophic signal transductions, physiology of growth and development, physiology of flowering, vernalisation, seed dormancy and germination, fruit ripening, bud dormancy, structure, occurrence and biosynthesis of the plant secondary metabolites, allelochemicals and allelopathy, stress physiology, mechanisms of stress acclimation in plants, climate change and ecophysiology

BOT 1224 - PLANT ANATOMY

Plant cell types: Parenchyma, Collenchyma, Sclerenchyma. **Tissue organization:** Simple tissues, Complex tissues – Epidermis, Xylem, Phloem. **Anatomy of angiosperms:** Root, Stem and leaf anatomy. **Primary and secondary growth. Wood:** Microscopic and macroscopic features, Manufactured wood.

4.1.1.2.2 ZOOLOGY

ZOO 1225 - VERTEBRATE DIVERSITY

Chordate Body plan, Major features of Phylum Chordata, Diversity of major Vertebrate classes: Jawless fish, Jawed fish, Amphibia, Reptilia, Aves, Mammalia.

ZOO 1226 – ANIMAL PHYSIOLOGY

Physiology of gastrointestinal, cardiovascular, nervous, muscular, excretory and reproductive systems. Homeostasis. Endocrine glands, hormones and functions.

ZOO 1227 – DEVELOPMENTAL BIOLOGY

Mechanisms of Developmental Organization, Mechanisms of Developmental Patterning, Differential Gene Expression and Cell Differentiation, Cell-to-Cell Communication and Morphogenesis, Stem Cells, Gametogenesis, Fertilization, Early Development: Cleavage, Gastrulation and Axis Formation in Different Taxa (Protostome and Deuterostome Invertebrates, fishes, amphibians, reptiles, birds and mammals), Neural Tube Formation and Nervous System Patterning, Mesoderm and Its Derivatives, Endoderm Formation, Post Embryonic Development, Development in Health and Disease, Evolution and Development.

4.1.1.2.3 PHYSICS

PHY 1224 - MODERN PHYSICS

Charged particles: Conduction of electricity in gases, Production and properties of X-rays, Thompson's and Bainbridge's mass spectrograph, Charged particle accelerators. **Spectra:** Rutherford's model of the atom, Bohr's model of the hydrogen atom, Explanation of line spectra, Series spectra, X-rays, X-ray spectra, Mosley's law. **Special theory of relativity:** Introduction to inertial frames, Galilean transformation equations, Invariance of physical laws, Propagation of light, Einstein's postulates, Time dilation, Length contraction, Doppler effect, Space time diagram, Lorentz transformation equations, Energy-momentum relation.

PHY 1225 - FUNDAMENTALS OF ELECTROMAGNETISM

Electrostatistic: Review of basic concepts of electrostatics, Coulomb's law, Electric flux and Gauss' law, Potential difference, equipotential surfaces, Charge distribution on conductors, Electric images, and Point discharge. **Current Electricity:** Ohms law and its derivation using free electron theory, Temperature dependence of the resistance, Cary-Foster bridge, Rayleigh potentiometer, Kirchoff's laws, Maxwell's cyclic currents, Unbalanced Wheatstone bridge. **Electromagnetism:** Biot–Savart law, Helmholtz coils, Solenoid magnetic shell, Ampere's circuital theorem, Force on a current carrying conductor, Laws of electromagnetic induction, Eddy currents, Search coil, Self inductance and mutual inductance.

4.1.1.2.4 INFORMATION TECHNOLOGY

INT 1223 - INTRODUCTION TO OPERATING SYSTEMS

Computer system overview, Operating system overview, Process states, process description, process control, threads, Memory management requirements, memory partitioning, paging, segmentation, virtual memory, uniprocessor scheduling, scheduling algorithms, I/O devices, file management.

INT 1224 – COMPUTER ARCHITECTURE

History of Computers, Organization and Architecture, Structure and Function, Von Neumann Architecture, The Computer System: Computer Components, Interconnection Structures, Bus Interconnection, **Processor Organization and Function**: CPU registers, Instruction fetch and execute, Instruction format, Instruction execution, Interrupts, Interrupts and the instruction cycle, Control Unit, Micro programmed Control, **Computer Memory System**: Characteristics of memory systems, The memory hierarchy, Cache memory, Internal memory, External memory, RAID, **Input/output System**: I/O modules, Programmed I/O, Interrupt-driven I/O, Direct memory access, Overview of Advanced Architecture

INT 1225 - IMPLEMENTATION OF DATABASE APPLICATIONS

RDBMS Programming with ACCESS and MySQL: Introduction to SQL, Benefit of SQL, Running SQL commands, Creating Database and Tables, Adding Data, Deleting Data, Updating Data, Altering Tables, Select Statements, Relational Operators and Constraint, Inner Joins and Outer Joins, Aliases and Synonyms, Built-in Functions, Creating Views, Database Sequences, Clauses, Index, Creating and Altering Table Space, Creating and Altering User, Granting and Revoking System Privileges and roles, Lock Table, Format Model. **Forms**: Developer 2000, File Format, Object Navigator, Properties Window and Property Class, Master-Detail Relationship, Event Triggers and PL/SQL Blocks, Description and use of different Forms Items, Alters, Editors and Windows, Record Groups and LOVS, Menus and Transaction Processing, Images, Parameters and Controls, Database Triggers and Libraries. **Report**: Reports Style, The Reports Wizards, Modifying a Report, Report Templates and Storage, Queries and Groups in the Reports Data Model, Creating Columns in the Report Data Model, The Layout Model.

4.1.1.2.5 STATISTICS

STA 1233 - APPLIED STATISTICS

Introduction to data collection and processing, distribution of data, graphical description of data, histogram, pie chart, line chart, etc. Measures of center and spread, Mean, Median, Mode, Quartiles, Deciles and Centiles. Variance and Standard Deviation. Correlation of data, Correlation Coefficient, Linear regression. Sampling, Sampling distributions. Normal Distribution and the Central Limit Theorem. Applications of Normal Distributions. Practical examples using Excel.

STA 1224 - INTRODUCTION TO STATISTICAL SOFTWARE

Introduction to MINITAB, Data management: Editing, summarizing, Transforming and Manipulating Data, Graphical methods for describing data, Numerical methods for describing data, Distributions and Random data. Applications. Introduction to the SAS Display manager system, Structure of a SAS program, Editing, rearranging, displaying and summarizing data using PROC PRINT, PROC SORT, PROC FREQ, PROC MEANS, PROC UNIVARIATE, PROC FORMAT, PROC CORR PROC TABULATE, PROC STANDARD, PROC RANK etc. Creating Graphics using PROC PLOT, PROC CHART etc. SAS Expressions, SAS Functions, Some SAS statements (ARRAY, DELETE, DO, DROP, FORMAT, GO TO, IF, INFILE, INFORMAT, INPUT, KEEP, LABEL MERGE, OUTPUT, PUT, SET, ID, VAR, TITLE, LIBNAME ETC.) Applications.

4.1.1.2.6 MATHEMATICS

MAA 1223 – LINEAR PROGRAMMING

Introduction: Introduction to operations research, Operations research models (Probabilistic and Deterministic). **Convex analysis**: Convex combinations, Convex sets, Extreme points of a convex set, Convex polyhedron, Hyper planes, Half-spaces and polytopes, Convex functions. **Linear programming (LP):** Mathematical formulation of the LP problem, LP in two-dimensional space, Graphical solution methods, General LP problem. **The simplex method:** Simplex algorithm, Two-phase simplex algorithm, Revised simplex algorithm, LP problems with unrestricted variables, LP problems with bounded variables. **Duality in LP:** Duality in LP problems, Duality theorems, Applications of duality, Dual simplex algorithm**. Special types of LP problems:** Transportation problem, Assignment problem. Computer Practical: Introduction to optimization software, Excel Solver in problem solving.

MAT 1234 - MATHEMATICAL ANALYSIS

The Real Number Systems: Real number system as a field, Identifying members (Integers, Rational and Irrationals). **Sequences:** Convergence and Divergence, Monotonic, Oscillating sequences, Limits of sequences. **Functions:** Properties Continuous Functions, Extreme and Intermediate Value Theorems, Uniform Continuity Concept, Continuity and Limits. **Differentiation:** Properties of Derivatives, Rolle's Theorem, Mean-Value Theorem. **Integration:** Definition of Integrals and Integrability, First Fundamental Theorem of Calculus. **Infinite Series:** Approximation by Taylor Polynomials, Convergence, Tests of Convergence.

4.1.2 SECOND YEAR PROGRAMME OF STUDY

4.1.2.1 LEVEL III

4.1.2.1.1 BOTANY

BOT 2321 - ECONOMIC BOTANY

Introduction to economic botany, man's association with plants, crop plants and their domestication, centers of origin and distribution of cultivated plants, classification of plants (in general), crop wild relatives, plant breeding and propagation (in general), marketing of crops and crop products, human and animal nutrition, human food and food additives, feed for livestock, food for bees and other desirable invertebrates, timber, wood products and fuel, vegetable fibres, phytochemicals, plant toxins and their applications, human and veterinary medicinal plants, useful ferns, bryophytes, algae, fungi, bacteria and viruses, environmental and social uses, and future role of plants in relation to mankind.

BOT 2322 – PLANT SYSTEMATICS

What is systematics, Plant taxonomy: History of plant taxonomy, Importance and objectives, Is this science needed in the 21st century? (Fascinating applications of plant taxonomy), Plant identification, Plant classification including briefly the historical development of different systems, Plant nomenclature emphasizing certain areas in ICN and ICNP, Field and herbarium techniques, Policies and regulations in field collections, Sources of taxonomic evidence including micro molecules and macromolecules, Numerical taxonomy, Historical development of plant taxonomy in Sri Lanka.

4.1.2.1.2 ZOOLOGY

ZOO 2321 - FISH BIOLOGY

Taxonomy and evolution of fish, common fish species of Sri Lanka, morphometric and meristic characteristics of fish, general anatomy and physiology – digestive system, food and feeding habits, circulatory system, osmoregulation, nervous and endocrine systems, sensory systems; growth and age determination, fish behaviour, reproductive biology and life histories.

ZOO 2322 - ANIMAL BEHAVIOUR

Animal behaviour and human society, proximate and ultimate explanations of animal behaviour, testing hypotheses in animal behavior studies, hormones and neurobiology, Learning and cultural transmission, predators and antipredatory behaviour, sexual selection, mating systems, kinship, cooperation, living in groups, foraging, habitat selection, play behaviour, behavior sampling methods, use of specialized software such as UCINET and idTracker.

4.1.2.1.3 PHYSICS

PHY 2311 - THERMODYNAMICS AND RADIATION

Thermodynamics: Laws of thermodynamics, Carnot cycle, Internal energy and heat engines, Entropy, General thermodynamic functions, Free expansion and throttling process, Phase transformation, Thermoelectricity, Seebeck, Joule, Peltier and Thompson effects. Radiation: Blackbody radiation, Kirchoff's law, Expression for energy density of radiation inside an enclosure, Stefan-Boltzmann law, Wien's distribution law, Rayleigh-Jean's formula, Failure of classical theory, Old quantum theory and Planck's radiation formula.

PHY 2312 - ELECTROMAGNETISM

A.C. Theory: Inductance, Capacitance and Resistance, Use of vectors, Use of complex numbers, Series and parallel circuits, Power dissipation, Quality factor, Simple radio receiver, AC measurement. Electromagnetic Theory: Summary of vector algebra, Gradient, Divergence and Curl, Maxwell's equations in free space, Properties of E.M. waves, Power dissipation, E.M. waves (a) in a conducting medium (b) in an insulator, Dielectric constant.

PHY 2323 – ELECTRONICS

Junction Diodes: Energy bands in crystals, Intrinsic and Extrinsic semiconductors, Hall effect, p-n Junction, Rectifier and voltage multifier circuits, Diode clippers and clamps, Other type of diodes. **Transistor Amplifier Circuits:** Junction transistor and its characteristics, Single stage amplifier, Equivalent circuits and analysis, Feedback multistage amplifiers, Multi vibrators. **Oscillators:** Basic sinusoidal oscillators and non- sinusoidal oscillators. **Operational Amplifiers:** Properties and uses of operational amplifiers.

PHY 2314 - QUANTUM MECHANICS

Introduction: Birth of Quantum mechanics, De Broglie hypothesis, Heisenberg uncertainty Principle, Schrodinger equation, Wave function of a quantum mechanical system, Normalization, Probability density, Expectation values, Eigen functions and Eigen values. Application of the Schrodinger Equation: A particle in an infinite potential well, finite potential step, Rectangular potential barrier, Barrier penetration.

4.1.2.1.4 INFORMATION TECHNOLOGY

INT 2321 - DATA STRUCTURES AND ALGORITHMS

Static and dynamic memory allocations, arrays, structures, files, stacks, queues, linked lists, trees, graphs, searching algorithms: binary searching, sorting algorithms: heap sort, quick sort, hashing.

INT 2342 - DATA COMMUNICATIONS AND COMPUTER NETWORKS

Computer networks, OSI model, TCP/IP model, conductive metal, optical fibre, wireless communications, ACII codes, EBCDIC code, analog and digital signals, digital encoding schemes. Bit rate, digital-to-analog conversion, analog-to-digital conversion, modems, DSL, transmission modes: serial and parallel transmissions, multiplexing, data compression, data integrity, data security, local area networks

4.1.2.1.5 STATISTICS

STA 2331 - STATISTICAL INFERENCE

Introduction of Likelihood and 3 ½ paradigm, Models, Random Samples, Generating Functions, Sufficiency, Exponential Families, Point Estimation, Bias, Risk, Consistency, Efficiency and the Frechet (Cramer-Rao) information inequality, Rao-Blackwell Theorem, Normal Approximations, Bayes and Frequentist Analysis, Testing of Hypothesis, P- Values, Power, Likelihood Ratios, Neyman-Pearson Lemma, Conditionality and Likelihood Principle, Survival Analysis.

STA 2322 - DATA ANALYSIS USING STATISTICAL PACKAGES

Introduction to Statistical Packages (SAS and SPSS). Basic in SAS and SPSS: reading in Data, creation of new variables, merging data sets, summarizing data sets, case selection, subsetting data, sorting and Stratification. Data Analysis: est, one-sample, paired and independent samples, Linear Regression. ANCOVA and ANOVA, Contingency tables.

4.1.2.1.6 MATHEMATICS

MAT 2331 - ABSTRACT ALGEBRA II

Groups: Cosets, Normal Subgroups and Factor Groups, Direct Product and Semi-direct Products, Omomorphisms, Isomorphisms, Isomorphism Theorems, Permutation Groups, Cayley's Theorem, Isomorphism between Dihedral and Symmetric Groups, Conjugacy and the Class Equation. **Rings**: Commutative rings, Rings with unity, Integral Domains and Fields, Subrings, Ring Homomorphisms, Ideals and Factor Rings, Principal Ideal Domains, Euclidean Domains and Unique Factorisation Domains, Quotient Fields. **Polynomials**: Polynomials with Integer Coefficients, Solution of Cubic and Quartic Polynomials, General Polynomial over a field, Roots of a Polynomial, Existence of Roots, Factorization, Irreducible polynomials, Gauss's Lemma, Eisenstein's Irreducibility Criterion. **Fields**: Properties of a Field, Properties of a multiplicative group of a Field, Field Extensions, Finite Fields.

MAT 2322 - MODERN APPLIED MATHEMATICS

Queuing Theory: Introduction, Characteristics of Queuing systems, Poisson Process and Exponential Distribution, Transient and steady states, Poisson Queues, Non-Poisson Queuing Systems, Queues in Series, Queuing Control. **Game Theory:** Introduction, Two-Person Zero-Sum Games, the maximum and Minmax Principle, Games without Saddle Points, Mixed Strategies, Graphical Solution of Games,

Dominance Property, The Modified Dominance Property, Reducing the game Problem to a Linear Programming Problem, Minmax and Saddle Point theorems, Fundamental Theorem of Games. **Sequencing:** Introduction, Sequencing Problem, Terminology, Notations and Assumptions, Problems with n-Jobs and Two-Machines, Optimal sequence Algorithm, Problems with n-jobs and Three-Machines, Problems with n-jobs and n-machines, graphic solution.

4.1.2.2 LEVEL IV

4.1.2.2.1 BOTANY

BOT 2423 - GENERAL MICROBIOLOGY

The microbial world and you, microbial naming and classification, microscopy, bacterial cell structure and functions, bacterial identification, nutrition and metabolism of microorganisms, microbial growth, microbial interactions, ecological and economic importance of microorganisms; plant growth promoting rhizobacteria, blue green bacteria and actinomycetes, mycoplasma, introduction to viruses, viroids and prions, general structural characteristics of viruses, disease mechanisms, host/pathogen relationships, virus and cancer, antibiotic producing microorganisms, control of microbial growth, microbial biofilm formation.

BOT 2414 - MOLECULAR BIOLOGY

Chemistry of genetics: Nucleic acids and genetic information, central dogma, weak chemical reactions, high energy bonds, chemical bonds and structure determination, **Genome:** composition and maintenance, **Gene expression**: mechanisms of transcription, RNA splicing, translation and genetic code **Regulation of expression:** regulation in prokaryotes, regulation in Eukaryotes and regulation during development**, Methods in molecular biology:** Gel electrophoresis, Blotting techniques, SDS PAGE, 2D PAGE, Microarray and PCR techniques

BOT 2425 - STATISTICAL METHODS IN BIOLOGY

Introduction to the scope and nature of statistics, Data collection and visual representation of data, Measures of position and dispersion, Normal distribution and its applications, Confidence intervals, Concept of hypothesis testing, Chi square test of independence and goodness of fit, Scatter plots and correlation, Least squares regression, Use of statistical software.

4.1.2.2.2 ZOOLOGY

ZOO 2413 – GENERAL ENTOMOLOGY

External morphology of insects, Insect Anatomy and Physiology: Structure and function of exoskeleton, Growth and Development, Feeding habits, Structure and function of digestive system, respiratory system, reproductive system, nervous system, Pheromones, Behavior and communication. Development and metamorphosis. Taxonomy and Evolution.

ZOO 2424 – ECOLOGY

Dynamics of Ecosystems: Introduction, Objectives, Ecosystem concept, Dynamics of biotic and abiotic components, Characteristics of ecosystems, productivity (primary productivity and feeding relationships, Food chains, Food web), Trophic levels, Ecological pyramids (pyramid of numbers, pyramid of biomass, energy pyramids), The nature of energetics, Laws of thermodynamics, Energy flow through ecosystems, Role of raw materials in the ecosystems (the hydrological cycle, gaseous cycle, sedimentary cycles). **Habitat and Niche: Introduction**, Objectives, Habitat, History and definition of niche, The hypervolume model, Niche interations (parameters of the niche, niche overlaps and factors affecting the niche and its parameters), Niche dynamics, Tolerance limits, Tolerance curves. **Populations:** Characteristics and growth. **Population Interactions:** Symbiosis, Competition, Predation, Herbivory, Parasitism, Pathogenicity and Commensalism. **Population Dynamics:** Population regulation.

4.1.2.2.3 PHYSICS

PHY 2425 - PHYSICAL OPTICS

Refraction of Light: Refraction at spherical surfaces, Sign conventions, Theory of rainbow, Prisms, Thin lens formula, Power of a thin lens and of a combination of lenses, Principal points and nodal points, Lens aberration. Interference: Wave nature of light, Superposition of two sinusoidal waves, Interference patterns, Intensity distribution and Mathematical representation, Coherence and incoherence, Fabry-Perot interferometer, Young's double slit, Michelson Interferometer, Fresnel's biprism, Newton's rings and wed films. Diffraction: Fraunhofer diffraction, resolving power of optical instruments, Diffraction gratings, Fresnel diffraction, Zone plate. Polarization: The nature of polarized light, Polarization by crystals, Rayleigh scattering and the colors in the sky.

PHY 2416 - ATOMIC AND NUCLEAR PHYSICS

Atomic Spectra: Introduction to 3–D time independent Schrodinger equation, Outline of the solution of the hydrogen atom, Comparison with Bohr theory, Spatial quantization, Larmor precession, Electron spin, Fine structure of spectral lines (L-S coupling), Normal and anomalous Zeeman effect, Selection rules, Stimulated emission. Nuclear Physics: Binding energy and the liquid drop model, Semi empirical mass formula, Fission and fusion, Nuclear reactors, Alpha particle scattering, Radioactive transformations, Secular and transient equilibria, Beta decay.

PHY 2427 – PRACTICAL UNIT II

Practical related to second year lectures (e.g. Electronics, Electricity, Sound, Physical Optics etc.)

4.1.2.2.4 INFORMATION TECHNOLOGY

INT 2423 – INTRODUCTION TO SIMULATION

Introduction to modelling and simulation, Random number generation, statistical tests of pseudorandom numbers: chi-square goodness-of-fit test, kolmogorov-smirniov goodness- of-fit test, cramer-con mises goodness-of-fit test, serial test, run-up-and-down test, gap test, maximum test, random variate generation: inverse transform method, acceptance- rejection method, simulation of random number vectors, generating random numbers from continuous distributions, generating from discrete distributions, mote-carlo integration method.

INT 2424 - IMAGE PROCESSING AND ANALYSIS

Gray level scaling transformation, equalization, geometric image scaling and interpolation, smoothing transformations, edge detection, laplacian and sharpening operators, line detection and template matching, scene segmentation and labelling, counting objects, projections, hough transformation, least square and eigenvector line fitting, shapes of regions, Fourier transformation, colour, image sequences, and image compression.

4.1.2.2.5 STATISTICS

STA 2433 - ANALYSIS OF VARIANCE AND DESIGN OF EXPERIMENTS

Replication, randomization, blocking, design structure and treatment structure, Models and Analysis of variance(ANOVA), Multiple Comparisons, Fixed and Random Effects, Equal and unequal replications, equal and unequal variances, Latin square Design, Model and ANOVA for Latin square design. Two and Three way experiments, completely andomized design, Factorial experiments. Analysis of Covariance (ANCOVA)

STA 2424 - NON-PARAMETRIC METHODS

Introduction, Statistical Functionals, Re-sampling Methods, Smoothing, Non-parametric Regression, Density estimation, Minimax Theory, Orthogonal function methods, Adaptive methods, Classification, Other methods.

4.1.2.2.6 MATHEMATICS

MAT 2433 - DISCRETE MATHEMATICS

Graph Theory: Isomorphism of Graphs, Paths, Circuits, Eulerian graphs, Hamiltonian graphs, Shortest path problem, Chinese postman problem, Directed graphs, Graph Colouring, Four colour problem, Proof of five colour theorem, Planar graphs. **Combinatorics :Recurrence relations and generating functions:** Computing solutions to recurrence relations, The principle of Inclusion and Exclusion, Latin squares, System of distinct representatives, Extremal set theory. **Steiner triple systems:** Direct construction, Recurrence construction, Tournaments and Kirkman's school girls problem, Further Graph Theory, Networks, Matroids, Designs, Hadamard matrices.

MAT 2424 - COMPUTATIONAL MATHEMATICS

Computational Linear Algebra: Evaluation of Matrix-Vector Multiplications, Solution of System of Linear Equations, Direct Methods (Gaussian Elimination, LU- Decomposition), Iterative Methods (Jacobi, Gauss-Seidal, SOR methods), Computing Inverse of Matrices. **Interpolation and Approximations:** Interpolation Polynomials for a experimental data, Natural, Lagrange and Newton forms, Interpolation Approximation of functions, Interpolation error and error estimation, Rational Polynomials and their evaluations, Pade Approximation of functions by Rational Polynomials. **Numerical Integration:** Mid-Point Rule, Trapezoid Rule and Simpson's Rule, Composite Rules, Error Forms and Controls, Romberg Integration, Gaussian Quadrature Rules.

4.1.3 THIRD YEAR PROGRAMME OF STUDY

4.1.3.1 LEVEL V

4.1.3.1.1 BOTANY

BOT 3521 - PLANT PATHOLOGY

Introduction to plant pathology, development of diseases in plants, effects of pathogens on plant physiological functions, environmental effects on the development of disease, genetics of plant disease, plant disease epidemiology, methods of attack by plant pathogens, defense mechanisms of plants against plant diseases, diagnosis of plant diseases, control and management of plant diseases, plant diseases caused by fungi, plant diseases caused by bacteria, plant diseases caused by viruses, plant diseases caused by nematodes, plant diseases caused by parasitic higher plants.

BOT 3522 – POST HARVEST TECHNOLOGY OF PLANT PRODUCTS

Postharvest physiology of plant products, biological and environmental factors involved in deterioration, postharvest losses, postharvest diseases, pre-harvest management, harvesting and field handling, harvesting maturity, packing house operations, cooling, storage, transport, marketing, handling systems of minor commodities, minimal processing and modified atmosphere packaging, emerging technologies of postharvest disease management

BOT 3513 – NITROGEN FIXATION

Biological Nitrogen fixation and its contribution to the Global budget. Nitrogen fixing organisms: Bacteria (nodule forming and free living types), Actinomycetes, Cyanobacteria. **Mechanism of Nitrogen fixation:** Enzymology, Biochemistry and Genetics of nitrogen fixation. **Assessment of nitrogen fixation: Direct method –** Using radio isotopes. **Indirect method –** Acetylene reduction method, N 15 dilution technique, Total N by Kejeldhal method, Analysis of N-transport compounds. **Applications of Nitrogen fixation:** Biofertilization (by rhizobial inoculation and by cyanobacteria), Nitrogen fixing trees in integrated agriculture.

4.1.3.1.2 ZOOLOGY

ZOO 3521- MEDICAL ENTOMOLOGY

Introduction to medical entomology, history of medical entomology, role of the medical entomologist, arthropods as medical importance, general characteristics of medically important arthropod orders (Orders – Scorpiones, Araneae, Acari, Thysanura, Blattodea, Hemiptera, Pthiraptera, Hymenoptera, Siphonaptera and Diptera), factors involved in vector-borne diseases, general disease cycle, methods of transmission, mechanisms by which arthropod vectors transmit parasites, characteristics of the arthropod element in the transmission cycle, biology, ecology and behavior of mosquitoes, biology, ecology and behavior of vectors other than mosquitoes (sand flies, tsetse flies, house flies, black flies, house flies, biting midges, fleas, lice, bed bugs, triatomine bugs, cockroaches, ticks and mites), major vector borne diseases in Sri Lanka and the globe, vector control, prevention and control of arthropod borne diseases, vector surveillance, emergence and resurgence of vector-borne diseases, environmental changes and vector borne diseases.

ZOO 3522 - BIODIVERSITY AND PRINCIPLES OF CONSERVATION

Biodiversity and conservation: Introduction. **Systematics and Biodiversity:** Genetic Diversity, Systematics and Diversity, Species concepts, Species inventory. **Species loss:** Species extinction, Invasive species and Threatened species. **Habitats and ecosystems:** Global habitat classification, Tropical moist forests, Grasslands**,** Wetlands, Coral Reefs, Mangroves. **Uses and values of Biodiversity:** Uses of biological resources; Plant use, Animal use. **Valuing Biodiversity:** Biodiversity and Economics**. Conservation and Management of Biodiversity:** Biological conservation in context. The growth and development of conservation. Why conserve nature? Conservation in practice. **Biodiversity convention:** Current practice in conservation, The convention on biological diversity.

ZOO 3523 - ENVIRONMENTAL POLLUTION

Environmental Pollution Introduction, Air Pollution from different sources, photochemical smog; Environmental effects due to air pollution Noise Pollution; Water Pollution, Agricultural Pollution, Solid waste and its management, Hazardous Waste Pollution, Energy and the Environment, Mitigatory Measures for environmental pollution, Economic and Legal questions and Environmental Action

4.1.3.1.3 PHYSICS

PHY 3521 - ENERGY RESOURCES

Fossil Fuel and Petroleum: Origin, Mining and refining, Industries based on petroleum products. Batteries and Fuel Cells: Primary and rechargeable batteries, Electrode materials, Ionically and electronically conducting polymers, Polymer

composite materials, H_2-O_2 fuel cells, Methanol fuel cells etc. Solar Energy: Solar spectrum, Energy harvesting materials (semiconductors, dyes, chlorophyll etc.) Physics of Semiconductor Solar Cells: p-n junction solar cells, Hetero junction, Interface and thin film solar cells; Dye sensitized nano crystalline solar cells, Dye sensitized p-n solar cells, Solar radiation conversion efficiency, Photodecomposition of water, H_2 gas clean fuel. Nuclear Energy: Fission and fusion, Waste handling. Hydro power, Wind power, Tidal power**.**

PHY 3532 – STRUCTURE AND PROPERTIES OF MATERIALS

Structure: Inter-atomic bonds; Ionic, Covalent, Metallic and Van der Walls bonds, Crystal structure, Space lattices, Crystal systems, Indices of planes and directions, The common crystal lattice, Lattice imperfections; Lattice vibrations, Point defects, Line defects and plane defects, Amorphous materials, Structure determinations; X-ray, Neutron and electron diffraction, Electron in solids, Band theory of solids, The Kronig-Penny model, The effective mass of electron. **Properties:** Conducting properties of materials, Semiconductors and Super-conductors, Mechanical properties of materials; Mechanical tests, Elastic and plastic behavior, Fracture; Brittle and Ductile fracture and fatigue failure, Creep.

4.1.3.1.4 INFORMATION TECHNOLOGY

INT 3531 - ARTIFICIAL INTELLIGENCE

Artificial Intelligence: Introduction, Intelligent Agents; Problem Solving: Solving Problems by Searching, Beyond Classical Search, Adversarial Search, Genetic Algorithms, Constraint Satisfaction Problems; Knowledge and Reasoning: Logical Agents, First-Order Logic, Inference in First-Order Logic, Prolog, Classical Planning, Planning and Acting in the Real World, Knowledge Representation; Uncertain Knowledge and Reasoning: Quantifying Uncertainty, Probabilistic Reasoning, Probabilistic Reasoning over Time, Making Simple Decisions, Making Complex Decisions, Fuzzy Logic; Learning: Learning from Examples, Knowledge in Learning, Learning Probabilistic Models, Reinforcement Learning , Artificial Neural Networks; Communicating, Perceiving, and Acting; Natural Language Processing: Natural Language for Communication, Perception, Robotics.

INT 3522 - DOCUMENT MARKUP LANGUAGES

Introduction to XML , Creation of XML Documents, DTDs , Namespaces and XML Schemas, Simple API for XML (SAX), Document Object Model (DOM), Xlinks, Xpointers, Transformation of XML Documents – XSLT , Resource Description Framework – RDF , XML Applications.

4.1.3.1.5 STATISTICS

STA 3521 - REGRESSION ANALYSIS

Simple linear regression, Tests for regression coefficients, Interval estimation, Prediction, Analysis of variance approach, Diagnostic and remedial measures, Matrix approach to simple linear regression, Multiple regression, Polynomial regression. Introduction to logistic regression and nonlinear regression, Introduction to Time series Analysis.

STA 3532 - STATISTICAL QUALITY CONTROL

Some practical assignments will be given for this course. Control charts for mean, variance, range etc, Properties of control charts, Acceptance sampling procedures and consumer risks, Operating characteristic curves, Process capability analysis, Introduction to Quality assurance and acceptance control, Lot-by-Lot acceptance sampling by attributes, Acceptance procedure based on AQL, Other acceptance procedures, Continues acceptance sampling by attributes, Acceptance procedures for variable characteristics.

4.1.3.1.6 MATHEMATICS

MAT 3531 – DIFFERNETIAL EQUATIONS II

Series solution, Picard iterates, Existence and uniqueness of solution, Linear systems, Eigen vector method, Fundamental matrix solutions. First `Order Partial Differential Equations: Linear equations, Non-linear equations, Characteristics. Second Order Partial Difference Equations: Equations with constant coefficients, Equations with variable coefficients, Laplace equation, Wave equation, Diffusion equation, Use of Fourier series.

MAT 3522 - SPREADSHEET MODELLING

Mathematical Modelling: Linear programming, integer programming and non-linear programming models. **Network Modelling:** The transshipment problem, the shortest path problem, the equipment replacement problem, transportation /assignment problems, generalized network flow problems, maximal flow problems, special modeling considerations and minimal spanning tree problems. **Project Management:** Introduction, creating the project network, critical path method, project crashing, project evaluation and review technique, simulating project networks and Microsoft project.

4.1.3.2 LEVEL VI

4.1.3.2.1 BOTANY

BOT 3624 - SOIL MICROBIOLOGY

Introduction, soil microbial community, soil as a special habitat, soil microbial diversity and interactions, soil microbial communities (colonization, succession, microbiostasis), survival strategies of microorganisms, quantitative microbial ecology, substrate for colonization, disease suppressive and permissive soils, overview of rhizosphere as a special soil environment, soil microorganisms and plant health and productivity, microbial inoculations of soil, modern methods of assessment of microbiota in soil.

BOT 3625 - BIOINFORMATICS

Introduction to bioinformatics, Molecular databases, Bioinformatics and computational biology software and freeware, Sequence alignment, Phylogenetic analysis, Functional genomics, DNA microarrays, Protein structure analysis and modeling, Motif identification, Evolutionary alignments and structure prediction.

BOT 3626 - MOLECULAR BIOTECHNOLOGY

Fundamentals: Recombinant technology, synthesis, sequencing and amplification of DNA, manipulation of gene expression, Medical biotechnology: molecular diagnostics, therapeutics, novel vaccines, MABs; introduction and applications, SABs and applications, gene therapy and stem cell therapy. Agricultural and environmental biotechnology: bioremediation and biomass utilization, transgenics and micropesticides, Food biotechnology: commercial production of fructose and alcohol; improvements, synthesis of L- Ascorbic acid and amino acids. Intellectual property rights and patenting

BOT 3627 - INDUSTRIAL MICROBIOLOGY

Microbial growth processes and kinetics, fermentation technology- bioreactor/ fermentor design, solid surface fermentation, microbial product development, regulation and safety, enzymes biotechnology, biotransformation, Introduction to industrial processes, biofertilizers, bioherbicides and biopesticides production, biofuels and industrial chemicals - ethanol, amino acids, microbial polysaccharides, single cell oils, antibiotics, vaccines, vitamins, production of steroid hormones, vinegar production, biomass production, environmental applications, microbial analysis of water, water treatment processes, waste water treatment, solid waste compost production, soil remediation processes, heavy metal bioabsorption,

biomining, biosurfactants, biopolymers and bioplastics production, biosensors and applications.

4.1.3.2.2 ZOOLOGY

ZOO 3624 - FISHERIES AND AQUACULTURE MANAGEMENT

Fisheries - World fisheries; Regulation of International and national fisheries; Fisheries legislation, prohibited and restricted fish species for exportation; Fishing gear and crafts; Marine fisheries - costal, inshore and offshore fisheries, pelagic and demersal fisheries; Potential of Brackish water fisheries; Inland fisheries – riverine fisheries, reservoir fisheries; Basic principles of fisheries management. **Aquaculture:** History of world aquaculture and status of aquaculture in Sri Lanka; Site selection criteria for aquaculture; Production methods and systems; Water quality management; Culture of Fin fish and Shell fish; Fish nutrition and health management; Basic principles in preservation and processing of fish and fishery products.

ZOO 3625 - ENVIRONMENTAL IMPACT ASSESSMENT

Environmental Impact Assessment (EIA): An introduction to EIA, Legal and Institutional background, EIA process, methodologies for assessing Impacts, Quantification of environmental impacts (techniques of valuing environmental impacts) – Productivity change method, Defensive expenditure method, Replacement cost method, Travel cost method, Hedonic pricing method, Contingent – valuation method, Hedonic wage method, Implicit- trade offs method- and assessment of environmental impacts (cost – benefit analysis) Environmental Policy Analysis: Criteria for evaluating environmental policies, Decentralized polices, Command and control policies, incentive–based strategies, Public participation in environmental performance reviews and the managerial response.

4.1.3.2.3 PHYSICS

PHY 3623 - PHYSICAL OCEANOGRAPHY

Introduction, Ocean dimensions, Shapes and bottom materials, Sea-floor dimensions, Scales, Shore, Continental shelf, Deep sea bottom and sounding. Physical properties of sea water, Salinity and conductivity, Properties of pure water, Salinity and conductivity, Temperature, Density, Effect of salinity and temperature on density, Other characteristic properties, Sound in the sea, Light in the sea, Color of sea water. Waves in the ocean, Physical distribution of water, Characteristics in the oceans, Density distribution, Temperature distribution, Salinity distribution, Water, Salt and Heat budget of the ocean, Circulation and water masses of the oceans, Indian ocean,

Pacific Ocean, Equatorial circulation, Easterly boundary currants and E1-Nino, Atlantic ocean, Southern oceans, Coastal oceanography, Coastal upwelling, Estuaries.

PHY 3614 - PHYSICAL GEOLOGY

Changing earth with time, Minerals and matter, Origins and occurrence of intrusive igneous rocks, Origin and occurrence of extrusive igneous rocks, Weathering and soils, Sedimentation and sedimentary rocks, Metamorphic rocks, Absolute time and geologic time, Deformation, Earthquakes and the earth's interior, Oceans plates, Continents and drift, Movements of surface material, Underground water and running water, Energy, Useful materials.

PHY 3627 - MEDICAL PHYSICS

Introduction to Medical Physics: Review of atomic and nuclear physics: Various attenuation coefficients, X-rays: X-ray tubes and generators, X-ray production and properties, Imaging with X-rays and film processing, X-ray imaging modalities (General radiography, Mammography fluoroscopy and computed tomography), Image quality influence factors, methods of optimizing quality and image system capabilities. Introduction to nuclear imaging: gamma camera, Basics of radiotherapy: Teletherapy machines, simple treatment planning, dosimetry principles and detectors. Radiobiology: Basics of radiobiology, radiation protection. Physical basis of light: Visible light, IR, UV and Laser, Interaction of light with biological systems, transillumination and endoscopy. Lasers: Principles of laser production, types of commercially available lasers and their features, biological effects caused by lasers, Laser instrumentation, Clinical applications of lasers and laser hazards. UV radiation: Production of UV radiation, Interaction with human body, Biological effects of UV radiation. Ultrasound: Basic physics behind diagnostic ultrasound/ultrasound wave, Properties of ultrasound (US), Generation and reception of US, Imaging with US and scanning methods, types of US scanners (A-mode, B-mode, M-mode) and their features, Typical applications of US in diagnostic radiology and biological effects. Medical applications of visible light. Fiber optics: Theory and medical applications. Nuclear magnetic resonance: Nuclear magnetic resonance, Nuclear magnetic resonance pulse sequences, relaxation processes and their measurement, Nuclear magnetic image acquisition and reconstruction, MRI Instrumentation, MRI safety.

4.1.3.2.4 INFORMATION TECHNOLOGY

INT 3633 - HUMAN COMPUTER INTERACTIONS

The human, the computer, the interaction, paradigms, interaction design basics, design rules, evaluation techniques, cognitive models, communication and collaboration models, task analysis, dialog notations and design, modeling rich interaction.

INT 3624 - WEB PAGE CONSTRUCTION

Introduction to Internet Programming, Client/Server model, Browsers-Graphical and Hypertext Access to the Internet, HTTP – Hyper Text Transfer Protocol, Creating Internet World Wide Web pages, HTML – Hyper Text Markup Language, headers, body, html tags, tables, Text, graphics, sounds, video clips, multi-media, Client side image mapping, web page counters, HTML resources - html converters and tools, HTML forms programming, Building a form, Text fields and value, size, maxlength, html buttons, radio, checkboxes, prechecked, Selection lists, Introduction to CGI scripting, Action and Method - GET and POST, html form interface with cgi scripts, Automating processing such as info forms and email, Programming cgi interfacing via forms, Creating Interactive Executable Content, Advanced Java Programming, Graphic User Interface with AWT, AWT calls, Windows, dialog boxes, pop-up menus, Graphics, Using a Layout manager, Manipulating Images, Image animation, Threads - Process Management, Socket programming - client-server processing, URL Connections, Java Beans.

4.1.3.2. 5 STATISTICS

STA 3633 - STOCHASTIC PROCESS AND APPLICATIONS

Some classes of discrete-time stochastic processes, Discrete-time Markov Chains, Chapman-Kolmogorov equations, large range behavior and invariant probability, Discrete-time martingales, filtration and conditional expectations, stopping times, Markov times, Optional Sampling theorem, Optional stopping theorem, uniform integrability, martingale convergence theorem, quadratic variation process, continuous-time stochastic process, continuous-time Markov process.

STA 3624 - TIME SERIES ANALYSIS AND FORECASTING

Introduction; Objectives of time series analysis, Components of time series, Traditional method of time series analysis; Estimation of trend, seasonal effect forecasting; Auto- correlation & Auto-covariance functions Correlogram; Probability models for time series; Stationary processes; Second order stationary processes; Purely random processes; Random walk; Moving average processes; Auto-regressive processes; Mixed models (ARMA, ARIMA); Estimation of parameters; Testing adequacy; Forecasting; Exponentially smoothing forecasting procedure; Non Stationary and Seasonal Time series models (SARIMA); Box-Jenkins forecasting procedure. Introduction to non linear models and Multivariate time series modeling. Some practical assignments will be given for this course.

4.1.3.2.6 MATHEMATICS

MAT 3633 - ADVANCED COMPUTATIONAL MATHEMATICS

Numerical Solutions of Initial value Problems: Euler, Taylor Methods, Explicit Implicit Methods, Runge-Kutta Methods, Multi-Step Methods, Adam-Moulton Methods, Adam-Bashforth methods, Stability Analysis of the Methods. **Finite Difference Techniques:** Approximation of Differentials by Finite Differences, Higher order Differential Approximations, Solution of Boundary Value Problems. **Solution of Partial Difference Equations:** *Hyperbolic PDEs* - Method of Characteristics, Finite Difference Schemes, Error Analysis, *Parabolic PDEs* - Discretization in Space, Explicit Methods, Implicit Methods (Crank-Nicolson), Error Analysis, *Elliptic PDEs* - Finite Difference Method, Error Analysis, *Applications*.

MAT 3624 - COMPLEX ANALYSIS

Complex Number System: Real and Imaginary Numbers, Algebraic Operations on Complex numbers, Geometric Interpretations (Argon Diagram), Exponentials, De Moivre's Theorem, Trigonometric, Hyperbolic and logarithmic functions, Limits of Complex sequences, Continuity of Complex functions. **Analytic Functions:** Differentiation of Complex functions, Cauchy-Riemann Condition, Harmonic functions.
Complex Integration: Path in a complex Plane, Parametric representation of paths, Path Orientation, Closed paths, Simple Paths, Path Integrals, the length of a path, Index of a closed path at a point. **Cauchy's Theorem and Applications:** Cauchy's Theorem for a complex set, Cauchy's Integral Formula, Cauchy's Formula for derivatives, Liouville's Theorem, The Fundamental Theorem of Algebra. **Complex Series:** Convergence of a series, Power Series, Radius of Convergence, Taylor Series, Zeros and Poles, Laurent Series, Residues. **Cauchy's Residue Theorem and Applications:** Cauchy's Residue Theorem, Evaluation of Real integrals, Summation of real series, Rouche's Theorem, Location of Zeros of Polynomials.

5 ANNEX

For Office Use only

B.Sc. (External) Degree Programmes
Faculty of Applied Sciences
Rajarata University of Sri Lanka

APPLICATION FOR COURSE REGISTRATION

Academic year: ……

1. Name of the student: Mr./Mrs./Miss……
2. Registration No/ Index No : ……..……..…….....
3. Email Address :…….Telephone No.:……
4. Postal address: ……
5. Year : 1st / 2nd / 3rd Level : I / II/ III/ IV/ V/ VI
6. Name of the Degree Program:
   ……
7. Subject Combination* :
   ……..
8. Courses enrolled in previous Level (Give the course code):
   ……
   ……...

Course Code	Title	No of credits

Course Code	Title	No of credits

Total Credits: …….

I wish to get registered for the above mentioned course units. I declare that I have fulfilled all the prerequisites to follow these course units.

……. …….
Signature of the Student Date

For Office Use only

B.Sc. (External) Degree Programmes
Faculty of Applied Sciences
Rajarata University of Sri Lanka

APPLICATION FOR EXAMINATIONS – YEAR …….

Name of the Examination: **Year** ☐ **Level** ☐

1. Name with Initials : Mr./Mrs./Miss……

   Name in Full:…….

   …….

2. Registration No./ Index No.: ……....

3. Postal Address:……..

   ……...

4. Telephone No.:…… 5. Email Address: ……

6. Degree Programme: ……

7. Subject combination: ……..

8. Year of Admission to the University : ……..

9. Details of Previous Examinations:

S/ N	Year of the Examination(1/ 2 /3)	Level of the Examination (I / II/ III/ IV/ V/ VI)	Results (Complete/ Incomplete)

10. Are you Repeating the Examination:……

    If so, number of previous attempts : …….

11. Fees paid for Repeat Examination:

Rs. | | Date of Payment | | Receipt No. | |

(Bank receipt should be attached. Only those repeating the Examination are required to pay Examination Fees Rs. 500/= per course)

12. Particulars of Examination for which admission is sought:

S/N	Course Code	Course Title	Proper (X) / Repeat (R)

The above particulars are true and accurate to the best of my knowledge.

……
Signature of the candidate Date: ……

For Office Use only

B.Sc. (External) Degree Programmes
Faculty of Applied Sciences
Rajarata University of Sri Lanka

MEDICAL CERTIFICATE SUBMISSION FORM

1.Name of the student: Mr./Mrs./ Miss. ……

……

2.Registration No./ Index No.: ……

3.Telephone Number:…… 4. Email Address: ……..

5. Name of the examination: …….…….....

Date of the Examination	Course Code	Course Title

6. Total number of course units that you have submitted medical certificates in this examination.……

7. Total number of course units that you have submitted medical certificates in the last semester/Level examination.: ……

……
Signature of the candidate

Date: ……