

DEPARTMENT OF LIFE SCIENCES

PROGRAMME OVERVIEW 2016/17 Academic Year

The Department of Life Sciences curriculum structure (as listed below) includes: two complete BSc programmes, five single majors and four minors. The Biology with Education Option has been revised and is still being offered as part of the list of Options offered by the Faculty. Having revised the BSc Programmes, Majors and Minors in the 2010/11 Academic Year, presented new second year courses in the 2011/12 Academic Year and new final year courses for 2012/2013, the curriculum remains essentially unchanged for the 2014/15 academic year, with a few revisions.

The BSc Programmes, Majors and Minors offered by the Department of Life Sciences are as follows:

BSC PROGRAMMES

1. BSc Environmental Biology »
2. BSc Experimental Biology »

MAJORS

3. Major in Animal Biology »
4. Major in Horticulture »
5. Major in Marine Biology »
6. Major in Plant Biology »
7. Major in Terrestrial and Freshwater Ecology »

MINORS

8. Minor in Animal Biology »
9. Minor in Coastal Ecosystems »
10. Minor in Plant Biology »
11. Minor in Terrestrial and Freshwater Ecology »

OPTION

12. Option: Biology with Education »

DEPARTMENT OF LIFE SCIENCES

LIST OF UNDERGRADUATE COURSES

2016/17 Academic Year

CODES	TITLES	CREDIT	SEMESTER OFFERED	LEVEL	PRE-REQUISITES
PRELIMINARY LEVEL					
BIOL0011	PRELIMINARY BIOLOGY I	6-PC	1	0	CSEC Biology or equivalent
BIOL0012	PRELIMINARY BIOLOGY II	6-PC	2	0	CSEC Biology or equivalent
LEVEL 1					
BIOL1017 AND BIOL1018	CELL BIOLOGY MOLECULAR BIOLOGY AND GENETICS	3 3	1	1	A pass in one of the following: Preliminary Biology I and II (BIOL0011 and BIOL0012) or CAPE Unit 1 & 2 ('A' level) Biology or equivalent
BIOL1262 AND BIOL1263	LIVING ORGANISMS I LIVING ORGANISMS II	3 3	2	1	A pass in one of the following: Preliminary Biology I and II (BIOL0011 and BIOL0012) or CAPE Unit 1 & 2 ('A' level) Biology or equivalent

LEVEL 2 AND 3

Life Sciences Advanced courses are all 3 credits and will be offered as outlined in the tables below.

Pre-requisites for all Life Sciences Level 2 courses are:

BIOL1017, BIOL1018, BIOL1262, BIOL1263 or equivalent, **and** a minimum of 24 credits from Level 1, 18 of which must be FST courses.

LEVEL 2 COURSES (3 credits each)

	6 Week Courses	12 Week Courses	6 Week Courses
Semester 1 Week 1-6	BOTN2401 Plant Form and Systematics	BIOL2401 Research Skills and Practices in Biology	BIOL2407- Biological Evolution
Semester 1 Week 7-12	BIOL2406 Eukaryotic Microbiology		BIOL2402- Fundamentals of Biometry
Semester 2 Week 1-6	BIOL2404 Molecular & Population Genetics	BIOL2403 Principles of Ecology	ZOOL2403- Maintenance Systems in Animals
Semester 2 Week 7-12	BOTN2402 Physiology of Plants		ZOOL2404- Coordination and Control in Animals

BIOL2408- Diving for Scientists. Courses in **bold font** are core to all Life Sciences Programmes, Majors and Minors.

LEVEL 3 COURSES (3 credits each)

<u>A1</u> <u>Tues/Thurs</u> <u>Mon/Fri</u>	<u>A2</u> <u>Tues/Thurs</u> <u>Mon/Fri</u>	<u>B1</u> <u>Friday/</u> <u>Monday</u>	<u>B2</u> <u>Friday/</u> <u>Monday</u>	<u>C1</u> <u>Monday</u>	<u>C2</u> <u>Mon/</u> <u>Fri</u>	<u>EVENINGS</u> <u>Tues/Wed</u>
BOTN3405 Plant Eco- Physiology	ZOOL3407 Human Biology	ZOOL3404 Parasitology	ZOOL3409 Aquaculture	BIOL3407 Oceanography	BIOL3403 The Biology of Soil	AGSL2401 Management of Soils
BOTN3402 Introduction to Plant Breeding	ZOOL3405 Vertebrate Biology	ZOOL3403 Entomology	BOTN3406 Tropical Forest Ecology	BIOL3408 Coastal Ecosystems	BOTN3403 Fundamentals of Horticulture	AGSL3001 Irrigation and Drainage Technology
ZOOL3407 Human Biology	ZOOL2402 Animal Physiology	BIOL3405 Pest Ecology & Management	BIOL3406 Freshwater Biology	ZOOL3408 Sustainable Use of Fish. Resources	BIOL3404 Virology	AGCP3407 Postharvest Technologies
BOTN3401 Principles of Plant Biotechnology	BIOL3410 Water Pollution Biology	ZOOL3406 Immunology	BIOL3400 Issues in Conservation Biology	BIOL3409 Caribbean Coral Reefs	BOTN3404 Economic Botany	AGCP3406 Fruit Crop Production
EVENING SCHEDULE (AG** COURSES) L1, L2- Mon: 5p.m. – 7p.m.; L3-Thurs: 5p.m. – 6p.m. Tutorial – Thurs: 6p.m. – 7 p.m.; Practical 1- Tues: 5p.m. – 8 p.m.; Practical 2- Wed: 5p.m. – 8 p.m. ZOOL3410 Advanced Topics in Animal Science Mon- 5:30 – 7:30, Wed- 5:30 – 6:30 BIOL3412-Internship; BIOL3413- Biology Project						

**LIFE SCIENCES BSc PROGRAMMES,
MAJORS, MINORS**

**BSC IN ENVIRONMENTAL BIOLOGY
(63 Advanced Credits)**

Programme Overview

The BSc in Environmental Biology is designed to provide a detailed understanding of the concepts, strategies and practices available to scientifically investigate and analyse species, communities and ecosystems towards the successful monitoring, management and development of strategies for sustainable use of these systems.

Programme Outline:

The **BSc in Environmental Biology** cannot be taken with any other major or minor because of the number of credits required which are as follows:

LEVEL 1: A minimum of **24** credits from Level 1, 18 of which must be FST courses and must include:

BIOL1017 Cell Biology
BIOL1018 Molecular Biology and Genetics
BIOL1262 Living Organisms I
BIOL1263 Living Organisms II

LEVEL 2: A total of **30** credits from Level 2 which must include:

BIOL2401 Research Skills and Practices in Biology
BIOL2402 Fundamentals of Biometry
BIOL2403 Principles of Ecology
BIOL2404 Molecular & Population Genetics
ZOOL2403 Maintenance Systems in Animals
ZOOL2404 Coordination and Control in Animals
BIOL2407 Biological Evolution
BOTN2401 Plant Form and Systematics
BOTN2402 Physiology of Plants
BIOL2406 Eukaryotic Microbiology

LEVEL 3: A total of **33** credits from the following which must include BIOL3412 Internship OR BIOL3413 Biology Project:

BIOL3400 Issues in Conservation Biology
BIOL3406 Freshwater Biology
BIOL3407 Oceanography
BIOL3408 Coastal Ecosystems
BIOL3409 Caribbean Coral Reefs
BOTN3405 Plant Ecophysiology
ZOOL3408 Sustainable use of Fishable Resources
ZOOL3409 Aquaculture
BOTN3407 Tropical Forest Ecology OR ZOOL3403 Entomology
BIOL3413 Biology Project **OR** BIOL3412 Internship
Plus one other Life Sciences advanced course

**BSC. EXPERIMENTAL BIOLOGY
(63 Advanced Credits)**

Programme Overview

The BSc Experimental Biology is designed to expose students to a wide range of laboratory based courses which reflect the variety of specializations available within the subject of Biology. These include areas as diverse as Plant Biotechnology, Parasitology and Vertebrate Biology. The programme is intended to appeal to those students seeking a degree which emphasizes a laboratory-based experimental approach to Biology with concomitant expertise in a wide range of laboratory techniques.

Programme Outline:

The BSc in Experimental Biology cannot be taken with any other major or minor because of the number of credits required which are as follows:

LEVEL 1: A minimum of 24 credits from Level 1, 18 of which must be FST courses and must include:

BIOL1017 Cell Biology
BIOL1018 Molecular Biology and Genetics
BIOL1262 Living Organisms I
BIOL1263 Living Organisms II

LEVEL 2: A total of 30 credits from Level 2

BIOL2401 Research skills and practices in Biology
BIOL2402 Fundamentals of Biometry
BIOL2403 Principles of Ecology
BIOL2404 Molecular & Population Genetics
ZOOL2403 Maintenance Systems in Animals
ZOOL2404 Coordination and Control in Animals
BIOL2407 Biological Evolution
BOTN2401 Plant Form and Systematics
BOTN2402 Physiology of Plants
BIOL2406 Eukaryotic Microbiology

LEVEL 3: At least 33 credits of final year courses chosen from the three groups of courses below with a minimum of 3 credits from any one group, inclusive of BIOL3412 Internship OR BIOL3413 Biology Project.

GROUP A
BIOL3402 Biology of Fungi (not offered 2016-2017) BIOL3403 The Biology of Soil BIOL3404 Virology BIOL3405 Pest Ecology and Management
GROUP B
BOTN3401 Principles of Plant Biotechnology BOTN3402 Introduction to Plant Breeding BOTN3403 Fundamentals of Horticulture BOTN3404 Economic Botany BOTN3405 Plant Ecophysiology
GROUP C
ZOOL3403 Entomology ZOOL3404 Parasitology ZOOL3405 Vertebrate Biology ZOOL3406 Immunology ZOOL3407 Human Biology

Plus BIOL3412 Internship OR BIOL3413 Biology Project.

MAJOR IN ANIMAL BIOLOGY (39 Advanced Credits)

Programme Overview

Animal Biology is the study of the huge variety of animal life on Earth. As a Department of Life Sciences with a central focus on the biotic environment there is a need to adopt a theoretical and practical approach to the biology of animals, how animals integrate into the environment, and how environmental change may affect animal populations in the future. The major examines the evolutionary origins of the various groups of animals, their structure, physiology, behaviour, interspecific associations, defence mechanisms, ecology and conservation.

Programme Outline

LEVEL 1: A minimum of 24 credits from Level 1 courses, and must include:

BIOL1017 Cell Biology
BIOL1018 Molecular Biology and Genetics
BIOL1262 Living Organisms I
BIOL1263 Living Organisms II

LEVEL 2 A minimum of 21 credits which must include:

- BIOL2401 Research Skills and Practices in Biology
- BIOL2402 Fundamentals of Biometry
- BIOL2406 Eukaryotic Microbiology
- BIOL2407 Biological Evolution
- BIOL2403 Principles of Ecology
- BIOL2404 Molecular & Population Genetics
- ZOOL2403 Maintenance Systems in Animals
- ZOOL2404 Coordination and Control in Animals

LEVEL 3 A minimum of 15 credits which must include:

- ZOOL3403 Entomology
- ZOOL3404 Parasitology
- ZOOL3405 Vertebrate Biology
- ZOOL2402 Animal Physiology
- ZOOL3410 Advanced Topics in Animal Science

And 3 credits from any of the following:

- BIOL3404 Virology
- BIOL3405 Pest Ecology and Management
- ZOOL3406 Immunology

MINOR IN ANIMAL BIOLOGY (15 Advanced Credits)

Programme Overview

The minor provides general training in animal biology in the areas of ecology, genetics and evolution, cellular/molecular biology and physiology, systematics and morphology, invertebrate and vertebrate organisms.

Programme Outline

LEVEL 1: A minimum of 24 credits from Level 1 courses, and must include:

- BIOL1017 Cell Biology
- BIOL1018 Molecular Biology and Genetics
- BIOL1262 Living Organisms I
- BIOL1263 Living Organisms II

LEVEL 2 6 credits as follows:

- ZOOL2403 Maintenance Systems in Animals
- ZOOL2404 Coordination and Control in Animals

LEVEL 3 9 credits from any of the following:

- BIOL3405 Pest Ecology & Management
- ZOOL2402 Animal Physiology
- ZOOL3403 Entomology
- ZOOL3404 Parasitology
- ZOOL3405 Vertebrate Biology
- ZOOL3406 Immunology

MAJOR IN PLANT BIOLOGY (39 Advanced credits)

Programme Overview

Plant Sciences is the scientific study of plant life and development. The Plant Biology major examines selected aspects of plant sciences through practical and theoretical studies to foster the desire for continued exploratory investigations into biological solutions to real-world problems.

Programme Outline

LEVEL 1: A minimum of 24 Credits from Level 1, 18 of which must be FST courses and include:

BIOL1017	Cell Biology
BIOL1018	Molecular Biology and Genetics
BIOL1262	Living Organisms I
BIOL1263	Living Organisms II

LEVEL 2 A minimum of 18 credits which must include:

BOTN2401	Plant Form and Systematics
BOTN2402	Physiology of Plants
BIOL2401	Research Skills and Practices in Biology
BIOL2402	Fundamentals of Biometry
BIOL2403	Principles of Ecology
BIOL2404	Molecular & Population Genetics

LEVEL 3 A minimum of 15 credits which must include:

BIOL3403	The Biology of Soil
BOTN3402	Introduction to Plant Breeding
BOTN3404	Economic Botany
BOTN3405	Plant Ecophysiology
BOTN3406	Tropical Forest Ecology

And 6 credits from any of the following:

BOTN3401	Principles of Plant Biotechnology
BOTN3403	Fundamentals of Horticulture
BIOL3404	Virology
BIOL3405	Pest Ecology & Management

MINOR IN PLANT BIOLOGY (15 Advanced Credits)

Programme Overview

Students will be exposed to the fundamental principles in the plant sciences through practical and theoretical studies of the interrelationships between plants and their environment and the anatomy, morphology and physiology of higher plants.

Programme Outline

LEVEL 1: A minimum of 24 Credits from Level 1, 18 of which must be FST courses and include:

BIOL1017	Cell Biology
BIOL1018	Molecular Biology and Genetics
BIOL1262	Living Organisms I
BIOL1263	Living Organisms II

LEVEL 2 9 credits as follows:

BOTN2401	Plant Form and Systematics
BOTN2402	Physiology of Plants
BIOL2403	Principles of Ecology

Level 3 6 credits from any of the following:

BOTN3401	Principles of Plant Biotechnology
BOTN3402	Introduction to Plant Breeding
BOTN3403	Fundamentals of Horticulture
BOTN3404	Economic Botany
BOTN3405	Plant Ecophysiology

MAJOR IN HORTICULTURE (42 Advanced credits)

Programme Overview

The Horticulture Major is designed to provide students with a background in general horticultural science with special emphasis on the production of tropical and subtropical crops. The selection of courses in the programme provides the

student with both the theoretical and the hands-on approach to learning the subject matter. In addition to the specialized courses offered, the programme is based on a solid core of traditional plant sciences courses.

Programme Outline

LEVEL 1: 12 credits as follows:

BIOL1017	Cell Biology
BIOL1018	Molecular Biology and Genetics
BIOL1262	Living Organisms I
BIOL1263	Living Organisms II

A total of **42** Advanced credits which must include:

LEVEL 2 21 credits as follows:

AGSL2401	Management of Soils
BIOL2401	Research Skills and Practices in Biology
BIOL2402	Fundamentals of Biometry
BIOL2403	Principles of Ecology
BIOL2404	Molecular and Population Genetics
BOTN2401	Plant Form and Systematics
BOTN2402	Physiology of Plants

LEVEL 3 17 credits as follows:

AGBU3008	Internship (4 credits)
AGBU3012	Project (4 credits)
AGCP3406	Fruit Crop Production
AGCP3407	Postharvest Technology
AGLS3001	Irrigation and Drainage Technology

And 6 credits from the following:

BOTN3402	Introduction to Plant Breeding
BOTN3403	Fundamentals of Horticulture
BIOL3405	Pest Ecology and Management

MAJOR IN MARINE BIOLOGY (39 Advanced Credits)

Programme Overview

The major in Marine Biology is designed to give students hands-on exposure to the study of the marine environment and its organisms. It enables students to gain detailed knowledge of the marine ecosystem so as to provide understanding of the concepts, strategies and practices available to scientifically investigate, analyse and manage marine species and communities.

Programme Outline

LEVEL 1: A minimum of 24 credits from Level 1, 18 of which must be FST courses and must include:

BIOL1017	Cell Biology
BIOL1018	Molecular Biology and Genetics
BIOL1262	Living Organisms I
BIOL1263	Living Organisms II

LEVEL 2 21 credits as follows:

BIOL2401	Research Skills & Practices in Biology
BIOL2402	Fundamentals of Biometry
BIOL2403	Principles of Ecology
BOTN2401	Plant Form & Systematics
BIOL2406	Eukaryotic Microbiology
ZOOL2403	Maintenance Systems in Animals
ZOOL2404	Coordination and Control in Animals

LEVEL 3 15 credits as follows:

BIOL3407	Oceanography
BIOL3408	Coastal Ecosystems
BIOL3409	Caribbean Coral Reefs

ZOOL3408 Sustainable Use of Marine Fishable Resources
ZOOL3409 Aquaculture

And 3 credits from any of the following:

ZOOL3405 Vertebrate Biology
BIOL3410 Water Pollution Biology

The following companion courses are strongly recommended:

BIOL2408 Diving for Scientists
BIOL3018 Project
BIOL3412 Internship

MINOR IN COASTAL ECOSYSTEMS (18 Advanced credits)

Programme overview

A minor in Coastal Ecosystems serves as an introduction to the essentials of the coastal component of the marine environment which includes coral reefs, mangroves and seagrass beds. These are all habitats of prime importance in Jamaica and the Caribbean and have links with such diverse areas as Fisheries and Tourism.

Programme outline

LEVEL 1: A minimum of 24 credits from Level 1, 18 of which must be FST courses and must include:

BIOL1017 Cell Biology
BIOL1018 Molecular Biology and Genetics
BIOL1262 Living Organisms I
BIOL1263 Living Organisms II

Level 2 9 credits as follows

BIOL2403 Principles of Ecology
BIOL2406 Eukaryotic Microbiology
BOTN2402 Physiology of Plants

Level 3 9 credits as follows

BOTN3405 Plant Ecophysiology
BIOL3408 Coastal Ecosystems
BIOL3409 Caribbean Coral Reefs

MAJOR IN TERRESTRIAL AND FRESHWATER ECOLOGY (39 Advanced Credits)

Programme Overview

The major in Terrestrial and Freshwater Ecology is designed to give students hands-on exposure to the study of terrestrial environments as well as lotic and lentic fresh water systems and associated organisms. It enables students to gain detailed knowledge of terrestrial animal communities so as to provide an understanding of the concepts, strategies and practices available to scientifically investigate, analyse and manage terrestrial and freshwater species and communities.

Programme Outline

A **Major in Terrestrial and Freshwater Ecology** requires:

LEVEL 1: A minimum of 24 credits from Level 1, 18 of which must be FST courses and must include:

BIOL1017 Cell Biology
BIOL1018 Molecular Biology and Genetics
BIOL1262 Living Organisms I
BIOL1263 Living Organisms II

LEVEL 2 21 credits as follows:

BIOL2401 Research Skills & Practices in Biology
BIOL2402 Fundamentals of Biometry
BIOL2403 Principles of Ecology
BIOL2407 Biological Evolution

BOTN2401	Physiology of Plants
ZOOL2403	Maintenance Systems in Animals
ZOOL2404	Coordination & Control in Animals

LEVEL 3: 12 credits as follows:

BIOL3400	Issues in Conservation Biology
BIOL3406	Freshwater Biology
BIOL3410	Water Pollution Biology
BOTN3406	Tropical Forest Ecology OR ZOOL3403 Entomology

And 6 credits from any of the following:

BIOL3403	The Biology of Soil
BIOL3405	Pest Ecology & Management
BOTN3405	Plant Ecophysiology

MINOR IN TERRESTRIAL AND FRESHWATER ECOLOGY (15 Advanced Credits)

Programme Overview

The minor in Terrestrial and Freshwater Ecology is designed to provide an introduction to the biological aspects of conservation science; community ecology, population biology, biogeography, conservation genetics, and assessment of threatened or endangered species and habitats. The redesigned minor expands the coverage of conservation biology previously only focused on terrestrial ecosystems and will introduce students to an important area of biology and its applications, much neglected in the Jamaican and Caribbean context.

Programme Outline

LEVEL 1: A minimum of 24 credits from Level 1, 18 of which must be FST courses and include:

BIOL1017	Cell Biology
BIOL1018	Molecular Biology and Genetics
BIOL1262	Living Organisms I
BIOL1263	Living Organisms II

LEVEL 2: 6 credits as follows

BIOL2403	Principles of Ecology
BIOL2407	Biological Evolution

LEVEL 3: 9 credits as follows

BIOL3400	Issues in Conservation Biology
BIOL3406	Freshwater Biology
BOTN3406	Tropical Forest Ecology

BIOLOGY WITH EDUCATION OPTION (63 Advanced Credits)

Programme Overview

This Option is designed to provide educators with a solid Foundation in selected aspects of plant and animal science and expose students to the practice of science pedagogy. The focus is on Biology with less emphasis on education courses as it is aimed at students lacking in Biology but who, through experience or previous courses, had exposure to the requisite teaching skills.

Programme Outline

LEVEL 1: A minimum of 24 credits from Level 1, 18 of which must be FST courses and must include:

BIOL1017	Cell Biology
BIOL1018	Molecular Biology and Genetics
BIOL1262	Living Organisms I
BIOL1263	Living Organisms II

The FST Level 1 courses Semester 1: MICR1010-Introductory, Microbiology and Molecular Biology (3 credits) and Semester 2: BIOC1020-Cellular Biochemistry (3 credits) are highly recommended.

LEVEL 2 63 credits which must include:

BIOL2401	Research skills and practices in Biology
BIOL2402	Fundamentals of Biometry
BIOL2403	Principles of Ecology
BIOL2404	Molecular & Population Genetics
BIOL2406	Eukaryotic Microbiology
BIOL2407	Biological Evolution
BOTN2401	Plant Form and Systematics
BOTN2402	Physiology of Plants
ZOOL2403	Maintenance Systems in Animals
ZOOL2404	Coordination and Control in Animals

EDUCATION COURSES

Please consult the Faculty of Humanities & Education regarding the selection of Education Courses.

COURSE DESCRIPTIONS

PRELIMINARY COURSES

BIOL0011

PRELIMINARY BIOLOGY I

(6 P-Credits) Semester 1 Level 0

Pre-requisite: CSEC Biology or equivalent

Course Content: This course covers the following topics:

Biological Techniques

- Biological Chemistry: Chemicals of Life;
- Enzymes; Cells and Tissues; Cell Division; Genetics;
- Evolution; Mechanisms of Speciation;
- Variety of life: Bacteria, Protists, Fungi, Plants and Animals;

Method of Delivery:

- Lectures: 36 hours
- Tutorials: 12 hours
- Laboratory Exercises: 72 hours: involving experiments demonstrating biochemical and biological processes and principles; studies of living/fresh and preserved protist, fungi, plants and animals to demonstrate biodiversity.

Evaluation:

(Students are required to pass both components):

- | | |
|-----------------------------------|-----|
| • One 2-hours theory paper | 30% |
| • One 2-hours comprehensive paper | 30% |
| • Course Work: | 40% |
| • One In-course theory test | 6% |
| • Two In-course practical tests | 24% |
| • Laboratory reports | 10% |

BIOL0012

PRELIMINARY BIOLOGY II

(6 P-Credits) Semester 2 Level 0

Pre-requisite: CSEC Biology or equivalent

Course Content: This course covers the following topics:

Organisms and the environment

- Levels of Ecological Organisation;
- Energy Flow;
- Biogeochemical Cycles;

Systems in plants and animals

- Plant Structure;
- Transpiration, Translocation, Photosynthesis;
- Animal structure;
- Respiration, Transport, Nutrition;
- Coordination and Control, Excretion and Osmoregulation;
- Movement and Support;
- Reproduction, Growth and Development;

Method of Delivery:

- Lectures: 36 hours
- Tutorials: 12 hours
- Laboratory Exercises: 72 hours: involving the study of living/fresh and preserved organisms and prepared slides to demonstrate the relationship between structure and function of the systems in plants and animals.

Evaluation:

(Students are required to pass both components):

- One 2-hours theory paper 30%
- One 2-hours comprehensive paper 30%
- Course Work: 40%
 - One In-course theory test 6%
 - Two In-course practical tests 24%
 - Laboratory reports 10%

LEVEL 1 COURSES

BIOL1017

CELL BIOLOGY

(3 Credits) Semester 1 Level 1

Pre-requisite:

A pass in one of the following: Preliminary Biology I and II (BIOL0011 and BIOL0012) OR CAPE Biology (Units 1 and 2), OR equivalent training

Course Content:

This course covers the following topics:

Identify and characterize various types of cells and their levels of biological organization

- Mount living organisms for proper examination under the various types of light microscopes;
- Explain how the cellular components are used in the transfer and utilization of energy and information in cells;
- Interpret experimental data derived from hypothetical investigations into cell function;
- Analyse the effectiveness of the mechanisms utilized by cells to maintain internal thermodynamic stability;
- Apply their knowledge of cell biology to selected examples of response(s) that take place within cells consequent upon defined environmental or physiological changes;
- Outline the processes by which cells gather raw materials from the environment, construct out of these a new cell in its own image, complete with a new copy of the hereditary information;
- Describe the basic functional events involved in cell reproduction and the factors that regulate this process;

Microscopical techniques to study living and fixed cells

- Structural organization of cells;
- Specialization in cells;
- Basic functional processes in cells and their regulation;
- Mitosis and Meiosis;

Practical Work

- Observation of living cells and permanent microscopical preparation;
- Making microscopical preparations;
- Interpretation of electron micrographs;

Method of Delivery:

- Lectures: 18 contact hours ~ Didactic and interactive
- Tutorials: 6 contact hours ~ Interactive
- Practicals: 30 contact hours ~ Interactive, Self-directed

Evaluation:

(Students are required to pass both components):

- One 2-hours comprehensive paper 50%
- Course Work: 50%
 - Laboratory reports 20%
 - Tutorial attendance and assignments 10%
 - One 1-hour In-course test 20%

BIOL1018**MOLECULAR BIOLOGY AND GENETICS**

(3 Credits) Semester 1 Level 1

Pre-requisites: A pass in one of the following: Preliminary Biology I and II (BIOL0011 and BIOL0012) or OR CAPE Biology (Units 1 and 2), OR equivalent training

Course Content: This course covers the following topics:

Molecular Biology

- The nature of genes;
- DNA replication;
- Transcription;
- Protein synthesis;
- Control of gene expression;
- PCR, cloning and DNA sequencing;

Genetics

- Mendelian Inheritance;
- Probability, binomial theorem and chi-square test;
- Quantitative traits;
- Linkage, crossing over and mapping;
- Sex linkage and sex determination;
- Gene frequencies in natural populations;

Practical Work

- DNA isolation, restriction digestion and agarose electrophoresis;
- Exercises on Mendelian crosses and gene frequencies;

Method of Delivery:

- Lectures: 18 contact hours ~ Didactic and interactive
- Tutorials: 6 contact hours ~ Interactive
- Practicals: 30 contact hours ~ Interactive, Self-directed

Evaluation:

(Students are required to pass both components):

- | | |
|-------------------------------------|-----|
| • One 2-hour comprehensive paper | 50% |
| • Course Work: | 50% |
| • Laboratory reports | 20% |
| • Tutorial attendance & assignments | 10% |
| • One 1-hour In-course test | 20% |

BIOL1262**LIVING ORGANISMS I**

(3 Credits) Semester 2 Level 1

Pre-requisites: A pass in: Preliminary Biology I and II (BIOL0011 and BIOL0012) OR CAPE Biology (Units 1 and 2), OR equivalent training

Course Content: This course covers the following topics:

- Evolutionary Concepts;
- Archaeobacteria & Eubacteria;
- Autotrophic protists;
- Phylogeny and classification of plants;
- Bryophytes;
- Seedless vascular plants;
- Seed plants – Gymnosperms;
- Seed plants – Angiosperms (form and function);
- Photosynthetic systems;
- Reproductive systems;
- Ecology;

Practical Work

- Structure of bacteria and protists
- Classification of plants;
- Studies of the structure of the main groups of plants;
- Demonstrations of adaptive radiation of main groups of plants;
- The virtual and actual herbarium;
- The dichotomous key;

Method of Delivery:

- Lectures: 18 contact hours ~ Didactic and interactive
- Tutorials: 6 contact hours ~ Interactive
- Practicals: 30 contact hours ~ Interactive, Self-directed

Evaluation:

(Students are required to pass both components):

- Final Examination:
 - One 2-hours Comprehensive paper 50%
- Course Work: 50%
 - Tutorials 10%
 - Laboratory reports (10 x 2% each) 20%
 - One In-course test 20%

BIOL1263

LIVING ORGANISMS II

(3 Credits) Semester 2 Level 1

Pre-requisites: A pass in: Preliminary Biology I and II (BIOL0011 and BIOL0012) OR CAPE Biology (Units 1 and 2) OR equivalent training

Course Content:

This course covers the following topics:

- Origin of animals;
- Evolution of diversity;
- Classification and phylogeny of animals;
- Ecological principles;
- Animal-like protists;
- Animal Architecture;
- Invertebrate animals;
- Vertebrate animals;
- Major groups of fungi;
- Classification of animals;
- Studies of the morphology of the main groups of animals and fungi;
- Dissection of selected animals to show internal anatomy and evolutionary development of the taxonomic group;
- Demonstrations of adaptive radiation of main groups of animals and fungi;

Method of Delivery:

- Lectures: 18 contact hours ~ Didactic and interactive
- Tutorials: 6 contact hours ~ Interactive
- Practical: 30 contact hours ~ Interactive, Self-directed

Evaluation:

(Students are required to pass both components):

- One 2-hours Comprehensive paper 50%
- Course Work: 50%
 - Tutorial 10%
 - Laboratory reports (10 x 2% each) 20%
 - One In-course test 20%

LEVEL 2 COURSES

AGSL2401

MANAGEMENT OF SOILS

(3 Credits) Semester 1 Level 2

Pre-requisites: BIOL1017, BIOL1018, BIOL1262, BIOL1263 or equivalent, and a minimum of 24 credits from Level 1, 18 of which must be FST courses

Course Description: The course will cover the basics of soil properties and the effects of land management on these properties. Soil management to improve water properties, soil fertility, overall soil quality and to mitigate against soil erosion will be covered.

Course Content: This course covers the following topics:

- Soil basics- texture and structure ;
- Methods of land clearing and their effects on soil structure;
- Soil tillage and the management of soil structure for plant growth;
- Management of soil structure to improve water intake, transmission and storage;
- Soil and crop water relations, water management for salinity control; soil erosion and the management of hillsides;
- Management of dry and wet lands;
- Management of forest soils; management of specific problem soils;
- Management for agriculture, soil management and its effects on microbes, microbial activity and soil fertility;
- Soil fertility management; soil quality, carbon sequestration;
- Soil management practices case studies.

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work: 30 contact hours

Evaluation:

(Students are required to pass both components):

- One 2 hours theory examination 60%
- Course Work: 40%
 - One 2-hours practical test 20%
 - Laboratory reports (4 at 5%) 20%

BIOL2401

RESEARCH SKILLS AND PRACTICES IN BIOLOGY

(3 Credits) Semester 1 Level 2

Pre-requisites: BIOL1017, BIOL1018, BIOL1262, BIOL1263 or equivalent, **and** a minimum of 24 credits from Level 1, 18 of which must be FST courses

Course Description: The course is designed to introduce students to 10 major topics related to Biological and Ethical skills that will equip students with a variety of practical and transferable skills in areas such as team/group work, scientific report writing, oral presentations, study skills, basic laboratory skills, experimental design, data handling, display and interpretation, and basic statistical analysis.

Course Content: This course covers the following topics:

1. Transferable skills (time management, note taking, production of accurate illustrations of microscopic and macroscopic specimens, group dynamics and coordination of group activities);
2. Information technology and library resources;
3. Bioethics: Plagiarism, fabrication and falsification of data;
4. Scientific Communication;
5. Laboratory techniques and procedures;
6. Field work- approaches and procedures
7. Analytical skills;
8. Collecting and identifying specimens;

9. Manipulating and observing specimens;
10. Basic analysis and presentation of data;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Laboratory and Field work: 30 contact hours

Evaluation:

- One 2-hour Final Examination Paper 50%
- Course Work: 50%
 - One 1hour MCQ Course Test 20%
 - Literature review 20%
 - Oral presentation based on Laboratory Reports (2 x 5% each) 10%

BIOL2402

FUNDAMENTALS OF BIOMETRY

(3 Credits) Semester 1 Level 2

Pre-requisites: BIOL1017, BIOL1018, BIOL1262, BIOL1263 or equivalent, **and** a minimum of 24 Credits from Level 1, 18 of which must be FST courses

Course Description: The course begins with an overview of descriptive methods and tests for one and two variables, using biological examples and then introduces testing relationships between multiple variables.

Course Content:

This course covers the following topics:

- Data in Biology: types of variables; accuracy and significant figures; data management;
- Populations and Samples: statistical populations; the need for samples; sampling procedures;
- Descriptive Statistics: frequency distributions; measures of central tendency; measures of dispersion;
- The Normal Distribution: probability density functions; properties of the normal distribution; the distribution of sample means; confidence intervals;
- Statistical Hypothesis Testing: making decision about populations based on samples; null and alternative hypotheses; alpha and beta error;
- One-Sample Hypotheses: hypotheses concerning population parameters; testing goodness of fit;
- Testing the relationship between two variables: the nature of a statistical relationship; criteria used to select appropriate tests; overview of major tests;
- Applying tests for two variables: contingency tests; analysis of variance; regression and correlation; rank tests; multiple comparisons; assessing validity of statistical assumptions;
- Tests for more than two variables: separating the influences of multiple independent variables on a dependent variable; statistical interaction;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work (exercises in solving statistical Problems using a software application and by hand): 30 contact hours

Evaluation:

(Students are required to pass both components):

- 2-hour Final Examination Paper 60%
- Course Work: 40%
 - One 2-hours practical test 20%
 - Laboratory Reports (4 x 5% each) 20%

BIOL2403**PRINCIPLES OF ECOLOGY**

(3 Credits) Semester 2 Level 2

Pre-requisites: BIOL1017, BIOL1018, BIOL1262, BIOL1263 or equivalent, and a minimum of 24 credits from Level 1, 18 of which must be FST courses

Course Description: The course is designed to introduce the scientific study of the interrelationships between and among organisms and between organisms and all aspects of the living and non-living environment.

Course Content: This course covers the following topics:

- Ecology and its domain;
- Geographic range habitat and niche, abiotic and biotic environment;
- Ecological role of abiotic factors (climatic and edaphic) on plant and animal populations Population performance along physical gradients;
- Population structure and demography; population change over time, growth models, dispersal, life tables and resource allocation patterns;
- Species interactions: competition, predation, herbivory, commensalism, ammensalism, proto cooperation and mutualism;
- Communities; community classification, concepts and attributes;
- Island Communities;
- Primary and secondary ecological succession;
- Nutrient cycling and energy flow;
- Primary and secondary production, trophic levels and ecological efficiency;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work (inclusive of case study presentation and discussion): 30 contact hours

Evaluation:

(Students are required to pass both components):

- One 2-hours theory examination paper 50%
- Course Work: 50%
 - One 2-hour practical test 20%
 - Laboratory and field reports 20%
 - One 1-hour MCQ test 10%

BIOL2404**MOLECULAR & POPULATION GENETICS**

(3 Credits) Semester 2 Level 2

Pre-requisites: BIOL1017, BIOL1018, BIOL1262, BIOL1263 or equivalent, and a minimum of 24credits from Level 1, 18 of which must be FST courses

Course Description: The course will introduce students to the genetics of living (prokaryotic and eukaryotic) organisms and will show how genetics is relevant to all the members of our technological society. Understanding the principles of inheritance will help us to make knowledgeable decisions about personal issues affecting us as well as issues of social concern.

Course Content: This course covers the following topics:

- The molecular and physical basis of inheritance;
- The genomes of viruses, bacteria, and higher organisms;
- The structure, expression, regulation, recombination, mapping, modification and manipulation (cloning) of genes;
- Embryonic development;
- The measurement and transmission of genetic variation (genes/alleles, genotypes) through time and space leading to speciation in plant and animal populations;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work : 30 contact hours

Evaluation:

(Students are required to pass all components)

- One 2-hour theory examination paper 60%
- Course Work: 40%
 - One 2-hour practical test 20%
 - Laboratory reports (4 x 5% each) 20%

BIOL2406

EUKARYOTIC MICROBIOLOGY

(3 Credits) Semester 1 Level 2

Pre-requisites: BIOL1017, BIOL1018, BIOL1262, BIOL1263 or equivalent, and a minimum of 24credits from Level 1, 18 of which must be FST courses

Course Description: The course is designed to expose students to the nature and properties of eukaryotic microorganisms, their effects on humans and the environment, and how they may be exploited to provide useful products.

Course Content: This course covers the following topics:
A study of the structure and function, taxonomy, reproduction, physiology and ecological applications of the protists and fungi inclusive of:

- The evolution of the eukaryotic condition;
- The biological diversity and phylogeny of the protists and fungi;
- The nutrition and adaptations within the protists and fungi;
- A systematic study of the major taxonomic groups:
 - Diplomonads;
 - Parabasilids;
 - Euglenoids;
 - Alveolates;
 - Stramenopiles;
 - The Algae;
 - Cyanophyta;
 - Glaucophyta;
 - Rhodophyta;
 - Chlorophyta;
 - Streptophyte algae;
- The Fungi & fungal-like microorganisms;
- Reproduction in the protists and fungi;
- Ecology and economic importance of the protists and fungi;
- Management of the protists and fungi;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work : 30 contact hours

Laboratory exercises include two group projects directed at the investigation of the morphology, physiology and ecology of selected protists and fungi involving the techniques of: light microscopy, isolation, inoculation techniques, aseptic technique and sterilization, making media, culture of microorganisms, and staining. Students are required to actively participate in interactive tutorial sessions in which they are required to apply their understanding of the material presented in lectures and demonstrate their understanding of the laboratory exercises.

Evaluation:

(Students are required to pass all components)

- One 2-hour final examination paper 50%
- Course Work: 50%
 - One 2-hour practical test 20%

- Laboratory reports 20%
- Project report 10%

BIOL2407 **BIOLOGICAL EVOLUTION**
(3 Credits) Semester 1 Level 2

Pre-requisites: BIOL1017, BIOL1018, BIOL1262, BIOL1263 or equivalent, and a minimum of 24 credits from Level 1, 18 of which must be FST courses

Course Description: Biological Evolution covers population genetics and provides an overview of evolutionary thought. The course establishes evolution as a demonstrable fact, and presents natural selection as an observable process. This course will also prepare students to analyze biological data in an objective fashion, and to use evolutionary thinking to understand complex biological issues.

Course Content: This course covers the following topics:

- A historical perspective to evolution and variation;
- Hardy-Weinberg equilibrium, mutation, selection, migration, and genetic drift; non-random mating and inbreeding;
- Evolution below the species level, adaptation;
- Sex ratio, sexual selection, kin selection;
- Speciation, systematics, and the evolution of hominids;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work : 30 contact hours

Evaluation:
(Students are required to pass both components):

- One 2-hours final examination paper 50%
- Course Work: 50%
 - Two 1-hour MCQ papers (2 X 20%) 40%
 - Laboratory report (1 X 10%) 10%

BOTN2401 **PLANT FORM AND SYSTEMATICS**
(3 Credits) Semester 1 Level 2

Pre-requisites: BIOL1017, BIOL1018, BIOL1262, BIOL1263 or equivalent, and a minimum of 24 credits from Level 1, 18 of which must be FST courses

Course Description: This course introduces students to the organization of tissues, the gross structure of plants and how these mediate the interaction of sporiferous and seed-bearing plants with their environment, evolutionary relationships, and classification of the major groups and the rules of nomenclature in Botany.

Course Content: This course covers the following topics:

1. Plant body organization;
Plant form and the environment Structures involved in:
 - a. accessing raw materials from the environment;
 - b. structural support of the plant body;
 - c. anatomical specializations and structural adaptations of plants;
 - d. excretory processes;
 - e. Plant reproduction;
 - f. Plant habit types and their anatomical features;
2. The evolution of plants;
3. Plant life cycles; Plant systematics;
 - a. Sources of taxonomic data;
 - b. Contemporary taxonomic system and nomenclature of plants;

- Analysis and interpretation of taxonomic data;
 - Herbaria and plant taxonomic research;
4. Plant identification

Sporiferous non-vascular Plants:

- i. Anthocerotophyta;
- ii. Hepaticophyta;
- iii. Bryophyta;

Sporiferous vascular plants:

- iv. Pteridophyta;
- v. Sphenophyta;

Seed-bearing plants:

- vi. The seed habit;
- vii. Gymnosperms;
- viii. Angiosperms;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work : 30 contact hours

Evaluation:

(Students are required to pass both components):

- One 2 hour theory examination paper 50%
- Course Work: 50%
 - One 2-hour practical test 20%
 - Laboratory reports (4 x 5% each) 20%
 - One 1-hour MCQ test 10%

BOTN2402

PHYSIOLOGY OF PLANTS

(3 Credits) Semester 2 Level 2

Pre-requisites: BIOL1017, BIOL1018, BIOL1262, BIOL1263 or equivalent, and a minimum of 24 credits from Level 1, 18 of which must be FST courses

Course Description: The course deals with plant functions from the level of cells, tissues, organs to the whole plant. It covers carbon fixation, growth and development, soil-plant relations, transport of substances within the plants and the production of secondary metabolites.

Course Content: This course covers the following topics:
How plants function at the level of cells, tissues, organs and the whole plant.

- Carbon fixation and the different photosynthetic pathways;
- Growth, development and differentiation of plant tissues and organs;
- Roles of Plant Growth Regulators in the physiology and biochemistry of cells and whole plants;
- Soil-plant relations, where and how water and nutrients are transported in plants;
- Source-sink relations and translocation of photosynthates;
- Introduction to secondary metabolites and their roles in the physiology and the biochemistry of plants;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Laboratory and greenhouse work: 30 contact hours

Evaluation:

(Students are required to pass both components):

- One 2-hour theory examination 50%
- Course Work: 50%
 - One 2-hour practical test 20%
 - Practical reports (5 x 4%) 20%
 - One 1-hour In-course quiz 10%

ZOOL2402**ANIMAL PHYSIOLOGY**

(3 Credits) Semester 2 Level 2

Pre-requisites: BIOL1017, BIOL1018, BIOL1262, BIOL1263 or equivalent, and a minimum of 24 Credits from Level 1, 18 of which must be FST courses

Course Description: The course serves as an introduction to the functioning of selected physiological systems in a range of animals. In all topics covered, examples are drawn from both vertebrate and invertebrate phyla.

Course Content: This course covers the following topics:

- Digestive physiology;
- Exchange and transport of respiratory gases;
- Excretion of nitrogenous waste and salt and water balance;
- Generation of nervous impulses and neuromuscular control;
- Hormonal control and homeostasis;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work: 30 contact hours

Evaluation:
(Students are required to pass both components):

- | | |
|------------------------------------|-----|
| • One 2-hours theory examination | 50% |
| • Course Work: | 50% |
| • One 2-hours practical test | 20% |
| • Laboratory reports (5 x 4% each) | 20% |
| • One 1-hour MCQ Test | 10% |

ZOOL2403**MAINTENANCE SYSTEMS IN ANIMALS**

3 credits Semester 2 Level 2

Pre-requisites: BIOL1017: Cells Biology; BIOL1018: Molecular Biology & Genetics
BIOL1262: Living Organisms I; BIOL1263: Living organisms II

Course description This course serves as an introduction to the gross structure and cellular organization of invertebrate and vertebrate animals, with emphasis on systems involved in feeding, gaseous exchange, transport, excretion and reproduction. The relationship between structure and function will be emphasized.

Course content

1. Feeding and digestion
 - Structures used for mastication, digestion, absorption and storage of food
 - Gut systems: types of gut systems, overview gut systems of vertebrates and invertebrates.
2. Gaseous exchange
 - Important physical considerations: oxygen availability in different environments, diffusion of gases in air and water, impact of shape and size.
 - Breathing in water and air, adaptations for diving.
3. Circulatory systems
 - Comparison of gastrovascular and blood vascular systems; open and closed systems
 - Components of circulatory systems of selected invertebrates and vertebrates
 - Evolution of vertebrate circulatory system, microcirculation in vertebrates
4. Excretion and osmoregulation.
 - Chemicals involved in excretion and osmoregulation.
 - Contractile vacuoles, nephridia, malpighian tubules and nephrons
 - Secondary structures: salt glands, rectal glands, urate cells.
5. Reproduction
 - Comparison of asexual and sexual reproduction. Alternation of generations.
 - Sexual and asexual reproduction various animal groups
 - Colonial life: case studies from Prolifera and Cnidaria

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work: 30 contact hours

Evaluation:

The course assessment will be as follows:

- One 2-hour final written examination 50%
- Coursework: 50%
Coursework comprised of:
 - One 2-hour practical test 20%
 - Laboratory reports (5 x 4% each) 20%
 - One 1-hour MCQ Test 10%

ZOOL2404

COORDINATION AND CONTROL IN ANIMALS

3 credits Semester 2 Level 2

Pre-requisites: BIOL1017: Cells Biology, BIOL1018: Molecular Biology & Genetics; BIOL1262: Living Organisms I, BIOL1263: Living organisms II

Course description This course will expose students to the derivation and modification of anatomical structures that coordinate and control homeostatic and other metabolic processes in vertebrates and invertebrates. Embryonic development/ontogeny of structures, their basic functional anatomy and evolutionary development/phylogeny will be studied

Course content

1. Embryonic development and structure of the vertebrate and invertebrate nervous system.
 - Neurulation in the vertebrate.
 - Regional specialization in the vertebrate brain.
 - Meninges and tracts.
 - Evolutionary trends in vertebrate brain development.
2. Reflex action and autonomic function.
 - Structural basis of visceral and somatic reflexes.
 - Comparative anatomy of the autonomic nervous system in vertebrates.
3. Development and evolution of the eye in animals considering mollusc and vertebrate eyes and the compound eyes of Arthropoda.
4. The acoustic-lateralis system.
 - Structure and functioning of hair cells in the teleost lateral line system and in the inner ear.
 - Evolutionary development of the mammalian middle ear bones.
5. The structure of selected endocrine glands and their function.
 - Origins and embryonic development of the vertebrate hypophysis and adrenal gland.
 - A survey of the endocrine system of insects, crustaceans and cephalopods.
6. Muscle development and function.
 - Embryological origins of the different muscle types their location and functions.
 - Detail of the sliding filament theory of muscle contraction.
 - The derivation of jaw muscles and facial muscles from the branchiomeric musculature
7. The integument.
 - Formation of the integument in insects and vertebrates.
 - Epidermal and dermal derivatives and their functions.

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work: 30 contact hours

Evaluation:

The course assessment will be as follows:

One 2-hour final written examination	50%
Coursework:	50%
Coursework comprised of:	
One 2-hour practical test	20%
9 Laboratory reports (equally weighted)	20%
One 1-hour MCQ Test	10%

Summer School Only:

BIOL2408

DIVING FOR SCIENTISTS

(3 Credits) Semester 3/4 Level 2

Pre-requisites

(Lecturer's approval required)

(Students must have 24 first year credits in the FST, a certificate of "Fitness to Dive" from the University Health Centre and be able to pass a test of swimming competence.)

Course Description:

This course provides the student with an introduction to the principles of diving, diving physiology and the effects of hyperbaric pressure on the body, safe diving practices, and an understanding of diving equipment and how it works. Students acquire the skill of SCUBA diving and have the opportunity to use diving as a tool for scientific research through the design and execution of a research project. The knowledge gained in this course has obvious practical application in the fields of marine and freshwater biology, coastal and fisheries management, and aquaculture.

Course Content:

This course covers the following topics:

- Principles of diving including the properties of water, pressure and buoyancy, gas laws, and air consumption;
- Physiology of diving including the effect of pressure on the human body, adverse effects of gases, barotraumas, the role of nitrogen in decompression illness (DCI), signs and symptoms of DCI;
- Safe diving practices including the use of decompression tables, diver rescue techniques and emergency ascents;
- Diving Equipment
- Diving as a tool for scientific research including an introduction to the fauna and flora of coral reefs;
- Underwater sampling and survey methods data collation and analysis;

Method of Delivery:

- Lectures: 15 contact hours
- Tutorials: 6 contact hours
- Practical Work: 30 contact hours

Evaluation:

(Students are required to pass both components):

- Final Theory Examination (2 hours.) 50%
- Course Work: 50%
 - 5 Open water skills tests 30%
 - One 1-hour MCQ paper 10%
 - Oral presentation of research project 10%

LEVEL 3 COURSES

AGCP3405 LANDSCAPE AND TURFGRASS PRODUCTION

(3 Credits) Semester 1 Level 3

Pre-requisite: BOTN2402

Course Description: Landscape and turfgrass production includes standards to prepare students for creating aesthetic and functional environments for homes, recreational and sporting facilities and businesses. This course includes site analysis and preparation, landscape drawing, plant selection, and installation. Maintenance of healthy attractive landscapes and turf areas will be emphasized. This will tool graduates for work in the private and public sector in the design and development of green spaces as well as their maintenance.

Course Content: This course covers the following topics:

- Introduction to Landscape and Turfgrass production;
- Landscape and Turfgrass Identification and uses;
- Turfgrass ecology and biology
- Landscape and turf establishment and renovation;
- Turf pest management (weeds, insects, diseases);
- Evaluating Opportunities in the Landscaping and Turfgrass Industries;
- Licensing laws and regulations pertaining to landscape contracting and maintenance;
- Environmental issues: water usage and pollution issues;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours;
- Practical Work : 30 contact hours

Evaluation:

(Students are required to pass both components)::

- | | |
|------------------------------------|-----|
| • One 2-hours theory paper | 50% |
| • Course work: | 50% |
| • Practical (field) test (2 hours) | 20% |
| • Field exercise/field trip report | 15% |
| • Research and oral presentation | 15% |

AGCP3406 FRUIT CROP PRODUCTION

(3 Credits) Semester 2 Level 3

Pre-requisites: BOTN2401 and BOTN2402

Course Description: This course presents the specific principles associated with tropical fruit crop farming, the optimum growth and sustainable yield. It starts with the value of fruit crops, the production principles and the innovations and how they can be adapted to local prevailing conditions of a tropical country including ecological variables, farming systems and cultural practices. The course is essential for use in the fields of horticulture, agronomy and food science. It will tool graduates to meet the demands of the agriculture industry for new types of crops and sustainable production methods.

Course Content: This course covers the following topics:

- classification of tropical fruit crops;
- Introduction to the status of fruit crop industry with specific reference to tropical/sub-tropical crops;
- The role of fruits in human nutrition
- The scientific principles of fruit crop growth and yield development;
- Production principles and technologies used in commercial fruit crop enterprises;
- Evaluation of the commercial potential of minor fruits;
- Current issues and research needs of tropical fruit crops in Jamaica;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work : 30 contact hours

Evaluation:

(Students are required to pass both components):

- One 2-hours theory examination 50%
- Course Work: 50%
 - Practical test (2 hours) 20%
 - Laboratory/field trip report 15%
 - Research and oral presentation 15%

AGCP3407

POSTHARVEST TECHNOLOGIES

(3 Credits) Semester 2 Level 3

Pre-requisite: BOTN2402

Course Description: This course will provide students with the basic knowledge and understanding of the ripening of crops and their senescence, as well as the different physiological and biochemical processes affecting the quality attributes of fresh crops. Details on the strategies and techniques to be utilised in the proper handling of fresh crops will also be explored. This will include the application of appropriate technologies to extend the shelf-life of crops, ensuring that they are maintained as “fresh as fresh”. Integrated and combined postharvest preservation technologies will also be considered and discussed.

Course Content: This course covers the following topics:

1. Ripening and Senescence of Fruits
Maturation, Ripening, Senescence;
2. Determinants of Readiness for Harvest
Maturation index, ripening index;
3. Harvesting Practices;
Manual harvesting, Mechanical harvesting; Best Agricultural Practices and harvesting;
4. Preparation for Storage and Transport
Transportation, Handling, Packaging
 1. Storage Technologies Refrigeration, MA/CA packaging, Irradiation, Chemicals
Other physical technologies (IR, UVc, hot water, etc.);
 2. Post-harvest Changes and Loss of Value;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work : 30 contact hours

Evaluation:

(Students are required to pass both components):

- One 2-hours theory paper 50%
- Course work: 50%
 - Consisting of one 2-hours practical test 20%
 - Laboratory and field trip report 15%
 - Research and oral presentation 15%

AGSL3001

IRRIGATION AND DRAINAGE TECHNOLOGY

(3 credits) Semester 1 Level 3

Prerequisites: AGCP 2001

Course content This course covers the following topics:
Soil water potential and measurements;
saturated /unsaturated water movement;

water movement to roots; evaporation, evapotranspiration and consumptive use. Sources of water; methods of water application; design, installation, operation and evaluation of irrigation systems; pumps and pumping for irrigation and drainage; drainage principles; types of drains; planning, design and installation of drainages systems; legal and administrative aspects of irrigation and drainage.

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work: 30 contact hours

Evaluation: Coursework 25%
 Final examination 75%

BIOL3400 **ISSUES IN CONSERVATION BIOLOGY**
(3 Credits) Semester 2 Level 3

Pre-requisites: BIOL2403 and BIOL2407

Course Description: Issues in Conservation Biology provides an overview of the field of Conservation Biology, while focusing on examples from Jamaica and the wider Caribbean. The course covers the recent, anthropogenic assault on Earth's species and habitats, and highlights the main drivers of the recent extinction crisis; it also details efforts to arrest the current biodiversity extinction crisis, including both *in situ* and *ex situ* interventions.

Course Content: This course covers the following topics:

- Biological diversity and its values
- Threats to biological diversity: habitat destruction, exotic species, pollution, global climate change, and over-exploitation
- Conservation genetics and the population biology of threatened species
- Managing threatened species: *in-situ* and *ex-situ* interventions
- Establishing and managing protected areas
- Social framework for the conservation of biodiversity

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work: 30 contact hours

Evaluation: (Students are required to pass both components):

- One 2-hours theory paper 50%
- Course Work 50%

BIOL3401 **ENVIRONMENTAL MICROBIOLOGY**
(3 Credits) Semester Level 3

Pre-requisite: BIOL2406

Course Description: This course will entail detailed study of various microorganisms in different natural and man-made environments. The course is designed to explore microbial abundance, distribution, and activities with regards to nutrient cycling, organic compound decomposition, bioremediation, and waste management in the environment. This course will provide students with the theoretical knowledge, practical skills and an appreciation of the application of the subject. It further aims to equip students with skills to enable them to pursue a career in applied and basic research in areas related to agriculture, environment and medicine.

Course Content:

This course covers the following topics:

- Cell Biology and Genetics: Overview of the chemical composition of microbial cells, cell structure, genetic elements, mutation and genetic exchange, taxonomy and phylogeny;
- Biosynthesis: Metabolism, anabolism, key enzymes, biosynthesis, nutrient assimilation, fuelling reactions, energetics;
- Metabolic Diversity: Aerobic respiration, diversity of aerobic metabolism, fermentation, anaerobic respiration, anaerobic food chains, autotrophy, regulation of activity;
- Methods: Sampling, detection, identification, enumeration
- Populations, Communities, Ecosystems: Interactions within and between populations, interactions with plants and animals, structure and dynamic of communities, abiotic factors;
- Applied Environmental Microbiology: importance of microorganisms in bio-deterioration, solid and liquid waste (sewage) treatment, bioremediation, biodegradation, biological pest control and public health
- Laboratory-based exercises on the techniques necessary to grow and identify microorganisms, recognition and differentiation of microbial characteristics in culture, identification based on metabolic differences and nucleic acid based techniques;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work: 30 contact hours

Evaluation:

One 2-hour theory examination	50%
Course Work:	50%
• Laboratory Reports (3 x 5%)	15%
• Student presentations	15%
• Participation in tutorials (submission of PBL responses)	5%
• In-course Test (1h)	15%

BIOL3402

BIOLOGY OF THE FUNGI

(3 Credits) Semester Level 3

Pre-requisites:

BIOL2406

Course Description:

The course is designed to expose students to the tremendous diversity and ecological importance of the fungi in roles of decomposers, parasites and their symbiotic relationships. Students will develop an informed and knowledgeable perspective of the medicinal benefits, poisonous risks, premium value as highly prized delicacies and the importance of the fungi to the daily existence of other life forms and industrial applications. This will be accomplished through the study of their varied morphology, structure, physiology, modes of reproduction, taxonomy and evolutionary relationships. Laboratory and field exercise will provide the learning opportunities for identification, culture and the observation of the diversity and metabolism of the fungi.

Course Content:

This course covers the following topics:

- The structural and ultra-structural characteristics and the ecological significance of the major groups of fungi of importance in the West Indies.
- The influence of genetic, nutritional and environmental factors on fungal growth, differentiation, reproduction and dispersal and germination of spores.
- The practical exploitation by man of fungal interactions.
 - Fungi as sources of food.
 - Fungal metabolite production.
 - The roles of fungi in biotechnology

- Prevention and control of fungal growth responsible for the bio-deterioration of commercial products.
- Collection, culture and preservation of fungi.

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work: 30 contact hours

Evaluation:

(Students are required to pass both components):

- | | |
|---|-----|
| • Final Theory Examination (2 hours) | 50% |
| • Course Work: | 50% |
| • Laboratory reports (5 x 4%) | 20% |
| • Oral presentation of a tutorial topic | 10% |
| • One 2 hour In-course test | 20% |

BIOL3403

THE BIOLOGY OF SOIL

(3 Credits) Semester 1 Level 3

Pre-requisites: BIOL2403

Course Description: The course is intended to provide an introduction to the physico-chemical features of typical soils, the various groups of organisms inhabiting soil and their role in soil biological processes. Also, the effects of agronomic practices and environmental factors like acidification and pollution on soil organisms and processes will be appraised.

Course Content: This course covers the following topics:

- The soil environment: soil formation and soil abiotic components; soil organisms: prokaryotic and eukaryotic microorganisms, animals and plant parts;
- Biological processes occurring in soil;
- Environmental issues affecting life in the soil: acid rain, metal toxicity, salinity, radioactivity, pesticides, and the introduction of organisms;
- The impact of agricultural practices and climate change on soil ecology and biodiversity;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work: 30 contact hours

Evaluation:

(Students are required to pass both components):

- | | |
|---|-----|
| • One 2-hours Theory examination | 50% |
| • Course Work: | 50% |
| • One 1-hour MCQ Test | 15% |
| • One 1-hour short-answer test | 15% |
| • Laboratory and field reports (5 x 4%) | 20% |

BIOL3404

VIROLOGY

(3 Credits) Semester 2 Level 3

Pre-requisites: BIOL2404 or BIOL2312

Course Description: This course will provide core training in the theoretical and practical aspects of virology, covering viruses (and virus-like agents) infecting human, animal, plant and microbial hosts. The course includes studies of the structure, the molecular biology of virus replication, interactions of viruses and hosts and the diseases they cause in these hosts, the evolution and history of viruses and virus diseases, transmission, diagnosis, and the prevention of virus

disease by vaccination, drugs and other methods. Knowledge gained in this course has obvious practical application in the management of virus infections and will impact the understanding of cell biology, molecular biology, genetics, and immunology. It further aims to equip students with skills to enable them to pursue a career in research, control or teaching related to medical or plant virology.

Course Content:

This course covers the following topics:

- Fundamental concepts of virology; structure, replication cycles, transmission, epidemiology of human, animal, plant and microbial viruses; laboratory diagnostic techniques;
- Laboratory-based exercises on the detection and basic characterization of viruses to include virus purification, bio-indexing, electron microscopy, serology, polymerase chain reaction and transmission.

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work : 30 contact hours

Evaluation:

(Students are required to pass both components):

- | | |
|--|-----|
| • One 2-hours Theory examination | 60% |
| • Course Work: | 40% |
| • Laboratory Report | 15% |
| • Participation in tutorials (PBL responses) | 5% |
| • In-course Test (1hour) | 20% |

BIOL3405

PEST ECOLOGY AND MANAGEMENT

(3 Credits) Semester 2 Level 3

Pre-requisites:

BIOL2401 and BIOL2403

Course Description:

The course explores the evolution of pests and the role of humans in organisms attaining pest status. Participants will be exposed to the various ecosystems in which organisms have attained pest status the ecological factors that impact on the populations of these pest species. Field exercises provide a hands-on approach to the identification of pests, the levels of pest infection and/or infestation, and the Evaluation of damage and economic impact. Critical analysis of various control strategies and an ecological approach to the selection and integration of various control strategies, that may be utilized in the management of pests, are intended to equip students with the critical thinking skills required to contribute to the development of eco-specific pest management programmes.

Course Content:

This course covers the following topics:

- Pest evolution;
- Population dynamics of pest species;
- Pest-host and pest-natural enemies interactions;
- Insects and diseases;
- Assessing pest populations and related economic impact;
- The concept of pest management;
- Pest management strategies;

Method of Delivery:

- Lectures: 18 contact hours
- Practical exercises: 30 contact hours
- Seminars/Discussion sessions: 6 contact hours

Evaluation:

(Students are required to pass both components):

- | | |
|----------------------------------|-----|
| • One 2-hours theory examination | 45% |
| • Course Work: | 55% |
| • Laboratory reports (5 x 4%) | 20% |
| • Insect pest collection | 20% |

- Oral presentations 15%
- Oral presentation on pest survey 5%
- Oral examination 10%

BIOL 3406 **FRESHWATER BIOLOGY**
(3 Credits) Semester 2 Level 3

Pre-requisite: BIOL2403

Course Description: This course introduces the student to the basic concepts, physical, chemical and biological, of freshwater habitats, as well as familiarising them with the main groups of animals and plants associated with freshwater habitats and their adaptations. Particular emphasis is placed on the interrelationships of the fauna within communities and the on the influence of physical conditions. The knowledge gained in this course has obvious practical application in the management of freshwater systems (employment with water authorities; the National Water Commission (NWC) of Jamaica) as well as in freshwater fisheries management and aquaculture (Dept. of Agriculture and Fisheries, private companies involved in aquaculture ventures) and in environmental protection, whether in government (NEPA) or non-government (JET, TNC) organisations or with environmental consultation companies.

Course Content: This course covers the following topics:

- Lotic habitats; Physico-chemical characteristics; Concepts of subdivision of rivers and their applicability to tropical locations; The allochthonous food web; Resilience and refuge theory
Lentic habitats; Stratification and lake classification Productivity; Bio-manipulation and the cascade effect; Lake benthos;
- Field based collection of material and Evaluation of physico-chemical data
Laboratory based identification of freshwater organisms;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work : 30 contact hours

Evaluation:

(Students are required to pass both components):

- Final theory examination (2 hours) 50%
- Course Work: 50%
 - Laboratory report 20%
 - Practical Examination 20%
 - Tutorial participation 10%

BIOL3407 **OCEANOGRAPHY**
(3 Credits) Semester 1 Level 3

Pre-requisite: BIOL2403

Course Description: Oceanography is an interdisciplinary approach to the study of the entire marine environment and marine phenomena. It includes the study of the structure of the sea floor and its sediments, the chemical composition and properties of sea water, the study of the movement of water in the oceans as current waves and tides and the diverse range of organisms and their adaptations to survive in the environment. The course will give students a hands-on appreciation to the importance of the marine environment which has application in Jamaica and any other island state.

Course Content: This course covers the following topics:

- Ocean basins- their origin and structure;
- Chemical and physical properties of ocean water;
- Circulation and mixing: currents, waves & tides;
- Marine sediments- their origin and deposition;

- Form and function of planktonic organisms;
- Distribution of planktonic organisms;
- Primary production and its measurement;
- Secondary production and its measurement;
- Food chains/food webs in the pelagic province;
- Ocean Nekton;
- Vertical migration and the deep sea pelagic area;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work : 30 contact hours

Evaluation:

(Students are required to pass both components):

- | | |
|---|-----|
| ● One 2-hours theory examination | 50% |
| ● Course Work: | 50% |
| ● Laboratory reports (5 x 5% each) | 25% |
| ● Oral presentation of tutorial topic | 5% |
| ● End of course practical test (2 hours.) | 20% |

BIOL3408

COASTAL ECOSYSTEMS

(3 Credits) Semester 1 Level 3

Pre-requisite: BIOL2403

Course Description: The course describes tropical coastal ecosystems with particular reference to the wider Caribbean. Selected ecosystems will be examined and analysed to illustrate the organisms, the abiotic conditions which characterize the ecosystem. Interactions between the adjacent ecosystems will be investigated and demonstrated. At the end of this course students will be well prepared to investigate the characteristics of, and predict and mitigate changes in, coastal ecosystems.

Course Content:

This course covers the following topics:

An examination of the diversity, productivity and functions associated with:

- beaches and dunes;
- coral reefs;
- mangroves forests;
- seagrass beds;
- estuaries and wetlands;

An examination of the range and impact of pollution affecting coastal ecosystems especially:

- organic;
- hydrocarbons;
- pesticides;
- heavy metals;
- physical and thermal pollution;

Exercises in evaluation of:

- coastal surveys;
- environmental monitoring;
- water quality ranges and criteria;
- zoning, parks and protected areas as conservation options of coastal ecosystems;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work : 30 contact hours

Evaluation:

(Students are required to pass both components):

- | | |
|----------------------------------|-----|
| ● One 2-hours theory examination | 50% |
| ● Course Work: | 50% |

- Practical test 2-hours 20%
- Laboratory and field reports (5 X 4%) 20%
- Research topic/oral presentation 10%

BIOL3409

CARIBBEAN CORAL REEFS

(3 Credits) Level 3 Semester 2

Pre-requisite: BIOL2403

Course Description: This course develops student competence in the biology of reef-building corals, the ecology of coral communities, and the impact of natural and anthropogenic factors on coral reefs in the context of the Caribbean region. In addition students are introduced to the ecosystem-based approach to reef management and to the economic valuation of reefs. Throughout the course the emphasis will be on the Caribbean and the interconnectedness of reefs throughout the region, however, comparisons will be made to reefs from other regions.

Course Content: This course covers the following topics:

- An introduction to the reef geography of the wider Caribbean and history of reef resource use in Caribbean;
- Coral Biology including taxonomy, anatomy and skeletal morphology, endosymbiosis with zooxanthellae, calcification and growth, nutrition, defensive behaviour, reproduction and recruitment;
- Environmental conditions required for coral reef formation, geological history of Caribbean reef formation and types of reefs; dynamics of reef structure formation and erosion;
- Reef community structure, zonation and dynamics;
- Major reef-associated organisms with attention to their ecological function; Uses including reef fisheries, tourism and recreation, biodiversity and marine products, and ecosystem services;
- Valuation including Total Economic Value, use values, option values and non-use values;
- The threats and future challenges to Caribbean coral reefs including natural disturbances and anthropogenic activities; Hurricanes, tsunamis, and earthquakes; Coral diseases and diseases of reef organisms; Overfishing, deterioration of water quality, physical destruction of reefs, climate change, invasive species;
- An introduction to monitoring methods and the ecosystem-based approach to reef management, including examples of mitigation actions appropriate to different geographic scales;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work: 30 contact hours

Evaluation:

(Students are required to pass both components):

- One 2-hours theory examination 50%
- Course Work: 50%
 - One in-water practical test 10%
 - Five Laboratory and field reports 30%
 - One tutorial research essay 10%

BIOL3410

WATER POLLUTION BIOLOGY

(3 Credits) Semester 2 Level 3

Pre-requisites: ZOOL2403 and ZOOL2404

Course Description: This course examines in detail the sources of pollutants, their constitution, and their effects on freshwater organisms both as individuals and as reflected in community composition and structure. The course also looks at the range of techniques used to monitor pollution, particularly bio-monitoring processes. Ecotoxicology and public health issues are also

considered. The factors which influence the success of invasive species and their consequences to aquatic biodiversity are illustrated using research carried out in the Jamaican context. The knowledge gained in this course has obvious practical application in the management of aquatic systems as well fisheries management and aquaculture and in environmental health.

Course Content:

This course covers the following topics:

- Sources and effects of water pollution;
- Biological monitoring of water quality;
- Toxicity of pollutants to aquatic organisms;
- Water pollution and public health;
- Water pollution control;
- Invasive species and their consequences to aquatic habitats;

Field and laboratory based exercises including examination of sources of pollution, conducting a bio-monitoring programme in Jamaican rivers, determining toxicity levels, determining coliform levels and BOD.

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work : 30 contact hours

Evaluation:

(Students are required to pass both components):

- | | |
|--------------------------------------|-----|
| • Final theory examination (2 hours) | 50% |
| • Course Work: | 50% |
| • Laboratory report | 20% |
| • Practical Examination (2 hours) | 20% |
| • Tutorials | 10% |

BIOL3411

RESEARCH PROJECT

(6 Credits) Semester: Any two consecutive semesters Level 3

Pre-requisites:

Approval from Head of Department

Course Description:

The Research Project course is designed to expose students to the processes involved in conducting scientific research. It facilitates their development from passive learner to active investigator – capable of ethical, independent research. The skills acquired are transferable to any branch of science or other professional endeavour. In the absence of such endeavours practical applications would be impossible.

Course Content:

This course covers the following topics:

- Aims and means of assessing feasibility of projects;
- Techniques in data collection, collation and analysis;
- Ethical research, experimental design, project reporting and presentation
- Scientific writing
- Investigation and written report on an approved topic;
- Multi-media-based oral presentations –remove;

Method of Delivery:

- Lectures: 8 contact hours
- Practical work: 55 contact hours
- Tutorials: 2 contact hours

Evaluation:

(Students are required to pass both components):

- | | |
|-----------------------------|-----|
| • Project written report | 75% |
| • Oral Examination: | 25% |
| • Presentation | 5% |
| • Knowledge & understanding | 10% |
| • Response to questions | 10% |

BIOL3412**INTERNSHIP**

(3 Credits) Semester 3 Level 3

Pre-requisites: BIOL2401-*Research Skills and Practices in Biology*; BIOL2402-*Fundamentals of Biometry*; Internships are available to students doing BSc degrees in Life Sciences but placement is based on the availability of appropriate host companies. HOD approval of course selection is therefore required.

Course Description: The Internship course is designed to provide work experiences, to carry out specific tasks in an actual work environment related to a student's major or option. The student will be able to apply their knowledge and skills gained during the majors to actual situations and document how their training and theoretical knowledge equipped them to operate effectively in the field of work. The exposure and experience facilitate development from a learner to a 'doer' who will transition more easily to full employment status in their chosen field.

Course Content: This course covers the following topics:

- On the job operations in a selected area of the Life Sciences disciplines;
- Daily log generation and production of written reports related to specially designed or general activities;
- Self-Evaluation of performance and operations in the work environment;
- Evaluation of the practices, efficiencies and suggest possible improvement of the operations for the main enterprise(s) at the host institution;

Method of Delivery:

The student is expected to spend 30 hours per week for approximately 6 weeks working in one of the pre-selected participating organisations.

The student is required to:

- meet regularly with the Departmental Internship Coordinator to discuss the internship experience and any work-related or logistical issues
- maintain a daily log of hours worked and a brief description of the work performed
- submit a final report summarising and evaluating the internship experience; and
- complete a résumé and interview at the Office of Placement and Career Services, UWI (Mona)

Evaluation:

Internship report (graded by the Department coordinator) which summarizes the activities carried out during the internship and how it relates to the BSc programme being pursued, documentation of the main operations and structure of the host organization, evaluation of the efficiency of the enterprise, and the student's own evaluation of the experience.

The daily log of activities should be included as an appendix at the end of the report.	50%
Evaluation of performance	25%
Oral presentation	25%

BIOL3413**BIOLOGY PROJECT**

(3 Credits) Semesters 1, 2, 3, 4 Level 3

Pre-requisites: BIOL2402 and HOD approval

Course Description: The Biology Project is designed to expose students to the process of hypothesis formulation, experimental design and execution of an initial investigation to solve a real-life problem. It facilitates the transformation of the student from a passive learner to an active problem solver who can transition into a research scientist and someone capable of independent research.

Course Content:

- The basic elements of scientific method, experimental design, project reporting and presentation.
- Aims and means of assessing feasibility of projects.
- Techniques in conducting a scientific study: data collection, collation and critical analysis.

- Scientific report writing on an approved topic.
- Power point presentations
- Review of research ethics

Methods of Delivery:

6 hours of lectures covering the course content, 3 hours of one-on-one tutorial sessions given to each student and 30 hours of student-driven research under the supervision of a member of the academic staff.

Evaluation:

Project report (at least 2000 words)	75%	
Oral Examination to include a 10 min Power Point Presentation		25%

BOTN3401

PRINCIPLES OF PLANT BIOTECHNOLOGY

(3 Credits) Semester 2 Level 3

Pre-requisite:

BOTN2402 or BIOL2312

Course Description:

The course will provide an overview of plant biotechnology with focus on applications in agriculture, forestry, pharmaceuticals, bio-fuels and the production of new materials. The course includes studies of plant tissue culture, gene transfer, methods of plant transformation, development and analysis of genetically modified plants, and ethical, safety, social, legal and environmental issues associated with the technology. This course will impart understanding of the basic principles of plant sciences, molecular biology and the integration of these disciplines, to provide healthy plants for food, non-food, feed and health applications. It will also give students a better understanding of the ethical, ecological and legal aspects of plant biotechnology. It further aims to equip students with skills to enable them to pursue a career in research, plant breeding or teaching related to plant biotechnology and molecular biology.

Course Content:

This course covers the following topics:

- Fundamental concepts of plant biotechnology; plant tissue culture, transformation of plants or plant cells, stress, pathogen and herbicide tolerance, Improved nutritional content and functional foods, phytoremediation, forest biotechnology, plants as green factories: production of plastics, fats/oils, fibers, proteins and biofuels, GMO-regulations;
- Laboratory-based exercises on plant micropropagation, transformation and molecular markers;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work : 15 contact hours

Evaluation:

(Students are required to pass both components):

- | | |
|--|-----|
| • One 2-hours theory paper | 60% |
| • Course Work: | 40% |
| • Laboratory Report (2 x 7.5%) | 15% |
| • Participation in tutorials (PBL responses) | 5% |
| • In-course Test (1hour) | 20% |

BOTN3402

INTRODUCTION TO PLANT BREEDING

(3 Credits) Semester 1 Level 3

Pre-requisites:

BIOL2404

Course Description:

This course will expose students to the achievements of plant breeding efforts from several countries and crops; discover the genetic basis of crop plant phenotypes; explore the wild and domesticated ancestors of our modern field crops as well as fruit and vegetable crops; design improvement strategies for self-pollinating, cross-pollinating and asexually

propagated crops; run, work in a successful crop breeding program; develop molecular tools that will directly assist in the crop breeding process; formulate conservation strategies of the world's crop biodiversity through gene/germplasm banks.

Course Content:

This course will include the following topics:

- Plant domestication and crop evolution;
- Reproduction in crop plants;
- Inheritance of quantitative characters and plant breeding;
- Breeding self-pollinated crops;
- Breeding cross-pollinated and clonally propagated crops;
- Breeding hybrid varieties by manipulation of fertility regulating mechanisms;
- Breeding for biotic and abiotic stress factors;
- Polyploidy and plant breeding;
- Germplasm resources, gene banks and conservation;
- New variety testing, release, maintenance and seed production; and
- Molecular breeding;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work : 30 contact hours

Evaluation:

(Students are required to pass both components):

- | | |
|---------------------------------------|------|
| • One Theory Examination (2 hours) | 60 % |
| • Course Work: | 40 % |
| • One Practical Examination (2 hours) | 20 % |
| • One Midterm Examination (1 Hour) | 10 % |
| • Laboratory Reports (5 x 2 %) | 10 % |

BOTN3403

FUNDAMENTALS OF HORTICULTURE

(3 Credits) Semester 1 Level 3

Pre-requisites:

BOTN2401 and BOTN2402

Course Description:

The course presents fundamental concepts underlying the science of crops and ornamentals production and management, including abiotic and biotic environmental factors relative to their effects on plant physiology. This course will give students an understanding of plants, plant growth requirements, geographic distribution of major plant types, the importance of soil, climate, topography and other factors on plant growth, pest control, food crops, landscape plants, floriculture, soil degradation, control, and the impact of plants on the social structure.

Course Content:

This course covers the following topics:

- Horticultural Plants (as distinct from routine agricultural plants): morphology, taxonomy, environmental physiology;
- Propagation of Horticultural Plants: Sexual propagation, Seed production and certification, methods of seeding, seed nursery, transplantation Asexual propagation: cuttings, grafting, budding, layering, specialised underground structures, micropropagation; Nursery Management;
- Controlled Environment Horticulture: Greenhouse design and construction, Internal environment control, Light, irrigation, temperature, humidity, substrate, pot and bed culture;
- Out-door Environment culture principles of landscaping, nursery production, bedding plants, ground cover/grasses, trees and shrubs;
- Growing Garden Crops: ornamentals, vegetables, herbs, fruit trees; Post-Harvest Handling and Marketing of Horticultural Produce; Computers in Horticulture;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work : 30 contact hours

Evaluation:

(Students are required to pass both components):

- One 2-hours theory examination 50%
- Course Work: 50%
 - One 2-hours practical test 20%
 - Laboratory (10%) and field trip report (5%) 15%
 - Research (10%) and oral presentation (5%) 15%

BOTN3404

ECONOMIC BOTANY

(3 Credits) Semester 2 Level 3

Pre-requisites: BOTN2401 and BOTN2402

Course Description: Critical thinking and creativity within a scientifically ethical framework are skills promoted through the learning experiences throughout the integrative and collaborative laboratory sessions, field work and consultative learning experiences. Students will be required to develop and execute laboratory investigations on non-food plant utilisations and then effectively communicate experimental findings and evaluate results from simulations during learning activities.

Course Content: This course covers the following topics:

- Plant families of medicinal and economic importance;
- Origin of agriculture;
Ethnobotany
 - a. Medicinal Plants:
 - Herbs and spices;
 - Phytochemicals;
 - Nutraceuticals;
 - Aromatherapy;
 - Conventional and Alternative Medical Systems;
 - Naturopathy;
 - Integrative medicine;
 - Eastern methods;
 - Social uses of plants:
 - Fumitories;
 - Masticatories;
 - Ethnic, cultural & religious influences on plant usage;
 - Plant Products: flavours and fragrances, gums, resins, oils, fibres;
 - » Under-utilized tropical plant food
 - » Timber and non-timber forest products;
 - » Economic uses of algae, bryophytes and pteridophytes;
 - » Conservation of medicinal and economically important plant genetic resources;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work : 30 contact hours

Evaluation:

(Students are required to pass both components):

One 2-hour theory examination 40%
Course Work: 60%

- Laboratory reports (3 x 5%) 15%
- Field project 10%
- Oral presentation & tutorials 15%
- 2-hours In-course test (theory and practical) 20%

BOTN3405

PLANT ECOPHYSIOLOGY

(3 Credits) Semester 1 Level 3

Pre-requisites: BOTN2402 and BIOL2401

Course Description: The course describes the range of physiological specializations demonstrated by plants as they colonise the range of environments across the world. Tropical plants receive special focus as these plants are responsible for the start of most tropical ecosystems, much of the agriculture in feeding the world, especially in harsh climatic conditions. At the end of this course students should be able to critically evaluate their knowledge of plants and re-examine them as highly specialized physiological species evolved over time to combat climate, location and even the consequences of modification for human needs.

Course Content: This course covers the following topics:

- An examination of the physiological adaptations of tropical plants to their environments using the following as examples:
- Tropical Forests (the physiology of nutrient cycling and photosynthetic plastic response);
- Epiphytes and Lianas (the physiology of foliar absorption);
- Mangroves and salinas (the physiology of water uptake and salt extrusion);
- Aquatic habitats (respiration and photosynthesis underwater);
- Savannas, deserts and dunes (the physiology of C3, C4 CAM, CAM shifting and CAM idling);

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work : 30 contact hours

Evaluation:

(Students are required to pass both components):

- One 2-hours Theory Examination 50%
- Course Work: 50%
 - 2-hours practical test 20%
 - Five Laboratory and field reports (5 x 4%) 20%
 - One research project (group) with an oral presentation 10%

BOTN3406

TROPICAL FOREST ECOLOGY

(3 Credits) Semester 1 Level 3

Pre-requisite: BIOL2403

Course Description: The course provides an overview of floristics, structure and regeneration dynamics of tropical forests world-wide. The course also covers the important services provided by these ecosystems such as their role in the hydrological and nutrient cycles. The course covers the impacts human activities such as deforestation, habitat fragmentation and global climate change on tropical forest ecosystems. Additionally, the course covers different ways in which the services provided by these ecosystems can be valued.

Course Content: This course covers the following topics:

1. Origins of tropical rain forests;
2. Origins of tropical forest diversity;
3. Characteristics of tropical rain forests;
4. Tropical rainforest formations;
5. Tropical dry forests;

6. Reproductive ecology of tropical rain forest trees;
7. Reproductive ecology of tropical dry and moist forest trees;
8. Principles of tropical forest hydrology;
9. Tropical forest nutrient cycles;
10. The effects of deforestation and habitat fragmentation;
11. Payments of ecosystem services and REDD (reducing emissions from deforestation and forest degradation);
12. Global climate change and tropical forest ecosystems;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work : 30 contact hours

Evaluation:

(Students are required to pass both components):

- | | |
|----------------------------------|-----|
| • One 2-hours theory examination | 60% |
| • Course Work: | 40% |
| • Research topic | 10% |
| • Fieldwork reports (3 x 10%) | 30% |

ZOOL3403

ENTOMOLOGY

(3 Credits) Semester 2 Level 3

Pre-requisite: (BIOL2401 and ZOOL2403 and ZOOL2404) OR (BIOL2401 and BOTN2401 and BOTN2402)

Course Description: This course explores the science of Entomology, focusing on morphology, development, ecology, taxonomy, and diversity. Examples of how insects have influenced human populations will be examined. Field trips provide opportunities to study insects in their natural habitats. This course provides a Foundation for individuals involved in pest management, parasitology, fresh water biology, management of terrestrial biodiversity. The course further aims to equip86 students for careers in agriculture, pest management, biodiversity conservation, the health sector, forensic science.

Course Content:

This course covers the following topics:

- Biology of the insects including external and internal morphology in relation to taxonomy and evolution, life histories, social organizations where applicable, place in biosphere;
- Diversity of the insects including: taxonomy, an order-by-order survey with emphasis on Caribbean fauna and economically important groups;
- Examples of harmful groups including pests and vectors;
- Examples of beneficial taxa, such as those important for pollination, natural control of populations, and ecotourism;
- Practical Component: Laboratory exercises to study basic morphological structures as well as modifications; Exercises in taxonomy including use of binomial keys; Practice of techniques in the collection and curation of insects; Field trips to practice and evaluate various techniques; opportunities to collect insects and study their adaptations to a wide variety of habitats;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work : 30 contact hours

Evaluation:

(Students are required to pass both components):

- | | |
|-------------------------------------|-----|
| • Final Theory Examination (2-hour) | 50% |
| • Course Work: | 50% |

- Insect Collection 25%
- Laboratory reports (3) 15%
- Oral Examination 10%

ZOOL3404

PARASITOLOGY

(3 Credits) Semester 1 Level 3

Pre-requisites: BIOL2406 AND (ZOOL2403 and ZOOL2404) OR (BIOC2014 and BIOL2312 and MICR2211)

Course Description: This course will provide core training in the theoretical and practical aspects of parasitology, covering the protozoan and metazoan parasites of humans and selected domesticated animals, and the vectors which transmit them. The course includes studies of the morphology, lifecycle, diagnosis, transmission, pathology and control of parasites. It further aims to equip students with skills to enable them to pursue a career in research, control or teaching related to medical or veterinary parasitology.

Course Content: This course covers the following topics:

- Fundamental concepts of parasitology; morphology, lifecycle, transmission, pathology and control of selected protist, helminth and arthropod parasites of humans and domesticated animals; laboratory diagnostic techniques; parasite ecology and evolution; parasite immunology; epidemiology of soil-transmitted helminth (STH) infections in the Caribbean region ;
- Laboratory-based exercises to include recognition and diagnosis of a range of parasitic infections of humans and domesticated animals;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work : 30 contact hours

Evaluation:

(Students are required to pass both components):

- Final Theory Examination (2hour) 50%
- Course Work: 50%
 - Laboratory Reports (10 x 3%) 30%
 - Participation in tutorials 5%
 - Visual Media Examination (2hour) 15%

ZOOL 3405

VERTEBRATE BIOLOGY

(3 Credits) Semester 1 Level 3

Pre-requisites: ZOOL2403 and ZOOL2404

Course Description: This course introduces students to the key elements of vertebrate biology by examining the origins and evolution of the group and looking in detail at the unique characteristics of each of the five main classes of vertebrates. The course adopts an integrated approach combining ecology, behaviour, physiology, and morphology to present a view of vertebrates as functioning systems. Adaptation to the environment is emphasised as is the diversity of body form and structure within each group. The economic significance of the various vertebrate groups is also examined in detail.

Course Content: This course covers the following topics:

- Vertebrate relationships and basic structure;
- Diversity and radiation of fishes;
- Radiation of tetrapod;
- Avian specializations;
- Radiation and diversity of birds;
- The evolution and biogeography of mammals;

- Mammalian characteristics, specializations and diversity;
- Aquatic mammals. Primate evolution.
- Ecology and social behaviour of mammals and birds;
- Herbivory;
- Reproductive strategies and population dynamics of vertebrate populations;
- Commensal vertebrates and vertebrate pests
- Practical Component: Field and laboratory-based exercises including, ecomorphology of fishes, lizard behaviour, composition of bird communities in different habitats, mammalian feeding strategies;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work : 30 contact hours

Evaluation:

(Students are required to pass both components):

- | | |
|-------------------------------------|-----|
| • Final theory examination (2hours) | 60% |
| • Course Work: | 40% |
| • Group presentation | 20% |
| • Laboratory report (5x3marks) | 15% |
| • Tutorial participation | 5% |

ZOOL3406

IMMUNOLOGY

(3 Credits) Semester 2 Level 3

Pre-requisites: (ZOOL2403 and ZOOL2404) OR (BIOC2014 and BIOL2312 and MICR2211)

Course Description: Immunology covers all aspects of the immune system. It deals with the physical, chemical and physiological characteristics of the components of the immune system; in the physiological functioning of the immune system in states of both health and disease; and malfunctions of the immune system in immunological disorders (autoimmune diseases, hypersensitivities, immune deficiency, transplant rejection). This course is designed to present the principles of immunology in a concise and easily comprehensible form, and to highlight the major functional operations and applications of immune responses.

Course Content: This course covers the following topics:

1. Basic Immunology
Components of innate and acquired immunity; immunogens and antigens; antibody structure and function; antibody-antigen interactions; the complement system; ontogeny of immune cells; triggering the immune response; the major histocompatibility complex in immune responses; control mechanisms in the immune response;
2. Immunity in Action
Immunoassays, hypersensitivity reactions, disorders of the immune response, HIV infection, autoimmunity, transplantation immunology, tumour immunology;
3. Laboratory Work
Histology of lymphoid organs of the mouse; viable counts of splenic lymphocytes; precipitation & agglutination reactions; diagnostic immunology; problem-based learning exercises, etc;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work : 30 contact hours

Evaluation:

(Students are required to pass both components):

- | | |
|------------------------------------|-----|
| • One 2-hour theory examination | 50% |
| • Course Work: | 50% |
| • One 2-hours MCQ paper | 20% |
| • Laboratory reports (5 x 6% each) | 30% |

ZOOL3407**HUMAN BIOLOGY**

(3 Credits) Semester 1 Level 3

Pre-requisites: (ZOOL2403 and ZOOL2404) OR (BIOC2014 and BIOL2312 and MICR2211)

Course Description: The course covers the main aspects of human biology, evolution and ecology. Through a combination of principles and research, the student will be exposed to human structure, function, evolution, the causes of abnormalities, and consequences of human activity (e.g. on the environment), normative ethics, etc. The successful student will be better equipped to pursue careers in the public services or the environment.

Course Content: This course covers the following topics:

- Human identity;
- Human development;
- Human functional systems;
- Musculo-skeletal;
- Neuro-sensory;
- Metabolic;
- Respiration;
- Circulatory;
- Urinary;
- Reproductive;
- Immune;
- Abnormalities e.g. cancer, congenital, autoimmune;
- Human heredity and genetics; aging;
- Human evolution;
- Man and the environment;
- Normative ethics; environmental ethics;

Method of Delivery:

The course will be delivered by means of 24 interactive multimedia presentations. A supervised, library-based project (30 hours = 15 quality hours) will focus on an applied aspect of the human organism e.g. human identity, human development, basic functions, learning, physical or mental health, human evolution, humans and the environment, normative ethics, etc.

Evaluation:

(Students are required to pass both components):

- One 2-hour theory examination 50%
- Project Written Report 50%

ZOOL3408**SUSTAINABLE USE OF MARINE FISHABLE RESOURCES**

(3 Credits) Semester 2 Level 3

Pre-requisites: ZOOL2403 and ZOOL2404

Course Description: The course will cover the fish biology, Evaluation of world fisheries resources and their status and the use of modeling software as part of modern Evaluation methods for fishable resources. Examples will be taken from world fisheries with focus on Caribbean fisheries and the application of modern fisheries management principles to achieve sustainable yield.

Course Content: This course covers the following topics:

1. Fish biology: External form and functional design; Locomotion; swim bladders; red muscle; Growth and estimation of growth rates, ageing techniques; reproduction & larval life;
2. Fisheries Evaluation: Fishing techniques; Fish population dynamics, stocks, populations, recruitment, mortality; Fish populations & exploitation, fishing effort, CPUE, yield, yield models, MSY, OEY; Introduction to fisheries modeling & Evaluation software;

3. Caribbean fisheries: Jamaica reef fisheries; Pelagics; Guyana shelf fisheries; Lobster & conch fisheries;
4. World fisheries: Case study- Peruvian anchoveta collapse, El Nino, ENSO phenomenon; Lionfish invasive in Atlantic & Jamaica; Large marine mammal exploitation;
5. Fisheries management: Principles of fisheries management; Paradigm shifts in management;
6. Practical Component: Laboratory demonstration of fishable species showing variability and difficulties of exploitation; Investigation of Fishable resources of Kingston Harbour demonstrating gear operation, gear selectivity, factors affecting resource distribution; Field trips to major fish landing site tours, fisher interviews, commercial catches and gears, stage 2 issues, marketing & economic factor; Visit to the Lionfish project at DBML, St. Ann, snorkeling on reef demonstrating invasive effects, management of invasives, lionfish behaviour and distribution studies; Caribbean Coastal Area Management Foundation (CCAMF), Salt River, Clarendon & fish sanctuary tour to demonstrate fisheries co-management issues, ecology of sanctuaries, reality of management of a major coastal zone.

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work : 30 contact hours

Evaluation:

(Students are required to pass both components):

- | | |
|--------------------------------------|-----|
| • Final Theory Examination (2 hours) | 60% |
| • Course Work: | 40% |
| • In-course test (2 hours) | 20% |
| • Practical assignments (4x5%) | 20% |

ZOOL3409

AQUACULTURE

(3 Credits) Semester 1 Level 3

Pre-requisites: ZOOL2403 and ZOOL2404

Course Description: The course will cover the status of aquaculture internationally, biology of the most important scalefish, crustaceans, molluscan and plants species with potential and those currently under production, water quality, hatchery practices, culture enclosures, pond construction, nutrition, diseases, crustaceans, molluscans, plants, new technology.

Course Content: This course covers the following topics:

1. Water quality: Dissolved gases, alkalinity and hardness, Nitrogen cycles, Phosphorus cycle, Sulphur cycles, iron cycle and Redox potential;
2. Hatchery management practices: Modern hatchery systems, fish seed production, hormonal treatment, fish propagation in hatcheries, fry handling and transportation;
3. Pond construction: Site selection criteria, site surveying and pond design, water supply, pond management;
4. Fish culture, Nutrition and Diseases: Fish culture, fish production principles, stocking rates, fertilization, food chemistry, feed composition, common diseases, prophylaxis and treatment;
5. Shrimp culture and Oyster culture: Marine shrimps and freshwater prawns, lobsters, oyster culture, harvesting technologies;
6. Practicals Component: Water quality on a commercial fish farm, monitoring and evaluation 2. Hatchery on commercial fish farm, Longville Park, Clarendon, 3. Pond infrastructure and construction principles, surveying ponds, Twickenham Park Station, St. Catherine, 4. Tilapia fry production, food fish production on commercial fish farm, Barton Isle, St. Elizabeth, 5. Oyster culture technologies and harvesting methods, Bowden Bay, St. Thomas;

Method of Delivery:

- Lectures: 18 contact hours
- Tutorials: 6 contact hours
- Practical Work : 30 contact hours

Evaluation:

(Students are required to pass both components)::

- Final Theory Examination (2 hours) 50%
- Course Work: 50%
 - In-course test (2 hours) 20%
 - Practical reports (5 x 6%) 30%

ZOOL3410

ADVANCED TOPICS IN ANIMAL SCIENCE

(3 Credits) Semester 2 Level 3

Pre-requisites:

ZOOL2403 and ZOOL2404

Course Description:

This seminar course will provide students with advanced, transferrable, specialized or applied exposure to current topics in animal and human biology through a structured series of formal presentations by local and overseas experts in the industry. It aims to equip students with in-depth awareness of the relevance of a diverse array of topical issues to the Caribbean, and with such transferable skills prepare them for the industry, or advanced studies in the field of animal or human biology.

Course Content:

This course covers the following topics:

- Loss of biodiversity and ecosystem balance;
- Ethical treatment of animals;
- Research ethics;
- Animal diseases;
- Rapid survey techniques;
- Horizontal gene transfer;
- Animal behaviour;
- Embryology;
- Climate change; diverse perspectives;
- Overpopulation;
- Zoological gardens;
- Professional zoology;
- Paleozoology;
- Permitting of investigations;
- Logical framework approach;
- Euthanasia;
- Evolution of hiv;
- Thinking critically;

Method of Delivery:

The course will be delivered by means of 12 x 2 hours interactive, multimedia presentations/discussions, with 15 hours of interactive, discussion-based tutorials based on the core material. Students will maintain a detailed Journal reflecting the main aims, content and conclusions contained in the formal presentations. In addition, students will provide their own, critically thought-out analyses (700-1000 words each) of an additional one in-depth topic (<2500 words) not covered in the formal seminar presentations.

Evaluation:

(Students are required to pass both components):

- Reflective Journal Record (10 x 5%) 50%
- In-depth written Analysis 50%