# DEPARTMENT OF LIFE SCIENCES

The Department of Life Sciences offers a new curriculum structure to new and returning students for the 2011/2012 academic year. Life Sciences will now offer two BSc programmes, four single majors and three minors as outlined below. Biology with Education option has been revised and is still being offered as part of the Faculty programme (Option 3c).

Department of Life Sciences NEW BSc programmes, majors and minors are as follows:

1. BSc Tropical Horticulture
2. BSc Environmental Biology

3. Major in Applied Plant Sciences (APS)
4. Major in Animal Biology (AB)
5. Major in Marine Biology (MB)
6. Major in Terrestrial and Freshwater Ecology (TFE)

7. Minor in Plant Sciences
8. Minor in Human Biology
9. Minor in Conservation Biology

10. Option 3a. Biology with Education Option.

Students starting the Advanced Life Sciences Programme in 2011/12 will be allowed to select the new majors although only the Level 2 courses are presently available.

Students who have already completed Level 2 in Life sciences (using the previous Level 2 courses) would not be allowed to select the new majors at the start of the 2011/12 academic year but would have to complete the majors/minors previously listed in the Faculty Handbook for Life Sciences (Experimental Biology, Environmental Biology, Microbiology, Botany and Zoology majors and minors) using the existing Level 3 courses.

The Level 2 courses taught in Life Sciences during the 2011/12 academic year will all be new, with the exception of the course Diving Technology for Aquatic Sciences. Final year students needing to repeat Level 2 courses will be facilitated by the scheduling of special re-sit examinations of the previous Level 2 courses in the appropriate semester.

The complete NEW Life Sciences curriculum will be available to all students by the 2012/13 academic year. This new curriculum structure with the Level III course descriptions and structure will be available in the 2012/13 Faculty Handbook.

**DEPARTMENT OF LIFE SCIENCES**
**LIST OF UNDERGRADUATE COURSES**
**2011/12 Academic Year**

| CODES | TITLES | CREDIT | SEMESTER OFFERED | Level | PREREQUISITES |
|---|---|---|---|---|---|
| **PRELIMINARY LEVEL** | | | | | |
| **BL05A/ BIOL0011** | **PRELIMINARY BIOLOGY I** | 6-P Credits | Semester 1 | 0 | CSEC Biology or equivalent |
| **BL05B/ BIOL0012** | **PRELIMINARY BIOLOGY II** | 6-P Credits | Semester 2 | 0 | CSEC Biology or equivalent |
| **LEVEL I** | | | | | |
| **BIOL1017**<br>**&**<br>**BIOL1018** | **CELLS BIOLOGY AND GENETICS**<br><br>**MOLECULAR BIOLOGY** | 3 Credits<br><br>3 Credits | Semester 1 | 1 | A pass in one of the following: Preliminary Biology I and II (BL05A/BIOL0011) and BL05B/BIOL0012) **or** CAPE Unit 1 & 2 ('A' level) Biology **or** equivalent |
| **BIOL1262**<br>**&**<br>**BIOL1263** | **LIVING ORGANISMS I**<br><br>**LIVING ORGANISMS II** | 3 Credits<br><br>3 Credits | Semester 2 | 1 | A pass in one of the following: Preliminary Biology I and II (BL05A/BIOL0011) and BL05B/BIOL0012) **or** CAPE Unit 1 & 2 ('A' level) Biology **or** equivalent |

## LEVEL II

NEW Life Sciences Level 2 courses are all 3 credits and will be offered as outlined in the table below.

**Pre-requisites for all NEW 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 FPAS courses.

### NEW LEVEL 2 COURSES (10 courses of 3 credits each)

| | 6-Week Courses | 12 Week Courses | 6-Week Courses |
|---|---|---|---|
| Semester 1<br>Week 1-6 | BOTN2401-<br>Plant Form and Systematics | **BIOL2401-<br>Research Skills and Practices in Biology** | BIOL2402- Fundamentals of Biometry |
| Semester 1<br>Week 7-12 | BIOL2406-<br>Eukaryotic Microbiology | | AGSL2401- Soil and Water Management |
| Semester 2<br>Week 1-6 | BIOL2404-<br>Genetics | **BIOL2403-<br>Principles of Ecology** | ZOOL2401-<br>Animal Form |
| Semester 2<br>Week 7-12 | BOTN2402-<br>Physiology of Plants | | ZOOL2402-<br>Animal Physiology |

Courses in **bold font** are core to all NEW Life Sciences Programmes, Majors and Minors.

## LEVEL III (2011/12 Academic Year) 4 credits each

| **SEMESTER 1** | | | | | |
|---|---|---|---|---|---|
| **A1<br>Experimental Biology major/ Botany major** | **B1<br>Experimental Biology major/ Zoology major** | **B2<br>Environmental Biology major/ Botany major** | **C1<br>Environmental Biology/Marine Biology major** | **C2<br>NEW Tropical Horticulture Courses I** | **D1<br>NEW Tropical Horticulture Courses II** |
| BOTN3016<br>Plant Biotechnology | ZOOL3015<br>Parasitology | BOTN3017<br>Principles of Horticulture | BIOL3014<br>Marine Ecology 1 | AGCP2004<br>Ornamental Horticulture | AGCP2003<br>Mechanization for Crop Production |
| BOTN3015<br>Principles of Plant Breeding | ZOOL3020<br>Insect Biology Systematics | BOTN3014<br>Forest Ecology, Agroforestry | BIOL3015<br>Marine Ecology 2 | AGBU3007<br>New Venture Creation and Management | AGSL3001<br>Irrigation and Drainage Technology |
| **SEMESTER 2** | | | | | |
| BIOL3017<br>Virology | ZOOL3017<br>Immunology | BIOL3121<br>Freshwater Ecology | ZOOL3019<br>Fisheries and Aquaculture | AGCP3005<br>Landscape and turf grass Management | AGCP3007<br>Post-Harvest Technology |
| BOTN3018<br>Medicinal and Economic Botany | ZOOL3021<br>Pest Management | BIOL3020<br>Conservation Biology | BIOL3023<br>Coral Reef Biology | AGCP3006<br>Principles of Fruit Crop Production | AGRI2001<br>Tropical Crop Protection |
| **Tues 2-5Thurs 10-1 /Mon & Fri 10- 1 Labs** | **Friday/Monday Labs** | **Friday/ Friday Labs** | **Monday/ Monday Labs** | **Monday Labs** | **Wed. 2 - 5<br>Thurs 10-1 Labs** |

**Possible combinations: A+B; A+C; A+D. Impossible combinations: Same letter- 1+2.**

**Please see Life Sciences time table and accommodation schedule 2011/12 for details.**

## NEW LIFE SCIENCES BSc PROGRAMMES, MAJORS, MINORS

The new BSc Programmes, Majors and Minors presented below are available for selection by returning students who have completed Level 1 courses but who have not yet completed Level 2.

**BSC IN TROPICAL HORTICULTURE** (63 Advanced credits)

**Programme Overview:**

The Tropical Horticulture programme is designed to provide students with a well-rounded background in general horticultural science with special emphasis on the production of tropical and subtropical crops. The programme is offering a wide selection of courses, each providing 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 and horticultural courses where students learn basic plant sciences, horticultural techniques, and cultivating crops that are of economic interest in the tropics.

**Learning Objectives:**

At the end of the programme, students will be able to:

- demonstrate the skills and academic background needed to be successful in horticulture, with emphasis on tropical horticulture
- outline how to cultivate plants for food, comfort, and aesthetics
- demonstrate technical and mechanical skills necessary to be a successful horticulturalist
- propagate, harvest, apply protection techniques and handling skills essential for crop production
- combine scientific, technological, and production activities that ensure the satisfaction of farmers, professionals and consumers of horticultural crops
- Demonstrate understanding of the purposes and the roles of the horticulture industries in:
  *Ornamental Horticulture* (flowers, ornamental trees, turf management, landscaping)
  *Olericulture* (planting, harvesting, storing, processing, and marketing of vegetable crops).
  *Pomology* (planting, harvesting, storing, processing, and marketing of fruit and nut crops).
- Develop and demonstrate effective written and oral communications skills in the field of horticulture.

**Programme Outline:**

The **BSc in Tropical Horticulture** 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 FPAS courses and must include:

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

A total of **63** Advanced credits from Part II which must include:

**Level 2 (24 credits)**

- BIOL2401 Research skills and practices in Biology
- BIOL2402 Fundamentals of Biometry
- BIOL2403 Principles of Ecology
- BIOL2404 Genetics
- AGSL2401 Management of Soils
- BOTN2401 Plant Form and Systematics
- BOTN2402 Physiology of Plants
- BIOL2406 Eukaryotic Microbiology

**Level 3: (39 credits)**

- AGCP3006 Principles of fruit crop production
- AGCP3007 Post harvest technology
- GABU3007 New Venture creation and management
- BOTN3017 Principles of Horticulture
- AGCP2003 Mechanization for Crop Production
- AGCP3005 Landscape and Turf Grass Management
- BOTN3405 Plant Ecophysiology
- BOTN3406 Economic Botany
- BOTN3402 Introduction to Plant Breeding
- BOTN3401 Principles of Plant Biotechnology
- BIOL3404 Plant-Microbe Interactions
- BIOL3403 Plant-Pest Interactions

**EITHER**

- AGBU3008 Internship

**OR**

- AGBU3012 Horticulture Research Project

**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.

**Learning Objectives:**

At the end of the programme students will be able to:

- recognise and distinguish between the different habitats associated with Caribbean and Jamaican environments
- identify the range of organisms associated with different environments; their biology ad interactions
- identify the association between organisms and the abiotic factors of the environment which affect their survival and distribution, with special emphasis on effects of anthropogenic disturbance
- apply conservation measures to mitigate against the effects of anthropogenic disturbance on marine systems
- apply strategies for the conservation of threatened species and habitats
- outline and evaluate the integrated management frameworks applicable to a range of environments and species
- demonstrate the ability to adequately investigate the organisms, habitats and processes associated with different environments
- analyse, interpret and present the results of their investigations in a range of scientific reporting formats

**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 FPAS courses and must include:

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

A total of **63** credits from Part II which must include:

- BIOL2401 Research skills and practices in Biology
- BIOL2402 Fundamentals of Biometry
- BIOL2403 Principles of Ecology
- BIOL2404 Genetics
- ZOOL2401 Animal Form
- ZOOL2402 Animal Physiology
- AGSL2401 Management of Soils
- BOTN2401 Plant Diversity and Systematics
- BOTN2402 Physiology of Plants
- BIOL2406 Eukaryotic Microbiology

- BIOL3409 Oceanography and Plankton
- BIOL3408 Coastal Ecosystems and Management
- BIOL3405 Caribbean Coral Reefs
- ZOOL3407 Marine Mammals and Fisheries
- ZOOL3408 Mariculture and Aquaculture
- BOTN3407 Forest Ecology and Conservation
- BIOL3402 Freshwater Ecology
- ZOOL3403 Entomology
- ZOOL3402 Terrestrial Vertebrate Conservation
- ZOOL3405 Human Evolution and Ecology
- BIOL3406 Research Project

**MAJOR IN APPLIED PLANT SCIENCES** (36 Advanced credits)

**Programme Overview:**

Plant Sciences is the scientific study of plant life and development. The Applied Plant Sciences 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.

**Learning Objectives:**

At the end of the programme, students should be able to:

- identify and describe the anatomical, morphological, developmental and evolutionary features of plants
- explain the physiology of plant growth and differentiation, inclusive of water and nutrient relations, photosynthate mobilization and homeostasis
- explain important biological processes in selected ecosystems, the effects of changing environmental factors and apply field and laboratory techniques in the study of these effects
- utilize the principles of plant propagation and cultivation in the improvement of food supply and plant conservation
- explain the significance of factors that promote plant health, plant parasites and pests and their interactions, and formulate suitable pathogen and pest management strategies
- apply the principles of Mendelian and Molecular Biology for the improvement of qualitative and quantitative characteristics of plant populations
- propose solutions to human wellness and environmental dilemmas common to developing countries based on the applied aspects of the physiology of plants.

**Programme Outline:**

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

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

**Level 2**:

- 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 Genetics

**Level 3**

- BOTN3405 Plant Ecophysiology
- BOTN3406 Economic Botany
- BOTN3402 Introduction to Plant Breeding
- BOTN3401 Principles of Plant Biotechnology
- BIOL3404 Plant-Microbe Interactions
- BIOL3403 Plant-Pest Interactions

**The following companion courses are strongly recommended**:

- BIOL2405 Biology of Microorganisms
- BOTN3403 Cladistic Botany
- BOTN3407 Forest Ecology and Conservation
- AGSL2401 Management of soils
- BIOL3406 Research Project

**MINOR IN PLANT SCIENCES** (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.

**Learning Objectives:**
At the end of the programme, students should be able to:

- recognize and describe the anatomical, morphological, developmental and evolutionary features of plants
- assess the impact of climate systems, soils, biotic interactions and human activity on the productivity and preservation of plant species and communities
- explain key concepts crucial to the processes of plant growth and differentiation; inclusive of water and nutrient relations, photosynthate mobilization and homeostasis

**Programme Outline:**
**Level 1:** A minimum of 24 credits from Level 1, 18 of which must be FPAS courses and include:

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

**Level 2**:

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

**Level 3:** 6 Advanced level BOTN credits from the syllabus of the Applied Plant Sciences Major.

**MAJOR IN ANIMAL BIOLOGY** (36 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.

**Learning Objectives**
On completion of this programme, the student will be able to:

- interpret biological material in terms of structure and function
- explain the effects of interspecific associations, defence mechanisms, and evolutionary forces on the success of animals
- explain the complexities of biological organisation, and to address conservation issues in a rational way
- integrate related topics from separate parts of the major
- analyse and report on material learned

**Programme Outline**

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

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

**Level 2**:

| | |
|---|---|
| BIOL2401 | Research skills and practices in Biology |
| BIOL2402 | Fundamentals of Biometry |
| BIOL2403 | Principles of Ecology |
| BIOL2404 | Genetics |
| ZOOL2401 | Animal Form |
| ZOOL2402 | Animal Physiology |

**Level 3**

| | |
|---|---|
| ZOOL3403 | Entomology |
| ZOOL3402 | Terrestrial Vertebrate Conservation |
| ZOOL3401 | The Human Organism |
| ZOOL3405 | Human Evolution and Ecology |
| ZOOL3404 | Parasitology |
| ZOOL3406 | Immunology |

**MINOR IN HUMAN BIOLOGY (15 advanced credits)**

**Programme Overview:**
The minor in human biology will expose students to the major types of interactions among humans, human activities and the environment such that students are provided with an appreciation of themselves as evolved, advanced organisms. It elucidates the roles and responsibilities of humans in the process of environmental and climate change.

Learning Outcomes:
At the end of the programme students will be able to:

- Describe the history and current status of human-mediated extinction crises and role of humans in climate change
- Demonstrate the relevance of evolution to global issues

**Programme Outline**

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

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

**Level 2**:

| | |
|---|---|
| BIOL2404 | Genetics |
| ZOOL2401 | Animal Form |
| ZOOL2402 | Animal Physiology |

**Level 3**

| | |
|---|---|
| ZOOL3401 | The Human Organism |
| ZOOL3405 | Human Evolution and Ecology |

**MAJOR IN MARINE BIOLOGY (36 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.

**Learning Outcomes:**

At the end of the programme students will be able to:

- Recognise and distinguish between the different habitats associated with the marine environment
- Identify the range of organisms associated with the different marine habitats, their biology ad interactions
- Evaluate the abiotic processes associated with different marine areas.
- Determine the extent of the association between organisms and the abiotic factors of the environment which affect their survival and distribution, with special emphasis on effects of anthropogenic disturbance.
- Apply conservation measures to mitigate against the effects of anthropogenic disturbance on marine systems.
- Outline and evaluate the integrated management frameworks applicable to marine areas and species.
- Demonstrate the ability to adequately investigate the organisms, habitats and processes associated with different marine areas
- Analyse, interpret and present the results of their investigations in a range of scientific reporting formats.

**Programme outline:**

A **Major in Marine Biology** requires:

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

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

The following 36 credits from Part II:

- BIOL2401 Research skills and practices in Biology
- BIOL2402 Fundamentals of Biometry
- BIOL2403 Principles of Ecology
- BOTN2401 Plant Form and Systematics
- ZOOL2401 Animal Form
- ZOOL2402 Animal Physiology

- BIOL3409 Oceanography and Plankton
- BIOL3408 Coastal Ecosystems and Management
- BIOL3405 Caribbean Coral Reefs
- BIOL3407 Marine Mammals and Fisheries
- BIOL3408 Mariculture and Aquaculture
- BIOL3406 Research Project

**The following companion courses are strongly recommended**:

- BIOL2407 Tropical Marine Invertebrates Field Course
- BIOL2408 Diving technology for Aquatic Sciences
- GEOL3005 Marine Geology and Geophysics

**MAJOR IN TERRESTRIAL AND FRESHWATER ECOLOGY (36 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 understanding of the concepts, strategies and practices available to scientifically investigate, analyse and manage terrestrial and freshwater species and communities.

**Learning Outcomes:**

At the end of the programme students will be able to:

- Distinguish between the different habitats associated with terrestrial and freshwater systems
- Identify and classify the different groups of terrestrial vertebrates and invertebrates associated with Jamaican and Caribbean terrestrial and freshwater habitats.
- Identify the association between organisms and the abiotic factors of the environment which affect their survival and distribution, with special emphasis on effects of anthropogenic disturbance.
- Recognise the role of natural disturbance on terrestrial systems
- Apply conservation measures to mitigate against the effects of disturbance on terrestrial and freshwater systems.
- Demonstrate the ability to adequately investigate the organisms, habitats and processes associated with different marine areas
- Analyse, interpret and present the results of their investigations in a range of scientific reporting formats.

**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 FPAS courses and must include:

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

The following 36 credits from Part II:

- BIOL2401 Research skills and practices in Biology
- BIOL2402 Fundamentals of Biometry
- BIOL2403 Principles of Ecology
- BIOL2404 Genetics
- ZOOL2401 Animal Form
- ZOOL2402 Animal Physiology

- BIOL3407 Forest Ecology & Conservation
- BIOL3402 Terrestrial Vertebrate Conservation
- BIOL3403 Entomology
- BIOL3402 Freshwater Ecology
- BIOL3401 Island Biogeography
- BIOL3406 Research Project

**The following companion courses are strongly recommended**:

- BOTN2401 Plant Form and Systematics
- BOTN2402 Physiology of Plants
- BIOL2406 Eukaryotic Microbiology
- BOTN3403 Cladistic Botany

**MINOR IN CONSERVATION BIOLOGY** (15 Advanced Credits)

**Programme overview:**
Students will be exposed to the fundamental principles conservation biology across terrestrial, marine and freshwater systems through practical and theoretical studies.

**Learning Objectives:**
At the end of the programme, students should be able to:

- outline the values of and threats to biodiversity
- explain key concepts crucial to the identification and conservation of threatened and endangered species and habitats.
- apply techniques used to control and eradicate invasive species

**Programme Outline:**

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

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

**Part 2**

- BIOL2401 Research skills and practices in Biology
- BIOL2403 Principles of Ecology
- BIOL2404 Genetics

- BOTN3407 Forest Ecology & Conservation
- ZOOL3402 Terrestrial Vertebrates and Conservation

**Option 3c**

**BIOLOGY WITH EDUCATION OPTION (63 advanced credits)**

**Programme Description:**
The 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.

**Learning Objectives:**
At the end of the programme, students should be able to:

- outline the variety of mechanisms involved in the functioning of eukaryotic and prokaryotic cells and the replication and transmission of genetic material.
- describe and compare the major groups of prokaryotes, autotrophic protists, plants, animals and fungi; their evolutionary associations, and adaptive radiation
- explain the interrelationships between and among organisms and between organisms and all aspects of the living and non-living environment
- demonstrate skills in microscopy and other practical skills (field and laboratory based) appropriate to the study of living organisms.

**Programme Outline:**
**Year I**
**Level 1:** A minimum of 24 credits from Level 1, 18 of which must be FPAS courses and must include:

*Semester 1*

- BIOL1017 Cell Biology
- BIOL1018 Molecular Biology and Genetics

*Semester 2*

- BIOL1262 Living Organisms I
- BIOL1263 Living Organisms II

The FPAS Level I course (BC10M/BIOC1011) is highly recommended (6 credits)

A total of **63** credits from Part II which must include:

Semester 1

- BIOL2401 Research skills and practices in Biology
- BIOL2402 Fundamentals of Biometry
- AGSL2401 Management of Soils
- BOTN2401 Plant Form and Systematics
- BIOL2406 Eukaryotic Microbiology

**Semester 2**

- BIOL2403 Principles of Ecology
- BIOL2404 Genetics
- BOTN2402 Physiology of Plants
- ZOOL2401 Animal Form
- ZOOL2402 Animal Physiology

**(All Life Sciences Year 1 and 2 courses are worth 3 credits each)**

## NEW LIFE SCIENCES CURRICULUM STRUCTURE

## PROPOSED YEAR 3 COURSES

## (AVAILABLE 2012/13)

**BSC TROPICAL HORTICULTURE** **BSC ENVIRONMENTAL BIOLOGY**

| SEMESTER 1 | | | | |
|---|---|---|---|---|
| **Horticulture Courses** | **Applied Plant Sciences Major** | **Animal Biology Major** | **Terrestrial and Freshwater Ecology Major** | **Marine Biology Major** |
| AGCP3006 Principles of Fruit Crop Production | BOTN3401 Principles of Plant Biotechnology | ZOOL3401 The Human Organism | BOTN3407 Forest Ecology & Conservation | BIOL3409 Oceanography and Plankton |
| AGCP3007 Post-Harvest Tech. | BOTN3402 Introduction to Plant Breeding | ZOOL3402 Terrestrial Vertebrates and Conservation | ZOOL3402 Terrestrial Vertebrates and Conservation | BIOL3408 Coastal Ecosystems & Management |
| AGBU3007 New Venture Creation + Farm Business Mgmt. | BIOL3403 Plant-Pest interactions | ZOOL3403 Entomology | BIOL3401 Island Biogeography | ZOOL3407 Marine Mammals and Fisheries |
| **SEMESTER 2** | | | | |
| BOTN3017 Principles of Horticulture | BIOL3404 Plant-Microbe Interactions/ | ZOOL3404 Parasitology | BIOL3402 Freshwater Ecology | ZOOL3408 Mariculture & Aquaculture |
| AGCP2003 Mechanization for crop production. | BOTN3405 Plant Ecophysiology | ZOOL3405 Human Evolution & Ecology | BOTN3403 Cladistic Botany | BIOL3405 Caribbean Coral Reefs |
| AGCP3005 Landscape & Turf Grass Management | BOTN3406 Economic Botany | ZOOL3406 Immunology | BIOL3406 Research Project | BIOL3406 Research Project |
| Monday/Monday Labs | Friday/Monday Labs | Monday/Friday Labs | Friday/Friday Labs | Monday/Monday Labs |

Additional courses not within the semester time table structure:

AGBU3008- Internship Course (BSc. Tropical Horticulture only)

AGBU3012- Horticulture Research Project (BSc. Tropical Horticulture only)

BIOL3406- Research Project in Biology

BIOL2408- Diving Technology for Aquatic Sciences

# LIFE SCIENCES COURSE DESCRIPTIONS

**PRELIMINARY COURSES:**
**(Same as described in 2010/12 Faculty Handbook)**

**BL05A/ BIOL0011** **PRELIMINARY BIOLOGY I**
(6 P-Credits) Semester 1 Level 0

Aim**:** To equip students with a basic knowledge of biological principles and processes.

Objectives**:** Upon successful completion of the course the students should be able to:

- describe the chemical and biological foundation for life;
- describe the role of cell division mechanisms in the processes of sexual and asexual reproduction;
- explain the basic principles involved in evolution;
- distinguish between the various forms of prokaryotic and eukaryotic organisms.

Pre-requisites**:** CSEC Biology or equivalent

Course Content**:**
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

Mode of Delivery:

36 hours of lectures, 12 hours of tutorials and 72 hours of laboratory exercises involving experiments demonstrating biochemical and biological processes and principles; studies of living/fresh and preserved protist, fungi, plants and animals to demonstrate biodiversity.

Evaluation**:**

| | | |
|---|---|---|
| Final Examinations: | 60% | |
| One 2-hour theory paper | 30% | |
| One 2-hour comprehensive paper | 30% | |
| Coursework: | 40% | |
| One in-course theory test | 6% | |
| Two in-course practical tests | | 24% |
| Laboratory reports | | 10% |

Prescribed text:

Campbell Biology (9th Edition) 2010 by Reece, Urry, Cain, Wasserman, Minkorsky and Jackson. ISBN10-0321739752; ISBN13: 9780321739759 Pearson.

**BL05B/ BIOL0012** **PRELIMINARY BIOLOGY II**
(6 P-Credits) Semester 2 Level 0

Aim: To equip students with a basic knowledge of the systems in plants and animals.

Objectives**:** Upon successful completion of the course the students should be able to:

- explain the relationships between organisms and the environment and between each other;
- describe the role of energy flow and the cycling of nutrients in the sustenance of ecosystems;
- describe the general form and function of plant life;
- describe the general form and function of animal life.

Pre-requisites**:** CSEC Biology or equivalent

Course Content:

- 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

Mode of Delivery:

36 hours of lecture, 12 hours of tutorials and 72 hours of laboratory exercises 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**:**

Final Examinations: 60%
One 2-hour theory paper 30%
One 2-hour comprehensive paper 30%

Coursework: 40%
One in-course theory test 6%
Two in-course practical tests 24%
Laboratory reports 10%

Prescribed text:

Campbell Biology (9th Edition) by Reece, Urry, Cain, Wasserman, Minkorsky and Jackson. ISBN10- 0321739752; ISBN13: 9780321739759 Pearson.

**LEVEL 1 COURSES**
**(Same as described in 2010/12 Faculty Handbook)**

**BIOL1017 CELL BIOLOGY**

(3 credits) Semester 1 Level I

Aim:

1. To expose students to a variety of mechanisms involved in the functioning of eukaryotic and prokaryotic cells, and the identification, replication and transmission of genetic material.

2. To develop skills in microscopy and other basic biological skills

Objectives: Upon successful completion of this course, students should be able to:

1. identify and characterize various types of cells and their levels of biological organization.
2. mount living organisms for proper examination under the various types of light microscopes.
3. explain how the cellular components are used in the transfer and utilization of energy and information in cells.
4. interpret experimental data derived from hypothetical investigations into cell function.
5. analyze the effectiveness of the mechanisms utilized by cells to maintain internal thermodynamic stability.
6. apply their knowledge of cell biology to selected examples of response(s) that take place within cells consequent upon defined environmental or physiological changes.
7. 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.
8. describe the basic functional events involved in cell reproduction and the factors that regulate this process.

Pre-requisites: A pass in one of the following:
Preliminary Biology I and II (BL05A/BIOL0011 and BL05B/ BIOL0012) or CAPE ('A' level) Biology or equivalent

Course Content:

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 preparations.
Making microscopical preparations.
Interpretation of electron micrographs

Mode of Delivery:

| | | |
|---|---|---|
| Lectures | 18 hours | Didactic and interactive |
| Tutorials | 6 hours | Interactive |
| Practicals | 33 hours | |

Evaluation:

Final Examination:
One 2-hour comprehensive paper 50%

Course Work: 50%

| | |
|---|---|
| Laboratory reports | 20% |
| Tutorial attendance and incourse writing assignments | 10% |
| One 1-hour in-course test | 20% |

Recommended Text:

Verma, P.S. and Agarwal, V.K. 2005. Cell biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand & Co. Ltd.
ISBN 81-219-2442-1

Useful websites
http://www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=mboc4
http://www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=stryer

**BIOL1018 MOLECULAR BIOLOGY AND GENETICS**
(3 credits) Semester 1 Level I

Aim: To provide an introduction to the identification, replication and transmission of genetic material of eukaryotic and prokaryotic cells and the essential concepts of the genetic theory

Objectives: Upon successful completion of this course, students should be able to:

1. Outline the essential principles and processes of molecular biology
2. Analyze the outcome of experiments that involve the use of recombinant DNA technology and other common gene analysis techniques
3. Explain Mendelian inheritance, quantitative traits, linked genes, crossing-over, gene mapping, sex determination, and gene frequencies in natural populations
4. Apply genetic concepts to solving problems on classic mechanisms of inheritance and those mechanisms of inheritance that extend beyond Mendel

Pre-requisites: A pass in one of the following:
Preliminary Biology I and II (BL05A/BIOL0011 and BL05B/ BIOL0012) or CAPE ('A' level) Biology or equivalent

Course Content:

- **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

Mode of Delivery:

| | | |
|---|---|---|
| Lectures | 18 hours | Didactic and interactive |
| Tutorials | 6 hours | Interactive |
| Practicals | 33 hours | |

Evaluation:

| | | |
|---|---|---|
| Final Examination: | | 50% |
| One 2-hour comprehensive paper | | |
| Course Work: | | 50% |
| Laboratory reports | 20% | |
| Tutorial attendance and in-course writing assignments | 10% | |
| One 1-hour in-course test | 20% | |

Recommended Text:
Verma, P.S. and Agarwal, V.K. 2005. Cell biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand & Co. Ltd. ISBN 81-219-2442-1

Useful websites:
http://ourvle.mona.uwi.edu/file.php/1889/Nucleic_Acid_Structure_and_DNA_Replication.pdf
http://www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=mboc4
http://www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=iga

**BIOL1262** **LIVING ORGANISMS I**

(3 credits) Semester 2 Level I

**Aim:**

1. Introduce students to the major groups of prokaryotes, autotrophic protists and plants, their evolutionary associations, and adaptive radiation
2. Develop skills appropriate to the study of plants and prokaryote in the laboratory

Learning Outcomes:

Upon successful completion of this course, students should be able to:

1. Describe the characteristic features of selected prokaryotes
2. Compare the biology of autotrophic protists and plants.
3. Classify common plants that occur in the Caribbean using the Linnaean system
4. Explain the functional consequences of different types of body and tissue organization in plants
5. Outline the main associations between the major taxonomic groups of plants
6. Describe the adaptive radiation of the major groups of plants
7. Solve simple problems in plant science
8. Demonstrate laboratory skills appropriate to the study and interpretation of living and preserved botanical specimens

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:

Evolutionary Concepts
Archaebacteria & 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

Mode of Delivery:

| | | |
|---|---|---|
| Lectures | 18 hours | Didactic; interactive |
| Tutorials | 6 hours | Interactive; mind maps; problem-solving |
| Laboratory classes | 33 hours | Interactive practical tasks; problem-solving |

Evaluation:

| | | |
|---|---|---|
| Final Examination: | | 50% |
| One 2-hour Comprehensive paper | | |
| Course Work: | | 50% |
| Writing across the curriculum exercises | 5% | |
| Laboratory reports (10 x 2% each = 20%) | 20% | |
| One in-course test | 20% | |
| Tutorial Attendance and participation | 5% | |

Prescribed Text:

Bidlack, James and Shelley Jansky. (2010) Stern's Introductory Plant Biology, 12th Ed. McGraw-Hill Science/Engineering/Math

Recommended reading:

Kingsley R. Stern, Shelley Jansky, James Bidlack (2007) Introductory Plant Biology, 11th Ed. McGraw-Hill Companies.
James D. Mauseth (2008) Botany: An Introduction to Plant Biology, 4th Ed. Jones & Bartlett Publishers.
Peter H. Raven, Ray F. Evert, Susan E. Eichhorn (2004) Biology of Plants, 7th Ed. W. H. Freeman.

Useful Websites

http://highered.mcgraw-hill.com/sites/0072830670/information_center_view0/
http://bcs.whfreeman.com/raven7e/

**BIOL1263** **LIVING ORGANISMS II**

**(**3 credits) Semester 2 Level I

Aim:

1. Introduce students to the major groups of:
   (a) animals, their evolutionary associations, and adaptive radiation; and
   (b) fungi as decomposers, symbionts, and pathogens
2. Develop practical skills appropriate to the study of animals and fungi in the laboratory

Learning Objectives: Upon successful completion of this course, students should be able to:

1. Classify common animals and fungi using the Linnaean system
2. Explain the functional consequences of different types of body organization of animals
3. Outline the main associations between the major groups of animals based on neo-Darwinian evolution
4. Describe the adaptive radiation of the major groups of animals and fungi
5. Solve simple problems in zoology
6. Compare the roles of fungi as primary decomposers, symbionts, and pathogens
7. Demonstrate laboratory skills appropriate to the study and interpretation of living and preserved specimens of animals and fungi

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:

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

Practical Work:

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

Mode of Delivery:

| | | |
|---|---|---|
| Lectures | 18 hours | Didactic; interactive |
| Tutorials | 6 hours | Interactive; mind maps; problem-solving |
| Laboratory classes | 33 hours | Interactive practical tasks; problem-solving |

Evaluation:

| | | |
|---|---|---|
| Final Examination: | | 50% |
| One 2-hour Comprehensive paper | | |
| Course Work: | | 50% |
| Writing across the curriculum exercises | 5% | |
| Laboratory reports (10 x 2% each = 30%) | 20% | |
| One in-course test | 20% | |
| Tutorial Attendance and participation | 5% | |

Prescribed Text:

Hickman CP, Roberts LS, Keen SL, Larson A, and Eisenhower DJ (2007). Animal Diversity. Fourth edition. McGraw Hill Higher Education.

Useful website (animals): www.mhhe.com/hickmanad4e
Useful website (fungi): http://tolweb.org/fungi

## NEW LEVEL 2 COURSES: (Available as of 2011/12 academic year)

**BIOL2401** **RESEARCH SKILLS AND PRACTICES IN BIOLOGY**
(3 Credits) Semester 1 Level II

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

**Rationale:**
This course is being designed to give students the opportunity to master the skills with which they seem to have great difficulty and which are vital tools for our majors. The intent is to impart the requisite skills and ethical principles that underpin the discipline. This is part of our response to infusing students who may not have had a firm background in practical biology with the skills, methods and principles that will allow them to be successful and functional biologists.

**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.

**Learning Outcomes:**
At the end of this course students should be able to:

- Outline the major transferrable skills
- Find, Evaluate and properly cite published information without plagiarising
- Communicate their research orally or in writing
- Demonstrate basic laboratory and field research skills
- Review the major ethical principles as they relate to appropriate scientific conduct.

**Content:**
This course will cover 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

**Teaching Methods/Approaches:**

| **Method/Approach** | **Contact hours** | **Credit hours** |
|---|---|---|
| Formal Lectures: | 18 | 18 |
| Tutorials/Seminars: | 9 | 9 |
| Laboratory and Field work: (inclusive of case study presentation and discussion). | 24 | 12 |
| Total: | 51 | 39 |

**Assessment Procedures/Methods:**
(Students are required to pass all components)

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

**Materials/Bibliography/Reading List:**
Jones, A., Reed, R. and Weyers, J. 4th Ed. 2007. Practical Skills in Biology. ISBN- 0-13-175509-9. Benjamin Cummings.

**Online Resources:**
www.ucl.ac.uk/keyskills/customised-pages/biology
http://oba.od.nih.gov/oba/about_oba.html), BioethicsResources@mail.nih.gov.

**BIOL2402 FUNDAMENTALS OF BIOMETRY**
(3 credits) Semester 1 Level 2

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

**Co-requisite**: BIOL2014- Research skills and practices in Biology.

**Rationale:**
This course is designed to provide a foundation in statistical concepts applicable to biological experiments.

**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.

**Learning Outcomes:**
Upon successful completion of this course the students should be able to:

- explain basic statistical concepts;
- summarise quantitative biological data using methods of descriptive statistics;
- based on specified criteria, identify appropriate statistical tests for one and two variables;
- apply statistical test procedures and interpret the results;
- describe relationships among multiple independent variables.

**Content:**

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

**Teaching methods/Approaches:**

| **Method/Approach** | **Contact Hours** | **Credit Hours** |
|---|---|---|
| Formal Lectures | 18 | 18 |
| Tutorials | 7 | 7 |
| Practical work | 28 | 14 |
| involving exercises in solving statistical problems using a software application and by hand | | |
| **Total** | **53** | **39** |

**Assessment Procedures/Methods:**
(Students are required to pass both components)

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

**Materials/Bibliography/Reading Lists**
Prescribed texts:

Zar, J.H. 2009. Biostatistical analysis, 5th Ed. Prentice Hall ISBN: 013081542X.
Hinton, Perry R. 2004. Statistics Explained, 3rd Ed. Routledge. ISBN: 0415332850

**BIOL2403** **PRINCIPLES OF ECOLOGY**
(3 Credits) Semester 2 Level II

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

**Rationale:** The discipline of ecology underpins and provides foundation for the study of the environment. The study of how organisms affect the transport and transformation of energy and matter in the biosphere helps us understand the principles of operation of the natural system which in turn provides useful models of sustainability.

**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.

**Learning Objectives:** Upon successful completion of this course, students should be able to:

1. explain population distributions and the abiotic and biotic factors which influence them
2. identify species interactions and evaluate the interdependence of species
3. describe concepts of community productivity, succession, cycling and transformation

**Content:**

- 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, protocooperation 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

**Teaching Methods/Approaches:**

| **Method/Approach** | **Contact hours** | **Credit hours** |
|---|---|---|
| Formal Lectures: | 21 hours | 21 |
| Tutorials/Seminars: | 6 hours | 6 |
| Laboratory and Field work: | 24 hours | 12 |
| (inclusive of case study presentation and discussion). | | |
| Total: | 51 hours | 39 hours |

**Assessment Procedures/Methods:**
(Students are required to pass both components)

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

**Materials/Bibliography/Reading lists:**
Prescribed text:
Smith, T.M. and Smith, R.L. 2006. Elements of Ecology 6th Ed. Benjamin Cummings; ISBN-10: 0805348301 ISBN-13: 978-0805348309

Recommended text:
MacKenzie, A; Ball, A and Virdee, S. 2006. BIOS Instant Notes Ecology 2nd Ed. BIOS Scientific Publishers Ltd. Oxford. ISBN 1-85996-257-2

**BIOL2404** **GENETICS**
(3 Credits) Semester 2 Level 2

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

**Rationale:**
The course is intended to provide a comprehensive and balanced account of genetics and genomics by integrating the subfields of classical genetics, molecular genetics and population genetics.

**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.

**Learning Outcomes**: Upon successful completion of this course students should be able to:

- explain the biological processes including expression, regulation, mutation, transmission, recombination, mapping, cloning of genes and analysis genomes in individuals and populations of living organisms.
- describe the experimental methods used by geneticists to solve biological problems
- display critical thinking skills that will be useful in the genetic analysis of living organisms

**Content:**
1. The molecular and physical basis of inheritance.
2. The genomes of viruses, bacteria, and higher organisms.
3. The structure, expression, regulation, recombination, mapping, modification and manipulation (cloning) of genes.
4. Embryonic development.
5. The measurement and transmission of genetic variation (genes/alleles, genotypes) through time and space leading to speciation in plant and animal populations.

**Teaching Methods/Approaches:**

| **Method/Approach** | **Contact Hours** | **Credit Hours** |
|---|---|---|
| Formal Lectures | 18 | 18 |
| Tutorials | 3 | 3 |
| Field and Laboratory work | 36 | 18 |
| Total | 57 | 39 |

**Assessment procedures/Methods:**
(Students are required to pass all components)

| | | |
|---|---|---|
| One 2-hour theory paper | | 60% |
| Coursework | | 40% |
| One 2-hour practical test | 20% | |
| Laboratory reports (4 x 5% each) | 20% | |

**Materials/Bibliography/reading lists:**
Prescribed text:
Klug, W. S., Cummings, M. R. & Spencer, C. A., 2009. Concepts of Genetics. Pearson Benjamin Commings, San Francisco . 779 pp ISBN- 13:978-0-321-52404-1

Highly Recommended texts:

Snustad, D.P.; Simmonds, M.J. 2009. Principles of Genetics. John Wiley and Sons, New Jersey. 823 pp. ISBN 978-0-470-38825-9

On-line resources: http://www.accessexcellence.org/RC/genetics.php

****BIOL2405 THE BIOLOGY OF MICROORGANISMS (Not available in 2011/12)****
(3 credits) Semester 2 Level II

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

**Rationale:**
Microbiology, the study of microorganisms, plays a very important role in Biology, being a component of almost every field of Biology. After completing this course, students should be versed in general microbiology and its relationship to other biological sciences, public health, and the environment. Essentially, the course replaces and re-focuses the Level 2 course, BIOL2252 Eukaryotic Microorganisms.

**Course Description:**
The course introduces students to the evolution, ecology and metabolism of microorganisms. In particular, emphasis will be placed on the ecological roles of eukaryotic microorganisms. Attention will be given to the various groups of microorganisms in relation to their interactions with the environment, including both beneficial and harmful aspects of these interactions.

**Learning Outcomes:**
At the end of this course students should be able to:
- Distinguish between the different classes of microorganisms
- Describe the nutrition, growth and metabolism of microorganisms
- Outline the roles of microorganisms in the environment, industrial processes, animal and plant health and disease.

**Content:**
This course will cover the following topics:
- General characteristics of each type of microbe (viruses, viroids, prions, archaea, bacteria, protozoa, algae, and fungi);
- Classification of microbes;
- Cell structure, metabolic diversity, growth and reproduction;
- Microbial genetics;
- Microbial interactions with humans and other animals;
- Microbial ecology (ecosystems, symbiosis, microorganisms in nature, agricultural uses);
- Industrial microbiology (microbial products, biotransformation, waste water treatments, biodegradation, bioremediation)

**Teaching Methods/Approaches:**
The teaching of this course will be carried out using the following strategies:

| **Method/Approach** | **Contact Hours** | **Credit Hours** |
|---|---|---|
| Formal Lectures | 18 | 18 |
| Laboratory sessions | 36 | 18 |
| Tutorials | 3 | 3 |
| Total | 57 | 39 |

**Assessment Procedures/Methods:**
(Students are required to pass all components)

| | | |
|---|---|---|
| One 2-Hour Final Examination Paper | | 50% |
| Course Work | | 50% |
| Two 1-Hour Course Tests | 20% | |
| Laboratory Reports (3 x 10% each) | 30% | |

**Materials/Bibliography/Reading lists:**
Deacon, J. W. (2006) Fungal Biology Blackwell Publishing Ltd. ISBN-13:987-1 4051-3066-0; ISBN-10: 1-4051-3066-0.
Madigan, M. T., Martinko, J. M. and Parker, J. (2006) Brock Biology of Microorganisms. Prentice Hall, New Jersey. ISBN0-13-219226-8
Kelly Cowan, K. and Park Talaro, K. (2008). Microbiology: A Systems Approach. McGraw-Hill. 896 pp. ISBN-13: 978-0077266868
Vashishta, B. R. (2001) Botany for Degree Students: Algae. S. Chand & Co. Ltd. 456 pp. ISBN: 81-219-0827-2

http://www.ncbi.nlm.nih.gov/books/NBK7627/ http://www.virology.net/ http://mycology.cornell.edu/

**BIOL2406 EUKARYOTIC MICROBIOLOGY**
(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 FPAS courses

**Co-Requisite**: BIOL2401

**Rationale**:
The eukaryotic microbes form an important link between the prokaryotes and the higher order eukaryotes, illustrating the progressive nature of life forms. Knowledge of the protists and fungi along with their interrelationships to other life forms is crucial to the understanding of the vital roles that these organisms fulfil in the environment. This level II course seeks to promote a critical awareness in the students of the contributions of these microorganisms to the biogeochemical cycles, food and medical industries as well as to environmental pollution and pathogenesis. Students are provided with foundation material for the study of the applied aspects of biotechnology and environmental management at higher levels.

**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.

**Learning Outcomes**:
Critical thinking and creativity within a scientifically ethical framework are skills promoted through the learning experiences designed particularly within cooperative and integrative laboratory sessions. Students will be required to effectively communicate their experimental findings and evaluate results from simulations during class presentations.

Upon successful completion of this course the students should be able to:

1. describe the range in morphology and structure of eukaryotic microorganisms and be able to distinguish them from prokaryotes.
2. classify eukaryotic microorganisms.
3. discuss the evolutionary relationships between the groups of eukaryotic microorganisms, to other eukaryotes as well as to the prokaryotes.
4. describe growth and metabolism in eukaryotic microbes.
5. outline the importance of eukaryotic microorganisms in the environment.
6. outline the utilisation of eukaryotic microorganisms in biotechnology.
7. identify and explain strategies for the management of eukaryotic microorganisms in the environment.
8. isolate and aseptically culture selected microorganisms.
9. critically evaluate experimental data gleaned from actual experiments.

**Course Content**:

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

**Teaching Method**:

| Method/Approach | Contact Hours | Credit Hours |
|---|---|---|
| Formal Lectures | 18 | 18 |
| Tutorials | 6 | 6 |
| Laboratory sessions | 30 | 15 |
| Total | 54 | 39 |

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.

**Assessment Procedures/Method**:
The achievement of learning outcomes will be measured through two components. Students are required to be successful in **both** components.

- The final theory exam (2 hours) **50%**
  - This paper consists of short answer and essay questions.
- Coursework Component worth **50%**
  consisting of:
  - One 2-hour practical test - 20%
  - Laboratory reports – 20%
  - Project report – 10%

(Both components must be successfully completed)

**Course Material**:

1. **Prescribed Text**:
   There is no text currently available that covers all the topics at the appropriate level. Students are advised to read widely from books and papers, e.g. in the recommended reading list and the web pages recommended below.

2. **Recommended Reading**:
   i. Madigan, M. T., Martinko, J. M. and Parker, J., 2008. Brock Biology of Microorganisms. Prentice Hall, New Jersey. ISBN-10: 9780132324601. ISBN-13: 978-0132324601
   ii. Lee, R. E., 2008. Phycology. 4th edition. Cambridge University Press. ISBN-10: 9780521682770. ISBN-13: 978-0521682770
   iii. Webster, J. & Weber, R. W. S., 2007. Introduction To Fungi. Cambridge University Press. ISBN-10: 9780521014830. ISBN-13: 978-0521014830.
   iv. Barsanti, L. & Gualtieri, P., 2006. Algae: Anatomy, Biochemistry and Biotechnology. CRC Press. 301 pp. ISBN-10: 0-8493-1497-4; ISBN-13: 978-0-8493-1467-4.
   v. Alexopoulos, C. J., Mims, C. W. and Blackwell. M., 1996. Introductory Mycology. John Wiley and Sons, New York. 868 pp. ISBN 0-471-52229-5.

**Online Resources:**

1. http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/P/Protists.html
2. http://comenius.susqu.edu/bi/202/Taxa.htm
3. http://www.algaebase.org/
4. http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/E/Endosymbiosis.html
5. http://www.experiment-resources.com/index.html
6. http://www.mycolog.com/
7. http://herbarium.usu.edu/fungi/FunFacts/StudyGuide.htm
8. http://www.biology.ed.ac.uk/research/groups/jdeacon/statistics/tress2.html#THESCIENTIFICMETHOD

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

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

**Co-requisite**: BOTN2402 – Physiology of Plants

**Rationale:**
A comprehensive knowledge of the organisation of the plant body, the systems that coordinate plant life and how these impact on the nomenclature, classification and identification of the embryophytes is prerequisite to understanding their form and phylogeny. This course is designed to provide a foundation in the diversity of, and the evolutionary relationships between the major groups of plants.

**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, classification of the major groups and the rules of nomenclature in botany.

**Learning Outcomes:**
Upon successful completion of this course the students should be able to:

10. compare the range in morphology and anatomy of sporiferous and seed-bearing plants.
11. utilise taxonomic data to classify plant specimens.
12. discuss the evolutionary relationships between the different groups of plants.
13. infer the evolution of important vegetative and reproductive features that has led to the dominance and success of extinct and extant groups of plants.

**Content:**
This course will cover the following topics:

1. Plant body organization
2. Plant form and the environment
    a. Structures involved in:
        i. accessing raw materials from the environment
        ii. structural support of the plant body
        iii. anatomical specializations and structural adaptations of plants
        iv. excretory processes
        v. plant reproduction
    b. Plant habit types and their anatomical features
3. The evolution of plants
4. Plant life cycles
5. Plant systematics
    a. Sources of taxonomic data
    b. Contemporary taxonomic systems and nomenclature of plants
    c. Analysis and interpretation of taxonomic data
    d. Herbaria and plant taxonomic research
6. Plant identification
    a. Sporiferous non-vascular Plants:
        i. Anthocerotophyta
        ii. Hepaticophyta
        iii. Bryophyta
    b. Sporiferous vascular plants:
        i. Pteridophyta
        ii. Sphenophyta
    c. Seed-bearing plants:
        i. The seed habit
        ii. Gymnosperms
        iii. Angiosperms

**Teaching Methods/Approaches:**

| Method/Approach | Contact Hours | Credit Hours |
|---|---|---|
| Formal Lectures | 18 | 18 |
| Tutorials | 6 | 6 |
| Practical work | 30 | 15 |
| Total | 54 | 39 |

**Assessment Procedures/Methods:**
The achievement of learning outcomes will be measured through two components. Students are required to be successful in **both** components.

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

**Materials/Bibliography/Reading Lists:**
**Prescribed text**:

Beck, C. E., 2010. An Introduction to Plant Structure and Development: Plant Anatomy for the Twenty-First Century. 2nd edition. Cambridge University Press. ISBN-10: 0521518059. ISBN-13: 978-0521518055.

**Recommended reading:**

1. Mauseth, J. D., 2008. Botany: An Introduction to Plant Biology. 4th edition. Jones & Bartlett Learning. ISBN-10: 9780763753450. ISBN-13: 978-0763753450
2. Judd, W. S, , Campbell, C. S., Kellogg, E. A., Stevens, P. F., Donoghue, M. J., 2007. Plant Systematics: A Phylogenetic Approach, 3rd Edition. Sinauer Associates. ISBN-10: 9780878934072, ISBN-13: 978-0878934072

**Internet resources**:

www.reading.ac.uk/.../research/.../biosci-**plantdiversity**.aspx
http://www.aspt.net/
http://www.sci.sdsu.edu/plants/plantsystematics/
http://www.ucmp.berkeley.edu/plants/plantae.html

**BOTN2402 PHYSIOLOGY OF PLANTS**
(3 Credits) Semester 1 Level 2

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

**Rationale:**
This course is designed to provide a foundation in the fundamental concepts of plant physiology through an appreciation of the form and function, growth and development of higher plants. It aims to introduce students to experimental plant science using methods that illustrate basic principles of plant physiology.

**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.

**Learning outcomes:**
Upon successful completion of the course, students should be able to:
- Identify the main processes and controls of plant cell growth and differentiation.
- Describe developmental stages from seedling to senescence or dormancy, and how they are regulated and affected by plant hormones and other biotic and abiotic factors.
- Describe the pathways and processes of water, mineral nutrient and photosynthate transport in plants.
- Explain differences between the main pathways of carbon fixation and assimilation and identify their benefits under various environmental conditions.
- Undertake, interpret and report basic plant physiological experiments in the laboratory and greenhouse.

**Content:**
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-ink relations and translocation of photosynthates.
- Introduction to secondary metabolites and their roles in the physiology and the biochemistry of plants.

**Teaching method/Approaches:**

| Method/Approach | Contact Hours | Credit Hours |
|---|---|---|
| Formal Lectures | 18 | 18 |
| Laboratory and greenhouse work | 36 | 18 |
| Tutorials | 3 | 3 |
| Total | 57 | 39 |

**Assessment Procedure/Methods:**
(Students are required to pass both components)

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

**Materials/Bibliography/Reading lists:**
Prescribed text:

Taiz, L. and Zeiger, E. (2010) Plant Physiology 5th Ed. Sinauer Associates Inc.
ISBN-10:0878938664, ISBN-13: 978-087878667, (Online access: http://5e.plantphys.net/

Recommended texts:

Hopkins, W.G. & Huner, N.P.A. 2008. Introduction to Plant Physiology, 4th ed. Wiley
ISBN-10: 0470247665. ISBN-13: 978-0470247662.
Heldt, H-W. (2005). Plant Biochemistry. 3rd Edition. Elsevier, Amsterdam.
Mohr, H and et Schopfer, P (1995) Plant physiology. **Springer Verlag**. Berlin.
Nobel, P. S. (2009). Physicochemical and Environmental Plant Physiology. 4th Edition. Academic Press-Elsevier, Amsterdam.

**ZOOL2401 ANIMAL FORM**
(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 FPAS courses

**Co-requisite**: ZOOL2402 Animal Physiology

**Rationale:**
Knowledge of the structure of animals and animal systems is essential in understanding how animals function. An understanding of animal structure affects the comprehension of most other major fields of zoology, including ecology, physiology and evolutionary biology. This course is designed as a core course for zoological sciences and will be essential for persons wishing to major in Zoology.

**Course Description:**
The course serves as an introduction to the gross structure and cellular organization of animals with emphasis on systems in animals. In all topics, examples are drawn from both vertebrate and invertebrate phyla.

**Learning Outcomes:**
At the end of this course students should be able to:
1. identify the relationship between structure of important components and their normal functioning in animals.
2. evaluate and compare selected systems commonly found in animals
3. evaluate and compare cell types commonly found in the selected systems studied.
4. describe the evolution of selected systems through the range of animal phyla.

**Content:**
This course will cover the following topics:
- Structures and systems associated with feeding in animals
- Structures and systems associated with excretion and osmoregulation
- Structures and systems involved in gaseous exchange in animals
- Nervous systems and muscles
- Endocrine systems,
- Animal reproductive structures and systems

**Teaching Methods/Approaches:**

| **Method/Approach** | **Contact Hours** | **Credit Hours** |
|---|---|---|
| Formal Lectures | 18 | 18 |
| Tutorials | 6 | 6 |
| Practical work | 30 | 15 |
| Total | 54 | 39 |

**Assessment Procedures/Methods:**
(Students are required to pass both components)

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

**Materials/Bibliography/Reading List**
Prescribed Text:
Starr, C. 2009. Animal Structure and Function (Biology: The Unity and Diversity of Life). Thomson Brooks/Cole, ISBN: 9780534397487

Recommended Texts:
Kardon, K. V. 2007. Vertebrates (Comparative anatomy, Function, evolution). 4th Ed. McGraHill. ISBN 978-0-07-252830-5.

Lemis, K.V.; Bemis, W.E.; Walker, W.F. and Grande, L. 2009. Functional Anatomy of vertebrates, an evolutionary perspective. Thomson learning ISBN 07-290956-0

Brusca, R. C. and Brusca, G.J. 2006. Invertebrates. 2nd Ed. Sinaure. ISBN 0-87893-097-3

**ZOOL2402 ANIMAL PHYSIOLOGY**
(3 credits) Semester 2 Level 2

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

**Co-requisite**: ZOOL2401 Animal form

**Rationale:**
Knowledge of how various animal systems function is essential in understanding most other major fields of zoology, including ecology, physiology, evolutionary biology. This course is designed as a core course for zoological sciences and will be essential for persons wishing to obtain a major in Zoology.

**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.

**Learning Outcomes:**
At the end of this course students should be able to:

1. evaluate standard physiological concepts such as Bohr shift, countercurrent systems, active transport and negative feedback control
2. describe the structure of important components involved in the normal functioning of animals.
3. explain the functioning of several major physiological systems found in animals
4. conduct, analyse and report on the results of simple physiological laboratory experiments conducted on animals.

**Content:**
This course will cover 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

**Teaching Methods/Approaches:**

| **Method/Approach** | **Contact Hours** | **Credit Hours** |
|---|---|---|
| Formal Lectures | 18 | 18 |
| Tutorials | 6 | 6 |
| Practical work | 30 | 15 |
| Total | 54 | 39 |

**Assessment Procedures/Methods:**
(Students are required to pass both components)

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

**Materials/Bibliography/Reading List**

Prescribed Text:

French, K.; Randall, D. and Burgren, W.E. 2009. Animal Physiology. W.H. Freeman.
ISBN- 07-16738635

Recommended Texts:

Starr, C. 2007 Animal Structure and Function (Biology: The Unity and Diversity of Life). Thomson Brooks/Cole, ISBN: 9780534397487

Schmidt-Nielsen, K. 2008. Animal Physiology: Adaptation and Environment. 5th Ed. Cambridge University Press, ISBN: 9780521570985

**AGSL2401 MANAGEMENT OF SOILS**
(3 credits) Semester 1 Level 2

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

**Co-requisite**: BIOL2014- Research skills and practices in Biology.

**Rationale:** The course is designed to provide a foundation in the management of soil structure and properties to achieve enhanced plant growth.

**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.

**Learning Outcomes:**

Upon successful completion of this course the students should be able to:

- describe basic types of soils and their physical, chemical and biological features;
- describe the main features of successful irrigation of soils;
- explain methods of effectively managing soils to improve and maintain its desirable properties;
- explain the relationship between microbial activity and soil fertility;
- explain the issues of soil erosion in Jamaica.

**Content:**

1. Soil basics- texture and structure ;
2. methods of land clearing and their effects on soil structure;
3. soil tillage and the management of soil structure for plant growth;
4. management of soil structure to improve water intake, transmission and storage;
5. soil and crop water relations, water management for salinity control; soil erosion and the management of hillsides;
6. management of dry and wet lands;
7. management of forest soils; management of specific problem soils:
8. management for agriculture, soil management and its effects on microbes, microbial activity and soil fertility;
9. soil fertility management; soil quality, carbon sequestration;
10. soil management practices case studies.

**Teaching Methods/Approaches:**

| **Method/Approach** | **Contact Hours** | **Credit Hours** |
|---|---|---|
| Formal Lectures | 16 | 16 |
| Tutorials | 5 | 5 |
| Practical work (laboratory and field exercises) | 36 | 18 |
| Total | 57 | 39 |

**Assessment Procedures/Methods:**

(Students are required to pass all components)

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

**Materials/Bibliography/Reading Lists**
**Prescribed texts:**

Brady, N.C. and Weil, R.R. (2008). The nature and properties of soils. (14th ed.). Upper saddle Rd., N.J. Pearson-Prentice Hall

Fangmeier, D. D.; Elliot, W.J. Workman, S.R. and Huffman, R.L. (Sep 26, 2009) 5th Ed. Soil and Water Conservation Engineering . Delmar Cengage Learning; ISBN-10: 9781401897499 ISBN-13: 978-1401897499

Schwab, G.O.; Fangmeier, D.D. and Elliot, W.J. 2001. Soil and Water Management Systems (9780471109730): Chichester- John Wiley and Sons. ISBN 0-471 5994 8

**Internet resources:**
http://afsic.nal.usda.gov/nal_display/index.php?info_center=2&tax_level=1&tax_subject=293
http://www.asareca.org/swmnet/home.php?LinkID=0c3c8322b833376d737f14a98a77d998
www.prenhall.com/brady, http://www.attra.com, http://www.fao.org/organicag

**BL20L/BIOL2013- Diving Technology for Aquatic Sciences** is only available in Summer School and remains the same as described in the 2010/12 Faculty Handbook.

**BL20L/BIOL2013 DIVING TECHNOLOGY FOR AQUATIC SCIENTISTS**
(4 credits) Summer School Level II

Aim: To train students in SCUBA diving to CMAS (The World Underwater Federation) 2 star diver standard and expose them to techniques for conducting scientific work underwater.

Objectives: On successful completion of this course students will be able to:

1. explain the principles of the physiology of diving and safe diving practices
2. SCUBA dive safely to a depth of 20 meters
3. perform a complete in-water rescue including CPR and oxygen administration
4. conduct an underwater survey of marine life using SCUBA diving skills

Pre-requisite: Completion of Level 1 in the FPAS (Regulation 15) and successful completion of a swim test.

Course Content:

- **Principles of diving**
  Pressure and buoyancy; atmospheric and water pressure; factors affecting buoyancy
  Diving equipment; the aqualung and accessory apparatus
  Decompression tables; planning and conducting no-stop dives and dives requiring decompression stops

- **Physiology of diving**
  The human life support system; physiology of circulatory and respiratory systems.
  Effect of pressure on human body; adverse effects of gases; role of nitrogen in decompression sickness (DCS); signs and symptoms of DCS

- **Safe diving practices**
  Dive planning and preparation; entry and exit methods
  Diver self-help techniques; situation avoidance and assessment
  Diver rescue techniques; emergency ascents
  Artificial ventilation; cardiopulmonary resuscitation; oxygen administration;
  first aid
  Adventurous diving; deep diving; night diving; wreck diving; drift diving;
  Diving from small boats

- **Diving with a purpose**
  Fauna and flora of the coral reef
  Underwater search techniques
  Underwater navigation; natural navigation and use of underwater compass
  Underwater sampling, survey and recovery methods
  Underwater photography

Mode of delivery:

22 hours of lecture, 4 of tutorial and 47 hours of practical involving snorkeling and diving, aqualung diving skills, diver self-help, diver rescue, underwater navigation, diving with a surface marker buoy and boat diving procedures. Each student must complete 10+ dives with confidence-building exercises progressing to 20 m depth.
Exercises in underwater scientific survey techniques.

Evaluation :

| | | |
|---|---|---|
| Final Examination: | | |
| One 2 hour theory paper | | 50 % |
| Course Work: | | 50% |
| One 1-hour MCQ paper (practical questions) | 10 % | |
| Open water Competence Assessments | 30 % | |
| Project | 10 % | |

Prescribed text: Graver, D.K. 2003. Scuba Diving. 3rd Ed. Human Kinetics Publishers.ISBN- 0736045392.
Recommended text: YMCA 2001. Scuba Diving. 3rd Ed. Human Kinetics Publishers. ISBN- 0736045392

## LEVEL III COURSES:
## (Same as described in 2010/12 Faculty Handbook)

**BL31E/BIOL3014 MARINE ECOLOGY I: BIOLOGICAL OCEANOGRAPHY**.
(4 credits) Semester 1 Level III

Aims: 1. Impart knowledge of the organisms as well as the physical and chemical processes associated with the marine pelagos.

2. Introduce the appropriate methods of measuring and sampling the oceans.

Objectives: Upon successful completion of this course students should be able to:

1. identify the types of organisms associated with the marine pelagos- their biology, associations and distribution.

2. describe and evaluate the physical and chemical processes associated with the marine pelagos.

3. adequately investigate the organisms, habitats and processes of the marine pelagos through "hands on" practical exercises.

4. analyse, interpret and present their investigations in a scientific report.

Pre-requisite**:** BL20N/BIOL2014. Admission to this course is limited due to the restriction of boat space on field trips.

Course Content:

- 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
- Vertical migration and the deep sea pelagos

Mode of Delivery:

24 hours of lecture, 6 hours of tutorial and 36 hours of laboratory and field exercises involving sampling from small boats which illustrate the major aspects of the lecture course. Laboratory sessions which involve field trips off campus necessitate adding 2 hours of travel time to the 6 hours normally used for the practical exercise.

Evaluation:

| | | |
|---|---|---|
| One 3-hour theory paper | | 60% |
| Coursework | | 40% |
| Consisting of: | | |
| Laboratory reports | 20% | |
| End of course practical test | 20% | |

Prescribed text: Nybakken, J. and Bertness, M. 2005.
Marine biology, an ecological and environmental approach.
6th Ed. Benjamin Cummings. 516 pp. ISBN- 0-321-03076-1

Recommended: Thrujillo, A. and Thruman, H. 2005.
Essentials of Oceanography. 8th Ed. Prentice Hall. 532 pp. ISBN- 0-13-144773-4

**BL31F/BIOL3015 MARINE ECOLOGY II: BENTHIC COMMUNITIES**
(4 credits) Semester 1 Level III

Aim: To impart knowledge of the range of habitats, organisms and ecological processes associated with the marine benthic environment as well as introduce the appropriate methods of investigation.

Objectives: Upon successful completion of this course students should be able to:

1. identify and categorise the range of marine benthic habitats.
2. identify the organisms in each habitat as well as their biology and interactions.
3. describe the important physical and chemical processes associated with benthic marine habitats.
4. adequately sample and investigate the organisms, habitats and processes through "hands on" practical exposure.
5. analyse, interpret and present their investigations in a scientific report.

Pre-Requisite: BL20N/BIOL2014. Admission to this course is limited due to the restriction of boat space on field trips.

Co-requisite: BL31E/BIOL3014.

Course Content:

1. The nature of the intertidal and sub-tidal benthic environment
2. The communities associated with sandy shores
3. The communities associated with rocky shores
4. Mangrove swamp communities
5. Seagrass communities
6. Meiofauna

7. Symbioses in the sea
8. Deep Sea ecology.

Mode of Delivery:

24 hours of lecture, 6 hours of tutorial and 36 hours of laboratory and field exercises involving the range of habitats which illustrate the major aspects of the lecture course.
Laboratory sessions which involve field trips off campus necessitate adding 2 hours of travel time to the 6 hours normally used for the practical exercise.

Evaluation:

| | | |
|---|---|---|
| One 3-hour theory paper | | 60% |
| Coursework | | 40% |
| Consisting of: | | |
| Laboratory reports | 20% | |
| End of course practical test | 20% | |

Prescribed Text: Nybakken, J. and Bertness, M. 2005.
Marine biology, an ecological and environmental approach. 6th Ed. Benjamin Cummings. 516 pp. ISBN- 0-321-03076-1

**BL31G/BIOL3023 CORAL REEF BIOLOGY**

(4 credits) Semester 2 Level III

Aim: To provide an introduction to the biology of reef building corals, the ecology of coral communities, and the natural phenomena and anthropogenic factors that impact coral reefs.

Objectives: Upon successful completion of this course students should be able to:

1. Identify Caribbean coral species and describe their biology, distribution and interactions.
2. Describe how reefs are formed and explain the role of the non-coral organisms associated with them.
3. Conduct laboratory and field exercises involved in the investigation of coral reefs.

Pre-Requisite: BL20N/BIOL2014
Co-requisite: BL31E/BIOL3014 and BL31F/BIOL3015

Course content:

- Biology of scleractinian corals: Anatomy, skeletal morphology, calcification and skeletogenesis, endosymbiosis with zooxanthellae, modes of feeding, reproduction and recruitment, environmental factors that influence growth and distribution.
- Ecology of coral communities: Theory of coral reef formation, types of reef. Reef community structure and zonation. Dynamics of coral communities including diversity/stability relationships, keystone species, algal-herbivore and predator-prey interactions, inter-specific competition, succession, and disturbance.
- A survey of the major groups of reef-associated organisms including other coelenterates, porifera, echinoderms, fishes, and algae.

Throughout the course the emphasis will be on Caribbean coral reefs, but comparisons will be made to reefs from other regions.

Mode of Delivery:

24 hours of lectures, 6 hours of tutorial and 36 hours of laboratory exercises on taxonomy and physiology of corals and other reef-associated organisms, and field exercises on coral reef assessment and monitoring.

Evaluation:

| | | |
|---|---|---|
| One 3-hour theory examination | | 60% |
| Course Work: | | 40% |
| Consisting of Laboratory reports | 30% | |
| In-course practical tests | 10% | |

Prescribed Text:

Kaplan, E.H., Kaplan, S.L. and Peterson, R.T. 1999. A field guide to coral reefs: Caribbean and Florida. Haughton Miffin. ISBN-618002111.

**BL33D/BIOL3021 FRESHWATER ECOLOGY**

(4 credits) Semester 2 Level III

Aims: 1. To introduce students to the diversity and taxonomy of freshwater fauna and flora.

2. To introduce the biotic and abiotic factors responsible for controlling the dynamics of freshwater communities.

3. To have students develop the necessary practical skills to undertake basic research in fresh water ecology.

Objectives: Upon successful completion of the course students should be able to:

1. Recognize and identify the common benthic macro invertebrates taxa found in Jamaica freshwaters.

2. Describe the physico-chemical factors and biotic interactions affecting freshwater communities with special emphasis on effects of anthropogenic disturbance.

3. Demonstrate the skills needed to assess and monitor water quality in fresh water systems.

Pre-requisite: BL20N/BIOL2014

Course Content:

- Introduction and definitions. Classification of freshwaters. Classification of rivers. Physico-chemical composition of river water. Longitudinal zonation of rivers, River Continuum Concept and the applicability of these concepts to the tropics. Breakdown of allochthonous material in rivers.Macroinvertberates in rivers as consumers and their feeding, strategies. Riverine freshwater fishes and their feeding strategies. Adaptations of fishes and macroinvertebrates in riverine habitat.
- Categorization of lentic habitats. Stratification in lakes and its biological consequences. Classifications of lake types. Primary productivity and nutrients (phytoplankton and marginal vegetation). Comparison temperate and tropical lake productivity.
- Zooplankton: composition, biology, production. Cascade effect. Biomanipulation. Benthos of lakes; composition; distribution in temperate and tropical lakes. Feeding of benthic invertebrates.
- Man made lakes: effect of damming on rivers. Freshwater pollution; definition, sources. Outline of sewage treatment processes. Effects of organic pollution on rivers and riverine communities. Biomonitoring systems: principles, choice of organisms, different systems.
- Other aspects of freshwater pollution. Pesticides, heavy metals, biomagnification, bioaccumulation. Acidification, Habitat degredation. Channelization. Abstraction. Deforestation/logging. Aquaculture effluents, Establishment of exotics. Conservation. Zoogeography of freshwaters.

Mode of Delivery:

24 hours of lecture, 6 hours of tutorials and 36 hours of mainly field based practical work utilizing a variety of techniques to illustrate freshwater habitats and communities.
Laboratory based analysis of biological material and other data.

Evaluation: One 3-hour theory examination 60%

Course Work: 40%
Consisting of one 2-hour practical
coursework test 20%
Practical reports 20%

Prescribed text: Allen, J.D. 2009. Stream Ecology 2nd Edition. Springer. ISBN- 0412355302
Giller P. And B, Malmqvist(1998) The Biology of Streams and Rivers 2nd Edition. Oxford University Press. ISBN -978-0-19-8549772

**BL38A/BIOL3017 VIROLOGY**

(4 credits) Semester 2 Level III

Aim: To introduce students to the fundamental concepts of viral structure, classification and pathogenesis.

Objectives: Upon successful completion of the course students should be able to:

- explain the basic principles of viral structure
- describe major animal and plant viral groups and the processes of virus replication
- identify and describe commonly occurring viral diseases of plants and animals and methods of control

Pre-requisite: BL 20J/BIOL/2011 or BC21C/BIOL2312

Course Content:

- Introduction to virology and the nature of viruses and sub-viral entities
- Structure and replication of RNA viruses, DNA viruses, and viroids
- Methods in Virology: detection, quantification and characterization
- Virus transmission
- Host cell-virus interactions: morphological alterations, biochemistry and molecular biology of the infection process
- Biological consequences of viral infections on organisms and populations; development of control strategies

Mode of delivery:

24 hours of lectures, 6 hours of tutorials, and 36 hours of laboratory exercises involve plant virus transmission, virus purification, electron microscopy, and serology

Evaluation: Written theory exam (3 hours) 60%

Coursework 40%
Two 1-hour In-course tests 20%
Laboratory reports 20%

Prescribed texts:
Cann, A., 2001. Principles of Molecular Virology. Elsevier Academic Press. ISBN: 0-12-158533-6
Hewlett, M. and Wagner, E. 2004. Basic Virology. Blackwell Science. ISBN: 1-4051-0346-9

**BL39C/BIOL3018 RESEARCH PROJECT**
(4 credits) Semester 1 or 2 Level III

Aim: To equip students with the basic knowledge and skills required to undertake and report on scientific research in the field of biology.

Objectives: On completion of the course students should be able to:

- Search information bases for appropriate supporting literature for a given topic.
- Formulate hypotheses for a proposed piece of scientific research and design appropriate means for testing the same.
- Collate and analyse data from their research and prepare a report in standard scientific format.

Co-requisite: BL20P/BIOL2015

*This course is available to students at the discretion of the Department.*

Course Content:

- The basics of scientific writing, experimental design, project reporting and presentation.
- Aims and means of assessing feasibility of projects.
- Techniques in data collection, collation and analysis.
- Investigation and written report on an approved topic.

Mode of Delivery:

8 hours of lectures, 2 hours of interactive tutorial sessions and 56 hours of student driven research under the supervision of a member of the academic staff.

| Evaluation: | | |
|---|---|---|
| | Project report | 75% |
| | Oral Examination | 25% |

**BL 39E/BIOL3020 CONSERVATION BIOLOGY**
(4 credits) Semester 2 Level III

Aims:
1. To evaluate sources of species extinctions and current threats to biodiversity.
2. To demonstrate strategies for the conservation of threatened species and habitats.
3. To establish the theoretical basis for managing small populations.
4. To establish the social context in which conservation efforts must proceed.

Objectives: On successful completion of the course students should be able to:

1. Describe the history and current status of the human-mediated extinction crisis.
2. Explain how population genetic models can be used to inform conservation efforts directed at endangered species.
3. Outline the values of and threats to biodiversity.
4. Show why island species are particularly vulnerable to anthropogenic impacts such as invasive species.
5. Describe techniques used to control or eradicate invasive species.
6. Explain the theoretical and practical aspects of designing protected areas.

Pre-requisites: BL 20N/BIOL2014 and BL20K/BIOL2012

Course Content:

- Biological diversity and its values.
- Threats to biological diversity: habitat destruction, exotic species, and over-exploitation.
- Population biology of threatened species.
- Managing threatened species: *in-situ* and *ex-situ.*
- Establishing and managing protected areas. Social framework for the conservation of biodiversity

Mode of Delivery:

24 hours of lecture, 6 hours of tutorials and 36 hours of field work in the form of a 2 night camping field trip (Friday to Sunday), which involves an assessment of conservation needs and the implementation of conservation measures in the Hellshire Hills and along the Hellshire coast as well as visiting current conservation projects in the field.

| | | | |
|---|---|---|---|
| Evaluation: | One three-hour theory exam | 65% | |
| | Course Work | | 35% |
| | Consisting of laboratory report | 10% | |
| | Project report | 15% | |
| | In course test | 10% | |

Prescribed text:

Primack, R. B. 2002. Essentials of conservation biology, 3rd Edition. Sinauer Associates, Inc. ISBN 0-87893-719-6

**BT33A/BOTN3014 FOREST ECOLOGY, AGROFORESTRY & SUSTAINABLE DEVELOPMENT**

(4 credits) Semester 1 Level III

Aim: To provide an introduction to the world's tropical rain forests, specifically to describe their structure and functioning, dynamics, succession and regeneration processes, their role in water and nutrient cycling and how disturbance affects these processes.

Objectives: Upon successful completion of this course the students should be able to:

- identify different forest types, where they occur and how environmental factors influence forest type.
- identify the role of natural disturbance in forest dynamics and the maintenance of species diversity.
- explain the importance of forests in the hydrological and nutrient cycles and the effects of anthropogenic disturbance on these cycles.
- explain how trees improve the soil and ways in which these enhancements can be incorporated in present agricultural systems.
- use various methods for forest inventory and monitoring.

Pre-requisite: BL20N/BIOL2014

Course Content:

1. Origins of tropical rain forests
2. Origins of tropical forest diversity
3. Contemporary diversity
4. Characteristics of tropical rain forests
5. Tropical rainforest formations
6. Tropical dry forests
7. Forests of Jamaica
8. Reproductive ecology of tropical rain forest trees
9. Reproductive ecology of tropical dry forest trees
10. Principles of tropical forest hydrology
11. Tropical forest nutrient cycles
12. Trees and soil fertility
13. Agroforestry systems

Mode of delivery:

24 hours of lectures, 6 hours of tutorial and 36 hours of laboratory sessions in which students will gain an understanding, through class sessions and field trips, data collection and analysis about the ecological information needed for the management and conservation of tropical forests, what research methods are used and how the results of this research can be applied. The field trips will include weekend camping to study types of forests

| | | |
|---|---|---|
| Evaluation: | One 3-hour theory examination (Paper I) | 70% |
| | Fieldwork report | 30% |

HIGHLY RECOMMENDED TEXTS

| | |
|---|---|
| An Introduction to Tropical Rain forests | T. C. Whitemore |
| The Tropical Rain Forest (2nd Edition) | P. W. Richards |
| Tropical Forest and its Environment | K. A. Longman & J. Jenik |

RECOMMENDED TEXT

| | |
|---|---|
| Tropical Forest: Botanical Dynamics | L. B. Holm-Neilsen |
| Speciation & Diversity | I. C. Neilsen & H. Balskov |

**BT33B /BOTN 3018 MEDICINAL AND ECONOMIC BOTANY**
(4 credits) Semester 2 Level III

Aim: The course is designed to develop students' understanding about the economic and ethnobotanical aspects of plant resource utilization medicinal properties of the various plant groups

Objectives: Upon successful completion of this course the students should be able to:

- describe the non-agricultural uses of plants
- identify and describe commonly occurring plants of medicinal value
- assess the use of phytochemicals in medicinal and industrial applications
- outline the ways in which plants may be sustainably exploited for crop diversification

Pre-requisite: BT21B/BOTN2011 and BT22A/ BOTN 2012

Course Content:

Plant families of medicinal and economic importance Ethnobotany:
Medicinal Plants

- Phytochemicals
- Herbs and spices
- Nutraceuticals
- Plant Products: flavours and fragrances, gums, resins, oils, fibres
- Aromatherapy
- 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.

Mode of Delivery:
24 hours of lectures, 6 hours of tutorials and 36 hours of laboratory exercises and field work.

Evaluation:

| | | |
|---|---|---|
| One 3-hour theory examination (paper I) | | 60% |
| Course work | | 40% |
| Consisting of: | | |
| Practical Course test (2 hour) | 20% | |
| Laboratory reports | 20% | |

Prescribed text:
Heinrich, M., Barnes, J., Gibbons, S., Williamson, E., 2004. Fundamentals of Pharmacognosy and Phytotherapy. Churchill Livingstone. ISBN-10: 0443071322, ISBN-13: 978-0443071324

Recommended:
-Payne-Jackson, A., 2004. Jamaican Folk Medicine: A Source of Healing. University of the West Indies Press. ISBN-10: 9766401233, ISBN-13: 978-9766401238.
-Warner, M., 2007. Herbal Plants of Jamaica. Macmillan Education. ISBN-10: 1405065664, ISBN-13: 978-1405065665.
-Simpson, B. B. & Ogarzaly, M. C., 2001. Economic Botany: Plants in Our World. (3rd ed.) McGraw-Hill. 529 pp. ISBN: 0-07-290938-2

**BT34A/BOTN3015 PRINCIPLES OF PLANT BREEDING**
(4 credits) Semester 1 Level III

Aims:

To provide an understanding of genetic manipulation of sexually and asexually propagated crops with an emphasis on sustainable agricultural production.

To prepare students for employment in plant breeding

Objectives: Upon successful completion of the course the students should be able to:

1. formulate breeding strategies that would lead to an increase in productivity and profitability in agriculture and horticulture.
2. use plant breeding to mitigate the impact of pests and diseases avoiding pesticide damage to the environment.
3. discuss the use of plant breeding in developing sustainable agricultural production systems that satisfy the increasing demand for food, fiber and plant based industrial products.

Pre-requisite: BL 20J/BIOL2011

Course Content: The course is designed to convey basic methods used in genetic improvement of crop plants and includes:

1. plant domestication
2. mating systems in crop plants
3. continuous versus discontinuous variation traits
4. heritability of economically important traits, genetics of self and cross pollinated crops
5. breeding methods with self and cross-pollinated crops
6. design of field experiments
7. genetics of disease and insect pest resistance in crop plants
8. induced mutations and chromosome manipulation in crop improvement
9. genetic diversity in crops and gene banks
10. seed production industry
11. crop improvement through genetic engineering
12. general breeding problems associated with regional crops.

Mode of delivery:

24 hours of lectures, 6 hours of tutorial and 36 hours of Laboratory exercises, inclusive of field exercises.

| Evaluation: | | |
|---|---|---|
| | 1 Theory examination (paper I) | 65% |
| | 1 Practical test (2 hours) | 20% |
| | Laboratory report | 15% |

PRESCIBED TEXT

Breeding Field Crops (4th Edition) J.M. Poehlman and D.A. Sleper

**BT38B/BOTN3016 PLANT BIOTECHNOLOGY**
(4 credits) Semester 1 Level III

Aim: To introduce students to the basic principles and applications of plant tissue culture and genetic engineering.

Objectives: Upon successful completion of the course the students should be able to:

- describe the underlying principles of aseptic culture of plant cells, tissues and organs outline the use of specialized plant cell culture techniques in plant science research and industry
- explain the principles of plant genetic engineering; describe the development and applications of transgenic plants
- discuss the role of patents and ethical issues associated with plant genetic engineering

Pre-requisite: BT 22A/BOTN2012 OR BC 21C/BIOL2312

Course Content:

- Overview of plant tissue culture
- Principles of aseptic culture, basic media components
- Organ culture, callus culture, cell suspension culture, organogenesis, somatic embryogenesis, micropropagation, anther culture, protoplast isolation, culture and regeneration
- Applications of plant tissue culture
- Overview of gene structure, regulation, and expression
- Methods of plant transformation
- Development and analysis of genetically modified plants
- Ethical, safety, social, legal and environmental issues associated with the technology

Mode of delivery:

24 hours of lectures, 6 hours of tutorials, and 36 hours of laboratory exercises including the aseptic culture of plant tissues, plant transformation and molecular analysis of regenerants.

| | | | |
|---|---|---|---|
| Evaluation: | Written theory exam (3 hours) | | 60% |
| | Coursework | | 40% |
| | Two 1-hour In-course tests | 20% | |
| | Laboratory reports | 20% | |

Prescribed texts:

Dodds, J. and Roberts, L. 1995. Experiments in Plant Tissue Culture. Cambridge University Press. ISBN: 0-521-47892-8

Slater, A., Scott, N., and Fowler, M. 2003. Plant Biotechnology: The Genetic Manipulation of Plants. Oxford University Press. ISBN: 0-19-925468-0

**BT38K/BOTN3017 PRINCIPLES OF HORTICULTURE**

(4 credits) Semester 1 Level III

Aim: To provide training in principles and practices of horticulture, especially as they relate to the Caribbean and the tropics.

Objectives: Upon successful completion of the course the students should be able to:

- propagate vegetable, ornamental and fruit tree crops.
- organize the cultivation of horticultural crops in nurseries, greenhouses and the field.
- explain the factors involved in the harvesting and handling of horticultural crops.

Pre-requisites: BT 21B/BIOL2011 AND BT22A/BIOL2012

Course Content:

- 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 Horticulture: 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

Mode of delivery:

24 hours of lectures, 6 hours of tutorials, and 36 hours of laboratory and field exercises. Practical work includes plant propagation techniques, field trips to, and work at, various horticultural entities..

Evaluation:

| | | |
|---|---|---|
| One 3-hour Theory examination (paper I) | | 60% |
| Coursework | | 40% |
| Consisting of: | | |
| Laboratory/Field report | 20% | |
| In-course test | 20% | |

Prescribed text:

Acquaah, G., 2004. Horticulture: principles and practices. (3rd edition) Pearson/Prentice Hall. ISBN: 013114412X

**Z 30G/ZOOL3015 GENERAL PARASITOLOGY**

(4 credits) Semester 1 Level III

Aims: The course seeks to increase awareness of the impact of the major parasites on the health of man and domesticated animals, and economic significance of the major parasites.

Objectives: Upon successful completion of this course students will be able to:

1. identify the major types of protist, helminth and arthropod parasites of man and domestic animals;
2. describe the life cycles of these parasites and pathology of infections;
3. determine the current health and economic costs of these parasites;
4. propose basic control strategies for infections.

Pre-requisites: Z20G/ZOOL2012 and Z20H/ZOOL2013

Course Content

- Introduction to parasitism: inter-specific associations; endo- and ecto-parasitism; hosts and host specificity
- Distribution, prevalence, life cycle, transmission, nutrition, immunology, pathology and control of the main protist, helminth and arthropod parasites of man and domestic animals.
- The cost of parasitism.

Mode of delivery:

24 hours of lectures, 10 hours of tutorials and 32 hours of laboratory exercises which include the identification and functional morphology of the major protist, helminth and arthropod parasites of man and domestic animals from living and preserved materials; stained whole mount preparations of helminth parasites; epidemiological exercises.

Evaluation:

| | | |
|---|---|---|
| One 2-hour theory examination | | 50% |
| Course Work | | 50% |
| Consisting of one 2-hours comprehensive test (Mix of practical and theory) | 25% | |
| Laboratory reports | 25% | |

Prescribed text: Roberts LS & Janovy J (2009). Foundations of Parasitology. McGraw Hill Publishers. ISBN 978 0 07 302827 9

Useful URL: http://www.med.sc.edu:85/book/parasit-sta.htm

**Z 30M/ZOOL3017 IMMUNOLOGY**
(4 credits) Semester 2 Level III

Aims: This course is designed to present the principles of immunology and to highlight the major functional operations and applications of immune responses.

Objectives: Upon successful completion of this course students should be able to:
1. describe the basic concepts in immunology
2. explain the role of immunology in real life situations e.g. transplantation, allergy, autoimmunity, HIV infection, vaccination, etc

Pre-requisites: Z20G/ZOOL2012 and Z20H/ZOOL2013

Course Content

- **Basic Immunology**
  Evolution of immune responses; 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

- **Immunity in action**
  Immunoassays; Hypersensitivity reactions; Disorders of the immune response; HIVInfection; Autoimmunity; Transplantation immunology; Tumor immunology

Mode of delivery:
24 hours of lectures, 10 hours of tutorials and 32 hours of laboratory exercises which include histology of lymphoid organs of the mouse, viable counts of splenic lymphocytes, precipitation & agglutination reactions, diagnostic immunology - IFA, ELISA and use of a Computer-assisted learning package (Ammit program)

Evaluation**:**

| | | |
|---|---|---|
| One 2-hour theory paper | | 50% |
| Course Work: | | 50% |
| Consisting of one 2-hour MCQ paper | 25% | |
| Laboratory reports (5 x 5% ea) | 25% | |

Prescribed text: Coico R & Sunshine G (2009). Immunology: a short course. Wiley-Blackwell Publishers. ISBN978 0 470 08158 7
Useful URL: http://pathmicro.med.sc.edu/book/immunol-sta.htm

**Z 31F/ZOOL3019 FISHERIES AND AQUACULTURE TECHNOLOGIES**
(4 credits) Semester 2 Level III

Aims:
1. To expose students to the basic principles related to natural production in Enclosed aquatic systems
2. To familiarize them with the main issues surrounding production and maintenance of these aquatic resources.

Objectives: Upon successful completion of this course students will be able to:
1. describe the basic principles related to sustainable harvesting of fishable resources
2. outline and evaluate the issues surrounding their assessment and management
3. outline the principles underlining the culture of aquatic animals and selected plants
4. evaluate the advantages as well as disadvantages surrounding aquaculture and mariculture practices.

Pre-requisite: Z 20G/ZOOL2012 and Z 20H/ZOOL2013
Co-requisite: Z 31C/ZOOL3018 **if available**

Course Content:

- ***Part A.*** Fisheries dynamics, assessment and management.

Age and growth. Fishable stock, populations and recruitment. Gear Selectivity and fishing effort. Yield models and their value. Introduction to principles of fisheries management.

- World and Caribbean Fisheries
  Review of world fisheries and status, fishing techniques. Fisheries and El Nino/ENSO phenomenon. Conch and lobster fisheries, Jamaica fisheries.

- ***Part B***. Principles of Fin-fish Aquaculture
- Reproductive cycle, maturation, gamete production and control. Fry and fingerling production. Gender manipulation. Culture site selection and construction. Nutrition and feeds. Diseases and treatment.
- Non-Finfish Culture Principle
  Penaeid shrimp and freshwater prawn culture. Oyster and seaweed culture.

Mode of Delivery:

24 hours of lectures, 6 hours of tutorials and 36 hours of practicals consisting of mainly laboratory based classes involving mainly field and some laboratory-based classes demonstrating major aspects of theory.

| | | | |
|---|---|---|---|
| Evaluation: | One 3-hour theory examination | | 60% |
| | Course Work : | | 40% |
| | Consisting of one 2-hour practical test | 20% | |
| | Practical reports | 20% | |

Prescribed Text:

Parker, R. 2000. Aquaculture Science. Thompson Delmar Learning, USA. ISBN-07-66813215.

**Z 32C/ZOOL3020 INSECT BIOLOGY AND SYSTEMATICS**
(4 credits) Semester 1 Level III

Aims:

1. To equip students with a general knowledge of the biology and taxonomy of insects.

2. To develop an understanding of the general principles of systematics with special emphasis on the rules governing insect taxonomy.

Objectives: Upon successful completion of this course students should be able to:

1. Identify and classify insects to the level of family.

2. Describe the biology of the different insect orders.

3. Explain the principles and techniques of insect systematics.

Pre-requisite: BL10L/BIOL1063 **or** BL12B/ BIOL1261or BIOL1262 and BIOL1263

Course Content:

- External and internal morphology in relation to taxonomy and evolution.
- The biology, life histories and, where applicable, social organization of the insect orders with special reference to economically important groups.
- The diversity of insects, with emphasis on Caribbean fauna and economically important groups.
- Principles of systematics, including important regulations. Theories of phylogenetics. Techniques in contemporary insect taxonomy.

Mode of Delivery:

24 hours of lectures, 6 hours of tutorials and 36 hours of practicals including hands-on laboratory sessions and field trips which emphasize the collection of insects and the study of insect *in situ*. Students are expected to produce a collection of 100 insect species.

Evaluation: One 3-hour theory paper 65%

Course Work 35%
Consisting of Insect collection 20%
Laboratory reports (5 X 3%) 10%
Oral presentation 5%

Prescribed text:
Tippledorn, C.A. and Johnson, N.F. 2005. Borrow and DeLong's introduction to the study of insects. 7th Edition. Thompson Books/Cole. ISBN 0-03-096835-6

**Z 32G/ZOOL3021 PEST MANAGEMENT**

(4 credits) Semester 2 Level III

Aim: To equip students with a general knowledge of arthropod and other pests of economic importance in the region and the appropriate management strategies of these pests.

Objectives: At the end of the course students will display knowledge of:

- the biology and behaviour of selected agriculture and urban pests of economic importance to the Caribbean;
- assessing the economic importance of these pests;
- past and present control strategies of these pests;
- techniques of formulating suitable pest management strategies.

Pre-requisite: BL 20N/BIOL2014

Course Content:

- Definition and evolution of arthropod and other pests
- Historical perspective of pest problems and the attempts by man to deal with them
- Pest identification techniques and the nature of damage associated with insect pests of tropical importance
- The biology, behaviour and economic importance of pests in tropical ecosystems like Jamaica
- Assessing pest populations and related loss
- Determination of Economic Injury Levels (EIL), and Action or Economic Thresholds (AT or ET)
- The pest control options available (legislative, physical, cultural, biological and chemical control).
- The principles of Integrated Pest Management (IPM)
- IPM of selected tropical pests

Mode of Delivery:
24 hours of lectures 4 hours of interactive tutorial sessions, 36 hours of practicals involving the collection of 20 economically important insect species, field and laboratory exercises on, pest identification and diagnostics, loss and damage assessment, determination of EIL and ET, assessment of the efficiency of different control strategies and the development of IPM programmes for selected pests.

Evaluation:
One 3-hour theory paper 65%
Course Work: 35% Consisting of laboratory reports 20%
Insect Collection 10%
Oral Presentation 5%

Prescribed Text: Pedigo, P. L. and Rice, M. E. 2005. Entomology and Pest Management 5th Edition. Prentice-Hall Inc. ISBN 0131525638
Recommended Text: Dent, D. 2000. Insect Pest Management. CABI Publishing.

## B.SC. TROPICAL HORTICULTURE- 2011/12

| LEVEL | TITLES | No. of CREDITS | SEMESTER OFFERED |
|---|---|---|---|
| **LEVEL II** | SEE NEW PROGRAMME STRUCTURE | | |
| **LEVEL III** | **Courses in bold are only available to Tropical Horticulture students.** | | |
| **AGRI2001/AG21C** | **Tropical Crop Protection** | **3** | 2 |
| BOTN3016/BT38B | Plant Biotechnology | 4 | 1 |
| **AGCP3006/AC32J** | **Principles of Fruit Crop Production** | **4** | 1 |
| **AGCP3007/AC33A** | **Post-Harvest Technology** | **3** | 1 |
| BIOL3016/BT37Q | Plant Health | 4 | 2 |
| **AGBU3007/AM37A** | **New Venture Creation and Management** | **4** | 2 |
| **AGBU3012/AM312** | **Research Project** | **4** | Year-Long |
| **Electives** | | | |
| ZOOL3021/Z32G | Pest Management | 4 | 1 |
| **AGCP2003/AC26B** | **Mechanization for Crop Production** | **4** | 2 |
| **AGCP2004AC38A** | **Ornamental Horticulture** | **3** | 2 |
| BOTN3015/BT34A | Principles of Plant Breeding | 3 | 1 |
| **AGCP3005/AC32H** | **Landscape and Turf Grass Management** | **3** | 2 |
| **AGSL3001/AS31A** | **Irrigation and Drainage Technology** | **3** | 1 |
| AGBU3000/AM30C | Farm Business Management (not available for 2011/12) | 4 | 2 |

**Detailed Time Table and Venue for these courses are available from Life sciences department.**

**Summary of credits:**

| | |
|---|---|
| Foundation | 9 credits |
| Level I | 36 credits |
| Level II | 32 credits |
| Level III | 32 credits |

## COURSE DESCRIPTIONS (TROPICAL HORTICULTURE)

**YEAR 3 of the Programme (2011/12):**

**AGRI 2001 (AG21C)** **TROPICAL CROP PROTECTION**
(3 credits) Semester 2 Level III

Syllabus: The nature and extent of pest damage in the tropics and the roles of various pest agents –insects, mites, nematodes, weeds, pathogens, vertebrate pests. Biology and ecology of tropical pests and the concept of pest threshold levels. Principles of pest control-cultural, biological, chemical, legislative. Pesticide for crop pest Management, formulations and application. Pesticide safety concepts. Integrated pest management.

Assessment: Coursework 40%
Final Examination 60%

**AGCP 3006 (AC32J)** **PRINCIPLES OF FRUIT CROP PRODUCTION**
(4 credits) Semester 2 Level III

Prerequisites: AGCP 2001 (AC24B)

Syllabus**:** Introduction to the status of fruit crop industry with specific reference to 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 for selected

fruits. Assessment of the commercial potential of minor fruits. Current issues and research needs of tropical fruit crops.

Assessment: Coursework 40%
Final Examination 60%

**AGCP 3007 (AC33A)** **POST HARVEST TECHNOLOGY**
(3 credits) Semester 2 Level III

Syllabus: The post harvest physiology and biochemistry of selected tropical fruits, vegetables, root crops and grains. The post harvest environment including pathological agents, with particular reference to these crops. Physiological disorders. Post harvest handling systems. Introduction to basic equipment used in evaluation, refrigeration and storage systems, and general post harvest produce management.

Assessment: Coursework 40%
Final examination 60%

**AGBU 3007 (AM37A)** **NEW VENTURE CREATION AND MANAGEMENT**
(4 credits) Semester 1 Level III

Prerequisites: AGBU 1005 (AM15A), AGBU 1006 (AM15B)

Syllabus: The "hands-on" tools and techniques for launching and managing a sustainable small business. Frameworks and guidelines that can be used to formulate strategies relevant in the contemporary business environment. Emphasis will be placed on real world application of business theory through the building of an effective business plan, case study analysis and interaction with entrepreneurs.

Assessment: Coursework 40%
Final Examination 60%

**AGBU 3012 (AM312)** **RESEARCH PROJECT**
(4 credits) Semester 1 & 2 Level III
Prerequisites: none
Syllabus: A project within a subject area relevant to the student's degree option.

Assessment: Project Report 80%
Oral Presentation 20%
*See Project Booklet for detailed guidelines
NOTE: Students will be examined at the end of the semester in which they are registered

**AGCP 2003 (AC26B)** **MECHANISATION FOR CROP PRODUCTION**
(4 credits) Semester 1 Level III

Prerequisites: AGRI 1003 (AG14C) and AGCP 2000 (AC23A)

Syllabus: Principles of design, construction, operation and maintenance of power units and machinery for crop production. Management of machinery; determination of machinery requirements; machinery selection, performance and costs of use. Machinery for field operations; tillage, seed bed preparation, cultivation seeding and planting, chemical application and harvesting. Analysis and development of mechanised production systems with special reference to crop production in the Caribbean.

Assessment: Coursework 20%
Final Examination 80%

**AGCP 3005 (AC32H)** **LANDSCAPE AND TURFGRASS MANAGEMENT**
(3 credits) Semester 2 Level III

Prerequisites: AGCP 2001 (AC24B)

Syllabus: The role of plants in human well-being, the importance of the landscape industry and the use of plants in private and public spaces. The history of gardens and garden design. Plant identification techniques. Tree and shrub growth, development selection, establishment and maintenance. Turfgrass and ground cover growth and development, selection, establishment and maintenance. The elements and principles of landscape design, design process; uses of plant materials in landscape design. Landscape installation and maintenance.

Assessment: Coursework 40%
Final Examination 60%

**AGSL3001 (AS31** **IRRIGATION AND DRAINAGE TECHNOLOGY**
(3 credits) Semester 1 Level III

Prerequisites: AGCP 2001 (AC24B)

**Syllabus:**

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.

Assessment: Coursework 25%
Final examination 75%

**Descriptions for other courses are provided in the course offerings for the respective Departments.**