BSc (Hons) Biology (Minor: Forensic Science or Marine & Coastal Environmental Science)/MSc Biology – SC516 (Subject to Approval) – SC516

1. Mission, Aims and Objectives

The new BSc (Hons)/ MSc course is a four year full-time programme that addresses an ever growing need for a highly skilled workforce with the possibility of exit at BSc (Hons) level. The course aims at providing students with a sound foundation in biology coupled with training in cutting edge bioscience areas, especially those relevant to the needs of our country. Students are encouraged to develop critical thinking and conduct research in different fields of Biosciences. Emphasis is also placed on personal development of students in the quest to acquire professional competence and a sense of responsibility within the community.

For the undergraduate programme students can choose electives from three offered lines of study: Biology, Forensic Science or Marine & Coastal Environmental Science. While the core modules provide students with a sound base in biological science, the elective modules focus on specific areas.

Biology Electives – The elective modules will cover specific topics in biology including animal and plant sciences, ecology, environmental biology, marine sciences, molecular biology and forensic science modules.

Minor Forensic Science – The core modules will ensure a good background in biology including basics in forensic biology, while the elective modules will cover selected topics in forensic science to provide students with a grounding in forensic evidence, crime scene procedures, expert witness and legal frame work, terrorism as well as drug abuse. The aim of this programme is to initiate training in forensic awareness and science. Graduates can seek employment in the fields of biology and forensic science including specialised laboratories.

Minor Marine & Coastal Environmental Science – The elective modules provide a basic understanding of how the marine & coastal ecosystems function and elaborate on the sustainable use and management of the marine & coastal environment and its resources. The many challenges of how to optimise resource yields without or with minimal compromise to the ecological integrity and to promote sustainable marine and coastal industry are dealt with. This programme gives an opportunity to acquire a basic foundation in Marine & Coastal Environmental Science with a view to developing skills for higher studies, research and entrepreneurship in the marine and coastal sectors.

The MSc programme allows a more in-depth study in applied biology and includes a research project. The course material is largely based on research papers and self-study.

Biology graduates can seek employment as Education, Scientific, Environmental and Research Officers in the public and private sectors as well as in the private seafood and marine industries.

2. General Entry Requirements for Admission to the University

As per General Entry Requirements for admission to the University for undergraduate degrees.

3. Programme Requirements

Credit at GCE ‘O’ Level including Biology, Chemistry and Mathematics.
Pass at GCE 'A' Level in Biology or equivalent.
To enrol for the MSc programme , i.e. Year 4, as and when it is on offer, the student should satisfy all the requirements for the award of BSc (Hons) Biology or possess equivalent qualifications and should have a CPA of at least 50%.

Note: Students will have to indicate if they wish to proceed to the MSc Programme at the end

of their second year of study. Students enrolled for the MSc programme will be charged tuition fees.

4. Programme Duration

	Minimum	**Maximum**
BSc (Hons) Biology (Minor: Forensic Science and Marine and Coastal Environmental Science)	6 Semesters	10 Semesters
Postgraduate Diploma in Biology	8 semesters	12 semesters
MSc Biology	8½ semesters	12½ semesters

5. Credit System

15 Hours Lectures and/or Tutorials - 1 Credit
15 Hours of Practical Work – 0.5 Credit

6. Credits per Year

Minimum 18 credits
Maximum (including retake modules): 48 credits

7. Minimum Credits Required for Awards

BSc (Hons) Degree: **105**
Postgraduate Diploma: **132** (105 + 27)
MSc Degree: **142** (105 + 27 +10)

Breakdown of Programme as follows:

		Credits from			
		Core Modules	Elective Modules	Project	Total
BSc (Hons)	Year I	Four *(6 credits each)+* Two*(3 credits each)*	Two *(3 credits each)*	--	36
	Year II	Four *(6 credits each)* *One (3 credits)*	Two *(3 credits each)*		33
	Year III	*Three (6 credits each)+* Two*(3 credits each)*	Two *(3 credits each)*	6 credits	36
	Total	**81 credits**	**18 credits**	**6 credits**	**105**
MSc	Year IV	Three *(6 credits each)+* One *(3 credits)*	Two *(3 credits each)*	10 credits	27+ 10 = **37**

Electives:
Biology- should include at least 18 credits from Biology, Forensic Science and Marine Environmental Science electives with a minimum of 12 credits from Biology electives and at least 6 credits from Year 1, 6 credits from Year 2 and 6 credits from Year 3.

Minor Forensic Science and Minor Marine and Coastal Environmental Science should include at least 18

credits from Forensic Science and Marine and Coastal Environmental Science electives respectively with at least 6 credits from Year 1, 6 credits from Year 2 and 6 credits from Year 3.

MSc and Postgraduate Diploma: should also include at least 6 credits from Year 4 Biology elective modules.

8. Assessment

Each module will carry 100 marks (i.e. expressed as %) and will be assessed as follows (unless otherwise specified):
Assessment will be based on a written examination of 3-hour duration for 6 credit modules and 2-hour for 3 credit modules. Written examinations for all modules, whether taught in semester 1 or in semester 2 or both, will be carried out at the end of the academic year (unless otherwise stated).
Except for a programme where the structure makes for other specific provision(s), for the BSc (Hons) programme, the continuous assessment will count for 25% of the overall percentage mark for the module, and for the postgraduate programme, the continuous assessment will count for 30% of the overall percentage mark for the module. Continuous assessment may be based on laboratory work, and/or assignments and should include at least 1 class test for 3 credit modules and 2 class tests for 6 credit modules.
Projects carry 6 credits for the BSc (Hons) degree. They will be carried out normally in the area of specialisation. MSc projects carry 10 credits.
An overall total of 40% for combined Continuous Assessment (CA) and Written Examination (WE) components is required to pass a module. Weighting for a particular module is indicated within parentheses in the module code.

9. Important Note

The rules as stipulated in this Programme Structure and Outline Syllabus will replace all other rules and regulations.

10. List of Modules

A. BIOLOGY CORE MODULES (81 credits BSc + 21 credits MSc = 102 credits)

Code	Module Name	Hrs/Year L+P/Visits	Credits
BIOL 1001Y(1)	Cell and Molecular Biology	75+30	6
BIOL 1002Y(1)	Evolution and Diversity of Organisms I	75+30	6
BIOL 1003Y(1)	Physiology and Biochemistry I	75+30	6
BIOL 1004Y(1)	Introduction to Environmental Science	75+30	6
BIOL 1005Y(1)	Research Methods and Skills for Biologists	37.5+15	3
CSE 1010e(1)	Introduction to IT	O.E.	3
BIOL 2001Y(3)	Evolution and Diversity of Organisms II	75+30	6
BIOL 2002Y(3)	Physiology and Biochemistry II	75+30	6
BIOL 2003Y(3)	Ecology and Environmental Monitoring	75+30	6
BIOL 2004Y(3)	Genetics and Bioinformatics	75+30	6
BIOL 2005Y(3)	Biostatistics	30+30	3
BIOL 3000Y(5)	Project		6
BIOL 3001Y(5)	Physiology and Biochemistry III	75+30	6
BIOL 3002Y(5)	Immunology, Parasitology & Applied Microbiology	75+30	6
BIOL 3003Y(5)	Conservation Biology & Environmental Management	75+30	6
BIOL 3004Y(5)	Developmental Biology	37.5+15	3
BIOL 3005Y(5)	Community and Ecosystem Ecology	37.5+15	3

BIOL 4000Y(5)	Project		10
BIOL 4001Y(5)	Cell Signalling & Advanced Developmental Biology	75+30	6
BIOL 4002Y(5)	Natural Resource Management	75+30	6
BIOL 4003Y(5)	Advanced Ecology & Conservation	75+30	6
BIOL 4004Y(5)	Genomics, Proteomics & Transcriptomics	37.5+15	3

B. BIOLOGY ELECTIVES

BIOL 1006Y(1)	Oceanography	37.5+15	3
BIOL 1007Y(1)	Pollution	37.5+15	3
BIOL 1008Y(1)	Mascarene Natural History	37.5+15	3
BIOL 2006Y(3)	Plant Biochemistry	37.5+15	3
BIOL 2007Y(3)	Functional Foods and Nutraceuticals	37.5+15	3
BIOL 2008Y(3)	Ethology	37.5+15	3
BIOL 2009Y(3)	Ecology of Invasive Species	37.5+15	3
BIOL 2010Y(3)	Aquaculture	37.5+15	3
BIOL 3006Y(5)	Food, Nutrition and Toxicology	37.5+15	3
BIOL 3007Y(5)	Mechanisms of Gene Expression	37.5+15	3
BIOL 3008Y(5)	Plant Pathology	37.5+15	3
BIOL 3009Y(5)	Ecotoxicology	37.5+15	3

C. FORENSIC SCIENCE ELECTIVES

FRSC 1001Y(1)	Introduction to Forensic Science and Crime Scene Investigation	40+10	3
FRSC 1003Y(1)	Chemical Principles for Forensic Science I	45+00	3
FRSC 2001Y(3)	Methods of Crime Detection I	35+20	3
FRSC 2002Y(3)	Methods of Crime Detection II	35+20	3
FRSC 3001Y(5)	Fires, Explosions, and Forensic Science in Court	45+00	3
FRSC 3002Y(5)	Forensic Biology and DNA Profiling	37.5+15	3

D. MARINE AND COASTAL ENVIRONMENTAL SCIENCE ELECTIVES

BIOL 1009Y(1)	Tropical Coastal Ecosystems	37.5+15	3
BIOL 1010Y(1)	Marine Biology	37.5+15	3
BIOL 2011Y(3)	Marine Biogeochemistry & Pollution	37.5+15	3
BIOL 2012Y(3)	Fish Diversity & Ecology	37.5+15	3
BIOL 2013Y(3)	Marine Resources and Biotechnology	37.5+15	3
BIOL 3010Y(5)	Coastal and Marine Management	37.5+15	3
BIOL 3011Y(5)	Fisheries Biology and Management	37.5+15	3
BIOL 3012Y(5)	Coastal Governance	37.5+15	3

E. MSc BIOLOGY ELECTIVES

BIOL 4005Y(5)	Advanced Bioinformatics and Nanotechnology	37.5+15	3
BIOL 4006Y(5)	Nutrigenomics	37.5+15	3
BIOL 4007Y(5)	Environmental Ethics & Bioethics	37.5+15	3
BIOL 4008Y(5)	Marine Environmental Protection	37.5+15	3
CHEM 4038Y(5)	Advanced Analytical Techniques	37.5+15	3
FRSC 3003Y(5)	Drugs of Abuse and Forensic Toxicology	37.5+15	3

NOTE: The list of modules is by no means exhaustive. Elective modules will be run subject to having a critical mass of students.

10. Programme Plan

A. Programme Plan – BSc (Hons) Biology

Year I

Code	Module Name	Hrs/Year L+P/Visits	Credits
CORE			
BIOL 1001Y(1)	Cell and Molecular Biology	75+30	6
BIOL 1002Y(1)	Evolution and Diversity of Organisms I	75+30	6
BIOL 1003Y(1)	Physiology and Biochemistry I	75+30	6
BIOL 1004Y(1)	Introduction to Environmental Science	75+30	6
BIOL 1005Y(1)	Research Methods and Skills for Biologists	37.5+15	3
CSE 1010e(1)	Introduction to IT	O.E.	3
ELECTIVES			
BIOL 1006Y(1)	Oceanography	37.5+15	3
BIOL 1007Y(1)	Pollution	37.5+15	3
BIOL 1008Y(1)	Mascarene Natural History	37.5+15	3

Year II

Code	Module Name	Hrs/Year L+P/Visits	Credits
CORE			
BIOL 2001Y(3)	Evolution and Diversity of Organisms II	75+30	6
BIOL 2002Y(3)	Physiology and Biochemistry II	75+30	6
BIOL 2003Y(3)	Ecology and Environmental Monitoring	75+30	6
BIOL 2004Y(3)	Genetics and Bioinformatics	75+30	6
BIOL 2005Y(3)	Biostatistics	30+30	3
ELECTIVES			
BIOL 2006Y(3)	Plant Biochemistry	37.5+15	3
BIOL 2007Y(3)	Functional Foods and Nutraceuticals	37.5+15	3
BIOL 2008Y(3)	Ethology	37.5+15	3
BIOL 2009Y(3)	Ecology of Invasive Species	37.5+15	3
BIOL 2010Y(3)	Aquaculture	37.5+15	3

Year III

Code	Module Name	Hrs/Year L+P/Visits	Credits
CORE			
BIOL 3000Y(5)	Project		6
BIOL 3001Y(5)	Physiology and Biochemistry III	75+30	6
BIOL 3002Y(5)	Immunology, Parasitology & Applied Microbiology	75+30	6
BIOL 3003Y(5)	Conservation Biology & Environmental Management	75+30	6
BIOL 3004Y(5)	Developmental Biology	37.5+15	3
BIOL 3005Y(5)	Community and Ecosystem Ecology	37.5+15	3
ELECTIVES			
BIOL 3006Y(5)	Food, Nutrition and Toxicology	37.5+15	3
BIOL 3007Y(5)	Mechanisms of Gene Expression	37.5+15	3
BIOL 3008Y(5)	Plant Pathology	37.5+15	3
BIOL 3009Y(5)	Ecotoxicology	37.5+15	3

B. Programme Plan – BSc (Hons) Biology (Minor: Forensic Science)

Year I

Code	Module Name	Hrs/Year L+P/Visits	Credits
CORE			
BIOL 1001Y(1)	Cell and Molecular Biology	75+30	6
BIOL 1002Y(1)	Evolution and Diversity of Organisms I	75+30	6
BIOL 1003Y(1)	Physiology and Biochemistry I	75+30	6
BIOL 1004Y(1)	Introduction to Environmental Science	75+30	6
BIOL 1005Y(1)	Research Methods and Skills for Biologists	37.5+15	3
CSE 1010e(1)	Introduction to IT	O.E.	3
ELECTIVES			
FRSC 1001Y(1)	Introduction to Forensic Science and Crime Scene Investigation	40+10	3
FRSC 1003Y(1)	Chemical Principles for Forensic Science I	45+00	3

Year II

Code	Module Name	Hrs/Year L+P/Visits	Credits
CORE			
BIOL 2001Y(3)	Evolution and Diversity of Organisms II	75+30	6
BIOL 2002Y(3)	Physiology and Biochemistry II	75+30	6
BIOL 2003Y(3)	Ecology and Environmental Monitoring	75+30	6
BIOL 2004Y(3)	Genetics and Bioinformatics	75+30	6
BIOL 2005Y(3)	Biostatistics	30+30	3
ELECTIVES			

FRSC 2001Y(3)	Methods of Crime Detection I	35+20	3
FRSC 2002Y(3)	Methods of Crime Detection II	35+20	3

Year III

Code	Module Name	Hrs/Year L+P/Visits	Credits
CORE			
BIOL 3000Y(5)	Project		6
BIOL 3001Y(5)	Physiology and Biochemistry III	75+30	6
BIOL 3002Y(5)	Immunology, Parasitology & Applied Microbiology	75+30	6
BIOL 3003Y(5)	Conservation Biology & Environmental Management	75+30	6
BIOL 3004Y(5)	Developmental Biology	37.5+15	3
BIOL 3005Y(5)	Community and Ecosystem Ecology	37.5+15	3
ELECTIVES			
FRSC 3001Y(5)	Fires, Explosions, and Forensic Science in Court	45+00	3
FRSC 3002Y(5)	Forensic Biology and DNA Profiling	37.5+15	3

C. Programme Plan – BSc (Hons) Biology (Minor: Marine and Coastal Environmental Science)

Year I

Code	Module Name	Hrs/Year L+P/Visits	Credits
CORE			
BIOL 1001Y(1)	Cell and Molecular Biology	75+30	6
BIOL 1002Y(1)	Evolution and Diversity of Organisms I	75+30	6
BIOL 1003Y(1)	Physiology and Biochemistry I	75+30	6
BIOL 1004Y(1)	Introduction to Environmental Science	75+30	6
BIOL 1005Y(1)	Research Methods and Skills for Biologists	37.5+15	3
CSE 1010e(1)	Introduction to IT	O.E.	3
ELECTIVES			
BIOL 1009Y(1)	Tropical Coastal Ecosystems	37.5+15	3
BIOL 1010Y(1)	Marine Biology	37.5+15	3

Year II

Code	Module Name	Hrs/Year L+P/Visits	Credits
CORE			
BIOL 2001Y(3)	Evolution and Diversity of Organisms II	75+30	6
BIOL 2002Y(3)	Physiology and Biochemistry II	75+30	6
BIOL 2003Y(3)	Ecology and Environmental Monitoring	75+30	6
BIOL 2004Y(3)	Genetics and Bioinformatics	75+30	6
BIOL 2005Y(3)	Biostatistics	30+30	3
ELECTIVES			
BIOL 2011Y(3)	Marine Biogeochemistry & Pollution	37.5+15	3
BIOL 2012Y(3)	Fish Diversity & Ecology	37.5+15	3
BIOL 2013Y(3)	Marine Resources and Biotechnology	37.5+15	3

Year III

Code	Module Name	Hrs/Year L+P/Visits	Credits
CORE			
BIOL 3000Y(5)	Project		6
BIOL 3001Y(5)	Physiology and Biochemistry III	75+30	6
BIOL 3002Y(5)	Immunology, Parasitology & Applied Microbiology	75+30	6
BIOL 3003Y(5)	Conservation Biology & Environmental Management	75+30	6
BIOL 3004Y(5)	Developmental Biology	37.5+15	3
BIOL 3005Y(5)	Community and Ecosystem Ecology	37.5+15	3
ELECTIVES			
BIOL 3010Y(5)	Coastal and Marine Management	37.5+15	3
BIOL 3011Y(5)	Fisheries Biology and Management	37.5+15	3
BIOL 3012Y(5)	Coastal Governance	37.5+15	3

D. Programme Plan – MSc Biology

Year IV

Code	Module Name	Hrs/Year L+P/Visits	Credits
CORE			
BIOL 4000Y(5)	Project		10
BIOL 4001Y(5)	Cell Signalling & Advanced Developmental Biology	75+30	6
BIOL 4002Y(5)	Natural Resource Management	75+30	6
BIOL 4003Y(5)	Advanced Ecology & Conservation	75+30	6
BIOL 4004Y(5)	Genomics, Proteomics & Transcriptomics	37.5+15	3
ELECTIVES			

BIOL 4005Y(5)	Advanced Bioinformatics and Nanotechnology	37.5+15	3
BIOL 4006Y(5)	Nutrigenomics	37.5+15	3
BIOL 4007Y(5)	Environmental Ethics & Bioethics	37.5+15	3
BIOL 4008Y(5)	Marine Environmental Protection	37.5+15	3
CHEM 4038Y(5)	Advanced Analytical Techniques	37.5+15	3
FRSC 3003Y(5)	Drugs of Abuse and Forensic Toxicology	37.5+15	3

11. Outline Syllabus
(This outline syllabus is not prescriptive and is intended to serve as a guide only.)

A. BIOLOGY CORE MODULES

BIOL 1001Y(1) - CELL AND MOLECULAR BIOLOGY
The basic structure of prokaryotic and eukaryotic animal and plant cells are introduced. The structure and function of the major cellular components and the various types of specialised cells in plants and animals are examined. This is followed by the study of the cell at the molecular level with principal focus on the membrane systems, protein dynamics and interactions, cell motility and cytoskeleton assembly, cellular compartmentalisation, nuclear transport, protein targeting and translocation and the cell's endocytotic system. Major cell biology techniques are emphasized. The molecular biology components provides a sound background on the structure and function of DNA and RNA and the relationship between genes and proteins with an in-depth discussion of the processes of DNA replication, transcription and translation in prokaryotic organisms, recombinant DNA and genetic engineering, and gene cloning. The role of molecular biology in forensic science is also discussed.

BIOL 1002Y(1) - EVOLUTION AND DIVERSITY OF ORGANISMS I
This module explores the theories of evolution mechanisms and modern evolutionary concepts. Historical perspectives and contributions of Lamarck and Darwin are also highlighted and evolving lineages, geological time scale and evolution in fossil records are covered. The module also deals with the range of organisms that inhabit the earth and the principles of classical and modern taxonomy and systematics that provide the basis for the classification of these organisms into hierarchical groupings are studied. The major groups of microorganisms, invertebrate phyla and non-vascular plants are covered with emphasis on their basic characteristics, morphology, identification and life cycles. Reference is also made to microbes and insects of forensic importance.

BIOL 1003Y(1) - PHYSIOLOGY AND BIOCHEMISTRY I
This module focuses on eukaryotic animal cells' components and functions emphasizing cellular and membrane physiological processes. In plant physiology, mineral plant nutrition is studied with focus on the importance, source, availability and role of minerals in plants. Plant cell-water relations are explored through the study of the physical and chemical properties of water and the movement of water and solutes in plants. Students are also exposed to concepts in biochemistry. The characteristics of major biochemical groups including carbohydrates, proteins, lipids and nucleic acids are explained. Emphasis is laid on structure-function relationships. Basic concepts of reaction kinetics are also introduced.

BIOL 1003Y(1) - INTRODUCTION TO ENVIRONMENTAL SCIENCE
The main focus of this module is on the components of the environment and interactions with humans. It deals with the major ecosystems and their thermodynamics, with highlights on energy flow and matter recycling. The major world biomes are covered and basic ecological concepts, urban ecology and the influence of climate change and tectonics in shaping the present are introduced. Ecological adaptations to the environment, life cycles and strategies, migration and dispersal in space and time, and survey techniques are discussed. The environmental component of the module deals with the key concepts on weather and climate science, the current major environmental issues, emphasizing on resource use, pollution and environmental impacts. Scientific approaches to environmental risk assessment, the precautionary principle, and environmental policy as key concepts for environmental sustainability are introduced.

BIOL 1005Y(1) - RESEARCH METHODS AND SKILLS FOR BIOLOGISTS

This module aims at providing basic concepts of laboratory and field techniques and their potential uses in biological sciences. Emphasis is laid on the use of standard procedures and good laboratory practice. Students are also initiated to essential research skills including the basic principles and practice of a range of research designs used in biological sciences and scientific communication of research findings. Issues of formulating a research question, independent and dependent variables (for hypothesis testing), quantitative (questionnaire design, in-depth interviewing, primary or secondary biological data analyses) and qualitative research methods (including sampling design), data collection, descriptive and inferential statistical analysis, interpretation and effective research reporting are also discussed.

CSE 1010E(1)- INTRODUCTION TO INFORMATION TECHNOLOGY

The module covers information technology (IT) and computers, stepping in the computer, input and output devices, secondary storage, programming, systems software, applications software, systems development, computer networks, the Internet, computer security, software utilities, and issues and trends in IT.

BIOL2001Y(3) - EVOLUTION AND DIVERSITY OF ORGANISMS II

The functional anatomy and life history of major invertebrate taxa are covered and selected chordate taxa are studied. The module also deals with aspects of comparative vertebrate anatomy including an evolutionary approach to the study of vertebrate systems. The module also includes a comparative study of vascular plants with emphasis on their classification, phylogeny, morphology, anatomy, life history, development and adaptations. The organisms and structures of forensic importance are also highlighted.

BIOL 2002Y(3) - PHYSIOLOGY AND BIOCHEMISTRY II

This module provides an overview and comparative study of animal physiology focussing on the understanding of how individual cells, tissues and organs are coordinated and integrated to different physiological functions of the organisms and life support systems such as the cardiovascular, respiratory, alimentary , urinary and musculo-skeletal systems. The plant physiology component deals with various aspects of plant bioenergetics and biochemistry. The mechanism of light capture and its conversion into a chemical form are studied. The photosynthetic carbon reduction cycle, the dual activity of the RUBISCO enzyme and the photorespiratory pathway are detailed. The photosynthetic adaptations of plants to stresses with special emphasis on C4 and CAM plants and leaf structure are examined. Finally the biochemistry and physiology of respiration are covered.

BIOL 2003Y(3) - ECOLOGY AND ENVIRONMENTAL MONITORING

This module builds up on the first year core ecology component and turns to species interactions. Interspecific competition is examined along with its ecological and evolutionary effects. Prey-predator interactions are covered including aspects like categories of predators, influences of herbivory and effects of predation on prey populations. Other topics include the types and ecological roles of decomposers and detritivores; parasitism and disease; symbiosis and mutualism, including culture of crops, dispersal of seeds and pollen and photosynthetic symbionts within aquatic invertebrates. The ecology part ends on a section on ecological applications at the level of population interactions such as pest control and harvest management. The module also addresses environmental monitoring strategies, the types & purposes of monitoring programmes, environmental standards, and monitoring of air, water, soil & vegetation quality. Use of environmental indicators and case studies demonstrate monitoring of environmental progress.

BIOL 2004Y(3) - GENETICS AND BIOINFORMATICS

The genetics part covers the basic principles of Mendelian genetics and methods used in genetic analysis. Patterns of inheritance and the chromosomal basis of heredity are first covered before dealing with more advanced topics such as gene interactions, sex determination and linkage and the relationship between genes and diseases. Basic concepts in human and population genetics are also covered. This module also introduces students to basic bioinformatics. Topics covered include structure of archives and information retrieval, use of basic common bioinformatics tools to analyse DNA and protein sequences, methods for predicting secondary and tertiary protein structure, the concept behind sequence alignments and the data matrices used to compute those, use of bioinformatics in molecular systematics as well as for functional genomics and gene expression profiling.

BIOL 2005Y(3) - BIOSTATISTICS
The module introduces methods for presenting and analysing biological data and designing experiments. The application of statistical ideas and methods (probability, discrete and continuous probability distributions, sampling, estimation and testing of hypothesis and correlation and linear regression models) for the design and interpretation of biological experiments are emphasised. Students are also given hands-on experience on the use of appropriate software for the analysis of biological data.

BIOL 3000Y(5) - PROJECT
The project has to be an approved topic and should be between 8000-12000 words excluding figures and tables. It is designed to test the ability of the student to undertake a piece of independent scientific research under guidance and demonstrate analytical capabilities.

BIOL 3001Y(5) - PHYSIOLOGY AND BIOCHEMISTRY III
This module deals with the control of physiological processes in different animal phyla. Topics covered include principles of homeostasis, regulatory systems such as the nervous, sensory and endocrine systems. Different aspects of plant growth and development are also dealt with. The importance, role and mechanism of action of the main phytohormones are surveyed. The responses of plants to light and other external factors and/or stimuli including plant movement and photomorphogenesis are investigated and the survival strategies of flowering plants with focus on seed dispersal, dormancy and germination are appraised. Finally, concepts of conformation and dynamics with particular reference to enzyme kinetics and biochemical regulation processes are studied. Emphasis is laid on reactions occurring during catabolism and anabolism. Topics including carbohydrate metabolism, lipid metabolism, amino acid metabolism and nucleic acid metabolism are considered.

BIOL 3002Y(5)- IMMUNOLOGY, PARASITOLOGY AND APPLIED MICROBIOLOGY
This module is an introduction to modern immunological theory and practice, including the biochemistry of antibodies, structure of antigens and antibody-antigen interactions, receptor interleukins and associated mediators of immune cell function, antigen processing and presentation, the major histocompatibility complex, organisation, re-arrangement of the immunoglobulin gene superfamily, T-cell mediated cytotoxicity and activation of the humoral immune responses. Parasitology covers the biology and pathogenesis of intestinal and urogenital protozoa, hemosomatic protozoa, trematodes, cestodes and nematodes. The applied microbiology component covers detailed aspects of bacterial pathogenesis with special emphasis on bacterial ultrastructure, mechanisms of pathogenesis and host defence mechanisms, and antibiotic therapy. Industrial microbiology is also dealt with. This includes the development and scope of microbiological industries, biomass and metabolite production and microbes in mine industries and waste treatment.

BIOL 3003Y(5) - CONSERVATION BIOLOGY AND ENVIRONMENTAL MANAGEMENT
The conservation biology component of the course focuses on understanding the value of biodiversity, its assessment, utilization and conservation. It examines species extinction and the current threats to both global and local biodiversity. Conservation strategies including aspects of restoration ecology are discussed with ample reference to case studies. International conventions, national legislation and society's perception and response to biodiversity conservation are considered. The environmental management component provides an understanding of the principles and concepts as well as the tools and techniques of environmental management for sound sustainable development. The topics covered include environmental change, environmental monitoring and evaluation, environmental indicators and sustainable development, the ecosystem approach (EA), environmental impact assessment (EIA), strategic environmental assessment (SEA), corporate environmental management and environmental auditing, environmental law and an overview of Integrated Coastal Zone Management (ICZM).

BIOL 3004Y(5) - DEVELOPMENTAL BIOLOGY
This module covers the basic concepts of developmental biology in animals including gametogenesis, fertilisation and the beginning of a new organism, its chemotaxis and fusion. Processes such as cleavage emphasising patterns and mechanisms, morphogenesis, gastrulation, the setting up of body axes in model organisms and neurulation are discussed. Model organisms to illustrate processes include examples from sea urchins, amphibians, fish, birds and mammals.

BIOL 3005Y(5) - COMMUNITY AND ECOSYSTEM ECOLOGY
This course builds up on previous core ecology components and starts with defining the nature of ecological communities and investigating community patterns in space and time. It then considers the flux of energy through ecosystems covering topics like patterns in and factors limiting primary productivity in communities before addressing the flux of matter. The influence of population interactions on community structure is covered and food webs including topics like trophic cascades, food web control and keystone species are studied. The next section covers species richness patterns arising from influences from spatially and temporally varying factors. Island biogeography and gradients of species richness are also discussed. The module ends on ecological applications at the community and ecosystem levels including management based on the theory of succession and concepts of food webs, ecosystem functioning and biological diversity.

BIOL 4000Y(5) - PROJECT
This module provides students with the opportunity to design, undertake and conduct an independent piece of research or study related to the programme under the guidance of a supervisor. The project should be between 10,000-14,000 words excluding figures and tables.

BIOL 4001Y(5) - CELL SIGNALLING AND ADVANCED DEVELOPMENTAL BIOLOGY
This module focuses on our current understanding of the intricate pathways of the cell in both plants and animals. The role of signalling in growth, differentiation and apoptosis are given particular attention. The natural sequence of developmental stages from gametogenesis and fertilisation to histogenesis is also investigated. An overview of our current knowledge of the cellular and molecular mechanisms that underlie development is provided.

BIOL 4002Y(5) - NATURAL RESOURCE MANAGEMENT
The module covers the Earth's natural terrestrial and aquatic resources and ecological systems (land/soil, freshwater, forests, oceans), policy instruments for management, conservation (wildlife, fisheries, endangered species), adaptive approaches, partnerships and stakeholder participatory management, local knowledge systems, monitoring and evaluation, and case studies. The exploration of biodiversity to detect, identify and evaluate bioactive natural products will be discussed with particular reference to agriculture and pharmaceutics. International treaties and national law regulating biodiscovery to prevent biopiracy will also be discussed.

BIOL 4003Y(5) - ADVANCED ECOLOGY & CONSERVATION
This module explores selected ecological concepts and conservation tools and projects particularly those of topical importance both globally and locally. Special emphasis is placed on analysing research and review papers dealing with current issues that are both fundamental and applied such as biogeography, species coexistence, ecosystem dynamism, homogenization of biota, *ex-situ* and *in-situ* conservation strategies and projects, ocean acidification, global warming, invasive species, role of biodiversity in ecosystem health, biological control, the human population 'problem', organic farming, ecosystem services, pollution or sustainability among other topics. The rationale for Large Marine Ecosystems (LMEs), marine parks/marine protected areas and legislation are discussed. The course incorporates reading from the primary literature.

BIOL 4004Y(5) - GENOMICS, PROTEOMICS & TRANSCRIPTOMICS
This module deals with the physical structure of the genome and higher-structure genome organisation in prokaryotes and eukaryotes, comparative genomics, genome mapping strategies, genome annotation, whole genome sequencing strategies, methods for probing the transcriptome, EST databases, SAGE, Differential Display methods, large-scale gene expression profiling using microarray technology, biochemical and computational approaches to studying the proteome, and commonly-used methods in functional genomics.

B. BIOLOGY ELECTIVES

BIOL 1006Y(1) - OCEANOGRAPHY
The module describes basic physical, chemical and biological oceanic processes. The factors affecting oceanic processes, the biology and ecology of organisms inhabiting the major divisions of the oceanic environment are discussed. Other topics include primary and secondary production together with estimation methodology. Composition of seawater, estimation of water quality and biogeochemical cycles in the oceans are addressed. Ocean currents, tsunamis, eddies, waves and tides, and air /sea interaction are also covered.

BIOL 1007Y(1) - POLLUTION
Many of our activities have undesirable effects on the environment. The module deals with the types of hazard, risks from pollutants, hazardous wastes, soil, water (including marine pollution) and air pollution, the major classes of contaminants and their impacts, and pollution prevention & control.

BIOL 1008Y(1) - MASCARENE NATURAL HISTORY
The module gives an account of the formation of the Mascarene islands, their main abiotic characteristic features, the history of scientific exploration, geology and soils, climate, forest ecology, marine and coastal ecosystems, plants, invertebrates, fish, reptiles and amphibians, birds and mammals. The historical, current and likely future threats to the region's unique biodiversity and the corresponding conservation efforts are examined and discussed. The module includes visits and field trips in Mauritius.

BIOL 2006Y(3) - PLANT BIOCHEMISTRY
This module deals with the chemical and structural constituents of plants, their synthesis, their contribution to key metabolic processes and the regulation of their biosynthesis. Emphasis is laid on biomolecules including carbohydrates, amino acids, proteins, lipids and nucleic acids and an overview of the main secondary metabolite classes is provided. Structure-function relationships are stressed.

BIOL 2007Y(3) - FUNCTIONAL FOODS AND NUTRACEUTICALS
The module examines the relation of functional foods and nutraceuticals (FFN) to foods and drugs. The safety and efficacy of individual FFN products, and the regulatory issues that influence the development and commercialisation of FFN in global markets are emphasised.

BIOL 2008Y(3) - ETHOLOGY
The module introduces the study of animal behaviour with a brief historical background. Topics covered include evolution of behaviour highlighting its development and genetics. The module also deals with behavioural mechanisms including animal perception, animal and its environment, emphasising on topics such as biological time-keeping, and animal learning. Some examples of social interactions and understanding of complex behaviour such as ritualisation and communication are also given.

BIOL 2009Y(3) - ECOLOGY OF INVASIVE SPECIES
After placing invasion ecology in context, this module analyses transport vectors and pathways of invasive species, trends in number of invaders, propagule pressure and biotic resistance to invaders, and discusses the role of disturbance in facilitating invasions. It then analyses the influence of biotic interactions in determining establishment success and geographical spread of invasive species before discussing their ecological impacts and considering their evolution in their introduced range. The course ends on aspects of prediction, risk assessment and management of species invasions.

BIOL 2010Y(3) - AQUACULTURE
The purpose of the module is to highlight the principles and practice of aquaculture. The principles of aquaculture are highlighted with focus on selection of organisms for culture, the design and construction of culture systems. It also includes topics such as reproduction techniques, nutrition and diseases, farm economics and management. The practice of aquaculture is discussed using representative freshwater and marine commercially cultured organisms emphasising on the culture systems, spawning and fry production, grow-out and harvesting.

BIOL 3005Y(5) - FOOD, NUTRITION AND TOXICOLOGY
The topics covered are: the role of foods, herbals and nutraceuticals as sources of antinutrients, natural toxins and environmental contaminants; the impact of toxic exposures on nutritional status; the impact of nutritional status on safe metabolism of toxins, and the use of this knowledge in the design of functional foods; assessing the risk of genetically modified foods and radioactive contamination of a food supply.

BIOL 3006Y(5) - MECHANISMS OF GENE EXPRESSION
Topics covered include prokaryotic and eukaryotic transcriptional control systems, structure and function of the components of the various transcriptional machineries, molecular interactions between general and promoter-specific transcription factors, molecular events governing initiation, elongation and termination of transcripts, and the effect of chromatin structure in regulation of gene expression.

BIOL 3007Y(5) - PLANT PATHOLOGY
This module provides an overview of the different types of plant diseases with emphasis on the causative agents. The major groups of plant pathogens namely fungi, bacteria, viruses and nematodes are dealt with. Plant diseases, biotic and abiotic, their diagnosis, and their management are studied. Other topics covered are disease cycles, plant disease epidemiology, disease forecasting, and the principles and practices of plant disease management including pesticides and pest control. Regulation of biotechnology for plant protection is also introduced.

BIOL 3008Y(5) - ECOTOXICOLOGY
The module covers the fundamentals of ecotoxicology. The historical and current need for ecotoxicology are discussed and the scientific, technological and practical goals are highlighted. An introduction to major classes of contaminants is given. The fate of the contaminants is discussed with focus on bioaccumulation including uptake, biotransformation, detoxification, elimination and accumulation and factors influencing it. The module also deals with toxicant effects from molecular to various levels of biological organization. Sublethal and lethal levels of toxicants are also discussed highlighting changes in development, reproduction and behaviour. Some examples of ecotoxicological testing, dose–response models and metameters used for risk assessment are also covered.

C. FORENSIC SCIENCE ELECTIVES

FRSC 1001Y(1)) - INTRODUCTION TO FORENSIC SCIENCE AND CRIME SCENE INVESTIGATION
The role and core concepts of forensic science is introduced. The historical development of forensic science is also surveyed. Students are provided with an integrated approach to criminal investigations starting from the scene of crime to the forensic laboratory. Emphasis is laid on crime scene examination and interpretation, evaluation and documentation of scientific evidence. Issues of quality control and continuity of evidence are introduced. The practical considerations of the preservation of the crime scene, as well as the recovery, packaging, labelling and preservation of evidence are highlighted.

FRSC 1003Y(1) - CHEMICAL PRINCIPLES FOR FORENSIC SCIENCE I
The basic principles of qualitative and quantitative chemical analysis are covered. Students are introduced to fundamental concepts such as units and concentrations, errors and significant figures, analytical precision and accuracy, selectivity and sensitivity, precision glassware, calibration methods and sampling and sample preparation. Principles of analytical measurements are provided through study of analytical techniques based on atomic and molecular spectroscopy and basic separation techniques.

FRSC 2001Y(3) - METHODS OF CRIME DETECTION I
This module is designed to introduce students to methods used in the analysis of some commonly encountered evidence at scenes of crime. Trace and contact evidence including paint, fingerprints, footwear impressions, glass and tool-marks are studied. Identification and analysis of paint, footwear, glass, toolmarks are carried out. The individuality of fingerprints is discussed, along with methods of fingerprint classification and fingerprint analysis and identification. In addition, the forensic examination and handling of questioned documents, inks and indented writing are dealt with.

FRSC 2002Y(3) - METHODS OF CRIME DETECTION II
This module builds up on the crime detection I module. The forensic examination of hairs and fibres mainly by microscopy are addressed and related to their relevance in solving crimes. The principles of blood spatter creation, and blood stain interpretation as it pertains to biological evidence is highlighted. The forensic study of firearms and ammunitions, including their classification, examination and interpretation of ensuing physical evidence are also addressed.

FRSC 3001Y(5) - FIRES, EXPLOSIONS AND FORENSIC SCIENCE IN COURT
Students are apprised with the principles and techniques for investigating and processing fire scenes and explosive crime scenes. The underpinning science, theory and the principal methods of detection and analysis of fire accelerants and incendiary devices are provided. The different classes of explosives, the types of detonators, the safe collection and examination of evidence from scenes of explosions and the investigation of post-explosion scenes are studied. Finally, students are initiated to the legal framework within which forensic scientists operate, with special reference to the existing Mauritian legal framework.

The role and responsibilities of an expert witness in court case involving evidence of forensic value is also covered.

FRSC 3002Y(5) - FORENSIC BIOLOGY AND DNA PROFILING
The module covers different aspects of forensic biology to be selected from the following. Presumptive testing of body fluids of forensic relevance such as blood, semen and saliva with emphasis on the evidential information that can be obtained from them. The theory and practice of DNA profiling and genetic analysis and statistical and computerised analysis of the profiles. The fundamental principles and investigative techniques of forensic anthropology. The role and use of entomology in post mortem examinations. Other topics in forensic biology.

D. MARINE AND COASTAL ENVIRONMENTAL SCIENCE ELECTIVES

BIOL 1009Y(1) - TROPICAL COASTAL ECOSYSTEMS
The module deals with tropical coastal ecosystems, with emphasis on shore ecology (rocky and sandy shores, coastal wetlands and estuaries) highlighting the environmental conditions and adaptations of shore organisms. The three critical ecosystems that are discussed include mangroves, seagrass beds and coral reefs. Focus is placed on the component organisms and ecosystem functioning. Coastal survey techniques are introduced with relevant local examples.

BIOL 1010Y(1) - MARINE BIOLOGY
The module introduces the marine environment and its major subdivisions, aimed at providing knowledge on the biology and ecology of marine organisms, primary and secondary production, and estimation methodologies. Emphasis is on plankton and plankton communities, factors affecting productivity, benthic communities, and oceanic nektons including cetaceans (dolphins, eels, sea birds, sea turtles and whales) and their life history, population and behaviour, and human threats.

BIOL 2011Y(3) - MARINE BIOGEOCHEMISTRY & POLLUTION
This module deals with material cycles emphasizing on carbon, nitrogen, phosphorus, silicon and sulphur budgets, and characteristics and degradation of organic matter in the ocean. It provides an overview of aquatic and solution chemistry (redox processes, pH and carbonates), acid-base equilibria in natural waters, metal speciation, water quality, nutrient fluxes and cycling, hydro-geochemistry, and sediment characteristics and chemistry. The marine pollution aspect addresses the types, sources and fates of marine pollutants, pollutant transport and transformation, economic losses and effects on living marine resources and humans. Other important topics include eutrophication, harmful algal blooms, marine biofouling, coastal water quality monitoring and assessment, waste water treatment and bioremediation, oil pollution and contingency planning.

BIOL 2012Y(3) - FISH DIVERSITY & ECOLOGY
The module gives an overview of the diversity and systematic position of fish with emphasis on characters of the main groups of Agnathans, Chondrichytes, Sarcopterygii and Actinopterygii. It deals with adult fish morphological characters (fish body parts including scales and fin rays), larval fish morphology and larval fish taxonomy. Focus is also placed on fish viscera such as gills, air bladder and digestive tract as well as osteological and muscle structures. Ecological aspects address feeding, behaviour, life history strategies, habitat adaptations and biotic interactions in fish.

BIOL 2013Y(3) - MARINE RESOURCES AND BIOTECHNOLOGY
The module provides an introduction to marine resources including mineral, biological and energy resources (e.g. tidal, OTEC, wave, deep water currents). Resource exploitation perspectives and the law of the sea are addressed. The biotechnology component introduces principles and fundamental techniques of genetic engineering, biotechnological applications in aquaculture and marine microbial biotechnology. The potential for producing new pharmaceuticals, biomaterials and other products including bioremediation and bioprocessing are examined.

BIOL 3010Y(5) - COASTAL AND MARINE MANAGEMENT
Human pressures on coastal resources are compromising many marine systems. Habitat loss remains the biggest threat to coastal and marine systems; other threats include habitat degradation via point source and land-based sources of pollution, climate change impacts, invasive species, and changes to watersheds. In this

module, issues and mechanisms of marine conservation are discussed e.g. spatial management (through zoning, marine protected areas, marine parks, Large Marine Ecosystems), fisheries management, biodiversity conservation strategies and restoration, integrated coastal zone management, policy, treaties and legislation.

BIOL 3011Y(5) - FISHERIES BIOLOGY AND MANAGEMENT
The module addresses fished species (fish and other commercial invertebrates), their reproductive biology, life history and distribution. The types of capture fisheries, fishing technology and gears are introduced. The population structure of fish in space and time, with emphasis on recruitment, methods of stock assessment, different techniques for obtaining stock identity and dynamics, abundance, and catch and effort data are examined. Fisheries management objectives, strategies and actions, and case studies are discussed.

BIOL 3012Y(5) - COASTAL GOVERNANCE
This module focuses on the integrated, holistic approach to managing the coastal area. It deals with the special nature of the coastal zone, the resources, the pressures exerted on the coastal zone, human activities, conflicts and the scope for management. Coastal pressures and critical management issues are discussed in detail with emphasis on objectives, concepts, principles, tools and techniques for integrated coastal zone management. Policy and legislation, governance jurisdiction, addressing significant problems and case studies are reviewed. Governance profiles of the coastal areas, together with regional areas, are investigated to ensure long-term sustainability of the coastal ecosystem.

E. MSc BIOLOGY ELECTIVES

BIOL 4005Y(5) - ADVANCED BIOINFORMATICS AND NANOTECHNOLOGY
This Advanced Bioinformatics module combines formal lectures with hands-on sessions in which students work to solve a series of higher-level problem sets covering common scenarios in the acquisition, validation, integration, analysis and visualization of biological data. Complex applications applied to drug discovery, microarray technology and molecular modeling are covered. Basic principles of nanotechnology are also introduced, such as visualisation, manipulation and characterisation at the nanoscale, nanomanipulation, nanolithography, nanocomposites and applications of nanotechnology in energy, informatics and medicine.

BIOL 4006Y(5) - NUTRIGENOMICS
This module discusses controversial and emerging topics in Human Biology and Nutritional and Nutraceutical Sciences as it relates to nutrigenomics. Topics include: nutrition in relationship to genetic diseases, development of genomic analytical techniques and effects of food substances on gene expression and cellular metabolism. The impact of genetically modified foods on health is also examined at the molecular level and ethical aspects are considered.

BIOL 4007Y(5) - ENVIRONMENTAL ETHICS & BIOETHICS
This module provides students with an understanding of the range of perspectives on human responsibility to the environment and critically examines moral arguments about environmental obligations. The main approaches to environmental ethics are covered, including anthropocentrism, animal liberation, rights of nature, Gaia-Centrism and, Biophilia. Major issues in environmental ethics such as Moral Psychology (Attitudes toward the Environment), Responsibility toward the Environment, The Significance of Wilderness, Environmental Policy-Making, and the Duty to Posterity are also discussed. In Bioethics, students address the moral principles and social policies around some of the major scientific advances in this twenty-first century, such as cloning of animals, genetically modified agricultural crops, genetically-engineered animals, new options for human reproduction, genetic diagnosis and screening, euthanasia, and abortion.

BIOL 4008Y(5) - MARINE ENVIRONMENTAL PROTECTION
The Law of the Sea Convention has given coastal states extensive and comprehensive rights and obligations over marine resources. Awareness of the economic potential of marine resources and the impacts of conflicting usage upon them are critical. This course examines the need for decisions to protect the marine environment by addressing the following themes: the major biological, chemical and physical oceanographic processes which control the marine resources, the environmental impacts of marine resource exploitation and their assessment, and development of policy decisions and practices to curb down the current global negative trends in ocean degradation.

CHEM 4038Y(5) - ADVANCED ANALYTICAL TECHNIQUES

This module addresses the principles that underpin a wide range of analytical techniques commonly encountered in biosciences. Students are familiarised with the fundamental principles, instrumentation aspects as well as analytical applications of modern separation techniques as well as advances in microscopy and mass spectrometry. Topics to be covered include sampling and sample preparation, good laboratory practice, liquid extraction and solid phase extraction, fundamentals and application of spectrophotometry, chromatography, atomic and molecular spectroscopy, infra-red and Raman spectroscopy, mass spectrometry, X-ray methods, thermal methods and electroanalytical methods. Traditional and modern extraction procedures are also compared.

FRSC 3003Y(5) - DRUGS OF ABUSE AND FORENSIC TOXICOLOGY

The role of Forensic Science in the investigation of suspect substances, drugs of abuse and toxic agents related to crime is highlighted. The major classes of drugs, alcohols and toxic agents are surveyed and an overview their pharmaco/toxico dynamic actions in the body and xenobiotic metabolism given. Their detection and identification in both fresh and aged body fluids, tissues and organs using a range of analytical chemical techniques in order to generate informed conclusions are studied and assessed.

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