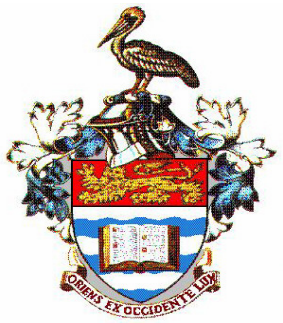
THE
UNIVERSITY
OF THE
WEST INDIES



FACULTY OF PURE
AND APPLIED SCIENCES
MONA

Part B

PROGRAMMES & SYLLABUSES
ACADEMIC YEAR 2011/2012

ANY REFERENCE IN THIS BROCHURE TO CXC (CSEC) QUALIFICATIONS SHOULD BE INTERPRETED TO MEAN GENERAL PROFICIENCY GRADES I OR II AND ALSO GRADE III OBTAINED SINCE 1998

INTRODUCTION

Teaching in the Science Faculty commenced at Mona in 1949 with students in the Departments of Botany, Chemistry, Mathematics, Physics, and Zoology. The 1960s saw a period of rapid expansion of the Faculty. At St. Augustine and Cave Hill, teaching commenced in 1963 and 1964 respectively in the then College of Arts and Sciences in Chemistry, Mathematics and Physics. These subjects were incorporated into the Faculty in 1972. Today the Science Faculty is among the largest in the University with teaching in Biochemistry, Biology, Botany, Chemistry, Computer Science, Geography, Geology, Mathematics, Meteorology, Physics and Zoology (some subjects are offered only at one campus). Most undergraduate students in the Faculty are full-time students and there are over 2200 students at Mona, 3,800 (Science and in Agriculture) at St. Augustine and 1000 at Cave Hill. There is also a substantial number of part-time students. The first eleven graduates appeared in 1952 and by 2000 over 9,000 graduates had been produced. Relationships with Tertiary level Colleges are increasing and students at such Colleges in Antigua, The Bahamas and St. Lucia read the Part I courses of our Faculty. Community Colleges in Jamaica offer our Preliminary Courses. In addition to undergraduate teaching, postgraduate teaching and research form an important aspect of the work of the Faculty. In addition to Diploma and MSc programmes, the Faculty offers programmes for the MPhil and PhD degrees in all Departments.

CONTENTS

FACULTY OFFICERS AND PERSONNEL

DEAN AT CAVE HILL	–	**Mr. Peter Gibbs**
Deputy Dean	–	**Dr. Colin Depradine**
DEAN AT MONA	–	**Professor Ishenkumba Kahwa**
Deputy Dean	–	**Professor Ralph Robinson**
Associate Dean (Distance Education)	–	**Dr. Novlette Sadler-McKnight**
Associate Dean (Student Matters)	–	**Dr. Eric Hyslop**
Associate Dean (Graduate Studies)	–	**Dr. Marcia Roye**
DEAN AT ST. AUGUSTINE	–	**Professor D. Narinesingh**
Deputy Dean (Science)	–	**Dr. Indar Ramnarine**
Deputy Dean (Agriculture)	–	**Dr. Reynold Stone**

AT MONA

FACULTY OFFICE	**Tel/FAX**	**Direct Line**	**Ext.**
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Deputy Dean, Prof. Ralph Robinson BSc (Hons), Zoology, PhD Parasitology *The Queen's University, Belfast*	977-1075	927-1202	2291-2
Associate Dean Student Matters, Dr. Eric Hyslop *University of Aberdeen* PhD *Open University*	977-6029	927-2129	2246
Administrative Officer, Mrs. Miriam Lindo BSc, *UWI*	927-1566	977-1785	2401
Senior Secretary	927-1566	977-1785	2401
DEPARTMENT OF CHEMISTRY			
Head, Prof. Helen Jacobs			
BSc (Hons), PhD, *UWI*	977-1835	927-1910	3022/2446
Administrative Officer	977-1835	9271910	3022
Senior Secretary, Miss Tracia Johnson	977-1835	927-1910	3021/2446
DEPARTMENT OF COMPUTING			
Head, Dr. Ezra Mugisa			
BSc (University of Ljubljana), MSc (University of Sheffield) PhD (Imperial College, University of London)	702-4455	702-4455	2815
Senior Administrative Assistant, Mrs. Donna Burke	702-4455	702-4455	2819/2827
Senior Secretary, Mrs. Fiona Porter-Lawson		970-0923	2621-2
DEPARTMENT OF GEOGRAPHY AND GEOLOGY			
Head, Prof. David Barker BSc (Econ) *University College of the Wales Aberystwyth,* Dip of Urban and Regional Studies *University of Birmingham,* PhD *University of Bristol*	977-6029	927-2728	2246
Senior Secretary, Mrs. Nadine Sherlock-Marshall	977-6029	927-2728	2246
DEPARTMENT OF LIFE SCIENCES			
Head, Dr. Mona Webber BSc, MPhil,PhD *UWI*	977-1075	927-1202	2291
Administrative Assistant Miss Josephine. Parchment	977-1075	927-1202	2991
Senior Secretary, Miss Debbie-Ann Brown	977-1075	927-1202	2991
DEPARTMENT OF MATHEMATICS			
Head, Prof. Alexandria Rodkina MSc *Voronezh State University, USSR* PhD *Institute of Mathematics of Ukraine, USSR*	927-2464	927-2728	2284
Administrative Assistant, Mrs. Maxine Francis			2621
Secretary, Mrs. Greta Everett			2455

DEPARTMENT OF PHYSICS

Head, Dr. Michael A. Taylor BSc, MPhil, UWI PhD. University of Maryland, College Park	977-1595	927-2480	2278
Administrative Assistant, Mrs. Rosalee Simmonds	977-1595	927-2480	2278
Senior Secretary, Miss Margaret. Little & Ms. Ann-Marie Miller	977-1595	927-2480	2278

LIBRARIAN-IN-CHARGE, SCIENCE LIBRARY

Ms. Beverley Lashley BA, UWI, MBA Nova Southeastern University			2202/3

DIRECTOR, BIOTECHNOLOGY CENTRE

Dr. Marcia Roye (Acting) BSc, PhD *UWI*	977-3331	977-1828	2518/9

DIRECTOR, CENTRE FOR MARINE SCIENCES

Dr. Dale Webber BSc, PhD *UWI*		927-1202	2290

ELECTRON MICROSCOPY UNIT

Dr. Klaus Wolf Dip, PhD Biol *Erlangen-Nuernberg*		977-1076	2252
Mr. Walton. Reid MPhil *UWI*, Engineer		977-1076	2252

REGISTRY OFFICERS AND PERSONNEL

OFFICE:	Tel/FAX	Direct Line	Ext.
CAMPUS REGISTRAR			
Dr. Camille Bell-Hutchinson BA, PhD *UWI*	970-4471	971-1202	2542/2600
SECRETARIAT			
Servicing Faculty Pure & Applied Sciences			
Assistant Registrar Mrs. Rodina Reid BA, MSc *UWI*			2200
Secretary/Stenographer – Miss Patrice Crossfield			
STUDENT AFFAIRS (ADMISSIONS)			
Senior Assistant Registrar Mrs. Marsha Morgan-Allen BSc *UWI*, MBA *Nova Southeastern University*		927-2779	2651
Assistant Registrar, Mrs. Marjorie. Bolero-Haughton			2947
Administrative Secretary, Mrs. Denzie. Bethune			2651
Faculty Clerk, Pure & Applied Sciences Mr. Terron Francis			2702
STUDENT AFFAIRS (EXAMINATIONS)			
Assistant Registrar, Mrs. Georgia Chambers-Anderson BSc, MSc *UWI*			2272
Administrative Assistant, Mr. Joel Shepherd			2863
Secretary/Stenographer, Miss Beatrice Brown			2272
STUDENT ADMINISTRATIVE SERVICES SECTION (SASS)			
Supervisor – Mrs. Sandra Ebanks	512-3736		3736
POSTGRADUATE STUDIES			
Campus Coordinator, Prof. Yvette Jackson BSc, PhD *UWI*	977-1835	977-1834	3023
Acting Assistant Registrar, Mrs. Sandra Powell-Mangaroo BSc, MSc *UWI*			3371/2263/2708
STUDENTS RECORDS UNIT			2856/2747
Assistant Registrar, Mrs. Elecif Arthurs BSc, MBA UWI			
Business Analyst, Miss Ann-Marie Rose BSc, MIS			
Senior Administrative Assistant, Miss Dahlia Saunders			

GLOSSARY

	TERM		DEFINITION
1.	Science Faculties	–	The Faculties of Pure & Applied Sciences and the Faculty of Science & Agriculture; does not include Social Sciences.
2.	Discipline	–	A body of knowledge encapsulated in a set of courses distinguishable from other such bodies on the basis of criteria such as method of enquiry, axioms, areas of application.
3.	Subject	–	An area of study traditionally assigned to the purview of a department.
4.	Course	–	A body of knowledge circumscribed by a syllabus to be imparted to students by sundry teaching methods and usually followed by an examination.
5.	Faculty Courses	–	All approved courses offered by a Faculty of the University for credits towards a degree, except Foundation and Co-curricular courses.
6.	In-Faculty Courses	–	All Faculty courses originating in the Science Faculties.
7.	Out-of-Faculty Courses	–	All Faculty courses originating in Faculties other than the Science Faculties.
8.	Programme	–	A selection of courses (designed to achieve pedagogical goals) the taking of which is governed by certain regulations and the satisfactory completion of which (determined by such regulations) makes a candidate eligible for the award of a degree/diploma/ certificate.
9.	Level	–	A measure of the standard of a course, designated at UWI by the first digit in the course number.
10.	Part	–	A stage of a program (i) Part I (Introductory Stage) - Level 1 and Preliminary courses (ii) Part II (Advanced stage) - Level 2 and 3 courses
11.	Credit	–	A measure of the workload required of students in a course. 1 Credit Hour = 1 hour lecture/tutorial/problem class per week OR 2 hours laboratory session per week, for a Semester.
12.	Major	–	32 credits (45-46 in Agriculture) from prescribed courses at Levels 2 & 3(see Departmental course listings).
13.	Minor	–	16 credits (15-16 in Agriculture) including prescribed courses at Levels 2 & 3 (see Departmental course listings).

14. Option – A prescribed programme of in-Faculty and, in some cases, Out-of Faculty courses, leading to a specific degree.

15. Elective – A course within a programme taken by free choice of the student.

16. Marginal Failure – A score for the overall examination of a course which is not more than 5 marks below the minimum pass mark for that course.

17. Supplemental Examination – A re-sit of an examination offered on recommendation of Department and Faculty, to candidates who, having passed course work, have registered a marginal failure in a course. **(Not currently offered at Mona).**

18. Supplementary – Oral An oral examination offered on recommendation of Department and Faculty, to candidates who have registered a marginal failure in a Level 2 or Level 3 course.

19. Pre-requisite – A course which must be passed before another course for which it is required may be pursued.

20. Anti-requisites – Two mutually exclusive courses of which credit may be granted for only one.

21. Co-requisite – A course which **must** be taken along with another specified course, in order to ensure the attainment of complementary and/or interdependent competencies.

22. Semester GPA – Grade point average computed on the basis of all courses done in a semester, without reference to weighting except in terms of credits. (The terms Grade Point, GPA, Quality Hours and Quality Points are defined in the UWI Grade Point Average Regulations Booklet)

23. Cumulative GPA – Grade Point Average obtained by dividing the total grade points earned by the total quality hours for which the student has registered for any period of time excluding courses taken on a Pass/Fail basis, audited courses, courses taken for Preliminary credit, incomplete and in-progress courses.

24. Programme GPA – Weighted grade point average used to determine the class of degree. This GPA is computed on the basis of all courses done in the advanced Part of the degree programme, weighted with respect to credits and to earned quality hours.

25. Plagiarism – "The unauthorized and/or unacknowledged use of other person's intellectual efforts and creations howsoever recorded, without proper and unequivocal attribution of such source(s), using the conventions for attributions or citing used in this University."

FACULTY OF PURE AND APPLIED SCIENCES

DEPARTMENTAL OPTIONS

OPTION 1

COMPUTER STUDIES

Part 1

Names		Credits
COMP1110/1120	Math for computing/Computing & society (I)	3 + 3
COMP1126/1127	Introduction to Computing (I)/(II)	3 + 3
COMP1161	Object-Oriented Programming	3
MATH1141/1142	Algebra/Calculus (I)	3 + 3
MATH1151/1152	Formal Mathematics/Calculus (II)	3 + 3
EC10C/ECON1001	Introduction to Microeconomics	3
EC10E/ECON1002	Introduction to Macroeconomics	3

Either		Credits
MS15D/ACCT1005	Financial Accounting	3
MS15B/ACCT1003	Introduction to Cost and Management Accounting	3
or		
SY14/SOCI1002	Sociology for the Caribbean	3
PS10C/PSYC1002	Introduction to Industrial and Organizational Psychology	3

Part II

CS20R/COMP2111	Analysis of Algorithms	4
CS20S/COMP2101	Discrete Mathematics for Computer Science	4
CS22Q/COMP2140	Introduction to Software Engineering	4
CS23Q/COMP2240	Computer Organization	4
CS31A/COMP3100	Operating Systems	4
CS35A/COMP3160	Database Management Systems	4
CS35Q/COMP3110	Information Systems in Organizations	4
CS39Q/COMP3900	Group Project	4

Plus

Twenty eight (28) additional credits from Level II or III chosen from Computer Science, Mathematics, Economics or Management Studies.

OPTION 2

CHEMISTRY AND MANAGEMENT

Part I

Titles		**Credits**
CHEM1901	Introductory Chemistry I Semester 1	6
CHEM1902	Introductory Chemistry II S2	6
ECON1001	Introduction to Microeconomics S1&2	3
ECON1002	Introduction to Macroeconomics S1&2	3
SOCI1002	Sociology for the Caribbean S1	3
PSYC1002	Introduction to Industrial & Organisational Psychology S2	3
ACCT1005*	Financial Accounting	3
ACCT1003*	Introduction to Cost and Management Accounting S2	3

*** Students entering after 2010/2011 and who have passed CAPE Accounting Units I & II with Grade IV or better will receive credit exemptions from ACCT1003 and ACCT1005.**

Part II		**Credits**
CHEM2001	Chemical Analysis I Semester 1	4
CHEM2101	Inorganic Chemistry S1	4
CHEM2201	Spectroscopy, Carbanions etc. S1	4
CHEM2301	Physical Chemistry S1	4
CHEM3101	Inorganic Chemistry S2	4
CHEM3201	Synthesis, Mechanism & Stereochemistry S2	4
CHEM3301	Physical Chemistry S2	4
MGMT2001	Principles of Marketing S1	3
MGMT2005	Computer Applications S1&2	3
MGMT2008	Organizational Behaviour S1&2	3
MGMT2012	Quantitative Methods & Research Principles S1&2	3
MGMT2021	Business Law S1&2	3
MGMT2023	Financial Management I S1&2	3
MGMT2026	Introduction to Production and Operations Management S1&2	3
MGMT3031	Business Strategy and Policy S2	3
MGMT3036	Entrepreneurship and Venture Capital S1&2	3

Plus

Four additional credits from Level II or Level III Chemistry Courses approved by the Department, to be taken along with **three** additional credits from Level II or III Management Studies courses to complete the course of study.

All students are required to successfully complete **MATH1185 (**Calculus for Scientists and Engineers, offered in Semester 2) **and either MATH1141** (Introduction to Linear Algebra & Analytical Geometry, offered in Semester 1) **OR STAT1001** (Statistics for Scientists, offered in Semesters 1 and 2) prior to entering the advanced Chemistry courses.

OPTION 3

(a) MATHEMATICS WITH EDUCATION

Part I

Twenty-four (24) credits from **two** subject areas in the Pure and Applied Sciences divided equally between the two so as to provide the prerequisite for Part II courses. One of the subject areas must be Mathematics. Required courses are MATH1141, MATH1142, MATH1151, MATH1152 (or M10A/MATH1140 and M10B/MATH1150). Foundations of Education courses (see A below) may also be taken with Part I courses from the Faculty of Pure and Applied Sciences.

Part II

Thirty-two (32) credits from Part II Mathematics courses, including:

(i) M20A/MATH2100, M20B/MATH2110, M21B/MATH21260 or MATH2300 [replaces M21B], and M21Q/MATH2125

(ii) Two courses from Level 3, and two other courses from Levels 2 or 3

MATH EDUCATION COURSES

Initial Teacher Training

Year	Semester I	Semester II
1	**EDTL 1020 (ED10T)** – Introduction to Teaching and Learning **EDPS1003 (ED10C)** – Psychological Issues in the Classroom ***EDTK2025 (ED20Y)** – Introduction to Computer Technology in Education	**EDTL1021 (ED10U)** – Planning for Teaching
2	**EDMC2213 (ED22M)** – Children Learning Mathematics **EDMC2214 (ED22N)** – The Nature and Scope of Mathematics **EDTL2021 (ED20U)** – School Based Experience I *** EDMC2213 (ED20M) –** Children Learning Mathematics or **EDTK3004 (ED30D)** – Educational Technology	**EDMA2216 (ED22P)** – Analysis & Teaching of Mathematics
3	**EDMA3206 (ED32F)** – Investigation & Problem Solving **EDMA3217 (ED32Q)** – Pedagogical Issues in the Teaching of Mathematics **EDTL3017 (ED30Q)** – School Based Experience II	**EDME3205 (ED32E)** – Teaching Mathematics in Grades **EDRS3019 (ED30S)** – Report

*core courses

Teacher Trained

Year	Semester I	Semester II

1	**EDMC2213 (ED22M)** – Children Learning Mathematics **EDMC2214 (ED22N)** – The Nature and Scope of Mathematics ***EDTK2025 (ED20Y)** – Introduction to Computer Technology in Education	**EDMA2216 (ED22P)** – Analysis & Teaching of Mathematics
2	**EDMA3206 (ED32F)** – Investigation & Problem Solving **EDMA3217 (ED32Q)** – Pedagogical Issues in the Teaching of Mathematics ***EDMC2213 (ED20M**) – Children Learning Mathematics *or* **EDTK3004 (ED30D)** – Educational Technology	**EDME3205 (ED32E)** – Teaching Mathematics in Grades
3	**EDTL3020 (ED30T)** – Pre-Practicum **EDTL3021 (ED30U)** – Field Study	**EDRS3019 (ED30S)** – Report

* core courses

OPTION 3 (b)

CHEMISTRY WITH EDUCATION

(FOR TRAINED AND PRE-TRAINED TEACHERS)

CHEMISTRY COURSES

LEVEL I

Twenty-four (24) credits from **two** subject areas in the Pure and Applied Sciences divided equally between the two so as to provide the prerequisite for Level II courses. One of the subject areas must be Chemistry (required courses are CHEM1901 and CHEM1902).

Trained Teachers with the New Double Option (since 2004) with Chemistry as one of their majors and who have a GPA of at least 2.9 may be granted exemption from Level I requirements.

Trained Teachers with Single Option science are required to do Preliminary Chemistry.

All students must complete the required Mathematics courses: foundation courses required by the FPAS.

LEVEL II/III

Thirty-two (32) credits from Level II Chemistry courses, which must include:

CHEM2001
CHEM2101
CHEM2201
CHEM2301
CHEM3101
CHEM3201 and
CHEM3301

All students are required to successfully complete **MATH1185 (**Calculus for Scientists and Engineers, offered in Semester 2) **and either MATH1141** (Introduction to Linear Algebra & Analytical Geometry, offered in Semester 1) **OR STAT1001** (Statistics for Scientists, offered in Semesters 1 and 2) prior to entering the advanced Chemistry courses.

EDUCATION COURSES

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

OPTION 3 (c)

PHYSICS WITH EDUCATION

Part I

Twenty-four (24) credits from **two** subject areas in the Pure and Applied Sciences divided equally between the two so as to provide the prerequisites for Part II courses (Note that CAPE/ A-Level Maths or MATH0100/M08B and MATH0110/M08C are prerequisites for Part II courses). One of the subject areas must be Physics (required courses are PHYS1411, PHYS1411 and PHYS1421 & PHYS1422). Foundations of Education courses (see A below) may also be taken with Part I courses from the Faculty of Pure and Applied Sciences.

Trained Teachers with the New Double Option (since 2004) with Physics as one of their majors and who have a GPA of at least 2.9 may be granted exemption from Level I requirements.

Trained Teachers with Single Option science are required to do Preliminary Physics.

Part II

Thirty-two (32) credits from Part II Physics courses, including:

(i) PHYS2350/P23E, PHYS2385/P23I, PHYS2395/P23J, PHYS3350/P33E and PHYS3385/P33K

(ii) Any three of the following: PHYS2560, PHYS2670, PHYS3395, PHYS3399, PHYS3660 and PHYS3670

EDUCATION COURSES

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

OPTION 3(d)

BIOLOGY WITH EDUCATION

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
- BOTN2402 Physiology of Plants

Semester 2
- BIOL2403 Principles of Ecology
- BIOL2404 Genetics
- BIOL2405 Eukaryotic Microbiology
- ZOOL2401 Animal Form
- ZOOL2402 Animal Physiology

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

EDUCATION COURSES

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

OPTION 4
ACTUARIAL SCIENCE

Part I

Code	Names	Credits
MATH1141	Intro. Linear Algebra and Analytic Geometry	3
MATH1142	Calculus I	3
MATH1151	Calculus II	3
MATH1152	Introduction to Formal Mathematics	3
COMP1110	Mathematics for Computing	3
COMP1120	Computing and Society	3
COMP1126	Introduction to Computing I	3
COMP1127	Introduction to Computing II	3
EC10C/ECON1001	Introduction to Microeconomics	3
EC10E/ECON1002	Introduction to Macroeconomics	3
MS15D/ACCT1005	Introduction to Financial Accounting	3
MS15B/ACCT1003	Intro. to Cost & Management Accounting	3

Part II Compulsory

M20A/MATH2100	Abstract Algebra	4
M20B/MATH2110	Linear Algebra	4
M21Q/MATH2125	Introduction to Mathematical Analysis	4
MATH2300	Introduction to Ordinary Differential Equations	4
or		
M21B/ MATH2160	Analysis and Mathematical Methods II)	4
M25A/MATH2140	Probability Theory	4
M25B/MATH2150	Statistical Inference	4
M27A/MATH2210	Mathematics of Finance	4
M27B/MATH2320	Introduction to Actuarial Mathematics	4
MS28D/MGMT2023	Financial Management I	3
MS38H/MGMT3048	Financial Management II	3
M31E/MATH3341	Applied Statistics	4
M34Q/MATH3310	Life Contingencies	4
M34R/MATH3320	Risk Theory	4
M35R/MATH3321	Principles of Asset/Liability Management	4

A minimum of eleven (11) additional credits should be selected from:

M30Q/MATH3360	Matrix Theory	4
M32A/MATH3120	Numerical Analysis	4
M32C/MATH3370	Topics in Operation Research	4
M33R/MATH3490	Complex Analysis	4
MATH3700	Introduction to Partial Differential Equations	4
MATH3701	Probability and Stochastic Modelling	4
M34T/MATH3311	Survival Models/Construction of Tables	4
M36Q/MATH3390	Metric Spaces and Topology	4
CS22Q/COMP2140	Software Engineering	4
CS35Q/COMP3110	Information Systems	4
SY35B/SOCI3018	Demography I (Popu Trends and Policies)	3

OPTION 5

BSc (SPECIAL) CHEMISTRY DEGREE

1. Candidates must satisfy the General Regulations for the degree of Bachelor of Science (except those relating to support courses) in addition to the following regulations.

2. The minimum standards for admission to the programme are as follows:

   Completion of Level I of the BSc degree programme, including passes in:

   (i) Introductory Chemistry (CHEM1901 and CHEM1902) at the prescribed level.

   (ii) Introductory Mathematics (MATH1185 AND EITHER MATH1141 OR STAT1001).

   (iii) Preliminary Physics (PHYS0410 and PHYS0420) or the equivalent.

3. Admission to this programme is limited and candidates with good grades in CHEM1901 and CHEM1902 will be given preference.

4. To be eligible for the award of the BSc. (Special) Chemistry degree, candidates must obtain:

   (a) A total of 56 chemistry credits by successfully completing the following:

   Level II courses:

   CHEM2001, CHEM3001,
   CHEM2101, CHEM3101, CHEM2201,
   CHEM3201, CHEM2301, CHEM3301.

   (ii) An additional twenty credits from Chemistry courses

   (iii) A research project CHEM3701.

   (b) An additional eight credits selected from Level II courses in any Science subject in the BSc degree programme approved by the Department.

OPTION 6

SCIENCE, MEDIA AND COMMUNICATION

This BSc contains a named Science major AND a Media and Communication major (i.e. double major)

The Option will be taught jointly by The Caribbean Institute of Media and Communication (Faculty of Arts and Education) and Departments in The Faculty of Pure and Applied Sciences, including the Biochemistry Section (Department of Basic Medical Sciences).

It is designed to produce a science graduate with expertise in Media and Communication.

On successful completion of the Option, the student will have acquired sufficient scientific, intellectual and practical foundation such that can be used to produce popular programs with scientific themes using a range of communications media.

Entry requirements

(a) Satisfy the University requirements for normal matriculation and have obtained passes at CXC Secondary Education General Proficiency Level (or equivalent) in Mathematics, and two approved science subjects at GCE Advanced Level (or equivalent);

(b) Obtain a pass in the CARIMAC Entry Examination;

(c) Undergo mandatory academic counselling

LEVEL 1

At least one (1) FPAS subject must be followed over two semesters

Semester I

MC10A/COMM1110	Communication, Culture & Caribbean Society	3 credits
MC11U/COMM1410	Understanding the Media	3 credits
FPAS course		6 credits
FPAS course		6 credits

Semester II

MC10B/COMM1210	Interviewing & Information Gathering	3 credits
MC11B/COMM1310	Mediating Communication	3 credits
FPAS course		6 credits
FPAS course		6 credits
		Total 36 credits

LEVEL 2
One (1) FPAS subject should be followed over two semesters

Semester I

MC20M/COMM2110	Media Ethics & Legal Issues	3 credits
MC22A/COMM2310	Introduction to Communication Research Methods	3 credits
Media Specialisation Course		3 credits
FPAS course		4 credits
FPAS course		4 credits

Semester II

MC20C/COMM2210	Communication, Analysis & Planning I	3 credits
Media Specialisation Course		3 credits
MC29S/COMM2248	Science, Society and Media	3 credits
FPAS course		4 credits
FPAS course		4 credits
		Total 34 credits

LEVEL 3
One (1) subject chosen at Level 2 should be followed over two semesters, leading to a major

Semester I

MC31O/COMM3910 Communication Analysis & Planning II (year long)

or

Research-based course	3 credits
Communication Elective	3 credits
Media Specialisation Course	3 credits
FPAS course	4 credits
FPAS course	4 credits

Semester II

MC31O/COMM3910 Communication Analysis & Planning II (year long)

or

Research-based course	3 credits
Media Specialisation Course	3 credits
FPAS course	4 credits
FPAS course	4 credits
	Total 31 credits
	101 credits

University Courses:

FD 10A/FOUN1001	English for Academic Purposes	3 credits
FD 11A/FOUN1101	Caribbean Civilisation	3 credits
FD 13A/FOUN1301	Law, Governance, Economy and Society	3 credits
		Total 110 credits

DEPARTMENT OF BASIC MEDICAL SCIENCES
BIOCHEMISTRY SECTION

LIST OF UNDERGRADUATE COURSES

BIOCHEMISTRY COURSES

CODES	TITLES	CREDIT	SEMESTER OFFERED	Level	PREREQUISITES
LEVEL 1					
BC10M/BIOC1011	**INTRODUCTORY BIOCHEMISTRY**	6 Credits	Semester 2	1	Passes in both units of Chemistry and Biology/Zoology at CAPE (or equivalent)
LEVEL 2					
BC21C/BIOL2312	**MOLECULAR BIOLOGY I**	4 Credits	Semester 2	2	C10J/CHEM 1901, C10K/CHEM 1902, BC10M/BIOC1011 **Co-requisite:** BC21D/BIOC2014
BC21D/BIOC2014	**BIOENERGETICS AND CELL METABOLISM**	8 Credits	Semester 1	2	C10J/CHEM1901, C10K/CHEM 1902, BC10M/BIOC1011]
BC21M/MICR2211	**MICROBIOLOGY**	4 Credits	Semester 2	2	C10J/CHEM1901, C10KCHEM1902, BC 10M/BIOC1011] **Co-requisite:** BC21D/BIOC2014
LEVEL 3					
BC31M/MICR3213	**APPLIED AND ENVIRONMENTAL MICROBIOLOGY**	4 Credits	Semester 1	3	BC21M/MICR2211

CODES	TITLES	CREDIT	SEMESTER OFFERED	Level	PREREQUISITES
BC34B/BIOC 3011	**ADVANCED BIOCHEMISTRY**	4 Credits	Semester 2	3	BC21D/BIOC2014
BC34C/BIOL 3312	**MOLECULAR BIOLOGY II**	4 Credits	Semester 1	3	BC21C/BIOL2312 and BC21D/BIOC2014
BC34D/BIOL3313	**HUMAN MOLECULAR BIOLOGY**	4 Credits	Semester 2	3	BC21C/BIOL2312 and BC21D/BIOC2014 **Pre/Co-requisite:** BC34C/BIOL3312
BC34M/MICR3214	**MOLECULAR MICROBIOLOGY**	4 Credits	Semester 1	3	BC21C/BIOL2312 and BC21M/MICR2211
BC35A/BIOC 3013	**BIOCHEMICAL PHYSIOLOGY**	4 Credits	Semester 1	3	BC21C/BIOL2312 and BC21D/BIOC2014
BC35C/BIOT 3113	**BIOTECHNOLOGY I**	4 Credits	Semester 1	3	BC21C/BIOL2312 and BC21D/BIOC2014
BC35D/BIOT 3114	**BIOTECHNOLOGY II**	4 Credits	Semester 1	3	BC21C/BIOL2312 and BC21D/BIOC2014 **Pre/Co-requisites:** BC35C/BIOT3113
BC35F/BIOT 3116	**THE BIOTECHNOLOGY OF INDUSTRIAL ETHANOL PRODUCTION**	4 Credits	Semester 2	3	BC21D/BIOC2014 and BC21M/MICR2211
BC36A/BIOC 3413	**PROJECT**	4 Credits	Semester 1 & 2	3	BC21C/BIOL2312 and BC21D/BIOC2014 and BC21M/ MICR2211 **Co-requisites:** BC31M/MICR3213, BC34B/BIOC3011, BC34C/BIOL3312, BC34D/BIOL3313, BC34M/MICR3214, BC35A/BIOC3013, BC35C/BIOT3113, BC35D/BIOT3114, BC35F/BIOT3116 or BC39P/BIOC3014
BC39P/BIOC 3014	**PLANT BIOCHEMISTRY**	4 Credits	Semester 2	3	BC21D/B10C2014

Biochemistry, Biotechnology, Microbiology and Molecular Biology are taught in Part II of the undergraduate program. In order to proceed to Part II courses candidates must have successfully completed C10J/CHEM1901, C10K/CHEM1902, and BC10M/BIOC1011.

Level 2 and 3 courses include:

BC21C/BIOL2312	Molecular Biology I
BC21D/BIOC2014	Bioenergetics and Cell Metabolism
BC21M/MICR2211	Microbiology
BC31M/MICR3213	Applied and Environmental Microbiology
BC34B/BIOC3011	Advanced Biochemistry
BC34C/BIOL3312	Molecular Biology II
BC34D/BIOL3313	Human Molecular Biology
BC34M/MICR3214	Molecular Microbiology
BC35A/BIOC3013	Biochemical Physiology
BC35C/BIOT3113	Biotechnology I
BC35D/BIOT3114	Biotechnology II
BC35F/BIOT3116	The Biotechnology of Industrial Ethanol Production
BC36A/BIOC3413	Project
BC39P/BIOC3014	Plant Biochemistry

A **major** in **Biochemistry** requires a total of thirty-two (32) credits from Part II and must include:

	BC21C/BIOL2312	(Molecular Biology I)
	BC21D/BIOC2014	(Bioenergetics and Cell Metabolism)
	BC21M/MICR2211	(Microbiology)
	BC34B/BIOC3011	(Advanced Biochemistry)
	BC34C/BIOL3312	(Molecular Biology II)
	BC35A/BIOC3013	(Biochemical Physiology)
and	BC34D/BIOL3313	(Human Molecular Biology)
	or	
	BC39P/BIOC3014	(Plant Biochemistry).

A **major** in **Biotechnology** requires a total of thirty-two (32) credits from Part II and must include:

	BC21C/BIOL2312	(Molecular Biology I)
	BC21D/BIOC2014	(Bioenergetics and Cell Metabolism)
	BC21M/MICR2211	(Microbiology)
	BC35C/BIOT3113	(Biotechnology I)
	BC35D/BIOT3114	(Biotechnology II)
	BC35F/BIOT3116	(The Biotechnology of Industrial Ethanol Production)
and	BC31M/MICR3213	(Applied and Environmental Microbiology)
	or	
	BT38B/BOTN3016	(Plant Biotechnology).

A **major** in **Molecular Biology** requires a total of thirty-two (32) credits from Part II and must include:

	BC21C/BIOL2312	(Molecular Biology I)
	BC21D/BIOC2014	(Bioenergetics and Cell Metabolism)
	BC21M/MICR2211	(Microbiology)
	BC34C/BIOL3312	(Molecular Biology II)
	BC34D/BIOL3313	(Human Molecular Biology)
	BC34M/MICR3214	(Molecular Microbiology)
	or	
	BC35C/BIOT3113	(Biotechnology I)
and	BC35D/BIOT3114	(Biotechnology II)
	or	
	BL38A/BIOL3017	(Virology).

All courses include laboratory sessions. Attendance at, and the submission of the relevant report pertaining to all laboratory sessions mounted for each course by the Biochemistry Section of the Department of Basic Medical Sciences are required.

Admission to some courses may be limited. Students are advised that some courses in different departments may clash. It is the responsibility of the student to identify any clash early and withdraw from such course(s) by the date stipulated in the Faculty regulations.

LEVEL 1 COURSE DESCRIPTION

BC10M/BIOC1011 INTRODUCTORY BIOCHEMISTRY
(6 Credits) Semester 2 Level 1

Aim: This course is to prepare students from a Chemistry background to enter programmes leading to majors in Biochemistry, Biotechnology, and Molecular Biology, and to introduce Microbiology.

Pre-requisites: Passes in both units of Chemistry and Biology/Zoology at CAPE (or equivalent).

Syllabus:

1. The structures and biochemical properties of the common biomolecule:
   - Mono-di-olio- and polysaccharides
   - Amino acids peptides and proteins
   - Nucleotides and nucleic acids
   - Fatty acids acyl glycerols and phosphatidates
   - Sterols and other polyisoprenoids

2. Simple enzyme kinetics:
   - Chemical reaction kinetics
   - The Michaelis-Menten rate equation
   - Reversible enzyme inhibition, the Linewear-Burke plot
   - Reversible enzyme: allosteric and covalently modified

3. The homolactic fermentation pathway reactions, other pathways and metabolic regulation in general.

4. Simple biochemical thermodynamics; Gibbs Free Energy Electron transport chains; proton gradients and chemiosmosis.

5. Introductory molecular biology
6. The molecular basis of microbial growth, relatedness and diversity
7. Introductory applied and environmental microbiology
8. Microbial biotechnology

A practical course of 72 hours

Evaluation:	Practical reports	20%
	Two in-course tests	20%
	Two 2 hour written final examination papers	60%

LEVEL 2 COURSE DESCRIPTIONS

BC21C/BIOL2312 MOLECULAR BIOLOGY I
(4 Credits) Semester 2 Level 2

Pre-requisites: C10J/CHEM1901, C10K/CHEM1902, BC10M/BIOC1011

Co-requisite: BC21D/BIOC2014

Syllabus: Nucleic acid structure and function; Genome organization in Eukaryotes, Bacteria, Yeast and Viruses. Methods of studying nucleic acids: DNA sequencing, DNA hybridization, cloning and analysis, restriction mapping, PCR. Recombinant DNA technology. Replication of DNA. Biology and genetics of bacteriophage lambda. RNA and protein synthesis. Protein trafficking.

A practical course of 36 hours.

Evaluation:	One 2-hour written paper	60%
	Two in-course tests	20%
	Laboratory reports	20%

BC21D/BIOC2014 BIOENERGETICS AND CELL METABOLISM
(8 Credits) Semester 1 Level 2

Pre-requisites: C10J/CHEM1901, C10K/CHEM1902, BC10M/BIOC1011

Syllabus: Basic mammalian and plant physiology. Mitochondrial and chloroplast ultrastructure. Biochemical bonding and thermal stability of macromolecules and membranes. Mitochondrial

acetyl-CoA formation and utilization. The TCA cycle and the glyoxylate pathway. The major biosynthetic, intermediary and degradative pathways. Nitrogen fixation. Redox reactions and the mitochondrial electron transport chain; the chemiosmotic mechanism; oxygenic and anoxygenic photosynthesis. The bioenergetics of photosynthetic reactions and of the chemoautotrophs. Transport across membranes: the mechanisms and bioenergetics. Induction and repression; auxotrophic mutants and the elucidation of metabolic pathways.

A practical course of 72 hours.

Evaluation:		
	One 2-hour written paper	60%
	Two in-course tests	20%
	Laboratory reports	20%

BC21M/MICR2211 MICROBIOLOGY

(4 Credits) Semester 2 Level 2

Pre-requisites: C10J/CHEM1901, C10KCHEM1902, BC 10M/BIOC1011

Co-requisite: BC21D/BIOC2014

Syllabus: The purpose and methods of microbial taxonomy and molecular systematics, the identification of organisms obtained in culture and the construction of phylogenetic trees. The major phylotypes of Bacteria and Archaea will each be discussed with respect to their habitats, physiology and cellular structures. Roles in natural ecosystems, applications and other outstanding features will be discussed in instances where particular organisms provide useful examples, some of which are noted below.

The deepest branches on the bacterial tree: *Aquifex* and *Thermotoga*. The molecular basis of life at high temperatures. Green nonsulfur bacteria and anaerobic photosynthesis. Spirochetes and microbial motility. Purple bacteria and relatives (Proteobacteria); metabolic diversity, phototrophs, organotrophs, lithotrophs. Microbial interactions with eukaryotes, nitrogen fixation, plant tumors, parasites and mitochondria. Cellular differentiation.

Cyanobacteria and the transition to the oxygen cycle; roles in aquatic and terrestrial environments. The chloroplast and prochlorophytes. Gram-positive bacteria. Phylogenetic significance of cell wall structures and endospores.

The actinomycetes; structural diversity and antibiotic production. Lactic acid bacteria in food fermentations. The phylogeny of bacterial photosynthesis. Crenarchaeota,

hyperthermophiles and hydrothermal vents. Methanogens; biochemical diversity at the level of co-enzymes, anaerobic digesters. Extreme halophiles; the limits of microbial adaptation; purple membranes. Protists and yeast.

Identification and quantification of microorganisms in natural habitats. Direct viable counts, epifluorescence microscopy, and nucleic acid probes. Direct analysis of nucleic acids from natural microbial communities. Extraction of nucleic acids, PCR amplification, cloning and sequencing. The phylogenetic structure of natural microbial communities.

A practical course of 36 hours.

Evaluation:	One 2-hour written paper	60%
	Two in-course tests	20%
	Laboratory reports	20%

LEVEL 3 COURSE DESCRIPTIONS

BC31M/MICR3213 APPLIED AND ENVIRONMENTAL MICROBIOLOGY

(4 Credits) Semester: 1 Level 3

Pre-requisites: BC21M/MICR2211

Syllabus: Microbial growth kinetics. Effects of chemical bactericides; bacteriolytic and bacteriostatic agents. Antiseptics and disinfection .
Microbial adaptation to extreme environments and the use of extreme environments to control microbial growth. The relationship between temperature and growth rate. Life at low temperatures; molecular adaptations and natural distribution of psychrophiles and psychrotrophs; spoilage in cold processed and stored foods. Thermoduric bacteria, pasteurization and sterilization with heat. The influence of high concentrations of salts and sugars on microorganisms; osmotic adaptation and compatible solutes; halophiles and osmophiles. Salts and sugar as preservatives. Microbial adaptation to extremes of pH. Organic acids in food processing and storage. Toxic derivatives of oxygen and cellular defenses. Anaerobic bacteria, anaerobic cell structure and vacuum packing of foods.

Microbial ecology; *in situ* measurement of microbial activity. Aquatic habitats: biomass distribution and oxygen relationships in lakes, rivers and marine environments. Biochemical oxygen demand and wastewater treatment: trickling filters, activated sludge and anaerobic digesters. Indicators of pollution. Soil as a microbial habitat: biodegradation of xenobiotics, microbial remediation of polluted environments. Deep subsurface microbiology.

Food and waterborne pathogens: their occurrence in nature, factors influencing their presence in food and water supplies and means of control. Food borne infections and intoxication. Staphylococcal food poisoning, *Clostridium perfringens* and *C. botulinum*, salmonellosis, *E. coli*, *Campylobacter*, *Salmonella typhi* and *Vibro cholerae*; *Cryptosporidium*.

A practical course of 36 hours

Evaluation:

One 2-hour written paper	60%
Two in-course tests	20%
Laboratory reports	20%

BC34B/BIOC3011 ADVANCED BIOCHEMISTRY

(4 Credits) Semester 2 Level 3

Pre-requisites: BC21D/BIOC2014

Syllabus: The role of cell membrane in the life of the cell. Introduction to Proteomics; Ligand binding; Protein folding; Protein-protein interactions. Cell signaling; Signal transduction. Protein crystallization studies and the photosystems. Molecular biology of photosynthesis. Introduction to the large complex secondary metabolites of plants. Toxins from plants. An overview of plant hormones. Post-harvest physiology.

A practical course of 36 hours

Evaluation:

One 2-hour written paper	60%
Two in-course tests	20%
Laboratory reports	20%

BC34C/BIOL3312 MOLECULAR BIOLOGY II

(4 Credits) Semester 1 Level 3

Pre-requisites: BC21C/BIOL2312 and BC21D/BIOC2014

Syllabus: Bacteria, eukaryotic and phage genes, genetic maps and mapping, plasmids, transposons. Genetic recombination, genetic exchange, models of recombination. The arrangement of genes, introns, exons, gene clustering, mitochondria and chloroplasts. Mutations and mutagens, base and nucleotide analogues, alkylating agents, intercalating dyes, ionizing radiation, UV, transposon mutagenesis. DNA repair mechanisms, excision repair, SOS repair. Expression and regulation of eukaryotic and prokaryotic genes, control of transcription-operons in bacteria, control of transcription-eukaryotic RNA polymerase eukaryotic, transcription factors, DNA binding proteins, zinc-finger motif. RNA interference.

A practical course of 36 hours

Evaluation:	One 2-hour written paper	60%
	Two in-course tests	20%
	Laboratory reports	20%

BC34D/BIOL3313 HUMAN MOLECULAR BIOLOGY
(4 Credits) Semester 2 Level 3

Pre-requisites: BC21C/BIOL2312 and BC21D/BIOC2014
Pre/Co-requisite: BC34C/BIOL3312

Syllabus: The molecular basis of the immune response. The biological basis of the HIV-AIDS epidemic. The molecular basis of cancer. Mutations and the role of genetic predisposition in the etiology of both monogenic and multifactorial diseases. Haemoglobinopathies; in-born errors of metabolism. How these genes are inherited and their frequencies among different populations. The concept of 'nature vs. nurture.' The Human Genome Project, the data generated and the practical and ethical implications of this knowledge. The projected role of gene therapy in treatment of genetic diseases. Pharmacogenomics.

A practical course of 36 hours

Evaluation:	One 2-hour written paper	60%
	Two in-course tests	20%
	Laboratory reports	20%

BC34M/MICR3214: MOLECULAR MICROBIOLOGY
(4 credits) Semester 1 Level 3

Prerequisites: BC21C/BIOL2312 and BC21M/MICR2211

Syllabus: Introduction to molecular microbiology; Health/economic significance of microorganisms. Culture-based and molecular detection of microorganisms. Microbial interactions: environmental and quorum sensing. Microbe-host interactions. Microbial pathogenicity. Comparative and environmental genomics. Control of infection: traditional and reverse vaccinology.

A practical course of 36 hours

Evaluation:	One 2-hr written paper	60%
	Two in-course tests	20%
	Laboratory and reports	20%

BC35A/BIOC3013 BIOCHEMICAL PHYSIOLOGY

(4 Credits) Semester 1 Level 3

Pre-requisites: BC21C/BIOL2312 and BC21D/BIOC2014

Syllabus: Cellular signaling, endocrinology, the regulation and integration of the metabolic pathways for carbohydrate, lipid and protein metabolism. Organ specialization, macro-nutrient and micro-nutrient nutrition, digestion and absorption. Sugar and fat substitutes; vitamin and mineral utilization by the body; energy expenditure and requirements during feasting, fasting, exercise; nutrient deficiencies; malnutrition and its sequelae; obesity, free radical formation, antioxidants. Clinical chemistry tests.

A practical course of 36 hours

Evaluation:	One 2-hour written paper	65%
	Two in-course tests	20%
	Laboratory reports	20%

BC35C/BIOT 3113 BIOTECHNOLOGY I

(4 Credits) Semester 1 Level 3

Pre-requisites: BC21C/BIOL2312 and BC21D/BIOC2014

Syllabus: **Fundamentals of Biotechnology:** The Biotechnology Revolution. Recombinant DNA – Technology and Methods. Molecular Research Procedures. Manipulation of gene expression in prokaryotes. Protein production in eukaryotic cells. Site-directed mutagenesis. Protein engineering. Fermentation Technology.

A practical course of 36 hours

Evaluation:	One 2-hour written paper	60%
	Two in-course tests	20%
	Laboratory reports	20%

BC35D/BIOT3114 BIOTECHNOLOGY II

(4 Credits) Semester 2 Level 3

Pre-requisites: BC21C/BIOL2312 and BC21D/BIOC2014
Pre/Co-requisites: BC35C/BIOT3113

Syllabus: **Microbial Systems:** Microbial synthesis of pharmaceutical and other commercial products. Molecular diagnostics systems for detecting diseases and transgenic organisms. Vaccines and Therapeutic Agents. Biomass utilization & bioremediation. Plant growth-promoting bacteria. Microbial insecticides.

Eukaryotic Systems: Development and use of transgenic plants. Development and use of transgenic animals. Isolation of human genes. Human somatic cell gene therapy. *In vitro* regenerative technology & biomaterials for organ regeneration.

Current issues: Regulation and patenting of biotechnology products. Biotechnology as a Business – current market trends.

A practical course of 36 hours

Evaluation:		
	One 2-hour written paper	60%
	Two in-course tests	20%
	Laboratory reports	20%

BC35F/BIOT3116 THE BIOTECHNOLOGY OF INDUSTRIAL ETHANOL PRODUCTION

(4 Credits) Semester: 2 Level 3

Pre-requisites: BC21D/BIOC2014 and BC21M/MICR2211

Syllabus: The theory and practice of industrial ethanol production: beers, wines, potable spirits and industrial grade ethanol. Preparation of fermentation feed stocks and media: batch & continuous fermentation systems; fermentor design, instrumentation & control. Biochemical aspects of nutrient utilization. Elementary Process Economics. Product recovery and treatment; waste treatment.

The practical component of the course will be fulfilled by site visits to local industrial fermenteries: a brewery, a winery and a distillery; and reports will be submitted thereof, including analysis of specific data supplied on site.

Evaluation:		
	One 2-hour written paper	60%
	Two 1-hour in-course tests	20%
	Site-visit reports	20%

BC36A/BIOC3413 PROJECT
(4 Credits) Semester 1 & 2 Level 3

Pre-requisites: BC21C/BIOL2312 and BC21D/BIOC2014 and BC21M/MICR2211

Co-requisites: BC31M/MICR3213, BC34B/BIOC3011, BC34C/BIOL3312, BC34D/BIOL3313, BC34M/MICR3214, BC35A/BIOC3013, BC35C/BIOT3113, BC35D/BIOT3114, BC35F/BIOT3116 or BC39P/BIOC3014

This course is available only to final year students majoring in Biochemistry, Biotechnology, Microbiology or Molecular Biology. Entry will be dependent on the student's academic performance to date and available space.

Syllabus: Practical research on an approved topic.

Evaluation:

Project Report	60%
Seminar presentation	40%

BC39P/BIOC3014 PLANT BIOCHEMISTRY
(4 Credits) Semester: 2 Level 3

Pre-requisites: BC21D/B10C2014

Syllabus: The course will consider the chemical constituents of plants, their synthesis, their contribution to key metabolic processes and the regulation of their biosynthesis. Topics will include the biosynthesis and mode of action of phytohormones and their role in development and plant defence; the role of ethylene in fruit ripening; carbohydrates, lipids and nitrogen fixation; plant secondary metabolites, anti-nutritional factors; storage organs and tuberization; and the regulation of gene expression in plants. The course will also provide tools for understanding fundamental features of plant-based research, such as modification of fruit-ripening using controlled atmospheres. Secondary metabolites and their uses.

A practical course of 36 hours

Evaluation:

One 2-hour written paper	60%
Two in-course tests	20%
Laboratory reports	20%

MICR3215: FOOD MICROBIOLOGY AND BIOTECHNOLOGY
(4 Credits) Semester 2 Level 3

Pre-requisites: BC21D/BIOC2014 and BC21M/MICR2211

Other qualified students may be admitted by the Head of Department

Syllabus:

1. Microbial ecology of foods

a. Importance of microbes in foods
b. Intrinsic factors affecting microbial growth
c. Microbial growth, death and survival in foods: meat, poultry, seafoods, dairy, fruits, vegetable and grains

2. Microbial examination of foods

a. Indicator organisms
b. Rapid methods for identification of microbes or GMOs in foods

3. Overview of food-borne pathogens

a. Bacteria, yeasts and moulds, parasites, viruses and prions
b. Recent and potential food-borne pathogens

4. Food technology

a. Chemical, physical and biological preservation
b. Sanitation
c. HACCP/ISO standards

5. Introduction to Food Biotechnology

a. Importance, advances and trends
b. Starter cultures
c. Ethical perspectives of food biotechnology: Environmental impact, safety, intellectual property rights, animal welfare, risk analysis, consumer perceptions, industry perspectives; DNA-based methods for food authentication

6. Microbial Synthesis and Production

a. Flavours
b. Vitamins

7. Enzyme Biotechnology

a. Applications of Enzymes in Food Industry: dairy, baking, meat and meat processing
b. Enzymic processing of fruit juices
c. Enzymes in Organic Solvents, e.g. Lipases
d. Enzyme Generation of Flavour and Aroma Compounds
e. Phytase in animal feeds
f. Impact of enzyme technology (bioethanol, protein hydrolysates, bioactive peptides)

8. Biotechnology Applied to Fats and Oils

a. Nutritional Value
b. Flavour
c. Lipid Modifications

Laboratory work:

1. Microbiology of fresh fruits and vegetables, and pastry and canned foods
    a. Aerobic counts

2. Bacillus
    a. Dilutions and plating
    b. Isolation from cereals and custards

3. Salmonella and Campylobacter
    a. Selective enrichment
    b. Direct plating
    c. Antibiotic sensitivity and motility

4. Visit(s) to Food Microbiology lab(s)
    a. Rapid methods
    b. Sanitation
    c. HACCP

5. Phytase production by Mucor spp./Phytase in animal feeds

6. Determination of soluble protein in foods (beer)

7. Biotransformation of L-citronellal to L-citronellol

Course Summary:

This course will consider how biotechnology exploits microorganisms in the production of foods. The course will review both traditional as well as modern biotechnological inputs in the food processing industry. The biotechnology of enzymes, fats, oils, flavour and recombinant DNA technology used in production of novel food ingredients or new food products will be explored. The course will also cover the main characteristics, diagnosis and control of commonly encountered food-borne pathogens, and the significance of currently important and emerging pathogens. Current issues related to genetically modified foods will also be discussed.

A practical course of 36 hours

Evaluation:

One 2-hr written paper	60%
Ten Laboratory reports	20% (equally weighted)
Two in-course tests	20% (equally weighted)

This course will be offered adjacent to BC35F/BIOT3116 *Biotechnology of Ethanol Fermentation*, therefore students will have to choose between BIOT3116 and MICR3215.

DEPARTMENT OF CHEMISTRY
CHEMISTRY COURSES

LIST OF UNDERGRADUATE COURSES

CODES	TITLES	CREDIT	SEMESTER OFFERED	Level	PREREQUISITES
PRELIMINARY LEVEL					
CHEM0901	**PRELIMINARY CHEMISTRY A**	6-P Credits	Semester 1	0	CSEC (CXC) Chemistry Grade III or better
CHEM0902	**PRELIMINARY CHEMISTRY B**	6-P Credits	Semester 2	0	CSEC (CXC) Chemistry Grade III or better
LEVEL I					
CHEM1901	**INTRODUCTORY CHEMISTRY A**	6 Credits	Semester 1	I	CHEM0901 and CHEM0902, or GCE A-level Chemistry, or CAPE Chemistry.
CHEM1902	**INTRODUCTORY CHEMISTRY B**	6 Credits	Semester 2	I	CHEM0901 and CHEM0902, or GCE A-level Chemistry or CAPE Chemistry.
LEVEL II					
CHEM2001	**CHEMICAL ANALYSIS I**	4 Credits	Semester 1	II	CHEM1901 and CHEM1902
CHEM2101	**INORGANIC CHEMISTRY**	4 Credits	Semester 1	II	CHEM1901 and CHEM1902
CHEM2201	**SPECTROSCOPY, MECHANISMS AND AROMATIC SYSTEMS**	4 Credits	Semester 1	II	CHEM1901 and CHEM1902
CHEM2301	**PHYSICAL CHEMISTRY**	4 Credits	Semester 1	II	CHEM1901 and CHEM1902
	CHEMISTRY IN OUR DAILY LIVES	3 Credits	Semester 1,2,3	II	CHEM1901 and CHEM1902

CODES	TITLES	CREDIT	SEMESTER OFFERED	Level	PREREQUISITES
CHEM2402					
CHEM2501	**BIOTECHNOLOGY IN THE CHEMICAL AND FOOD INDUSTRIES**	4 Credits	Semester 1	II	CHEM1901 and CHEM1902 and Permission of HOD
CHEM2502	**FOOD PROCESSING TECHNIQUES**	8 Credits	Semester 1	II	CHEM1901 and CHEM1902 and Permission of HOD
CHEM2601	**ENVIRONMENTAL CHEMISTRY**	8 Credits	Semester 1	II	CHEM1901 and CHEM1902 and Permission of HOD.
LEVEL III					
CHEM3001	**CHEMICAL ANALYSIS II**	4 Credits	Semester 2	III	CHEM2001
CHEM3101	**INORGANIC CHEMISTRY**	4 Credits	Semester 2	III	CHEM1901 and CHEM1902
CHEM3104	**BIO-INORGANIC CHEMISTRY**	4 Credits	Semester 2	III	CHEM2101 and Permission of HOD.
CHEM3201	**ORGANIC SYNTHESIS, BIOMOLECULES AND STEREOCHEMISTRY**	4 Credits	Semester 2	III	CHEM2201 (Pass or Fail but not Fail Absent)
CHEM3202	**THE CHEMISTRY OF ORGANIC NATURAL PRODUCTS**	4 Credits	Semester 2	III	CHEM2201 and CHEM3201
CHEM3203	**ORGANIC CHEMISTRY IN MEDICINE AND AGRICULTURE**	4 Credits	Semester 1	III	CHEM2201 and CHEM3201
CHEM3301	**PHYSICAL CHEMISTRY**	4 Credits	Semester 2	III	CHEM1901 and CHEM1902
CHEM3302	**CHEMISTRY OF POLYMERS**	4 Credits	Semester 1	III	CHEM2301 and CHEM3301

CODES	TITLES	CREDIT	SEMESTER OFFERED	Level	PREREQUISITES
CHEM3303	**PROPERTIES OF MATTER**	4 Credits	Semester 2	III	CHEM2301 and CHEM3301
CHEM3401	**PROJECT EVALUATION AND MANAGEMENT FOR SCIENCE BASED INDUSTRIES**	4 Credits	Semester 1	III	*This course is only available to students majoring in Applied Chemistry and Food Chemistry but students who do not have any overlapping Management Studies courses and are majoring in areas which have an industrial direction and have the approval of the Department within which they are majoring may be allowed to take this course.* **Co-requisite:** CHEM2601 or CHEM2502 or CHEM3403 or approved courses from departments other than Chemistry.
CHEM3402	**THE CHEMICAL INDUSTRIES**	4 Credits	Semester 2	III	Any two of CHEM2001, CHEM2101, CHEM2201 or CHEM2301 (Pass or Fail but not Fail Absent) and Permission of HOD.
CHEM3403	**CHEMICAL PROCESSING PRINCIPLES**	8 credits	Semester 2	III	CHEM2301 or CHEM3301 and Permission of HOD.
CHEM3501	**FOOD AND FLAVOUR CHEMISTRY**	8 Credits	Semester 2	III	CHEM2201 and Permission of HOD.
CHEM3701	**RESEARCH PROJECT**	4 Credits	Semester 1, 2 & 3	III	Majoring in Chemistry, 16 Advanced credits in Chemistry and Permission of HOD.
CHEM3702	**ADVANCED RESEARCH PROJECT**	4 Credits	Semester 1, 2 & 3	III	CHEM3701 and Permission of HOD.
CHEM3703	**COMPREHENSIVE RESEARCH PROJECT**	8 Credits	Semester 1, 2 & 3 or across two semesters	III	Majoring in Chemistry, 16 Advanced credits in Chemistry and Permission of HOD.

DEGREE OFFERINGS

A **major in Pure Chemistry** requires a total of 32 credits from Level II Chemistry courses which must include:

CHEM2001
CHEM2101
CHEM2201
CHEM2301
CHEM3101
CHEM3201 and
CHEM3301.

A **major in Applied Chemistry** requires 32 credits in approved courses which must include:

CHEM2601
CHEM3001
CHEM3401
CHEM3402 and
CHEM3403.

A **major in Food Chemistry** requires 32 credits in approved courses which must include:

CHEM2501
CHEM2502
CHEM3001
CHEM3401 and
CHEM3501.

To complete a major in Pure Chemistry, Applied Chemistry or Food Chemistry the following Level I 3-credit Mathematics courses are required prior to entering the advanced Chemistry courses:

MATH1185 Calculus for Scientists and Engineers (Semester 2)

AND EITHER:

MATH1141 Introduction to Linear Algebra & Analytical Geometry (Semester 1)

OR

STAT1001 Statistics for Scientists (offered in Semesters 1 and 2)

TYPICAL SCHEDULE OF COURSES FOR DEGREES INCLUDING A GENERAL CHEMISTRY MAJOR

1. When no other Chemistry Major is involved (ie. no Food or Applied Chemistry Major):

YEAR	COURSES/Semester 1	COURSES/Semester 2
Introductory	CHEM1901 , MATH1141 or STAT1001 + 9 other level I credits	CHEM1902 , MATH1185 + 9 other level I credits
1st Advanced Year	CHEM2101, CHEM2201 + 8 other level II credits	CHEM3101, CHEM3201 + 8 other level II credits
2nd Advanced Year	CHEM2001, CHEM2301 + 8 other level II or III credits	CHEM3301, Chem. Elective + 8 other level II or III credits

Chem. Elective may include any Advanced Chemistry Course.

2. When it is a Double Major with Applied Chemistry:

YEAR	COURSES/Semester 1	COURSES/Semester 2
Introductory	CHEM1901, MATH1141 or STAT1001 + 9 other level I credits	CHEM1902, MATH1185 + 9 other level I credits
1st Advanced Year	CHEM2001, CHEM2301 CHEM 2201, CHEM2101	CHEM3001, CHEM3402 + two of CHEM3101, CHEM3201 & CHEM3301.
2nd Advanced Year	CHEM2601, CHEM3401 + 4 other level II or III Chemistry credits	CHEM3403, the remaining course from CHEM3101, CHEM3201 & CHEM3301, + 4 other level III Chemistry credits.

Note that CHEM2001 and CHEM2301 are prerequisites for Applied Chemistry Courses

3. When it is a Double Major with Food Chemistry:

YEAR	COURSES/Semester 1	COURSES/Semester 2
Introductory	CHEM1901, MATH1141 or STAT1001 + 9 other level I credits	CHEM1902, MATH1185 + 9 other level I credits
1st Advanced Year	CHEM2001, CHEM2201, CHEM2502	CHEM3001, CHEM3201 + 8 other level II or III Chemistry credits
2nd Advanced Year	CHEM2101, CHEM2301, CHEM2501, CHEM3401	CHEM3501 + 8 other level III Chemistry credits

Note that CHEM2001 and CHEM2201 are prerequisites for Food Chemistry Courses

TYPICAL SCHEDULE OF COURSES FOR DEGREES INCLUDING AN APPLIED CHEMISTRY MAJOR

YEAR	COURSES/Semester 1	COURSES/Semester 2
Introductory	CHEM1901, MATH1141 or STAT1001 + 9 other level I credits	CHEM1902, MATH1185 + 9 other level I credits
1st Advanced Year	CHEM2001, CHEM2301 + 8 elective credits	CHEM3001, CHEM3402 + 8 elective credits
2nd Advanced Year	CHEM2601, CHEM3401 + 4 elective credits	CHEM3403 + 8 elective credits

TYPICAL SCHEDULE OF COURSES FOR DEGREES INCLUDING A FOOD CHEMISTRY MAJOR

YEAR	COURSES/Semester 1	COURSES/Semester 2
Introductory	CHEM1901, MATH1141 or STAT1001 + 9 other level I credits	CHEM1902, MATH1185 + 9 other level I credits
1st Advanced Year	CHEM2001, CHEM2502 + CHEM2201 or 4 elective credits	CHEM3001+ 12 elective credits
2nd Advanced Year	CHEM2501, CHEM3401 + the remaining course from CHEM2201 or 4 elective credits	CHEM3501 + 8 elective credits

A **minor in Chemistry** requires a total of 16 credits from Level II Chemistry courses which must include:

CHEM2001
CHEM2201
and either CHEM2101 or CHEM3101
and either CHEM2301 or CHEM3301.

A **minor in Environmental Chemistry** requires 16 credits which must include:

CHEM2601
and 8 credits from CHEM2001, CHEM3001, CHEM3402.

A minor in Food Chemistry requires 16 credits which must include:

CHEM3501
and 8 credits from CHEM2001, CHEM3001,
CHEM2201, CHEM3201, CHEM2501.

A **minor in Food Processing** requires 16 credits which must include:

CHEM2502
and 8 credits from CHEM2501, CHEM3401,
CHEM3402, CHEM3403.

A minor in Industrial Chemistry requires all of:

CHEM3401
CHEM3402
and CHEM3403.

DEPARTMENTAL OPTIONS

Three options involving Chemistry are offered: Chemistry and Management, Chemistry with Education and Special Chemistry.

CHEMISTRY AND MANAGEMENT

Part I

Titles		**Credits**
CHEM1901	Introductory Chemistry I Semester 1	6
CHEM1902	Introductory Chemistry II S2	6
ECON1001	Introduction to Microeconomics S1&2	3
ECON1002	Introduction to Macroeconomics S1&2	3
SOCI1002	Sociology for the Caribbean S1	3
PSYC1002	Introduction to Industrial & Organisational Psychology S2	3
ACCT1005*	Financial Accounting	3
ACCT1003*	Introduction to Cost and Management Accounting S2	3

*** Students entering after 2010/2011 and who have passed CAPE Accounting Units I & II with Grade IV or better will receive credit exemptions from ACCT1003 and ACCT1005.**

Part II		**Credits**
CHEM2001	Chemical Analysis I Semester 1	4
CHEM2101	Inorganic Chemistry S1	4
CHEM2201	Spectroscopy, Carbanions etc. S1	4
CHEM2301	Physical Chemistry S1	4
CHEM3101	Inorganic Chemistry S2	4
CHEM3201	Synthesis, Mechanism & Stereochemistry S2	4
CHEM3301	Physical Chemistry S2	4
MGMT2001	Principles of Marketing S1	3
MGMT2005	Computer Applications S1&2	3
MGMT2008	Organizational Behaviour S1&2	3
MGMT2012	Quantitative Methods & Research Principles S1&2	3
MGMT2021	Business Law S1&2	3
MGMT2023	Financial Management I S1&2	3
MGMT2026	Introduction to Production and Operations Management S1&2	3
MGMT3031	Business Strategy and Policy S2	3
MGMT3036	Entrepreneurship and Venture Capital S1&2	3

Plus

Four additional credits from Level II or Level III Chemistry Courses approved by the Department, to be taken along with **three** additional credits from Level II or III Management Studies courses to complete the course of study.

All students are required to successfully complete **MATH1185 (**Calculus for Scientists and Engineers, offered in Semester 2) **and EITHER MATH1141** (Introduction to Linear Algebra & Analytical Geometry, offered in Semester 1) **OR STAT1001** (Statistics for Scientists, offered in Semesters 1 and 2) prior to entering the advanced Chemistry courses.

CHEMISTRY WITH EDUCATION

(FOR TRAINED AND PRE-TRAINED TEACHERS)

CHEMISTRY COURSES

LEVEL I

Twenty-four (24) credits from **two** subject areas in the Pure and Applied Sciences divided equally between the two so as to provide the prerequisite for Level II courses. One of the subject areas must be Chemistry (required courses are CHEM1901 and CHEM1902).

Trained Teachers with the New Double Option (since 2004) with Chemistry as one of their majors and who have a GPA of at least 2.9 may be granted exemption from Level I requirements.

Trained Teachers with Single Option science are required to do Preliminary Chemistry.

All students must complete the required Mathematics courses: foundation courses required by the FPAS.

LEVEL II/III

Thirty-two (32) credits from Level II Chemistry courses, which must include:

CHEM2001
CHEM2101
CHEM2201
CHEM2301
CHEM3101
CHEM3201 and
CHEM3301

All students are required to successfully complete **MATH1185 (**Calculus for Scientists and Engineers, offered in Semester 2) **and EITHER MATH1141** (Introduction to Linear Algebra & Analytical Geometry, offered in Semester 1) **OR STAT1001** (Statistics for Scientists, offered in Semesters 1 and 2) prior to entering the advanced Chemistry courses.

EDUCATION COURSES

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

BSc (SPECIAL) CHEMISTRY DEGREE

1. Candidates must satisfy the General Regulations for the degree of Bachelor of Science (except those relating to support courses) in addition to the following regulations.

2. The minimum standards for admission to the programme are as follows:

   Completion of Level I of the BSc degree programme, including passes in:

   (i) Introductory Chemistry (CHEM1901 and CHEM1902) at the prescribed level.

   (ii) Introductory Mathematics (MATH1185 AND EITHER MATH1141 OR STAT1001).

   (iii) Preliminary Physics (PHYS0410 and PHYS0420) or the equivalent.

3. Admission to this programme is limited and candidates with good grades in CHEM1901 and CHEM1902 will be given preference.

4. To be eligible for the award of the BSc. (Special) Chemistry degree, candidates must obtain:

   (a) A total of 56 chemistry credits by successfully completing the following:

   Level II courses:

   (i) CHEM2001, CHEM3001,
   CHEM2101, CHEM3101, CHEM2201,
   CHEM3201, CHEM2301, CHEM3301.

   (ii) An additional twenty credits from Chemistry courses

   (iii) A research project CHEM3701.

   (b) An additional eight credits selected from Level II courses in any Science subject in the BSc degree programme approved by the Department.

COURSE DESCRIPTIONS

PRELIMINARY COURSES

CHEM0901 **PRELIMINARY CHEMISTRY A**
(6 P-Credits) Semester 1 Level 0

Prerequisite: CSEC (CXC) Chemistry Grade III or better

Syllabus: Introduction to Chemistry. Atomic theory of matter. Electronic configuration of the elements. The Periodic Table and related studies. The mole concept and stoichiometry. Chemical Bonding and molecular geometry.

The characteristics and properties of matter. Properties of solutions. Chemical Energetics, the First Law of Thermodynamics; Enthalpy and its calculation.

The chemistry of aliphatic hydrocarbons.

A practical course of 72 hours.

Evaluation:

Two 2-hour written papers	70%
Course work	15%
Practical work	15%

Practical work is assessed throughout the duration of the course. Students whose practical work is considered to be unsatisfactory are required to sit a practical examination of not more than six hours duration. Candidates must provide the ORIGINAL worksheets of their laboratory work at the practical examination. These must be certified by the laboratory course Supervisor and may be taken into consideration by the Examiners.

CHEM0902 **PRELIMINARY CHEMISTRY B**
(6 P-Credits) Semester 2 Level 0

Pre-requisite: CSEC (CXC) Chemistry Grade III or better.

Syllabus: Properties and Reactivity of Main Group Elements and their compounds. Transition Elements and their compounds. Coordination compounds.

Kinetics, Rates of chemical reactions. Principles of Electrochemistry. Chemical Equilibrium and its application. A functional group approach to the chemistry of organic compounds: alkyl halides, alcohols, carbonyl compounds, carboxylic acids and their derivatives and amines.

A practical course of 72 hours.

Evaluation:		
	Two 2-hour written papers	70%
	Course work	15%
	Practical work	15%

Practical work is assessed throughout the duration of the course. Students whose practical work is considered to be unsatisfactory are required to sit a practical examination of not more than six hours duration. Candidates must provide the ORIGINAL worksheets of their laboratory work at the practical examination. These must be certified by the laboratory course Supervisor and may be taken into consideration by the Examiners.

LEVEL I COURSES

CHEM1901 **INTRODUCTORY CHEMISTRY A**
(6 credits) Semester 1 Level I

Pre-requisites: CHEM0901 and CHEM0902, or GCE A-level Chemistry, or CAPE Chemistry.

Syllabus: Introductory analytical chemistry, theory of neutralization titrations, titration curves, spectrophotometry.

Atomic theory. Interactions between atoms, ions and molecules. Crystal structures and symmetry elements. Born-Haber cycle. Molecular Orbital Theory for homo- and heteronuclear diatomic molecules.

Energetics and Molecular Structure, heat capacity variation with temperature, wave behaviour in molecules, Boltzmann distribution, origin of molecular spectra.

A mechanistic approach to the chemistry of alkanes, alkenes and alkynes. An introduction to the stereochemistry of organic molecules.

A practical course of 72 hours.

Evaluation:		
	Two 2-hour written papers	75%
	In-course test	10%
	Practical work	15%

Practical work is assessed throughout the duration of the course. Students whose practical work is considered to be unsatisfactory are required to sit a practical examination of not

more than six hours duration. Candidates must provide the ORIGINAL worksheets of their laboratory work at the practical examination. These must be certified by the laboratory course Supervisor and may be taken into consideration by the Examiners.

CHEM1902 **INTRODUCTORY CHEMISTRY B**
(6 credits) Semester 2 Level I

Pre-requisites: CHEM0901 and CHEM0902, or GCE A-level Chemistry or CAPE Chemistry.

Syllabus: A detailed study of Main Group elements based on their position in the Periodic Table. The properties of oxygen and its compounds. Coordination compounds of First Row Transition Elements and their stereochemical features. Introduction to Crystal Field Theory. Stability of metal complexes. Isomerism.

Thermodynamics – introduction to meaning and uses of Internal Energy, Enthalpy, Entropy and Gibbs Energy to ideal gas processes and chemical reactions. Electrochemistry of cells, Nernst Equation. Kinetics; order, molecularity and rate equations. Enthalpy and Entropy of activation.

Synthesis and Reactions of functionalised organic compounds. Introduction to Aromatic Chemistry.

A practical course of 72 hours.

Evaluation:

Two 2-hour written papers	75%
In-course test	10%
Practical Work	15%

Practical work is assessed throughout the duration of the course. Students whose practical work is considered to be unsatisfactory are required to sit a practical examination of not more than six hours duration. Candidates must provide the ORIGINAL worksheets of their laboratory work at the practical examination. These must be certified by the laboratory course Supervisor and may be taken into consideration by the Examiners.

Both CHEM1901 and CHEM1902 ***must*** *be successfully completed before students can proceed to Part II courses in Chemistry.*

LEVEL II COURSES

CHEM2001 **CHEMICAL ANALYSIS I**
(4 credits) Semester 1 Level II

Pre-requisites: CHEM1901 and CHEM1902

Syllabus: Statistical methods and their use in laboratory management. Types of errors, rejection of data, means and standard deviations and their use in testing analytical results and methods, quality control charts.

Oxidation-reduction titrations and an introduction to the use of electrodes in analytical chemistry as illustrated by the pH electrode. Other ion selective electrodes.

An introduction to spectroscopic methods as illustrated by Molecular Spectroscopy, including Fluorescence in the UV/VIS region of the electromagnetic spectrum. The components of Spectrometers. Applications of such methods.

An introduction to Chromatography. General chromatographic principles of separation. An introduction to gas chromatography including instrumentation. Some illustrations of applications of Gas Chromatography.

A practical course of 36 hours.

Evaluation:

One 2-hour written paper	60%
In-course test and report	20%
Practical work	20%

Practical work is assessed throughout the duration of the course. Students whose practical work is considered to be unsatisfactory are required to sit a practical examination of not more than 6 hours duration. Candidates must provide the ORIGINAL worksheets and reports of their laboratory work at the practical examination. These must be certified by the laboratory course supervisor and may be taken into consideration by the examiners.

CHEM2101 **INORGANIC CHEMISTRY**
(4 credits) Semester 1 Level II

Pre-requisites: CHEM1901 and CHEM1902

Syllabus: Structure and Bonding: Review of Crystal Field Theory. Ligand Field Theory. Spectroscopic and Magnetic properties of complexes. Chemistry of transition metals. Mechanisms of

inorganic reactions. Substitution and electron transfer reactions. Transition metal organometallics: metal carbonyls, metal alkyls, cyclopentadienyl and arene complexes. Catalysis.

A practical course of 36 hours.

Evaluation:

One 2-hour written paper	60%
In-course test	20%
Practical Work	20%

Practical work is assessed throughout the duration of the course. Students whose practical work is considered to be unsatisfactory are required to sit a practical examination of not more than six hours duration. Candidates must provide the ORIGINAL worksheets of their laboratory work at the practical examination. These must be certified by the laboratory course Supervisor and may be taken into consideration by the Examiners.

CHEM2201 **SPECTROSCOPY, MECHANISMS AND AROMATIC SYSTEMS**

(4 credits) Semester 1 Level II

Pre-requisites: CHEM1901 and CHEM1902

Syllabus: The application of spectroscopic techniques in organic chemistry: electronic, infrared, proton and carbon-13 magnetic resonance spectroscopy, mass spectrometry. Their utility in elucidating the structure of organic compounds.

Carbocyclic and heterocyclic aromatic compounds. Review of the concept of aromaticity. Electrophilic and nucleuphilic substitution in benzenoid systems. Polycyclic aromatic compounds - napthalene, anthracene and phenanthrene. Selected reactions of simple heterocycles.

Overview of the main types of organic reactions - substitution, addition, elimination, cyclization. Reaction mechanisms and methods of determining them. Generation, structure and fate of reactive intermediates (carbocations and carbanions). The role of carbanions in carbon-carbon bond formation - reactions of enolate ions and organometallic compounds. Diels Alder reactions.

A practical course of 36 hours.

Evaluation:

One 2-hour written paper	60%
In-course tests	20%
Practical work	20%

CHEM2301 **PHYSICAL CHEMISTRY**

(4 credits) Semester 1 Level II

Pre-requisites: CHEM1901 and CHEM1902

Syllabus: Kinetic factors influencing the rates of chemical change in complex reacting systems. Theories of reaction rates. Methods of determining the rates of fast reactions.

Quantum Mechanics: treatment of translational, rotational and vibrational energy of molecules based on Schroedinger wave equation, implications for molecular spectra.

Polymers, Colloids and Surfaces: Kinetic models for chain and stepwise polymerisation. Methods of determining the relative molar mass (RMM) of polymers. The relationship between RMM and properties of polymers.
Adsorption of gases on solid surfaces. Adsorption kinetics and thermodynamics: Adsorption isotherms. Monolayer and multilayer adsorption on uniform surfaces. Capillary condensation. Determination of surface areas of adsorbents.

A practical course of 36 hours.

Evaluation:

One 2-hour written paper	60%
In-course test	20%
Practical Work	20%

Practical work is assessed throughout the duration of the course. Students whose practical work is considered to be unsatisfactory are required to sit a practical examination of not more than six hours duration. Candidates must provide the ORIGINAL worksheets of their laboratory work at the practical examination. These must be certified by the laboratory course Supervisor and may be taken into consideration by the Examiners.

CHEM2402 **CHEMISTRY IN OUR DAILY LIVES**

(**3** credits) Semester 1, 2 and 3 Level II

Pre-requisites: CHEM1901 and CHEM1902 and Permission of HOD

Syllabus: Role of chemistry in producing consumer products, cosmetics and other necessities of life. Chemistry in agriculture, food production, housing, pharmaceuticals and healthcare, clothing, transport and communications. Applications of chemistry to the arts, crime-fighting and law enforcement, warfare, economics and politics. Chemistry and the environment.

The course includes 24 hours of lectures and 16 hours of problem-based tutorials.

Evaluation:

One 2-hour written paper	50%
In-course test	20%
Graded Assignments/Presentations	30%

This course is available as an elective to students who are NOT pursuing a Major in Chemistry. It is open to FPAS students at the advanced level who have successfully completed level 1 (CHEM1901 and CHEM1902) chemistry courses. It is also available as an elective to students doing the Bachelors programme in Education with Chemistry, the Chemistry and Education Option and the OESH programme. This course CANNOT be counted towards a Major in Chemistry.

CHEM2501 BIOTECHNOLOGY IN THE CHEMICAL AND FOOD INDUSTRIES

(4 credits) Semester 1 Level II

*This course is **not** available to students intending to major in Biotechnology nor students reading the following courses BIOT3113, BIOT3114, BIOT3116.*

Pre-requisites: CHEM1901 and CHEM1902 and Permission of HOD.

Syllabus: Industrial fermentation. Fermentation kinetics. Fermenter design and operation. Food processing plant sanitation and food spoilage. Selected food and animal feed produced by the action of microorganisms. Biogas.

A practical course of 36 hours.

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Evaluation:

One 2-hour written paper	60%
In-course test	20%
Practical work	20%

Practical work is assessed throughout the duration of the course. Students whose practical work is considered to be unsatisfactory are required to sit a practical examination of not more than six hours duration. Candidates must provide the ORIGINAL notebooks of their laboratory work at the practical examination. These must be certified by the laboratory course Supervisor and may be taken into consideration by the Examiners.

CHEM2502 **FOOD PROCESSING TECHNIQUES**
(8 credits) Semester 1 Level II

Pre-requisites: CHEM1901 and CHEM1902 and Permission of HOD.

Preference will be given to students majoring in Food Chemistry.

Syllabus: Unit operations of the food industry. HACCP. Technologies for processing meat, fish and poultry, fruit and vegetables and dairy. Thermal processing, freezing, juices and concentrates, jams and jellies, irradiation, curing and smoking of meats, preservatives. Water relations in food processing, drying and dehydration. Enzymes in food processing. Packaging. New technologies.

A practical course of 72 hours.

Evaluation:

Two 2-hour written papers	60%
In-course test and report	20%
Practical work	20%

Practical work is assessed throughout the duration of the courses. Students whose practical work is considered to be unsatisfactory are required to sit a practical examination of not more than six hours duration. Candidates must provide the ORIGINAL worksheets and reports of their laboratory work at the practical examination. These must be certified by the laboratory course supervisor and may be taken into consideration by the examiners.

CHEM2601 **ENVIRONMENTAL CHEMISTRY**
(8 credits) Semester 1 Level II

*It is **strongly** recommended that students **read CHEM2001and** **CHEM3001** **before** entering this course.*

Pre-requisites: CHEM1901 and CHEM1902 and Permission of HOD.

Syllabus: A study of the important processes and reactions in the environment by a consideration of:

(a) the biogeochemical cycles of the major, minor and trace elements showing sources and dispersion processes;
(b) the divisions into lithosphere, hydrosphere, atmosphere and biosphere; and
(c) the interactions between man and the environment (including pollution control).

A study of corrosion by a consideration of:

(a) metallic corrosion (i) in gaseous environments, and (ii) in aqueous environments;
(b) degradation of materials other than metals;
(c) corrosion protection.

A practical course of 72 hours.

Evaluation:

Two 2-hour written papers	60%
In-course test and report	20%
Practical work	20%

Practical work is assessed throughout the duration of the courses. Students whose practical work is considered to be unsatisfactory are required to sit a practical examination of not more than 6 hours duration. Candidates must provide the ORIGINAL notebooks and reports of their laboratory work at the practical examination. These must be certified by the laboratory course supervisor and may be taken into consideration by the examiners.

LEVEL III COURSES

CHEM3001 **CHEMICAL ANALYSIS II**

(4 credits) Semester 2 Level III

Pre-requisite: CHEM2001

Syllabus:

Classical Methods. Gravimetric methods of analysis. The properties of electrolytes and their effects on solubility. Properties of colloids. Practical methods.

Analytical Atomic Spectroscopy. Atomic Absorption, Emission and Fluorescence Spectroscopies. Basic experiments and instrumentation. Methods of atomisation and practical considerations. X-ray Fluorescence Spectroscopy: sources and detectors, sample preparation, interpretation of spectra-interferences and enhancements. Instrumental Neutron Activation Analysis: the basic experiment, instrumentation, applications and limitations.

Chromatography: A review of the principles of chromatography. Sampling for chromatography. Further applications of GC, GC detectors. Liquid chromatography: HPLC in its various forms, instrumentation, columns, detectors. GC-MS and other hyphenated systems.

The analysis of real samples. The analysis of trace vs major components. Sampling theory, contamination, and errors associated with sampling. Inter-laboratory calibration/testing exercises. The Professional Analyst.

A practical course of 36 hours.

Evaluation:

One 2-hour written paper	60%
In-course test and report	20%
Practical work	20%

Practical work is assessed throughout the duration of the course. Students whose practical work is considered to be unsatisfactory are required to sit a practical examination of not more than 6 hours duration. Candidates must provide the ORIGINAL notebooks and reports of their laboratory work at the practical examination. These must be certified by the laboratory course supervisor and may be taken in consideration by the examiners.

CHEM3101 **INORGANIC CHEMISTRY**

(4 credits) Semester 2 Level III

Pre-requisites: CHEM1901 and CHEM1902

Syllabus: Structure and Bonding. Introduction to Group Theory. Symmetry elements and operations. Point groups. Construction of character tables. Application of Group Theory to Bonding. Energy level of diagrams for octahedral transition metal complexes. Main Group elements: Hydrogen and its compounds, Oxides and oxyacids. Halogens and halides. Main Group organometallic compounds.

A practical course of 36 hours.

Evaluation:

One 2-hour written paper	60%
In-course test	20%
Practical Work	20%

Practical work is assessed throughout the duration of the course. Students whose practical work is considered to be unsatisfactory are required to sit a practical examination of not more than six hours duration. Candidates must provide the ORIGINAL notebooks of their laboratory work at the practical examination. These must be certified by the laboratory course Supervisor and may be taken into consideration by the Examiners.

CHEM3104 **THE INORGANIC CHEMISTRY OF BIOLOGICAL SYSTEMS**

(4 credits) Semester 2 Level III

Pre-requisite: CHEM2101 and Permission of HOD.

Syllabus: The role of metal ions in metal-protein systems. Interaction of metal ions with macrocyclic ligands. The importance of macrocyclic compounds in living systems. Structural aspects of macrocyclic compounds. Porphyrins and Phthalocyanins. Crown and cryptate complexes. Metallo- and metal-activated enzymes. Biological redox reactions. Nitrogen fixing microrganisms. Oxygen carriers. Storage and transport of iron. Metal ion toxicity and chelation therapy.

A practical course of 36 hours.

Evaluation:

One 2-hour written paper	60%
In-course tests	20%
Practical work	20%

Practical work is assessed throughout the duration of the course. Students whose practical work is considered to be unsatisfactory are required to sit a practical examination of not more than six hours duration. Candidates must provide the ORIGINAL notebooks of their laboratory work at the practical examination. These must be duly certified by the laboratory course Supervisor and may be taken into consideration by the Examiners.

CHEM3201 **ORGANIC SYNTHESIS, BIOMOLECULES AND STEREOCHEMISTRY**

(4 credits) Semester 2 Level III

Pre-requisites: CHEM2201 (Pass or Fail but not Fail Absent)

Syllabus: Target oriented organic synthesis. An introduction to retrosynthetic analysis. Reagents and methods for effecting carbon-carbon single and double bond formation, oxidation, reduction and cyclization. Mechanisms of carbo-cation and related rearrangements, substitution and elimination reactions. Stereochemistry of organic molecules. Static and dynamic aspects. The chemistry of carbohydrates- the synthesis and properties of mono- and disaccharides. The chemistry of amino acids, peptides and proteins.

A practical course of 36 hours.

Evaluation:	One 2-hour written paper	60%
	In-course test	20%
	Practical Work	20%

Practical work is assessed throughout the duration of the course. Students whose practical work is considered to be unsatisfactory are required to sit a practical examination of not more than six hours duration. Candidates must provide the ORIGINAL notebooks of their laboratory work at the practical examination. These must be certified by the laboratory course Supervisor and may be taken into consideration by the Examiners.

CHEM3202 THE CHEMISTRY OF ORGANIC NATURAL PRODUCTS

(4 credits) Semester 2 Level III

Pre-requisite: CHEM2201 and CHEM3201

Syllabus: Diversity, classification, biosynthesis and biological activity of natural compounds of commercial, pharmaceutical and agricultural interest (polyketide and macrolide antibiotics, terpenes, steroids, alkaloids). Structure determination by spectral analysis. C-13 nuclear magnetic resonance spectroscopy and mass spectrometry. Natural products of biological importance as synthetic targets synthetic strategy and methodology.

A practical course of 36 hours.

Evaluation:	One 2-hour written paper	60%
	In-course tests	20%
	Practical work	20%

Practical work is assessed throughout the duration of the course. Students whose practical work is considered to be unsatisfactory are required to sit a practical examination of not more than six hours duration. Candidates must provide the ORIGINAL notebooks of their laboratory work at the practical examination. These must be duly certified by the laboratory course Supervisor and may be taken into consideration by the Examiners.

CHEM3203 **ORGANIC CHEMISTRY IN MEDICINE AND AGRICULTURE**

(4 credits) Semester 1 Level III

Pre-requisites: CHEM2201 and CHEM3201

Syllabus: The synthesis of organic compounds of medicinal and agricultural interest. General principles of drug action; Structure-Activity Relationships; Principles of drug design. Synthetic approaches to selected pharmacologically active compounds, e.g. sulfonamides, pyrimidines, penicillins; central nervous system drugs: tranquillizers, anti-depressants, hallucinogens. Insecticides, fungicides, herbicides, growth regulators.
Natural products used in medicine and agriculture.

A practical course of 36 hours.

Evaluation:

One 2-hour written paper	60%
In-course tests	20%
Practical work	20%

Practical work is assessed throughout the duration of the course. Students whose practical work is considered to be unsatisfactory are required to sit a practical examination of not more than six hours duration. Candidates must provide the ORIGINAL notebooks of their laboratory work at the practical examination. These must be duly certified by the laboratory course Supervisor and may be taken into consideration by the Examiners.

CHEM3301 **PHYSICAL CHEMISTRY**

(4 credits) Semester 2 Level III

Pre-requisites: CHEM1901 and CHEM1902

Syllabus: The two laws of Thermodynamics: Energy and Entropy. Free energy. Thermodynamics of closed and open systems. Chemical potentials, applications to ideal gas mixtures and liquid mixtures (ideal and regular solutions; activity and activity coefficient). Homogeneous and heterogeneous chemical equilibria. The Phase Rule. Interpretation and use of phase diagrams. Colligative effects in dilute solutions.
Thermodynamics of galvanic cells. The Nernst equation and its applications. Contributions to cell potentials: Double layers and liquid junctions. Electroanalytical chemistry. Electrochemical theories of ion-ion interactions: Debye-Hückel theory. Ionic

transport: Mobility, transport number and (molar) conductivity. Strong and weak electrolytes. Applications of conductivity and liquid junction potential measurements: dissociation constants of weak electrolytes, ionic mobilities.

Spectroscopy and Photochemistry. Rotational, vibrational and Raman spectroscopy for diatomic and non-linear molecules. UV/visible spectra for diatomic molecules electronic transitions; dissociation energies, Franck- Condon principle. Collisional processes and energy changes in electronically excited atoms and molecules.

A practical course of 36 hours.

Evaluation:

One 2-hour written paper	60%
In-course test	20%
Practical Work	20%

Practical work is assessed throughout the duration of the course. Students whose practical work is considered to be unsatisfactory are required to sit a practical examination of not more than six hours duration. Candidates must provide the ORIGINAL notebooks of their laboratory work at the practical examination. These must be certified by the laboratory course Supervisor and may be taken into consideration by the Examiners.

CHEM3302 **CHEMISTRY OF POLYMERS**
(4 credits) Semester 1 Level III

Pre-requisites: CHEM2301 and CHEM3301

Syllabus: Polymers; classification, synthesis, molar mass and distribution. Step-growth polymerisation, control of molar mass. Free radical addition polymerisation; Initiators and terminators, chain growth. Steady state kinetics. Thermodynamics of radical polymerisation. Cationic and anionic polymerisation general characteristics. Co-polymerisation, block copolymers, graft polymerisation. Thermodynamics of polymer solutions. Flory-Fluggins theory. Solubility parameters. Phase separation and fractionation methods. Crystalline, amorphous and elastomeric states. Structure/ property relationships.

A practical course of 36 hours.

Evaluation:

One 2-hour written paper	60%
In-course tests	20%
Practical work	20%

Practical work is assessed throughout the duration of the course. Students whose practical work is considered to be unsatisfactory are required to sit a practical examination of not more than six hours duration. Candidates must provide the ORIGINAL notebooks of their laboratory work at the practical examination. These must be duly certified by the laboratory course Supervisor and may be taken into consideration by the Examiners.

CHEM3303 **PROPERTIES OF MATTER**

(4 credits) Semester 2 Level III

Pre-requisites: CHEM2301 and CHEM3301

Syllabus: The structure of solids, liquids and gases. The properties of surfaces and colloids. Intermolecular forces, van der Waals interactions, equations of state for non-ideal gases. Structure of solids. X-ray diffraction for determining structure. Structure of liquids. Electrical properties of solids and liquids, polarizability refractive index, optical activity. Magnetic properties. Transport properties, Surface Chemistry, Thermodynamics of surfaces. Modern methods for studying surfaces. Kinetics of surface reactions.

A practical course of 36 hours.

Evaluation:

One 2-hour written paper	60%
In-course tests	20%
Practical work	20%

Practical work is assessed throughout the duration of the course. Students whose practical work is considered to be unsatisfactory are required to sit a practical examination of not more than six hours duration. Candidates must provide the ORIGINAL notebooks of their laboratory work at the practical examination. These must be duly certified by the laboratory course Supervisor and may be taken into consideration by the Examiners.

CHEM3401 **PROJECT EVALUATION AND MANAGEMENT FOR SCIENCE BASED INDUSTRIES**

(4 credits) Semester 1 Level III

This course is only available to students majoring in Applied Chemistry and Food Chemistry but students who do not have any overlapping Management Studies courses and are majoring in areas which have an industrial direction and have the approval of the Department within which they are majoring may be allowed to take this course.

Co-requisite: CHEM2601 or CHEM2502 or CHEM3403 or approved courses from departments other than Chemistry and Permission of HOD.

Syllabus: ***Economics:*** An introduction to macro & micro- economics, economic development and the role of science based industry. Supply and demand, pricing policy, price elasticity, profit vs revenue maximising decisions, production function, maturity of industry.

Accounting: Cost, volume and profit analysis, allocation of resources, budgeted and standard costing, preparation, analysis and reporting on management accounts.

Project Evaluation and Management: The project concept, project development and appraisals, discounting (NPV, IRR, payback period) and non-discounting techniques (net payback period, accumulated rate of return), risk analysis, cost estimation, project implementation and time management, critical path method. Issues peculiar to small business and management.

Team building workshops: The project team, teamwork, interpersonal and teambuilding skills, leadership, decision making, communication and conflict management.

Evaluation:

One 2-hour written paper	75%
Team-based Project	25%

CHEM3402 **THE CHEMICAL INDUSTRIES**

(4 credits) Semester 2 Level III

Pre- requisites: Any two of CHEM2001, CHEM2101, CHEM2201 or CHEM2301 (Pass or Fail but not Fail Absent) and Permission of HOD.

Syllabus: One of the Bauxite to Alumina, Cement or Glass industries AND one of the Sugar, Petroleum or Forestry Industries: raw materials, major unit operations and the flow of materials through and chemical changes within them, products and possible alternatives, product quality assurance methods, possible future and developments, local and global relevance, environment issues. Global and Caribbean Chemical Industries.

Practical work comprises satisfactory participation in an approved work-study programme. Students will be required to satisfy the examiners in both the written paper and the practical work separately.

Evaluation:		
	One 2-hour written paper	50%
	Work-Study Placement	25%
	Project	25%

CHEM3403 CHEMICAL PROCESS PRINCIPLES

(8 credits) Semester 2 Level III

This course is available to Applied Chemistry majors (as a requirement) and Food Chemistry majors (as an elective). It is also available to students doing minors in Food Processing and Industrial Chemistry.

Pre-requisite: CHEM2301 and Permission of HOD.

Co-requisite: CHEM3402 or CHEM3501

Syllabus: Process Material Balances. Transfer Operations and Separation Processes. Applied Thermodynamics and Kinetics.

A practical course of 72 hours.

Evaluation:		
	Two 2-hour written papers	60%
	In-course test	15%
	Practical work	25%

Practical work is assessed throughout the duration of the courses. Students whose practical work is considered to be unsatisfactory are required to sit a practical examination of not more than six (6) hours duration. Candidates must provide the ORIGINAL notebooks and reports of their laboratory work at the practical examination. These must be certified by the laboratory course supervisor and may be taken into consideration by the examiners.

CHEM3501 FOOD AND FLAVOUR CHEMISTRY

(8 credits) Semester 2 Level III

Pre-requisite: CHEM2201 and Permission of HOD.

Syllabus: The chemistry and nutritional significance of the major food constituents (lipids, proteins, carbohydrates). Enzymes. Vitamins and minerals required for health. Food additives and flavourings. Naturally occurring toxicants in foods. Food contaminants.

A practical course of 72 hours.

Evaluation:	Two 2-hour written papers	60%
	In-course test and report	20%
	Practical work	20%

CHEM3701 **RESEARCH PROJECT**
(4 credits) Semesters 1, 2 and 3 Level III

Pre-requisites: Majoring in Chemistry, 16 credits from Advanced Chemistry and Permission of HOD. It is recommended that in the semester prior to enrolling in this course candidates discuss suitable topics with potential academic supervisors.

Syllabus: Research methods and Ethics. Use of chemical literature. Experiment design. Advanced instrumental and chemical investigation techniques. Preparation of scientific reports. Investigation of an approved topic with oral and written reporting of results.
Students are expected to spend about 100-120 hours in the laboratory.

Course Evaluation:	Written Report	40%
	Assessment of course work	40%
	Oral presentation	20%

CHEM3702 **ADVANCED RESEARCH PROJECT**
(4 credits) Semesters 1, 2 and 3 Level III

Pre-requisites: CHEM3701 and Permission of HOD.

Syllabus: Advanced instrumental and chemical investigation techniques. In-depth investigation of an approved topic with oral and written reporting of results.

Course Evaluation:	Written Report	40%
	Assessment of course work	40%
	Oral presentation	20%

CHEM3703 **COMPREHENSIVE RESEARCH PROJECT**

(8 credits) Semesters 1, 2 and 3, or any two semesters
Level III

Pre-requisites: Majoring in Chemistry, 16 credits from Advanced Chemistry and Permission of HOD. It is recommended that in the semester prior to enrolling in this course candidates discuss suitable topics with potential academic supervisors.

Syllabus: Research methods and Ethics. Use of chemical literature. Advanced instrumental and chemical investigation techniques; experiment design. Preparation of scientific reports. In-depth investigation of an approved research question with oral and written reporting of results.
Students are expected to spend about 200-240 hours in the laboratory.

Course Evaluation:		
	Written Report	40%
	Assessment of course work	40%
	Oral presentation	20%

OCCUPATIONAL AND ENVIRONMENTAL SAFETY AND HEALTH (OESH)

Bachelor of Science

The Bachelors programme delivers the knowledge and skills to apply OESH competencies in business enterprises and government agencies. These generalists are able to develop, implement and manage basic programmes and to assist in the provision of training and consultancy services.

Entry Requirements

In order to be admitted into the Bachelor's programme, candidates must have satisfied the general Faculty entry requirements and have passed two units of Chemistry, Biology or Physics at CAPE (or equivalent).

Graduates of this programme will form a core of professionals who will be competent in:

- The recognition, evaluation and provision of basic control options for workplace hazards;
- The development, implementation and management of basic OESH programmes;
- The provision of OESH training;
- Assisting in the provision of OESH consultancy services.

Programme Structure

The programme runs for three (3) years full-time and is divided into two (2) levels. Level I consists of seven (7) courses which must be completed in year one, while Level II consists of twenty (2) courses plus a practicum, which are completed in years 2 and 3. Most year three courses focus on professional development in OESH. The part-time option runs over six (6) years.

The BSc OESH Programme requires 122 credits.

Course Outline

Year 1 **(39 Credits)**

Semester 1

OESH1000	Introduction to OESH	(6 credits)
BIOL1017	Cells Biology	(3 credits)
BIOL1018	Molecular Biology and Genetics	(3 credits)
CHEM1901	Introduction to Chemistry A	(6 credits)

Semester 2

CHEM1902	Introduction to Chemistry B	(6 credits)
BIOL1262	Living Organisms I	(3 credits)

BIOL1263	Living Organisms II	(3 credits)
GEOG1132	Human Geography II: World Economy, Agriculture and Food	(3 credits)
GEOG1232	Earth Environments II: Climate and the Biosphere	(3 credits)
	Foundation Course	(3 credits)
Summer	This period may be used to do any make-up courses	

Year 2 **(41 credits)**

Semester 1

CHEM2001	Chemical Analysis I	(4 credits)
OESH2000	Environmental Contaminants and Control	(8 credits)
COMM2926	Organizational Communication (Dept. of Media and Communication)	(3 credits)
BIOL2014	Ecology	(4 credits)

Semester 2

CHEM3001	Chemical Analysis II	(4 credits)
PHAL3306	Toxicology (Department of Basic Medical Sciences)	(4 credits)
BIOL2252	Eukaryotic Microorganisms	(4 credits)
	Foundation Course	(3 credits)

Summer

PSYC1002	Introduction to Industrial/Organizational Psychology	(3 credits)
MDSC3200	Understanding Research	(3 credits)

Year 3 **(42 credits)**

Semester 1

OESH3200	Occupational Safety Assessment and Measurement	(4 credits)
OESH3100	Environment Hazard Assessment and Risk Management and Control	(4 credits)
OESH3030	Workplace Survey and Evaluation	(4 credits)
OESH3220	Occupational Hygiene	(4 credits)
M32F	Labour and Employment (and Environment) Laws	(3 credits)

Semester 2

OESH3010	Occupational and Environmental Health Disorders	(4 credits)
OESH3020	OESH Measurement Methods	(4 credits)
OESH3040	Disaster and Emergency Management	(4 credits)
OESH3210	Ergonomics	(4 credits)
	Foundation Course	(3 credits)

Summer

OESH3430	Practicum	(4 credits)

LIST OF CHEMISTRY DEPARTMENT SCHOLARSHIPS & AWARDS

THE CHEMISTRY DEPARTMENT PRIZE
THE CEDRIC HASSALL PRIZE
THE WILFRED CHAN AWARD
THE GARFIELD SADLER AWARD
THE BERT FRASER-REID PRIZE
THE LEORNARD J. HAYNES AWARD
THE PAVELICH/HONKAN PRIZE
THE GERALD LALOR SCHOLARSHIP
THE KENNETH MAGNUS SCHOLARSHIP
THE EARLE ROBERTS SCHOLARSHIP
THE TARA DASGUPTA SCHOLARSHIP

The Chemistry Department reserves the right to determine which awards are offered each year.

DEPARTMENT OF COMPUTING

LIST OF UNDERGRADUATE COURSES

CODES	TITLES	CREDIT	SEMESTER OFFERED	Level	PREREQUISITES
LEVEL I					
COMP1110	**MATHEMATICS FOR COMPUTING**	3 Credits	Semester 1 & 2	1	CSEC Mathematics
COMP1120	**COMPUTING AND SOCIETY**	3 Credits	Semester 1 & 2	1	None
COMP1126	**INTRODUCTION TO COMPUTING I**	3 Credits	Semester 1 & 2	1	**Any one of the following**: • CAPE (or A-level) Science subject • EC14C • Teacher's College Diploma or Assoc. Degree in Mathematics or Science or Computing
COMP1127	**INTRODUCTION TO COMPUTING II**	3 Credits	Semester 1 & 2	1	**Any one of the following**: • CAPE (or A-level) Science subject • EC14C • Teacher's College Diploma or Assoc. Degree in Mathematics or Science or Computing
COMP1161	**OBJECT-ORIENTED PROGRAMMING**	3 Credits	Semester 1 & 2	1	COMP1126 and COMP1127
LEVEL II					
CS20R/COMP2111	**ANALYSIS OF ALGORITHMS**	4 Credits	Semester 2	2	CS11Q/COMP1125 and CS11R/COMP1160
CS20S/COMP2101	**DISCRETE MATHEMATICS FOR COMPUTER SCIENCE**	4 Credits	Semester 1	2	CS11Q/COMP1125 and CS11R/COMP1160
CS21R/COMP2230	**COMPUTER ARCHITECTURE & ORGANIZATION**	4 Credits	Semester 2	2	CS21S/COMP2120
CS22Q/COMP2140	**SOFTWARE ENGINEERING**	4 Credits	Semester 1	2	CS11Q/COMP1125 and CS11R/COMP1160
COMP2141	**INTRODUCTION TO SOFTWARE ENGINEERING**	3 Credits	Semester1	2	COMP1110 and COMP1120 and COMP1126 and COMP1127 and COMP1161
CS23Q/ COMP2240	**COMPUTER ORGANIZATION**	4 Credits	Semester 2	2	CS11Q/COMP1125 and CS11R/COMP1160

CODES	TITLES	CREDIT	SEMESTER OFFERED	Level	PREREQUISITES
CS24W/COMP2180	**WEB DESIGN & PROGRAMMING I**	4 Credits	Semester 1	2	CS11Q/COMP1125 and CS11R/COMP1160
CS28Q/COMP2170	**OBJECT TECHNOLOGY**	4 Credits	Semester 2	2	CS11Q/COMP1125 and CS11R/COMP1160 **Co-requisite:** CS22Q/COMP2140
COMP2190	**NET-CENTRIC COMPUTING**	3 Credits	Semester 2	2	COMP1110 and COMP1120 and COMP1126 and COMP1127 and COMP1161
INFO2100	**MATHEMATICS AND STATISTICS FOR IT**	3 Credits	Semester 1	2	COMP1110
INFO2110	**DATA STRUCTURES FOR IT**	3 Credits	Semester 2	2	COMP1110 and COMP1126 and COMP1127 and COMP1161
INFO2180	**DYNAMIC WEB DEVELOPMENT 1**	3 Credits	Semester 1	2	COMP1110 and COMP1120 and COMP1126 and COMP1127 and COMP1161
LEVEL III					
CS31A/COMP3100	**OPERATING SYSTEMS**	4 Credits	Semester 1	3	CS20R/COMP2111 and (CS21R/COMP2230 or CS23Q/COMP2240)
CS32Q/COMP3150	**COMPUTER NETWORKING AND COMMUNICATION**	4 Credits	Semester 1	3	CS20R/COMP2111 and (CS21R/COMP2230 or CS23Q/COMP2240)
CS32R/COMP3160	**COMPUTER AND NETWORK SECURITY**	4 Credits	Semester 2		CS32Q/COMP3150
CS33Q/COMP3120	**INTRODUCTION TO ARTIFICIAL INTELLIGENCE**	4 Credits	Semester 1	3	CS20R/COMP2111 and CS20S/COMP2101
CS34Q/COMP3651	**LANGUAGE PROCESSORS**	4 Credits	Semester 1	3	CS20R/COMP2111
CS34W/COMP3180	**WEB DESIGN & PROGRAMMING II**	4 Credits	Semester 2	3	CS24W/COMP2180
CS35A/COMP3160	**DATABASE MANAGEMENT SYSTEMS**	4 Credits	Semester 2	3	CS20S/COMP2101
COMP3161	**INTRODUCTION TO DATABASES**	3 Credits	Semester 2	3	COMP2101 or INFO2100
CS35Q/COMP3110	**INFORMATION SYSTEMS IN ORGANISATIONS**	4 Credits	Semester 2	3	CS22Q/COMP2140
CS35R/COMP3170	**USER INTERFACE DESIGN**	4 Credits	Semester 2	3	CS22Q/COMP2140 or CS24W/COMP2180
CS37R/COMP3701	**THEORY OF COMPUTATION**	4 Credits	Semester 2	3	CS20S/COMP2101

CODES	TITLES	CREDIT	SEMESTER OFFERED	Level	PREREQUISITES
CS38Q/COMP3800	**REAL-TIME EMBEDDED SYSTEMS**	4 Credits	Semester 1	3	CS21Q/COMP2120 and CS21R/COMP2230
CS39Q/COMP3900	**GROUP PROJECT**	4 Credits	Semester 1,2 & 3	3	CS20R/COMP2111 and 8 other credits from Level 2 or 3 CS Courses
COMP3901	**CAPSTONE PROJECT**	3 Credits	Semester 2	3	All core courses are pre- or co-requisites
INFO3105	**COMPUTER SYSTEM ADMINISTRATION**	3 Credits	Semester 1	3	COMP2190
INFO3110	**INFORMATION SYSTEMS**	3 Credits	Semester 2	3	COMP2140
INFO3155	**COMPUTER AND NETWORK SECURITY FOR IT**	3 Credits	Semester 2	3	COMP2190
INFO3170	**USER INTERFACE DESIGN FOR IT**	3 Credits	Semester 1	3	COMP2140 or INFO2180
INFO3180	**DYNAMIC WEB DEVELOPMENT II**	3 Credits	Semester 2	3	INFO2180
INFO3435	**E-COMMERCE**	3 Credits	Semester 2	3	COMP2141

Computer Science Major

A major in Science Major requires a minimum of 39 credits from Level II and III Computer Science courses. The courses that make up the Computer Science major must include the following:

Course Codes	Course Name
Level I	
COMP1110	Mathematics for Computing
COMP1120	Computing and Society
COMP1126	Introduction to Computing I
COMP1127	Introduction to Computing II
COMP1161	Object-Oriented Programming
Level II	
CS20R/COMP2111	Analysis of Algorithms
CS20S/COMP2101	Discrete Mathematics for Computer Science
COMP2141	Introduction to Software Engineering
CS23Q/COMP2240	Computer Organization
CS28Q/COMP2170	Object Technology
COMP2190	Net-Centric Computing
Level III	
CS31A/COMP3100	Operating Systems
CS33Q/COMP3120	Introduction to Artificial Intelligence
CS35A/COMP3161	Introduction to Databases
COMP3901	Capstone Project

B.Sc. Information Technology

The B.Sc. in Information Technology is a new programme starting in 2011/ 2012. The required credits are as summarized below.

Summary

	No. of Credits	
Level I:	30	
Level II Core:	15	
Level III Core:	21	
Additional level II and III:	9	from Computing
Additional level II and III:	18	from any discipline including Computing
Foundation Courses:	09	
Total:	**102**	

Below are the details of what is required for the B.Sc. in Information Technology.

Level I: (30 credits)

Course Code	*Course Name*	*Credits*
COMP1126	Introduction to Computing I	3
COMP1127	Introduction to Computing II	3
COMP1161	Object-Oriented Programming	3
COMP1120	Computing and Society	3
COMP1110	Mathematics for Computing	3
	In-Faculty course	3
	Courses from any discipline	12

Level II: (15 credits)

Course Code	*Course Name*	*Credits*
INFO2100	Mathematics and Statistics for IT	3
INFO2110	Data Structures for IT	3
COMP2141	Introduction to Software Engineering	3
INFO2180	Dynamic Web Development I	3
COMP2190	Net-Centric Computing	3

Level III: (21 credits)

INFO3105	Computer System Administration	3
INFO3110	Information Systems	3
INFO3155	Computer & Network Security for IT	3
COMP3161	Introduction to Databases	3
INFO3170	User Interface Design for IT	3
INFO3180	Dynamic Web Development II	3
COMP3901	Capstone Project	3

Plus nine (9) credits at level II or level III taken from Computing (i.e. CS, IT, IS, SWE, CE)
Plus eighteen (18) credits at level II or level III taken from any discipline including Computing.
Plus nine (9) credits of foundational courses

COURSE DESCRIPTIONS
COMMON COMPUTING COURSES

(These courses are common to both the Computer Science major and the BSc IT programme)

COMP1110 **MATHEMATICS FOR COMPUTING**
(3 credits) Semester 1 & 2 Level I

Pre-requisites**:** CSEC Mathematics

Rationale
Discrete structures include important material from such areas as set theory, logic, graph theory, and combinatorics. This material is foundational for computing. This course includes a body of material of a mathematical nature that computer science and information technology education must include. The course material forms the basis of knowledge necessary for specialization in computing.

Course Description
The course introduces students to fundamental concepts in theoretical computer science, such as proof by induction and the use of graphs as a general abstraction mechanism. The course also exposes students to specific topics that are likely to be relevant to many of the areas of application of computing, particularly in the science and engineering disciplines. This course introduces mathematical tools and concepts that have been found to be useful in general computing. These include the use of logic and various proof techniques. The formal language of mathematics and the terminology therein are introduced to set the foundation for the formality that is inherent in all the computing sub-disciplines. Sets, relations and functions are covered.

Learning outcomes
At the end of the course the students will be able to do the following:

- Apply formal methods of symbolic propositional and predicate logic.
- Describe how formal tools of symbolic logic are used to model real-life situations, including those arising in computing contexts such as program correctness, database queries, and algorithms.
- Use formal logic proofs and/or informal but rigorous logical reasoning to, for example, predict the behavior of software or to solve problems such as puzzles.
- Describe the importance and limitations of predicate logic.
- Explain with examples the basic terminology of functions, relations, and sets.
- Perform the operations associated with sets, functions, and relations.
- Relate practical examples to the appropriate set, function, or relation model, and interpret the associated operations and terminology in context.
- Calculate probabilities of events and expectations of random variables for elementary problems
- Differentiate between dependent and independent events.
- Illustrate by example the basic terminology of graph theory

- Model problems in computer science using graphs and trees.

Content

- Propositional logic
- Logical connectives
- Truth tables
- Normal forms (conjunctive and disjunctive)
- Validity
- Predicate logic
- Universal and existential quantification
- Modus ponens and modus tollens
- Limitations of predicate logic
- Functions (surjections, injections, inverses, composition)
- Relations (reflexivity, symmetry, transitivity, equivalence relations)
- Sets (Venn diagrams, complements, Cartesian products, power sets)
- Pigeonhole principle
- Cardinality and countability
- Finite probability space, probability measure, events
- Conditional probability, independence
- Trees
- Undirected graphs
- Directed graphs
- Spanning trees/forests

Method of Delivery

	Contact Hours	***Credit Hours***
Lectures	26	26
Tutorials	13	13

Assessment

2-hour written final exam	60%
Coursework	40%
• 3 assignments/quizzes	30% (10% each)
• 1 in-course test (1 hr)	10%

Students will be required to pass both the coursework and the final examination to pass the course.

Reading List

1. Johnsonbaugh. Discrete Mathematics (7th ed.). Prentice-Hall. 2009.
2. Norman L. Biggs. Discrete Mathematics. Oxford University Press (2nd ed.). 2003.
3. Edgar G. Goodaire, Michael M. Parmenter Discrete Mathematics with Graph Theory (3rd ed.). Prentice-Hall. 2006.

COMP1120 **COMPUTING AND SOCIETY**
(3 credits) Semester 1 & 2 Level I

Pre-requisites**:** None

Rationale
Students need to develop the ability to ask serious questions about the social impact of computing and to evaluate proposed answers to those questions. Future practitioners must be able to anticipate the impact of introducing a given product into a given environment. Will that product enhance or degrade the quality of life? What will the impact be upon individuals, groups, and institutions? What are the particular considerations and issues for developing countries?
Students also need to be aware of the basic legal rights of software and hardware vendors and users, and they also need to appreciate the ethical values that are the basis for those rights. Future practitioners must understand the responsibility that they will bear, and the possible consequences of failure. They must understand their own limitations as well as the limitations of their tools. All practitioners must make a long-term commitment to remaining current in their chosen specialties and in the discipline of computing as a whole.

Course Description
This course aims to engender an understanding of the basic cultural, social, legal, and ethical issues inherent in the discipline of computing. It describes where the discipline has been, where it is, and where it is heading, in the global as well as the regional context. It also aims to create an awareness of the role of the individual in this process, as well as an appreciation of the philosophical questions, technical problems, and aesthetic values that play an important part in the development of the discipline. This course on Computing and society examines the relatively short history of computing and establishes context and trends. It looks at the emergence of different programming languages and paradigms and the significant impact they have had. Computing has a social context that the course examines. Issues of professional ethics and risks of computing products are also examined.

Learning Outcomes
At the end of the course students should be able to:
- Identify and discuss the contributions of several pioneers in the computing field.
- Identify significant continuing trends in the history of the computing field.
- Summarize the evolution of programming languages and programming paradigms
- Describe how computing hardware, software and networks work at a conceptual level through real-world examples, and diagrams.
- Describe the computing opportunities globally, locally, regionally, in developing countries, and for entrepreneurs.
- Describe the economic and developmental impact, and costs versus benefits of local and imported ICT products, software and consulting services.
- Discuss the social and developmental issues related to computing in the global and regional context.
- Compare the industrial policy approach of developing countries which have created successful computing industries with countries that have tried and failed thus far.

- Describe positive and negative ways in which computing alters the modes of interaction between people. Discuss studies of the effects of social networking, videogames, etc.
- Explain why computing/network access is restricted in some countries.
- Articulate the role and risks of computing in the implementation of public policy and government (e.g. electronic voting).
- Articulate the ethical tradeoffs in a technical decision. Identify ethical issues that arise in software development and determine how to address them technically and ethically.
- Evaluate the professional codes of ethics from the ACM, the IEEE Computer Society, and regional organizations.
- Identify the social implications of ergonomic devices and the workplace environment to people's health.
- Assess the limitations of using testing to ensure correctness.

Content

History of Computing
- History of computer hardware, software, networking. Regional computing history.
- Pioneers of computing. Contributions of region and of other developing countries.

An Overview of Computing
- How hardware, software, and networks work at a conceptual level; use and high-level construction of computing artifacts, e.g. simple webpages, animations, robotics programs.
- Sub-disciplines within Computing: Computer Science, IT, IS, etc.
- The global computing industry and its impact on industry and society.
- The use of computing in enterprise, entrepreneurship, various disciplines and careers.

Social Context of Computing
- Social implications of computing and networked communication in general and on youth, e.g. cultural, self-image, possible effects of videogames
- Understanding the social and cultural context of design
- Understanding the potential of computing to transform society positively, globally or regionally, or to exacerbate inequalities or mask underdevelopment.
- Analysis of the government and business policies of developing and developed countries with successful computing industries.
- Accessibility issues in computing professions (e.g. class, culture, ethnicity, gender, disabled)
- Public policy issues (e.g. cyber crime, privacy, electronic voting)
- Growth and control of and access to the Internet
- Environmental Issues and Computing, e.g. e-waste, green computing

Professional Ethics in Computing
- Making and evaluating ethical choices and arguments, identifying assumptions and values
- The nature of professionalism (including care, attention and discipline, fiduciary responsibility, and mentoring)

- Keeping up-to-date as a professional (in terms of knowledge, tools, skills, legal and professional framework as well as the ability to self-assess and computer fluency)
- Various forms of professional credentialing and the advantages and disadvantages
- The role of the professional in public policy
- Maintaining awareness of consequences of decisions
- Introduction to ethics, ethical dissent and whistle-blowing
- Codes of ethics, conduct, and practice (IEEE, ACM, SE, and so forth)
- Harassment and discrimination, "Acceptable use" policies for computing in the workplace
- Healthy computing environment (ergonomics)

Risks of Computing Products
- Historical examples of software risks (such as the Therac-25 case)
- Implications of software complexity on risk. The limits of computing.

Method of Delivery

	Contact Hours	***Credit Hours***
Lectures	26	26
Tutorials	13	13

Assessment

2-hour written final exam	50%
Coursework	50%
• 3 written assignments	30% (10% each)
• 2 tutorial presentations	20% (10% each)

Students will be required to pass both the coursework and the final examination to pass the course.

Reading List

1. *Computer Science Illuminated, 3rd edition*, Nell Dale and John Lewis, Jones and Bartlett Publishers, 2011. ISBN-13: 9780763776466

2. *Ethics for the Information Age, 4th edition*, Michael J. Quinn. Addison-Wesley, 2010. ISBN-13: 978-0132133876

Internet Resources

3. Kotelnikov, Vadim, 2007. *Small and Medium Enterprises and ICT*. e-Primers for the Information Economy, Society and Polity Series. UNDP Asia-Pacific Development Information Programme (UNDP-APDIP). Accessed October 15, 2010 at http://en.wikibooks.org/wiki/Small_and_Medium_Enterprises_and_ICT.

4. Gaible, Edmond, 2009. Survey of ICT and Education in the Caribbean – Volume I: Regional Trends and Analysis. The International Bank for Reconstruction and Development/The World Bank, Washington DC. Accessed Oct. 11, 2010 at http://www.infodev.org/en/Publication.441.html

COMP1126 **INTRODUCTION TO COMPUTING I**

(3 credits) Semester 1 & 2 Level I

Pre-requisites**:** **Any one of the following**:

- CAPE (or A-level) Science subject
- EC14C
- Teacher's College Diploma or Assoc. Degree in Mathematics or Science or Computing

Rationale

This course is intended to lay the foundations for developing good problem solving skills within students of Computing. It is not aimed at teaching any particular programming language or paradigm per se. The ideas covered in this course will be revisited in more detail in a variety of courses in the subsequent part of the Information Technology/Computer Science major. As a consequence, no knowledge of programming is assumed as a prerequisite to this course, yet at the end of the course students would have been exposed in a concrete way to computation, and the tools that have been developed to control its complexity as well as implement its processes in physical devices. This course therefore serves as one of the cornerstone courses of the entire curriculum for the Information Technology programme and the Computer Science major, and requires only that students come to it prepared to think in ways unfamiliar to them.

Course Description

The style of programming used is functional, and the language used is Python. The choices of programming style and language are intended to encourage students to think about solutions to problems in terms of the requirements of those solutions, rather than the mechanics of how to fulfil them. This entry level course into both the Computing sub-disciplines of Computer Science and Information Technology leans more towards the functional-first approach although basic concepts of Object-Oriented Programming are introduced. It is a first programming course and focuses attention on basic programming concepts (such as computation, function, operation) and structures (such as basic and structured data, procedures).

Learning Outcomes

At the end of the course the students should be able to do the following:

- describe the concept of a function and implement functions to perform simple mathematical operations.
- explain the concept of tail recursion and its use in implementing iterative processes with recursively written procedures.
- design and implement iterative and recursive processes in a functional language;
- process data stored in tuple and list data structures;

Content

1. History of programming languages. Brief survey of programming paradigms
2. Building Abstractions
   a. Computational Processes
      - Primitive Operations
      - Special Forms for naming, conditional execution
      - Procedures as sequences of operations

- Recursion and Iteration
- Lexical scoping and Nested Procedures

b. Higher-order procedures
- Customising Procedures with procedural arguments
- Creating new functions at run-time

c. Compound Data: Pairs and Lists

Method of Delivery

	Contact Hours	***Credit Hours***
Lectures	22	22
Tutorials	6	6
Laboratory Exercises	22	11

Assessment

2-hour written final exam	60%
Coursework	40%
• 1 written assignment/ programming project	15%
• 1 in-course test (1 hr)	10%
• 5 labs	10%
• 1 quiz	5%

Students will be required to pass both the coursework and the final examination to pass the course.

Reading List

1. Think Python, How to Think Like a Computer Scientist, Version 1.1.22. Allen Downey. Green Tea Press, 2009.
2. Practical Programming, An Introduction to Computer Science Using Python. Campbell J., Gries P., Montojo J., Wilson G., Pragmatic Bookshelf, 2009

COMP1127 **INTRODUCTION TO COMPUTING II**

(3 credits) Semester 1 & 2 Level I

Pre-requisites**:** **Any one of the following**:

- CAPE (or A-level) Science subject
- EC14C
- Teacher's College Diploma or Assoc. Degree in Mathematics or Science or Computing

Rationale

This course is intended to lay the foundations for developing good problem solving skills within students of Computing. It is not aimed at teaching any particular programming language or paradigm per se. The ideas covered in this course will be revisited in more detail in a variety of courses in the subsequent part of the Information Technology/Computer Science major. As a consequence, no knowledge of programming is assumed as a prerequisite to this course, yet at the end of the course students would have been exposed in a concrete way to computation, and the tools that have developed to control its complexity as well as implement its processes

in physical devices. This course therefore serves as one of the cornerstone course of the entire curriculum for the Information Technology and Computer Science major, and requires only that students come to it prepared to think in ways unfamiliar to them.

Course Description

The primary goal of the course is to introduce students to the big ideas in Computer Science, and how they are used to control the complexity of developing large computational systems. In this course, recognising patterns of problem solving is more important than the efficiency of the solutions themselves. An interpreted language is used to facilitate rapid feedback to the student as she experiments with proposed solutions to a problem. We hope that this mode of interaction will build confidence in students as they learn the joys and challenges of programming. This course continues the entry level course COMP1126. It covers concepts and tools that are essential in strengthening the learning of programming. These include data structures and higher order functions.

Learning Outcomes

At the end of the course the students should be able to do the following:

- process data stored in data structures;
- describe and develop higher order functions including map, filter and folds;
- implement and compute with complex structures such as trees and streams;
- use the concept of state, message passing, data encapsulation, to explore the object-oriented approach to solving problems.

Content

1. Building Abstractions
    - Compound Data: Lists and Trees
    - Abstract Data Types

2. .Controlling Interactions
    - Generic operations
    - Self-Describing Data
    - Message Passing
    - Streams and Infinite Data Structures
    - Object-oriented Programming

Method of Delivery

	Contact Hours	***Credit Hours***
Lectures	22	22
Tutorials	6	6
Laboratory Exercises	22	11

Assessment

2-hour written final exam 60%

Coursework 40%

- 1 written assignment/ programming project 15%
- 1 in-course test (1 hr) 10%
- 5 labs 10%
- 2 quizzes 5%

Students will be required to pass both the coursework and the final examination to pass the course.

Reading List

1. Think Python, How to Think Like a Computer Scientist, Version 1.1.22. Allen Downey. Green Tea Press, 2009.
2. Practical Programming, An Introduction to Computer Science Using Python. Campbell J., Gries P., Montojo J., Wilson G., Pragmatic Bookshelf, 2009

COMP1161 OBJECT-ORIENTED PROGRAMMING
(3 credits) Semester 1 & 2 Level I

Pre-requisite: COMP1126 & COMP1127

Rationale

Object-Oriented programming (OOP) is a fundamental component of modern computing, and is currently the dominant paradigm used by software developers. A course in OOP is considered essential in a modern undergraduate computing degree, and should be covered early in the degree so that this knowledge may be utilized in advanced courses.

Course Description

This course covers the methodology of programming from an object-oriented perspective, and introduces OOP principles using a language that supports the OOP paradigm. It also introduces object-oriented testing and debugging techniques, as well as the basics of graphical user interface programming and event-driven programming. The course continues the introduction to programming started in COMP1126 and continued in COMP1127.

Learning Outcomes

At the end of the course the students should be able to do the following:

- Justify the philosophy of object-oriented design and the concepts of encapsulation, abstraction, inheritance, and polymorphism.
- Use parameter passing methods and procedural control structures in the context of an object-oriented language.
- Develop methods using top-down and stepwise refinement.
- Use simple object-oriented analysis and design methods such as CRC cards and UML class diagrams.
- Design, implement, test, and debug object-oriented programs
- Use encapsulation and composition in the creation of classes and objects
- Use polymorphism and inheritance to create simple class hierarchies.
- Use abstraction mechanisms to create reusable software components.
- Use class libraries and API's to write programs.
- Develop code that responds to exception conditions raised during execution.
- Design, code, test, and debug simple event-driven programs that respond to user events.

- Use a GUI toolkit to create a simple application that supports a graphical user interface.
- Use a graphical library to do simple graphics programming.
- Develop simple embedded web objects, e.g. applets.

Content

Object-Oriented Programming
Objects and classes. Methods, message passing. Instance and class variables.
Encapsulation and information-hiding.
Imperative control structures, assignment/state, parameter passing models. Primitive types.
Inheritance, polymorphism, class hierarchies. Object composition.
Abstract and concrete classes, interfaces. Templates.
Using APIs, class libraries. Modules/packages.
Array and string processing. I/O processing.
Concept of object references and aliases.
Collection classes and Iterators.
OO Testing. Debugging tools.

Graphics and GUI Programming, Web Concepts and Objects
Introduction to GUI programming. Event-driven programming. Exception handling.
Use of simple graphical libraries, and simple animation programming.
Simple HTML-embedded objects such as applets.

Method of Delivery

	Contact Hours	***Credit Hours***
Lectures	22	22
Tutorials	6	6
Laboratory Exercises	22	11

Assessment

2-hour written final exam	50%	
Coursework	50%	
• 3 projects		30% (10% each)
• 3 labs		5%
• 2 in-course tests (1 hr each)		15% (5% & 10%)

Students will be required to pass both the coursework and the final examination to pass the course.

Reading List

1. *Java Software Solutions: Foundations of Program Design, 6th edition,* John Lewis and William Loftus, Addison Wesley, 2009; ISBN-10: 0-321-53205-8

Programming and Problem Solving with Java, 2nd edition, Nell Dale and Chip Weems, Jones and Bartlett Publishers, 2008; ISBN-13: 9780763734022

COMP2140 **SOFTWARE ENGINEERING**
(4 credits) Semester 1 Level II

Pre-requisites: CS11Q/COMP1125 and CS11R/COMP1160

Syllabus:

Introduction to Software Engineering
Overview and relevance of Software Engineering.
Professional and ethical responsibility.
Process Models
Sequential, iterative/incremental and rescue-based paradigms.
Process activities.
Project Management
Project planning

Project scheduling
Risk Analysis
Identification, analysis and planning
Software Requirements
Preparing software requirements document
Requirement elicitation, analysis and management
System models
Object Oriented Software Design
System modeling using UML
CRC cards
Verification and Validation
Static and dynamic models
Testing
System and dynamic methods
Test case design
Software Evolution
Software maintenance
Evolution process

Assessment:		
	One 2-hour written paper	60%
	Coursework	40%
	- In-course test	(5%)
	- Project	(25%)
	- Presentations and quizzes	(10%)

COMP2190 **NET-CENTRIC COMPUTING**
(3 credits) Semesters 2 Level II

Pre-requisite: COMP1110, COMP1120, COMP1126, COMP1127 & COMP1161

Rationale
Advances in computer and telecommunications networking, security and the pervasiveness of the Internet, have increased the importance of the related underlying

technologies in the computing discipline. Net-centric computing covers a range of these underlying technologies. They include: computer communication network concepts and protocols, multimedia systems, Web standards and technologies, network security, wireless and mobile computing, and distributed systems.

Course Description

The underlying principle of Net-Centric Computing is a distributed environment where applications and data are downloaded from servers and exchanged with peers across a network on as as-needed basis. This is in stark contrast to the use of powerful personal computers that rely primarily on local resources. The course will provide students with an understanding of the various technologies involved in developing systems and providing services in such distributed environments. It examines the protocols that underpin the interaction among the heterogeneous platforms, the services that are provided by combining various elements of these platforms and ways in which these end systems are presented. End users impose many requirements upon the systems and services they interact with and these requirements play an important role during development. Security is foremost among these requirements and as such, the course also exposes students to important aspects of secure systems development including cryptography, intrusion detection and malware detection. The course will also provide students with the opportunity to experiment with the knowledge they gain. They will be required to engage in weekly laboratory exercises using various tools and/or development environments, and demonstrate an understanding of the concepts by completing graded projects. Bi-weekly lectures and weekly tutorials provide the main avenue for the introduction and discussion of the material.

Learning Outcomes

At the end of the course the student should be able to:

- Discuss the evolution of early networks and the Internet.
- Explain the hierarchical, layered structure of a typical network architecture.
- Identify the protocols behind a range of common networked applications including e-mail, telnet, FTP, wikis, and web browsers, online web courses, and instant messaging.
- Describe the responsibilities of the first (lowest) four layers of the ISO reference model.
- Explain how a network can detect and correct transmission errors.
- Explain how a packet is routed over the Internet.
- Create and configure a simple network with two clients and a single server using standard host configuration software tools such as DHCP and DNS.
- Identify protocols used to enhance Internet communication, and choose the appropriate protocol for a particular case.
- Discuss intrusions and intrusion detection.
- Discuss the fundamental ideas of cryptography with particular emphasis on public-key cryptography and its use in contemporary communication.
- Generate and distribute a key pair to be used to send an encrypted e-mail message.
- Describe and discuss recent successful security attacks.
- Summarize the strengths and weaknesses associated with different approaches to security.
- Explain the different roles and responsibilities of clients and servers for a

range of possible applications.
- Design and build a simple interactive web-based application that incorporates fundamental security considerations.
- Describe emerging technologies in the net-centric computing area and assess their current capabilities, limitations, and near-term potential.

Content

- Background and history of networking and the Internet
- Network architectures
  - Client/server and Peer to Peer paradigms
- The ISO 7-layer reference model in general
  - Network protocols
  - Physical and Data Link layer concepts (framing, error control, flow control, protocols)
  - Internetworking and routing (routing algorithms, internetworking, congestion control)
  - Transport layer services (connection establishment, performance issues, flow and error control)
- Overview of Distributed Computing
- Overview of Mobile and wireless computing
- Fundamentals of cryptography
- Authentication protocols
- Public-key algorithms
- Types of attack e.g. denial of service, flooding, sniffing and traffic redirection.
- Basic network defense tools and strategies
  - Intrusion Detection
  - Firewalls
  - Detection of malware
  - Kerberos
  - IPSec
  - Virtual Private Networks
  - Network Address Translation
- Web technologies
  - Basic server-side programs (php, MySQL)
  - Basic client-side scripts (XHTML, XML, JavaScript,CSS)
- Nature of the client-server relationship
- Web protocols with particular emphasis on HTTP
- Support tools for web site creation and web management

Method of Delivery

	Contact Hours	***Credit Hours***
Lectures	22	22
Tutorials	6	6
Laboratory Exercises	22	11

Assessment

2-hour written final exam	50%
Coursework	50%
• 2 assignments:	20% (10% each)
• 2 projects:	30% (15% each)

Students will be required to pass both the coursework and the final examination to pass the course.

Reading List

James F. Kurose and Keith W. Ross, Computer Networking – A Top-Down Approach, 5th Edition, Addison Wesley , ISBN-13-978-0136079675

Online Resources

Title	-	w3schools Online Web Tutorials
URL	-	http://www.w3schools.com
Accessed on	-	May 5, 2011

Title	-	Internet Society Publications
URL	-	http://www.isoc.org/pubs/
Accessed on	-	May 5, 2011

CS35A/COMP3160 **DATABASE MANAGEMENT SYSTEMS**
(4 credits) Semester 2 Level III

Pre-requisites: CS20S/COMP2101

Syllabus:

1. Introduction to database concepts: Goals of Database Management Systems
   - Logical and physical organizations
   - Schema and subschema, trade-offs between utilization of data
   - Control of data.
2. Database Design
   - Overview of the design process
   - Database design and the Entity-Relationship model
   - ER diagrams
   - Constraints
   - Reduction to relational schema
3. Data Normalization
   - Features of a good relational design
   - Functional Dependency Theory
   - Decomposition using functional dependencies
   - Normal Forms: First; Second; Third; Boyce Codd Normal Form (BCNF); Fourth Normal Form
4. Description/Manipulation Languages:
   - Relational algebra
   - Relational calculus

- Structured Query Languages - SQL
- Query Optimization

5. Application Design and Development
   - User Interface and Tools
   - Web Interface to a database
   - Authorization in SQL
   - Application Security
6. Current trends
   - Distributed systems
   - Object-oriented systems
   - Knowledge-based systems

Assessment:

One 2-hour written paper	60%
Coursework	40%
- In-course test	
- Project	

CS39Q/COMP3900 **GROUP PROJECT**

(4 credits) Semesters 1, 2 & 3 Level III

Pre-requisites: CS20R/COMP2111 and CS22Q/COMP2140 and 8 other credits from level 2 or 3 CS courses.

Syllabus/Content: Groups of 2-4 students implement a substantive software system under the supervision of a staff member. The software may address a problem in any domain, but must meet minimum standards of design and functionality, appropriate for a capstone course of a B.Sc. degree.

Assessment: The final mark for each project depends on the following:

Mid-term presentation	10%
Final presentation	15%
Demonstration	15%
Report	50%
Web Page	10%

Students will be asked to assess their peers and themselves on different aspects of the project. Those assessments are combined with a peer assessment weighting from the supervisor to determine, for each student, an adjustment to the base score of the group.

B. COMPUTER SCIENCE COURSES

CS20R/COMP2111 ANALYSIS OF ALGORITHMS

(4 credits) Semester 2 Level II

Pre-requisites: CS11Q/COMP1125 and CS11R/COMP1160

Syllabus:
- Recursive Data structures (lists and trees) and recursion as a Problem-solving tool.
- Divide and conquer algorithm.
- Solving recurrence equations, the Master Theorem.
- Heaps as implementations for priority queues.
- Sorting.
- Binary search trees, Red-Black trees.
- Dynamic programming (matrix multiplication, longest substring)
- Graphs.

Selected algorithms from:
- Fast exponentiation, Euclid's algorithm, Discrete logarithm
RSA cryptography.
- Matrix computations.
- Representation of and computation with polynomials.
- NP-completeness.

Assessment:		
	One 2-hour written paper	60%
	Coursework	40%
	Mid-term	(5%)
	3 Assignments	(15%)
	2 Projects	(20%)

CS20S/COMP2101 DISCRETE MATHEMATICS FOR COMPUTER SCIENCE

(4 credits) Semester 1 Level II

Pre-requisites: CS11Q/COMP1125 and CS11R/COMP1160

Syllabus:

Background
- Asymptotic Analysis
- Limits
- Orders of Growth

Counting
- Permutations
- Combinations
- Inclusion-exclusion principle

Elementary Probability Theory

- Counting in event space
- Probability Tree
- Bernoulli distribution
- Geometric distribution
- Binomial distribution
- Poison distribution
- Elementary Number Theory
- Modular Arithmetic
- Chinese Remainder Theorem
- Groups formed from Z modulo a prime Generating Functions and their Applications
- Convergence Properties
- Convolution
- Applications to:
- signal processing
- image compression
- solving linear recurrences
- probability theory
- error detection and correction
- Graph Theory
- Trees
- Planarity
- Spanning Trees
- Eulerian and Hamiltonian Cycles
- Colouring
- Matching

Assessment: One 2-hour written paper 60%
Course work 40%
- (In-course test and assignments)

CS21R/COMP2230 **COMPUTER ARCHITECTURE AND ORGANIZATION**
(4 credits) Semester 2 Level II

Pre-requisites: CS21S/COMP2120

Syllabus: Tour of computer systems
Representation and manipulation of information:

- Computer arithmetic
- Instruction set architecture design and machine-level representation of programs
- Basic processor organization
- Single cycle data path and control unit
- Multicycle processor design
- Microprogramming
- Exceptions, Interrupts and traps

- Pipelining
- Memory hierarchy and Virtual memory
- RISC Architectures
- Instruction-level parallelism, superscalar, multithreaded and EPIC architectures
- Case Studies: MMIX, Itanium, and PowerPC
- Optimizing Program Performance
- Measuring a program execution time

Assessment:

One 2-hour written paper	60%
Coursework	40%

CS23Q/COMP2240 **COMPUTER ORGANISATION**
(4 credits) Semester 2 Level II

Pre-requisites: CS11Q/COMP1125 and CS11R/COMP1160

Syllabus:

Electronic Bits: Transistors; Logic Gates as combination of transistors: Universal Gates

Basic Components: Adders and ALUs; Flip-flops; Registers and Register Files; Memory (ROM, SRAM and DRAM); Counters

Achieving Computation: Separating Datapath and Controller; Controlling the feedback: Status bits; the Controller as hardware

Processor Architecture: Single cycle instruction architecture;
Microcoded instructions architecture

Flavours of Parallelism (Briefly): Pipelining; Super-scalar architecture; Very Long Instruction Word architecture; Vector processors; MIMD architecture

Data Representation: + Simple Data: Fixed Point Representation; Floating Point Representation; Characters and Pointer;
+ Compound Data; Arrays; Strings; Records and Objects

Exceptions: Interrupts; Traps; Faults

Caching: Direct Mapped Caches; Set-associative caches; multi-level caches

Virtual Memory: Page Tables; Address Translation; Multi-level page tables

Multi-tasking: Threads and Processes; Context Switching; Concurrent access to shared memory; Thrashing

Peripherals: Video Displays; Disk I/O; Serial Devices; Network Devices and Protocols

Assessment:

One 2-hour written paper	60%
Coursework	40%
Mid-term (10%) 3 Assignments	(30%)

CS24W/COMP2180 **WEB DESIGN & PROGRAMMING 1**

(4 credits) Semester 1 Level II

Pre-requisites: CS11Q/COMP1125 and CS11R/COMP1160

Syllabus:

Networking concepts, Internet protocols - TCP/IP.
DNS, MIME types.
XHTML, dynamic XHTML, CSS, DOM.
Overview of website design principles: requirements, concept design, implementation, testing.
Overview of website UI design: low-fidelity prototyping, layout, use of colour, fonts, controls.
Server-side frameworks and languages, client-side languages. Basic session tracking.
Introduction to three-tier architecture.
Fundamental web frameworks and design patterns for the web.
Overview of web server architecture and web services standards.
Web database connectivity.
Overview of principles, design and frameworks for e-commerce.
Overview of network security issues, ethical and social l issues.
Introduction to multimedia for the web.
Introduction to mobile and wireless web platforms.

Assessment:

One 2-hour written paper	50%
Coursework	50%
- 10 Labs, 5 Projects	(45%)
- In-course test	(5%)

CS28Q/COMP2170 **OBJECT TECHNOLOGY**
(4 credits) Semester 2 Level II

Pre-requisites: CS11Q/COMP1125 and CS11R/COMP1160

Co-requisites: CS22Q

Syllabus: Basic concepts of Object Technology:
- Encapsulation, information hiding, inheritance, composition, polymorphism.

Phases of an Object-Oriented software development process:
- Object-oriented analysis with Use-Cases;
- Object-oriented design with the Unified Modelling Language (UML) notation;
- Object-oriented programming with Java;
- Object-oriented testing.

Reuse of software designs and architectures:
- Design patterns
- Reference software architectures

Assessment:

One 2-hour written paper	60%
Course work	40%

CS31A/COMP3100 **OPERATING SYSTEMS**
(4 credits) Semester 1 Level III

Pre-requisites: CS20R/COMP2111 and (CS21R/COMP2230 or CS23Q/COMP2240)

Syllabus: Overview
- Role and purpose of operating systems
- Functionality of a typical operating system
- Design issues (efficiency, robustness, flexibility, portability, security

Basic Principles
- Structuring methods
- Abstractions, processes and resources
- Design of application programming interfaces (APIs)
- Device organization; interrupts
- User/system state transitions

Concurrency
- The idea of concurrent execution
- States and state diagrams

- Implementation structures (ready lists, process control blocks, etc.)
- Dispatching and context switching
- Interrupt handling in a concurrent environment

Mutual exclusion

- Definition of the "mutual exclusion" problem
- Deadlock detection and prevention
- Solution strategies
- Models and mechanisms (semaphores, monitors, condition variables, rendezvous)
- Producer-consumer problems; synchronization
- Multiprocessor issues

Scheduling

- Pre-emptive and non-pre-emptive scheduling
- Scheduling policies
- Processes and threads
- Real-time issues

Memory management

- Review of physical memory and memory management
- Overlays, swapping and partitions
- Paging and segmentation
- Virtual memory
- Page placement and replacement policies; working sets and thrashing
- Caching

Device management

- Characteristics of serial and parallel devices
- Abstracting device differences
- Buffering strategies
- Direct memory access
- Recovery from failures

File systems

- Fundamental concepts (data, metadata, operations, organization, buffering, sequential vs. non-sequential files)
- Content and structure of directories
- File system techniques (partitioning, mounting and un-mounting, virtual file systems)
- Memory-mapped files
- Special-purpose file systems
- Naming, searching and access
- Backup strategies

Security and protection

- Overview of system security
- Policy/mechanism separation

- Security methods and devices
- Protection, access and authentication
- Models of protection
- Memory protection
- Encryption

Assessment: One 2-hour written paper 60%
Coursework 40%
-In-course test (10%)
-2 Projects (30%)

Assessment: One 2-hour written paper 60%
Coursework 40%
- In-course test
- 3 Homework assignments

CS32Q/COMP3150 COMPUTER NETWORKING AND COMMUNICATION

(4 credits) Semester 1 Level III

Pre-requisites: CS20R/COMP2111 and (CS21R/COMP2230 or CS23Q/COMP2240)

Syllabus:

Computer Networks and the Internet
- The network edge and network core
- Access networks and physical media
- ISPs and backbones
- Delays and loss in packet-switched networks
- Protocol layers and service models
- History of networking

Application Layer
- Principles of network applications
- Web and HTTP
- FTP
- SMTP and electronic mail
- DNS
- Peer-to-peer file sharing (P2P)
- Socket programming in TCP and UDP

Transport Layer
- Transport layer services
- Connectionless transport: UDP
- Principles of reliable data transfer
- Connection-oriented transport: TCP

Network Layer
- Virtual circuits and datagram networks
- Routers
- IP protocol

- Routing algorithms

Link Layer
- Error detection and correction
- Multiple access protocols
- Link layer addressing
- Ethernet
- Hubs and switches

Special Topics (selected from)
- Computer security
- Wireless communication and mobile networks
- Multimedia networking
- Network management

Assessment:

One 2-hour written paper	60%
Coursework	40%

- In-course test
- 2 or 3 Practical programming assignments

CS32R/COMP3160 **COMPUTER & NETWORK SECURITY**

(4 credits) Semester 2 Level III

Pre-requisite: CS32Q/COMP3150

Syllabus:

Confidentiality, integrity and availability: the pillars of security. The ethics issues facing the security professional.

Physical access to information resources: secure sites, security policies, backups, disaster recovery

The human factor: social engineering

Malware: viruses, worms, Trojan horses, mailers etc
Penetration testing: threat discovery, assessment and system hardening.
Confidentiality, integrity and non-repudiation: the use of cryptography in security (hash functions, message digests, public/private key cryptography)

Tools for securing systems and preventing and detecting attacks: firewalls, IDSes, anti-malware (antivirus, anti-spyware, anti-rootkit)

Assessment:

One 2-hour written paper	60%
Coursework	40%
-Assignments	(10%)
-In-course test	(10%)
-Project	(20%)

CS33Q/COMP3120 **INTRODUCTION TO ARTIFICIAL INTELLIGENCE**

(4 credits) Semester 1 Level III

Pre-requisites: CS20R/COMP2111 and CS20S/COMP2101

Syllabus:

1. Introduction to AI: Overview and history of AI; Philosophical issues
2. Introduction to Prolog
3. Search: Search in Prolog
4. Game Playing
5. Knowledge representation and reasoning: Logic; Production rules structured objects
6. Planning
7. Introduction to Expert Systems
8. Knowledge Acquisition in Expert Systems
9. Elective topics: Neural networks; Machine Learning; Reasoning under uncertainty; Natural Language Processing; Speech recognition; Robotics; Fuzzy logic; Virtual reality

CS34Q/COMP3651 **LANGUAGE PROCESSORS**

(4 credits) Semester1 Level III

Pre-requisites: CS20R/COMP2111

Syllabus:

Syntactic Processing:
- Context Free Grammars: Definition, BNF notation, ambiguity parse trees and derivations
- Regular Expressions: Definition, JLex (a lexing tool)
- Parsing: top down (recursive descent and LL(k))
-Parsing: bottom up (LR(k), LALR(1) and SLR parsers)

Semantic Representation and Processing:
- Operational vs. Denotational semantics
- Postfix: an example of a stack-based programming language
- Syntax-directed translation
- Design of Intermediate Representations (IR)
- Interpretation by IR traversal

Features of Programming Languages:
- Typing: static vs. dynamic
- Scoping: static vs. dynamic
- Evaluation: lazy vs. eager
- Parameter passing conventions
- Data allocation strategies
- First class citizens (objects)

- Tail recursion
- Garbage collection

Assessment:

One 2-hour written paper	40%
Coursework	60%
- 4 Assignments	(40%)
Group Projects	(20%)

CS34W/ COMP3180 **WEB DESIGN & PROGRAMMING II**
(4 credits) Semester 2 Level III

Pre-requisite: CS24W/COMP2180

Syllabus:
DOM. XML, XSLT, AJAX.
Web application design principles: requirements, concept design, implementation, testing.
Web application UI design: low-fidelity prototyping, layout, use of colour, fonts, controls.
Further server-side frameworks and languages, client-side languages. Session tracking.
n-tier architecture for the web.
Service-oriented architectures.
Web frameworks and design patterns for the web.
Web server architecture and web services standards.
Principles, design and frameworks for e-commerce.
Web security issues: cross-site scripting, SQL injection, phishing
Web network security issues, ethical and social issues.
Multimedia for the web.
Mobile and wireless web platforms.

Assessment:

One 2-hour written paper	40%
Coursework	60%
-5 Projects	(60%)

CS35Q/COMP3110 **INFORMATION SYSTEMS IN ORGANISATION**
(4 credits) Semester 2 Level III

Pre-requisites: CS22Q/COMP2140

Syllabus:

1. Organization Characteristics
   - Business Functions
   - Management Hierarchy
   - Business Process
2. Information Systems
   - Types of applications

- Enterprise systems
- Supply Chain Management Systems
- Customer Relationship Management Systems
- Knowledge Management Systems

3. Information Systems and Business Strategy
   - Corporate strategy
   - Information Systems strategy
   - Strategic information
4. Information Technology Infrastructure
   - Computer hardware
   - System software
   - Data management
   - Telecommunication networks
5. IT for business intelligence gathering
   - Data mining
   - Artificial Intelligence
   - Environment Scanning
6. Internet and Other IT Innovations
   - E-Commerce
   - E-Business
   - Collaborative Commerce
7. Information Systems Delivery
   - Concepts
   - Evaluation and selection
   - Alternative Approaches
   - Process and Project Management
8. Managing Information Systems
   - Information system staff
   - Information systems security and control
   - Disaster planning and recovery
   - Ethics and social issues

Assessment: One 2-hour written paper 60%
Coursework 40%
- In-course test
- 3 or 4 Homework assignments

CS35R/COMP3170 **USER INTERFACE DESIGN**
(4 credits) Semester 2 Level III

Pre-requisites: CS22Q/COMP2140 or CS24W/COMP2180

Syllabus: Overview of HCI
- The role of user interfaces in computer applications.
- History of human-computer interaction (HCI) and user interface (UI) systems.

- Human Factors: perception, movement, and cognition. Ergonomics.
- Contextual issues in HCI: culture, communication, and organizations.
- HCI models. UI paradigms: command, graphical user interface (GUI), etc. UI Guidelines.

UI Environments

- Overview of graphics systems, display devices, input devices.
- GUI system architecture, event driven interaction model. UI toolkits.
- Collaborative Systems. Embedded Systems.

UI Development Methods

- UI development cycle: investigation, design, prototyping, evaluation, implementation.
- Developing UI requirements: inquiry methods, developing task and workflow models.
- Information collection and analysis methods.
- Prototyping: storyboarding, implementation.
- Evaluation methods: heuristic, observational, empirical.

Assessment:		
	One 2-hour written paper	60%
	Coursework	40%
	-1 or 2 In-course test	(10%)
	- Group laboratory/project reports	(20%)
	-Individual projects/reports/presentations	(10%)

CS37R/COMP3701 **THEORY OF COMPUTATION**

(4 credits) Semester 2 Level III

Pre-requisites: CS20S/COMP2101

Syllabus:

1. Computability
   - Regular languages (DFA, NFA, Regular Expressions)
   - Context Free Languages (CFGs, PDAs)
   - Decidable languages (Turing Machines)
   - Church-Turing thesis (Lambda calculus, Register Machines, Logic)
   - Turing reducibility and Mapping reducibility
   - Undecidability
2. Complexity Theory
   - Distinction between time and space complexity
   - Definitions of complexity classes: L, P, NP, PSPACE, EXPTIME

- Effect of non-determinism on Space and Time complexity
- Polynomial time reducibility
- Hardness and completeness relative to various complexity classes (e.g. NP-hardness, NP-completeness)
- Example NP-complete problems

Assessment:

One 2-hour written paper	60%
Coursework	40%
- In-course test	(5%)
- 5 Written homework assignments	(35%)

CS38Q/COMP3800 **REAL-TIME EMBEDDED SYSTEMS (Software + HW)**

(4 credits) Semester 1 Level III

Pre-requisites: CS21Q/COMP2120 and CS21R/ COMP2230

Syllabus:

Overview of Embedded Systems
Models of computation used in designing Embedded Systems: State Machines, State Charts, UML
Specification of Embedded Systems
Hardware/Software Co-design Concepts
Organization of Embedded Systems
Embedded Inputs/Outputs: Characterization and Methods
Embedded Volatile and Non-Volatile memory dev ices
Fundamentals of Real-time theory
Scheduling executions of tasks
Real-time Synchronization and Implementation Challenges
HW/SW Architectures for real-time services
CPU architectural effects on Real-time performances
Architecture of existing embedded real-time OS: uClinux, uCOS, VxWorks, RTEMS, Windows CE.net, and ecos.
Embedded Internet
Case studies: Applications of Embedded Systems in robotics, medicine and telecommunications.
Development of software tools for Embedded Systems
Fault-tolerant Embedded Systems

Organization:

- Lectures
- Tutorials
- Labs and project

Assessment:	One 2-hour written paper	40%
	Coursework	60%
	- In-course test	(20%)
	- Labs	(10%)
	- Final Project	(30%)

C. INFORMATION TECHNOLOGY COURSES

INFO2100 **MATHEMATICS AND STATISTICS FOR IT**
(3 credits) Semesters 1 Level II

Pre-requisite**:** COMP1110

Rationale
Information Technology relies heavily on concepts from mathematics and statistics. While IT professionals are unlikely to work directly on mathematical or statistical concepts, they will need the ability to manipulate mathematical concepts and to generate and interpret statistical data in order to be successful in their careers.

Course Description
This course introduces probability and statistics to students of Information Technology as well as the application of these concepts to the computing discipline. It examines the basic concepts of probability theory including counting and measuring and conditional probability and independence of events. It studies discrete, continuous, and joint random variables and functions of random variables. The course shows how to sum independent random variables, generate random numbers, and random event generation. It also discusses the Law of large numbers and the Central Limit Theory. The course also introduces linear and nonlinear regression, sampling distributions, confidence intervals, and hypothesis testing. The applications of these concepts to computing will be stressed throughout the course.

Learning Outcomes
At the end of the course the students will be able to do the following:

- Calculate probabilities of events and expectations for random variables.
- Differentiate between dependent and independent events.
- Apply the binomial theorem to independent events and Bayes' theorem to dependent events.
- Apply the tools of probability to create simple discrete event simulations.
- Given a sample situation, formulate an appropriate null hypothesis for a simple question and perform an appropriate test to determine its acceptability.
- Given a scenario, determine whether a parametric or non-parametric test is appropriate.
- Discuss the limitations of correlations.

- Given a sample of two random variables, calculate the t-test, z-test, and Chi-square test statistics and determine if statistical significance exists.
- Given a set of data, determine the best regression model.
- Describe the difference between stochastic and deterministic analysis.
- Explain the purpose and nature of statistical sampling.
- Distinguish between the concepts of mean, median and mode, and discuss the drawbacks of each as a descriptive statistic.
- Calculate the mean, median and mode of a given sample of data.
- Calculate the standard deviation of a given sample of data.
- Explain, with examples, the role of probability and statistics in IT.
- Perform a statistical analysis of a system's performance.
- Analyze a statistical analysis of a system's performance and recommend ways to improve performance.

Content

- Randomness, finite probability space, probability measure, events
- Conditional probability, independence, Bayes' theorem
- Integer random variables, expectation
- Formulation of hypotheses: null and alternate hypothesis
- Parametric and non-parametric tests and their applicability
- Criteria for acceptance of hypotheses, significance levels
- t-test, z-test, Chi-square test, and their applicability
- Correlation coefficients
- Linear and nonlinear regression models
- Stochastic versus deterministic analysis
- Purpose and nature of sampling, its uses and applications
- Mean, median, mode, variance, standard deviation

Method of Delivery

	Contact Hours	***Credit Hours***
Lectures	26	26
Tutorials	13	13

Assessment

Final Exam (2 hr long)	60%	
Coursework	40%	
• 3 assignments/quizzes		30% (10% each)
• 1 in-course test (1 hr)		10%

Students will be required to pass both the coursework and the final examination to pass the course.

Reading List

1. Charles M. Grinstead and J. Laurie Snell's (1997), *Introduction to Probability*, published by the American Mathematical Society, 1997. http://www.dartmouth.edu/~chance/teaching_aids/books_articles/probability_book/book.html

2. Mario F. Triola (2010), *Essentials of Statistics*, Addison Wesley; 4 edition (January 13, 2010).
3. Charles Marchant Reeder (2001), *Computer Math problem solving for IT*, Prentice Hall.

INFO2110 DATA STRUCTURES FOR IT
(3 credits) Semesters 2 Level II

Pre-requisite: COMP1110, COMP1126, COMP1127 & COMP1161

Rationale
Data structures are extensively used in writing programs or software system. They provide a means to manage huge or small amounts of data efficiently. Usually, the organization and management of one's data is key to designing efficient software systems and modern programming languages put much emphasis on data structures as basic units of programming systems. Any serious study of programming has to be accompanied by a useful foundation in data structures.

Course Description
In computing, a data structure is a particular way of storing and organizing data in a computer so that it can be used efficiently Different kinds of data structures are suited to different kinds of applications, and some are highly specialized to specific tasks. This course covers several data structures and seeks to equip the student with these as tools for managing data in their programs. From simple and structured data types the course progresses through some commonly used built-in data structures to special-purpose user-defined structures.

Learning Outcomes
At the end of the course the students will be able to do the following:
- describe the representation of numeric and character data.
- understand how precision and round-off can affect numeric calculations.
- utilise primitive data types and built-in data structures.
- describe common applications for each data structure in the topic list.
- write programs that use each of the following data structures: arrays, records, strings, linked lists, stacks, and queues, trees.
- write programs that use each of the following data structures: arrays, records, strings, linked lists, stacks, queues, and hash tables.
- implement the user-defined data structures in a high-level language.
- choose the appropriate data structure for modeling a given problem.
- describe a simple hash function

Content
- Primitive types
- Arrays
- Records
- Strings and string processing
- Data representation in memory

- Pointers and references
- Linked structures
- Knowledge of hashing function
- Use of stacks, queues
- Use of graphs and trees
- Strategies for choosing the right data structure

Method of Delivery

	Contact Hours	***Credit Hours***
Lectures	26	26
Tutorials	13	13

Assessment

2-hour written final exam	60%
Coursework	40%
• 3 written assignments	15% (5% each)
• 2 programming projects	20% (10 each)
• 1 in-course test (1 hr)	5%

Students will be required to pass both the coursework and the final examination to pass the course.

Reading List

1. Rance D. Necaise, *Data Structures and Algorithms Using Python***,** Wiley 2010, ISBN 978-0-470-61829-5

2. Bruno R. Preiss, *Data Structures and Algorithms with Object-Oriented Design Patterns in Java*, http://www.brpreiss.com/books/opus5/body.html (Online resource)

INFO2180 **DYNAMIC WEB DEVELOPMENT I**
(3 credits) Semesters 1 Level II

Pre-requisite: COMP1110, COMP1120, COMP1126, COMP1127 & COMP1161

Rationale

The internet and world-wide web has become essential to business, communication, and to modern life in general. This area has thus assumed a central role in contemporary computing. This course provides a foundation for understanding various aspects of internet and world-wide web technologies, and introduces students to the design and implementation of web software. This course satisfies the national and regional need for graduates with fundamental knowledge in web design, programming and administration. This course covers also a number of the core objectives established by international standards organisations such as the ACM in networking, HCI/UI design, software design, web client-server computing, databases, software engineering, and security.

Course Description

This course covers the foundations of the technologies that enable the creation of interactive websites that process and modify server-based data. This includes fundamental networking technologies, data representation for the web, web UI design and site design, client-server architecture and client-side and server-side programming. It covers the fundamentals of ecommerce, web security, ethical and social issues, and relevant software engineering concepts such as the three-tier architecture and frameworks for the web. It also provides an introduction to mobile web issues and web multimedia.

Learning Outcomes

At the end of the course the students should be able to:

- explain how network standards and internet protocols such as TCP/IP and DNS work.
- use web page description languages such as XHTML and CSS in web design.
- use XML in web data representation.
- use modern software engineering principles for the web to conceptualise, design, implement and test websites.
- apply established UI design principles and guidelines in website design.
- use server-side and client-side languages in website design.
- use web frameworks in website design.
- design websites that connect to databases.
- apply fundamental principles, design and frameworks for e-commerce in website design.
- apply fundamental network security principles in website design.
- explain network security risks, ethical and social issues in website development.
- explain considerations for mobile web development.
- use basic multimedia in web design.

Content

- Networking concepts, Internet protocols - TCP/IP. DNS, MIME types.
- XHTML, dynamic XHTML, CSS, DOM. XML, XSLT.
- Overview of website design principles: requirements, concept design, implementation, testing.
- Overview of website UI design: low-fidelity prototyping, layout, use of colour, fonts, controls.
- Server-side frameworks and languages, client-side languages. Basic session tracking.
- Introduction to three-tier architecture.
- Fundamental web frameworks and design patterns for the web.
- Overview of web server architecture and web services standards.
- Web database connectivity.
- Overview of principles, design and frameworks for e-commerce.
- Overview of network security issues, ethical and social issues.
- Introduction to multimedia for the web.

- Introduction to mobile and wireless web platforms.

Method of Delivery

	Contact Hours	***Credit Hours***
Lectures	22	22
Tutorials	6	6
Laboratory Exercises	22	11

Assessment

2-hour written final exam	50%
Coursework	50%
• 10 labs	10% (1% each)
• 5 programming projects	35% (7% each)
• 1 in-course test (1 hr)	5%

Students will be required to pass both the coursework and the final examination to pass the course.

Reading List

1. Robert W. Sebesta, Programming the World Wide Web, 4/E, Addison-Wesley, 2008. ISBN-10: 0321489691

2. Harvey M. Deitel and Paul J. Deitel, Internet & World Wide Web How to Program, 4/e, Prentice-Hall, 2008, 1400pp, paper, ISBN 0-13-175242-1

3. Terry Felke-Morris, Harper College, Web Development and Design Foundations with XHTML, 4/E, Addison-Wesley, 2008. ISBN-10: 0321530195

INFO3105 COMPUTER SYSTEM ADMINISTRATION
(3 credits) Semesters 1 Level III

Pre-requisite: COMP2190

Rationale

Virtually all organizations have IT needs. It is the role of the IT professional to design, select, apply, deploy and manage computing systems to support the organization. This knowledge area consists of those skills and concepts that are essential to the administration of operating systems, networks, software, file systems, file servers, web systems, database systems, and system documentation, policies, and procedures. This also includes education and support of the users of these systems.

Course Description

IT professionals will encounter a variety of platforms in their careers. The role of the IT professional is to select, deploy, integrate and administer platforms or components to support the organization's IT infrastructure. This knowledge area includes the fundamentals of hardware and software and how they integrate to form essential components of IT systems. This course covers the techniques that are used for the installation, configuration, and maintenance of computer hardware, software, and

network infrastructure. The course presents the basic theoretical concepts of computer networks and operating systems in a little less detail than would be the case for specialist courses on these subjects. These basic concepts are complemented by practical demonstrations and hands on exercises of tasks that are carried out by a system administrator.

Learning Outcomes

At the end of the course the student should be able to:

- Describe the necessary components and functions of an operating system and explain how the organization of these components can impact on design goals.
- Perform the installation and configuration at least two current operating systems and validate that the installations were successful.
- Perform the installation and configuration of a system with at least two virtual machines.
- Discuss virtualisation, and explain the associated advantages and issues.
- Explain the value of fault tolerance and virtualisation for disaster recovery.
- Estimate the power requirements for a computer system and explain the need for power and heat budgets within an IT environment.
- Evaluate the operating system and application configurations of an organization and identify whether there is a need for reconfiguration.
- Describe the importance of operating system and application maintenance in an organization.
- Describe the five administrative domains (Web, Network, OS, Support, and Database) and identify the responsibilities in each domain.
- Identify situations in which system administrative activities are required as well as situations which can interfere with system administrative activities.
- Implement policies and procedures governing IT systems.
- Explain the benefits of managing users and groups.
- Discuss the efficiencies that are gained via the use of content management systems within an organization and the benefits of centralized content deployment.
- Describe the responsibilities associated with server administration and management.
- Compare and contrast proactive administrative activities and reactive administrative activities.
- Write simple scripts to automate common operating system tasks and discuss the benefits of automation management.

Content

- Operating systems
    - Overview
    - Operating system principles
    - Concurrency, Scheduling and dispatch
    - Memory management
    - Device management
    - Security and protection
    - File systems
    - Real-time and embedded systems
    - Fault tolerance

    - Scripting
    - Virtualisation
- Installation, configuration and maintenance of OS and Applications
    - Installation and Configuration
    - Maintenance (upgrades, patches, etc.)
    - Server services (print, file, DHCP, DNS, FTP, HTTP, mail, SNMP, telnet)
    - Application Management (database, web, network services, etc.)
    - Deployment of a system image using imaging software.
    - Support and Licensing issues
- Administration Activities
    - Content management
    - Content deployment (file system planning and structure)
    - Server administration and management
    - User and group management
    - Backup management
    - Security management
    - Disaster recovery
    - Resource management
    - Automation management (automatic job scheduling)
    - Use of site management logs
    - System support
- Administrative domains
    - Web, Network, OS, Support, Database
- Power management
    - Power requirements for individual systems
    - Heat and power budgets
    - Power load monitoring and management

Method of Delivery

	Contact Hours	***Credit Hours***
Lectures	22	22
Tutorials	6	6
Laboratory Exercises	22	11

Assessment

2-hour written final exam	50%
Coursework	50%
• 2 written assignments:	20% (10% each)
• 5 labs:	20% (4% each)
• 1 programming project:	10%

Students will be required to pass both the coursework and the final examination to pass the course.

Required Reading

IT Systems Management (2nd Edition), Rich Schiesser, Prentice Hall, 2010; ISBN 0137025068

INFO3110 INFORMATION SYSTEMS
(3 credits) Semesters 2 Level III

Pre-requisite: COMP2140

Rationale
A Computing graduate will be employed in the capacity of an Information Systems Manager, or other role that is responsible for the management of information technology in support of the business of an organization. In order to be successful the graduate must not only have a good grasp of the technical aspects of information technology but must also be aware of the organizational issues that if not properly managed can lead to failure of information systems efforts. This course brings together the technical and social aspects of the use of information systems in the organization so that the Computing graduate will be well prepared to take on the challenges of managing information technology in a business.

Course Description
This course introduces students to the challenges that are faced by organizations as they attempt to use information technology to create competitive businesses that provide useful goods and services to their customers. It presents an overview of an organization, organizational characteristics, and basic theories of organizational behavior. It introduces the issues surrounding the management of information systems in organizations. This course presents a review of current information technology and the application of these technologies in organizations. It presents the interactions and relationship between information systems and other organizational systems.

Learning Outcomes
At the end of the course the student should be able to:

- Explain how business processes give rise to information flows within an organization.
- Explain the challenges that cross-functional business processes present to the effective management of information in traditional function oriented information systems environment.
- Recognize the different types of information systems in use in an organization.
- Recognize key components of Information Technology Infrastructure.
- Discuss the advantages and disadvantages of enterprise systems.
- Discuss the use of the Internet and Internet technologies as part of the Information Technology infrastructure of an organization.
- Identify some general approaches used by senior management for planning corporate strategy.
- Discuss the role of Information Systems strategy in supporting the corporate strategy of an organization.
- Evaluate the effectiveness of Information Systems strategy in an organization.
- Identify the types of information technology that may be applied to add value to a business.
- Describe the activities that are involved in preparing of a Strategic Information Systems Plan (SISP).

- Prepare technical specifications of computer hardware, software, database, and telecommunication equipment for inclusion in an Information Systems Request for Proposal.
- Prepare evaluation and selection criteria for information systems proposals.
- Evaluate the effectiveness of a disaster recovery plan for information systems in an organization.

Content

2. Characteristics of an Organization
    - Business Functions
    1. Management Hierarchy
    - Business Processes
3. Information systems.
    - Types of Applications
    - Enterprise Systems
    - Supply Chain Management Systems
    1. Customer Relationship Management Systems
    - Knowledge Management Systems
4. Information Systems and Business Strategy
    - Corporate Strategy
    - Information Systems Strategy
    - Strategic Information Systems
5. Information Technology Infrastructure
    - Computer Hardware
    - System Software
    - Data Management
    - Telecommunication Networks
6. IT for business intelligence gathering
    - Data mining
    - Artificial Intelligence
    - Environment Scanning
7. Internet and Other IT Innovations
    1. E-Commerce
    - E-Business
    - Collaborative Commerce
8. Managing Information Systems
    - Information Systems Security and Control
    - Disaster Planning and Recovery

Method of Delivery

	Contact Hours	***Credit Hours***
Lectures	26	26
Tutorials	13	13

Assessment:

2-hour written final exam	60%
Coursework	40%
• 3 assignments	30% (10% each)
• In-Course Test (1 hr)	10%

Students will be required to pass both the coursework and the final examination to pass the course.

Reading List

1. Kenneth C. Laudon and Jane P. Laudon, *Management Information Systems - Managing the Digital Firm,* (9^{th}. Edition), Prentice Hall, 2005. ISBN: 0-13-153841-1
2. E. Wainright Martin, Carol V. Brown, Daniel W. DeHayes, Jeffrey A. Hoffer, William C. Perkins, *Managing Information Technology (5th Edition),* Prentice Hall 2004. ISBN: 0131454439
3. David L. Anderson, *Managing Information Systems: Using Cases within an Industry Context to Solve Business Problems with Information Technology,* Prentice Hall, 2004. ISBN: 0201611767

INFO3155 COMPUTER AND NETWORK SECURITY FOR IT
(3 credits) Semesters 2 Level III

Pre-requisite: COMP2190

Rationale:

The knowledge and ability to securely administer computer systems is a skill that has become a necessity for contemporary computer science practitioners. An introductory course in computer and network security that considers the ways computer systems can be compromised and how to compensate for the exposure to these threats will provide the requisite background in proper security practices and skills. The course will provide the student with a general understanding of computer and network security issues. It will cover the physical, software and social aspects of securing computer systems.

Course Description

Building upon the concepts introduced in Net-Centric Computing, this course explores the security issues that every IT professional must be aware of. The course will inform the student on the various attack surfaces and defensive approaches that must be considered during all phases of life of an organisation's information technology assets. The course will also provide an opportunity for students to gain hands-on experience with the tools needed to protect an organisation from the various forms of attack it can be subjected to.

Learning Outcomes:

At the end of the course the student should be able to

- Discuss the importance and dimensions of security.
- Discuss the issues involved in the storage and retrieval of information on computer based systems.
- Discuss the ethical issues involved in computer and network security.
- Examine the legal issues associated with computer and network security.
- Explain the importance of the physical aspects and methods of securing computer and network systems..

- Describe the techniques involved in social engineering and the importance of their use in compromising computer systems.
- Examine the various methods of subversion of computer systems and networks including the Internet.
- Discuss the various forms of malware, how they achieve their desired goals, how they are created and detected.
- Demonstrate the use of cryptography in securing computer and network systems.
- Develop an ability to analyze the vulnerabilities and countermeasures of computer and network systems.

Course Content:

- The reality for the growing need of security in our day to day tasks.
- Confidentiality, integrity and availability: the pillars of security.
- The ethical issues facing the security professional.
- Physical access to information resources: secure sites, security policies, backups, disaster recovery
- The human factor: social engineering
- Malware: viruses, worms, Trojan horses, mailers etc
- Penetration testing: threat discovery, assessment and system hardening.
- Confidentiality, integrity and non-repudiation: the use of cryptography in security (hash functions, message digests, public/private key cryptography)

Method of Delivery

	Contact Hours	***Credit Hours***
Lectures	26	26
Tutorials	13	13

Assessment:

2-hour written final exam	60%
Coursework	40%
• 2 assignments	25% (13%, 12%)
• Programming project	15%

Students will be required to pass both the coursework and the final examination to pass the course.

Reading List

William Stallings and Lawrie Brown**,** *Computer Security: Principles and Practice***,** Prentice Hall, ISBN-13: 978-0136004240

The MITRE Corporation, *Common Weakness Enumeration*, http://cwe.mitre.org/index.html (Online resource)

INFO3170 **USER INTERFACE DESIGN FOR IT**
(3 credits) Semesters 1 Level III

Pre-requisite: COMP2140 or INFO2180

Rationale
User Interface Design has become a fundamental component of software design and the design of interactive devices in general. A well-designed user interface facilitates efficient completion of user tasks. User-centered design methods can be used to identify individual task requirements as well as tasks across an organization, and to design and evaluate appropriate user interfaces. Knowledge of human-computer interaction models and user interface development methods is essential for computer scientists intending to do software design.

Course Description
This course introduces students to issues in the design, development, and evaluation of user interfaces for computer systems. Concepts in human factors, usability, and interface design will be covered, and the effects of human capabilities and limitations on interaction with computer systems will be studied. Students will apply the concepts to the design and implementation of graphical user interfaces.

Learning Outcomes

- To provide the future user interface designer with concepts and strategies for making design decisions.
- To expose the future user interface designer to tools, techniques, and ideas for interface design.
- On completion of this course, students will be able to:
    - Analyze user interfaces (UI) in terms of human factors and human-computer interaction (HCI) models.
    - Conduct and design inquiry and a usability test.
    - Design, prototype, and evaluate a UI illustrating knowledge of HCI concepts, human factors, UI guidelines, and UI development methods.

Content
1. **Overview of HCI**
    - The role of user interfaces in computer applications.
    - History of human-computer interaction (HCI) and user interface (UI) systems.
    - Human Factors: perception, movement, and cognition. Ergonomics.
    - Contextual issues in HCI: culture, communication, and organizations.
    - HCI models. UI paradigms: command, graphical user interface (GUI), etc. UI Guidelines.
2. **UI Environments**
    - Overview of graphics systems, display devices, input devices.
    - GUI system architecture, event-driven interaction model. UI toolkits.
    - Collaborative Systems. Embedded Systems.

3. **UI Development Methods**
    - UI development cycle: investigation, design, prototyping, evaluation, implementation.
    - Developing UI requirements: inquiry methods, developing task and workflow models.
    - Information collection and analysis methods.
    - Prototyping: storyboarding, implementation.
    - Evaluation methods: heuristic, observational, empirical.

Method of Delivery

	Contact Hours	***Credit Hours***
Lectures	26	26
Tutorials	13	13

Assessment

2-hour written final exam	50%
Coursework	50%
• In-Course test (1 hr)	5%
• Programming projects (6) with reports and presentations	45%

Students will be required to pass both the coursework and the final examination to pass the course.

Reading List

1. Benyon David, Turner Phil, Turner Susan, *Designing Interactive Systems: People, Activities, Contexts, Technologies*, Addison-Wesley, 2005. ISBN=10: 0321116291; ISBN-13: 9780321116291
2. Preece Jennifer, Rogers Yvonne, Sharp Helen, *Interaction Design: Beyond Human-Computer Interaction*, Wiley, 2008.
3. Norman Don, *The Design of Everyday Things*, Basic Books, 2002.

INFO3180 DYNAMIC WEB DEVELOPMENT II
(3 credits) Semesters 2 Level III

Pre-requisite: INFO2180

Rationale

The internet and world-wide web has become essential to business, communication, and to modern life in general. This area has thus assumed a central role in contemporary computing. This course provides solid coverage of various aspects of internet and world-wide web technologies, and the design and implementation of web software. This course satisfies the national and regional need for graduates with solid knowledge in web design, programming and administration. This course covers also a number of the intermediate and advanced objectives established by international standards organisations such as the ACM in networking, HCI/UI design, software design, web client-server computing, databases, software engineering, and security.

Course Description

This course covers the technologies that enable the creation of interactive web applications that process and modify server-based data, at an intermediate level. It continues from Web Design and Programming I, covering many of the same topics in more depth. This includes further coverage of topics in networking technologies, data representation for the web, web UI design and site design, client-server architecture and client-side and server-side programming. It covers relevant topics in e-commerce, web security, ethical and social issues, and engineering concepts such as the three-tier architecture and frameworks for the web. It also covers further topics in mobile web issues and web multimedia.

Learning Outcomes

At the end of the course the students should be able to:

- Use XML in web data representation.
- Use modern software engineering principles for the web to conceptualise, design, implement and test web applications.
- Apply established UI design principles and guidelines in web application design.
- Use server-side and client-side languages to develop an extensive web application.
- Use web frameworks in web application design, such as service-oriented and multi-tiered architectures.
- Implement a secure e-commerce web application.
- Explain network security risks, ethical and social issues in web application development.
- Implement web applications that are capable of running on both desktops and mobile devices.
- Use extensive multimedia in a web application.

Content

- DOM. XML, XSLT, AJAX.
- Web application design principles: requirements, concept design, implementation, testing.
- Web application UI design: low-fidelity prototyping, layout, use of colour, fonts, controls.
- Further server-side frameworks and languages, client-side languages. Session tracking.
- *n*-tier architecture for the web.
- Service-oriented architectures.
- Web frameworks and design patterns for the web.
- Web server architecture and web services standards.
- Principles, design and frameworks for e-commerce.
- Web security issues: cross-site scripting, SQL injection, phishing
- Web network security issues, ethical and social issues.
- Multimedia for the web.
- Mobile and wireless web platforms.

Method of Delivery

	Contact Hours	***Credit Hours***

Lectures	22	22
Tutorials	6	6
Laboratory Exercises	22	11

Assessment

2-hour written final exam	50%
Coursework	50%
• 10 labs	10% (1% each)
• 5 programming projects	35% (7% each)
• 1 in-course test (1 hr)	5%

Students will be required to pass both the coursework and the final examination to pass the course.

Reading List

1. Robert W. Sebesta, Programming the World Wide Web, 4/E, Addison-Wesley, 2008. ISBN-10: 0321489691

2. Harvey M. Deitel and Paul J. Deitel, Internet & World Wide Web How to Program, 4/e, Prentice-Hall, 2008, 1400pp, paper, ISBN 0-13-175242-1

3. Terry Felke-Morris, Harper College, Web Development and Design Foundations with XHTML, 4/E, Addison-Wesley, 2008. ISBN-10: 032153

INFO3435 E-COMMERCE
(3 credits) Semesters 2 Level III

Pre-requisite: COMP2141

Course Description: Major business models for Businessto- Consumer, Business-to Business, Consumer-to-Consumer, and Business-to-Government models. E-commerce payment systems. E-commerce security environment, security threats, technology and business solutions. E-commerce marketing strategies. Systematic approach to building an E-commerce web site.

Assessment:

Coursework (test/assignments)	40%
Final Examination - One 2-hour written paper	60%

DEPARTMENT OF GEOGRAPHY AND GEOLOGY
LIST OF UNDERGRADUATE COURSES
GEOGRAPHY COURSES

CODE	TITLE	CREDITS	SEMESTER OFFERED	Level	PREREQUISITES
LEVEL I					
GEOG1131	**Human Geography I: Population, Migration & Human Settlement**	3 credits	Semester 1	1	FPAS Matriculation Requirements **and** Geography at CSEC or its equivalent
GEOG1132	**Human Geography II: World Economy, Agriculture & Food**	3 credits	Semester 1	1	FPAS Matriculation Requirements **and** Geography at CSEC or its equivalent
GEOG1231	**Earth Environments I: Geomorphology & Soils**	3 credits	Semester 2	1	FPAS Matriculation Requirements **and** Geography at CSEC or its equivalent
GEOG1232	**Earth Environments II: Climate & the Biosphere**	3 credits	Semester 2	1	FPAS Matriculation Requirements **and** Geography at CSEC or its equivalent
LEVEL II					
GEOG2101	**Urban Geography**	4 credits	Semester 1	2	GEOG1101 **and** GEOG1201
GEOG2102	**Geography & Development**	4 credits	Semester 2	2	GEOG1101 **and** GEOG1201
GEOG2201	**Geosphere & Hydrosphere**	4 credits	Semester 1	2	GEOG1101 **and** GEOG1202
GEOG2202	**Atmosphere & Biosphere**	4 credits	Semester 2	2	GEOG1101 **and** GEOG1201
GEOG2301*	**Geographical Thought & Research Methods**	4 credits	Semester 2	2	GEOG1101 **and** GEOG1201
LEVEL III					
GEOG3301*	**Geography of the Caribbean**	4 credits	Semester 1	3	**Three** of [GEOG2101, GEOG2102, GEOG2201, GEOG2202]
GEOG3401*	**Geography Research Project**	4 credits	Year-long	3	GEOG2301 **and** any **three** from [GEOG2101, GEOG2102, GEOG2201, GEOG2202]
GEOG3103	**Tropical Agricultural Systems & Development**	4 credits	Semester 1	3	GEOG2101 **or** GEOG2102
GEOG3106	**Geographies of Tourism**	4 credits	Semester 2	3	GEOG2101 **or** geog2102 **or** HOD permission
GGEO3201	**Geomorphic Processes & Landforms**	4 credits	Semester 2	3	GEOG2201 **or** GEOL2003
GGEO3203	**Climate Change in the Tropics**	4 credits	Semester 1	3	GEOG2202 **or** GEOL2003 **or** GEOL2004 **or** HOD permission
GEOG3301	**Introduction to GIS & Remote Sensing**	4 credits	Semester 1	3	Any **two** from [GEOG2101, GEOG2102, GEOG2201, GEOG2202] **or** any **two** from [GEOL2001, GEOL2002, GEOL2003, GEOL2004] **or** HOD permission
GEOG3302	**Urban & Regional Planning**	4 credits	Semester 2	3	GEOG2101 **or** GEOG2102
GGEO3302	**Disaster Management**	4 credits	Semester 2	3	GEOG2201 **or** GEOG2202 **or** GEOL2004 **or** HOD permission

**** Compulsory for the Geography major.***

DEPARTMENT OF GEOGRAPHY AND GEOLOGY

The Department of Geography and Geology currently offers 2 BSc Majors (Geography, Geology), a BSc Double Major in Geography and Geology, and 2 BSc Minors (Geography, Geology).

A **BSc (Geography** or **Geology)** degree requires a minimum of 44 credits of Geography or Geology, of which at least 32 should be from Level II and Level III courses. The entry requirements for a BSc degree in Geography include a pass in Geography at CSEC and two CAPE passes in approved science subjects. The entry requirements for a BSc degree in Geology are two CAPE passes in approved science subjects.

In addition, the Department offers **BA** and **BEd** degrees in Geography to students in the Faculty of Humanities and Education. The entry requirements for both these degrees are a pass in Geography at CSEC and two CAPE passes.

Students are advised that compulsory field work in the Department of Geography and Geology is carried out on Saturdays.

A **Major in Geography** requires a minimum of 32 credits from Part II GEOG or GGEO courses, which must include the following:

GEOG2301	Geographical Thought & Research Methods	4 credits
GEOG3301	Geography of the Caribbean	4 credits
GEOG3401	Geography Research Project	4 credits

plus at least **three** of the following:

GEOG2101	Urban Geography	4 credits
GEOG2102	Geography & Development	4 credits
GEOG2201	Geosphere & Hydrosphere	4 credits
GEOG2202	Atmosphere & Biosphere	4 credits

plus at least **two** other Level III GEOG/GGEO courses, selected from different groups (two from two different groups, three from three different groups; if more than three courses are selected, the fourth, fifth, etc. may be from any of the three groups).

A **Major in Geology** requires a minimum of 32 credits from Part II GEOL or GGEO courses, which must include the following:

GEOL2001	Palaeontology	4 credits
GEOL2002	Sedimentology	4 credits
GEOL2003	Igneous & Metamorphic Petrology	4 credits
GEOL2004	Structural Geology & Geological Mapping	4 credits
GEOL3011	Research Project in Field Geology	4 credits
GEOL3002	Caribbean Geology	

plus at least two other Level III GEOL or GGEO courses. The GGEO courses must be selected from different groups (two from two different groups, three from three different groups; if more than three courses are selected, they fourth, fifth, etc. may be from any of the three groups).

TYPICAL CURRICULUM FOR THE B.Sc. GEOGRAPHY MAJOR

Level I

Semester 1

GEOG1131	Human Geography I: Population, Migration and Human Settlement	3 credits
GEOG1231	Earth Environments I: Geomorphology and Soils	3 credits
Two other Level 1 Science courses		6 credits
Two other Level 1 Science courses		6 credits
FD10A *or* FD14A		3 credits

Semester 2

GEOG1132	Human Geography II: World Economy, Agriculture and Food	3 credits
GEOG1232	Earth Environments II: Climate and the Biosphere	3 credits
Two other Level 1 Science courses		6 credits
Two other Level 1 Science courses		6 credits
(F10A *or* FD14A, if not done in Semester 1)		(3 credits)
Total credits for 2 semesters		**39**

Level II

Semester 1

GEOG2101	Urban Geography	4 credits
GEOG2202	Geosphere & Hydrosphere	4 credits
One other Level 2 Science course		4 credits
One other Level 2 Science course		4 credits
FD11A *or* FD13A		3 credits

Semester 2

GEOG2102	Geography & Development	4 credits
GEOG2201	Atmosphere & Biosphere	4 credits
GEOG2301	Geographical Thought & Research Methods	4 credits
One other Level 2 Science course		4 credits
(FD11A *or* FD13A, if not done in Semester 1)		(3 credits)
Total credits for 2 semesters		**35**

Level III

Semester 1

GEOG3301	Geography of the Caribbean	4 credits
One other Level 3 GEOL/GGEO course		4 credits
Two other Level 3 Science courses, which may include GEOL/GGEO courses		8 credits
FD11A *or* FD13A		3 credits

Semester 2

GEOG3401	Geography Research Project	4 credits
One other Level 3 GEOL/GGEO course*		4 credits
Two other Level 3 Science courses, which may include GEOL/GGEO courses		8 credits
(FD11A *or* FD13A, if not done in Semester 1)		(3 credits)
Total credits for 2 semesters		**35**

NOTE

- *The total number of credits required for the B.Sc. degree is 101, including the 9 credits from the FD courses. Sixty of these credits must be from Levels 2 and 3 of the discipline for a single major, and 64 for a double major. The programme outlined here gives a total of 109 credits, so for a single GEOG major there is some flexibility in the non-GEOG/GGEO courses which do not need to be included for the minimum of 101 credits.*
- *For a **Geography Minor**, the selection is of any two Level 2 GEOG courses and any two Level 3 GEOG/GGEO courses, subject to the satisfaction of prerequisites for these courses. The two Level 3 courses must be selected from different groups of courses. If three Level 3 courses are selected, they must be from three different groups; if more than three such courses are selected, the fourth, fifth, etc. may be from any of the three groups.*
- *Students must have at least two CAPE passes or equivalent to register for a Level I course in Geography or Geology.*
- *Not all elective courses are available every year.*
- *Certain combinations of courses are limited by time-table constraints.*
- *Students intending to read any course(s) in Geography and Geology are advised that it will be necessary to conduct fieldwork on Saturdays. Non-attendance will debar them from final examinations. All fieldwork in Geography and Geology is mandatory.*
- *Where an examination has a practical or coursework component as well as a final examination, candidates must satisfy the examiners in both parts.*
- *All four Level 1 courses in Geography must be successfully completed before the student can proceed to Part II courses in Geography.*
- *All four Level 1 courses in Geology must be successfully completed before the student can proceed to Part II courses in Geology.*

TYPICAL CURRICULUM FOR THE BSc GEOLOGY MAJOR

Level I

Semester 1

GEOL1101	Earth Science I: Earth Materials and Plate Tectonics	3 credits
GEOL1102	Earth Science II: Earth Processes and Earth History	3 credits
Two other Level I Science courses		6 credits
Two other Level I Science courses		6 credits
FD10A or FD14A		3 credits

Semester 2

GEOL1103	Earth Science III: Minerals and Mineral Deposits	3 credits
GEOL1104	Earth Science IV: Geological Maps and Environmental Geology	3 credits
Two other Level I Science courses		6 credits
Two other Level I Science courses		6 credits
(F10A or FD14A, if not done in Semester 1)		(3 credits)

Total credits for 2 semesters **39**

Level II

Semester 1

GEOL2002	Sedimentology	4 credits
GEOL2003	Igneous & Metamorphic Petrology	4 credits
One other Level II Science course		4 credits
One other Level II Science course		4 credits
FD11A or FD13A		3 credits

Semester 2

GEOL2001	Palaeontology	4 credits
GEOL2004	Structural Geology & Geological Mapping	4 credits
One other Level II Science course		4 credits
One other Level II Science course		4 credits
(FD11A or FD13A, if not done in Semester 1)		

Total credits for 2 semesters **35**

Level III

Semester 1

GEOL3002	Caribbean Geology	4 credits
One other Level III GL course		4 credits
Two other Level III courses, which may include GL courses		8 credits
FD11A or FD13A		3 credits

Semester 2

GEOL3001	Research Project in Field Geology	4 credits
One other Level III GL course		4 credits
Two other Level III courses, which may include GL courses		8 credits
(FD11A or FD13A, if not done in Semester 1)		(3 credits)

Total credits for 2 semesters **35**

NOTE:

- *The total number of credits required for the BSc degree is 101, including the 9 credits from the FD courses. Sixty of these credits must be from Levels II and III of the discipline of a single major, and 64 for a double major. The programme outlined here gives a total of 109 credits, so for a single GEOL major there is some flexibility in the non-GEOL courses which do not need to be included for the minimum of 101 credits.*
- *For a **Geology Minor**, the selection of GEOL courses is of any two Level II GEOL courses and any two Level III GEOL/GGEO courses, subject to the satisfaction of prerequisites for these courses, and subject to the rules regarding the selection of GGEO courses from different groups.*
- *Students must have two CAPE passes or equivalent to register for a Level I course in Geography or Geology.*
- *Not all elective courses are available every year.*
- *Certain combinations of courses are limited by time-table constraints.*
- *Students intending to read any course(s) in Geography and Geology are advised that it will be necessary to conduct fieldwork on Saturdays. Non-attendance will debar them from final examinations. All fieldwork in Geography and Geology is mandatory.*
- *Where an examination has a practical or coursework component as well as a final examination, candidates must satisfy the examiners in both parts.*
- *All four Level 1 courses in Geography must be successfully completed before the student can proceed to Part II courses in Geography.*
- *All four Level 1 courses in Geology must be successfully completed before the student can proceed to Part II courses in Geology.*

DEPARTMENT OF GEOGRAPHY & GEOLOGY
Courses Available, 2011/2012

SEMESTER 1

Geography

GEOG1131	Human Geography I: Population, Migration and Human Settlement	3 credits
GEOG1231	Earth Environments I: Geomorphology and Soils	3 credits
GEOG2101	Urban Geography	4 credits
GEOG2201	Geosphere and Hydrosphere	4 credits
GEOG3301	Geography of the Caribbean	4 credits
GEOG3103	Tropical Agricultural Systems and Development	4 credits
GGEO3203	Climate Change in the Tropics	4 credits
GGEO3301	Introduction to Geographical Information Systems and Remote Sensing	4 credits

Geology

GEOL1101	Earth Science I: Earth Materials and Plate Tectonics	3 credits
GEOL1102	Earth Science II: Earth Processes and Earth History	3 credits
GEOL2002	Sedimentology	4 credits
GEOL2003	Igneous and Metamorphic Petrology	4 credits
GEOL3002	Caribbean Geology	4 credits
GEOL3010	Hydrogeology	4 credits
GGEO3203	Climate Change in the Tropics	4 creduts
GGEO3301	Introduction to Geographical Information Systems and Remote Sensing	4 credits
GGEO3302	Disaster Management	4 credits

SEMESTER 2

Geography

GEOG1132	Human Geography II: World Economy, Agriculture and Food	3 credits
GEOG1232	Earth Environments II: Climate and the Biosphere	3 credits
GEOG2301	Geographical Thought and Research Methods	4 credits
GEOG2102	Geography and Development	4 credits
GEOG2202	Atmosphere and Biosphere	4 credits
GEOG3106	Geographies of Tourism	4 credits
GGEO3201	Geomorphic Processes and Landforms	4 credits
GEOG3302	Urban and Regional Planning	4 credits
GGEO3302	Disaster Management	4 credits
GEOG3401	Geography Research Project	4 credits

Geology

GEOL1103	Earth Science III: Minerals and Mineral Deposits	3 credits
GEOL1104	Earth Science IV: Geological Maps and Environmental Geology	3 credits
GEOL2001	Palaeontology	4 credits
GEOL2004	Structural Geology and Geological Mapping	4 credits
GEOL3001	Research Project in Field Geology	4 credits
GEOL3004	Applied Sedimentology and Petroleum Geology	4 credits
GEOL3005	Marine Geology and Geophysics	4 credits
GGEO3201	Geomorphic Processes and Landforms	4 credits
GGEO3302	Disaster Management	4 credits

Please note:

- GEOG refers to Geography courses, GEOL to Geology courses, and GGEO to courses available to both Geography and Geology students in Level III.
- Level III GEOG/GGEO courses are grouped as follows:

  Group A: Human Landscape:
  - GEOG3106: Tropical Agricultural Systems & Development
  - GEOG3106: Geographies of Tourism

  Group B: The Physical Environment:
  - GGEO3201: Geomorphic Processes & Landforms
  - GGEO3203: Climate Change in the Tropics

  Group C: Techniques and Applications:
  - GGEO3301: Introduction to Geographic Information Systems & Remote Sensing
  - GEOG3302: Urban & Regional Planning
  - GGEO3302: Disaster Management

  Students selecting two of these courses must do so from two different groups; those selecting three courses must do so from all three groups. A student selecting more than three of these courses may choose the fourth, fifth, etc. courses from any of the groups.

GEOGRAPHY COURSE DESCRIPTIONS

LEVEL I

GEOG1131 HUMAN GEOGRAPHY I: POPULATION, MIGRATION AND HUMAN SETTLEMENT

(3 credits) Semester 1 Level I

Prerequisites: Passes in at least **two** CAPE subjects **and** Geography at CSEC or its equivalent

Syllabus: Modern approaches to the study of Population Geography. The human and physical factors determining population distribution and dynamics; theories of population change, including Malthus' and neo-Malthusian thoughts; and the demographic transition theory. The sources of, and problems associated with, population statistics; how to measure fertility, mortality and migration; and population projection techniques. Family planning and population control efforts around the world; the status of women and its crucial role in population dynamics; major causes of death around the world, including AIDS; the role of migration in population dynamics; culture, population and the environment. Historical and contemporary perspectives on urbanization in both the industrialized world and the developing world, and theories on the geographical distribution of human settlement.

Evaluation:		
	Two-hour written examination	60%
	One-hour multiple-choice review test	10%
	Three practical assignments	20%
	Tutorial assignments	10%

GEOG1132 HUMAN GEOGRAPHY II: WORLD ECONOMY, AGRICULTURE AND FOOD

(3 credits) Semester 2 Level I

Prerequisites: As for GEOG1101

Syllabus: The processes of economic development and globalization, and the economic interdependence of countries in the modern world. Basic theories, concepts, and methods for describing, measuring and analyzing patterns of economic and social development. The main factors that have contributed to uneven patterns of economic development, such as the distribution and exploitation of natural resources, and the process of industrialization, technological change and globalization. The section on agriculture and the food industry illustrates in depth many issues related to economic development and globalization, including the role of agribusiness in food production and food consumption, and the impacts of traditional and modern agricultural production systems on the environment. The geographical

dimensions of world hunger and malnutrition in relation to the structure of the world economy and world agriculture. Prospects for future agricultural development.

Evaluation:		
	Two-hour written examination	60%
	One-hour multiple-choice review test	10%
	Three practical assignments	20%
	Tutorial assignments	10%

GEOG1231 EARTH ENVIRONMENTS I: GEOMORPHOLOGY AND SOILS

(3 credits) Semester 1 Level I

Prerequisites: As for GEOG1131

Syllabus: Modern approaches to geomorphology and soil science. The main geomorphic processes in the context of endogenic and exogenic systems from a global perspective. The geomorphology section examines and describes endogenic systems and processes. The internal structure of the Earth and the geographic patterns of global relief of the solid surface in the context of plate tectonics. The relationship between global tectonics and the patterns and styles of volcanic activity. The passive control of rock type and geological structure in relation to landscape form and process. The soils section examines and describes the main exogenic systems and processes. The geographical patterns and types of rocks. Aspects of soil science from a geographical perspective through an examination of the main soil-forming factors, and analysis of physical and chemical soil-forming processes. Exogenic systems in relation to the main geomorphic agents of water, wind and ice in the context of fluvial, slope, aeolian, karst, glacial and periglacial systems.

Evaluation:		
	Two-hour written examination	60%
	One-hour multiple-choice review test	10%
	Three practical assignments	20%
	Tutorial assignments	10%

GEOG1232 EARTH ENVIRONMENTS II: CLIMATE AND THE BIOSPHERE

(3 credits) Semester 2 Level I

Prerequisites: As for GEOG1131

Syllabus: A modern holistic approach to the study of the earth system. Introduction to climate science: the processes operating within the atmosphere and biosphere, including general circulation of the atmosphere, ocean-atmosphere interactions, and global climate systems. Emphasis on the impacts and consequences of human-

environment interactions. Spatial and temporal variability of these processes on local, regional and global scales. The primary causes, both natural and human, and consequences of climate change and the impact of a changing climate for communities both within and outside the Caribbean region. Particular emphasis on the impacts of climate change on the biosphere, as well as their implications for agricultural systems. Introduction to the study of biogeography, focussing on the geographical features of biodiversity at different geographical scales, and reviewing ideas about ecosystem processes and vegetation disturbance and succession.

Evaluation:		
	Two-hour written examination	60%
	One-hour multiple-choice review test	10%
	Three practical assignments	20%
	Tutorial assignments	10%

PART II LEVEL II

GEOG2301 GEOGRAPHICAL THOUGHT AND RESEARCH METHODS
(4 credits) Semester 2 Level II

Prerequisites: GEOG1101 **and** GEOG1201

Syllabus: Defining a research problem. Theoretical frameworks and geographic thought. Formulation of the research design: methods and data. Methods of data analysis: qualitative and quantitative. Producing the report.

Evaluation:		
	Two-hour written examination	40%
	Coursework (lab exercises and projects)	60%

GEOG2101 URBAN GEOGRAPHY
(4 credits) Semester 1 Level II

Prerequisites: GEOG1101 **and** GEOG1201

Syllabus: An introduction to the key areas of urban geography, with a particular focus on urban land use and the planning of urban systems. Much of this theoretical framework of urban geography is based on studies of cities in developed countries, especially in North America.

Evaluation:		
	Two-hour written examination	60%
	Coursework (lab exercises and field project)	40%

GEOG2102 GEOGRAPHY AND DEVELOPMENT
(4 credits) Semester 2 Level II

Prerequisites: GEOG1101 **and** GEOG1201

Syllabus: An examination of global patterns of development and global processes of polarization and marginalization which lead to disparities and deprivation. The course focuses on location theory models, especially those of von Thünen and Weber.

Evaluation: Two-hour written examination 60%
Coursework (lab exercises and field project) 40%

GEOG2201 GEOSPHERE AND HYDROSPHERE
(4 credits) Semester 1 Level II

Prerequisites: GEOG1101 **and** GEOG1201

Syllabus: An introduction to hillslope processes and movement on slopes, the work of rivers within a fluvial system; the work of waves, tides and currents in coastal zones, and beach and shoreline processes and landforms. An introduction to hydrology; components of the hydrological cycle; and the impact of human modification of the hydrological cycle.

Evaluation: Two-hour written examination 60%
Coursework (lab exercises and field project) 40%

GEOG2202 ATMOSPHERE AND BIOSPHERE
(4 credits) Semester 2 Level II

Prerequisites: GEOG1101 **and** GEOG1201

Syllabus: The recognition of non-random patterns in species distribution; causal processes in species distribution; and an explanation of species distribution in space and time. Climatic variations in the tropics. The nature of the atmosphere near the ground. The dynamics of and the debate on global warming and climate change. Climatic classifications.

Evaluation: Two-hour written examination 60%
Coursework (lab exercises and field project) 40%

PART II LEVEL III

Group A	GEOG3103	Tropical Agricultural Systems and Development
	GEOG3106	Geographies of Tourism
Group B	GGEO3201	Geomorphic Processes and Landforms
	GGEO3203	Climate Change in the Tropics
Group C	GEOG3301	Urban and Regional Planning
	GGEO3301	Introduction to Geographical Information Systems and Remote Sensing
	GGEO3302	Disaster Management

If two of these Level III courses are selected, they must be from different groups. If three or more courses are chosen, all groups must be represented in the selection.

GEOG3301 GEOGRAPHY OF THE CARIBBEAN
(4 credits) Semester 1 Level III

Prerequisites: **Three** of [GEOG2101, GEOG2102, GEOG2201, GEOG2202]

Syllabus: Analysis of physical and cultural patterns within the Caribbean area. A geographical evaluation of the origin, development and present-day outlines of settlement, cultures, resource use, economic structure, and growth problems of selected Caribbean countries.

Evaluation:	Two-hour written examination	60%
	Course work	40%

GEOG3401 GEOGRAPHY RESEARCH PROJECT
(4 credits) Semester 2 Level III

Prerequisites: GEOG2301 **and** any **three** from [GEOG2101, GEOG2102, GEOG2201, GEOG2202]

Syllabus: A 7000-word research project approved by the Department.

Evaluation:	Research project typed and bound	100%

GROUP A: HUMAN LANDSCAPES

GEOG3103 TROPICAL AGRICULTURAL SYSTEMS AND DEVELOPMENT
(4 credits) Semester 1 Level III

Prerequisite: GEOG2101 **or** GEOG2102

Syllabus: An advanced course on the geography of agricultural systems, focusing on the relationships between population, resources and the environment. Agricultural decision-making in theory and practice as applied to small-scale farming and as applied to problems in the agrarian sector in developing countries.

Evaluation:		
	Two-hour written examination	60%
	Coursework	40%

GEOG3106 GEOGRAPHIES OF TOURISM
(4 credits) Semester 2 Level III

Prerequisite: GEOG2101 **or** GEOG2102 **or** HOD permission

Syllabus: A focused examination and understanding of the ways in which tourist practices are intricately interwoven with space and place. In particular, students will explore the different ways that tourism can be understood, and the significance that this has in relation to contemporary concerns about travel, globalization, representation, and development. Through an examination of a selection of theoretical perspectives and case studies (e.g., colonialism and travel writing, mass tourism in the Caribbean, and ecotourism), the course will critically analyze how we understand concepts such as leisure and recreation, and how relationships between and across people and places exist in different ways.

Evaluation:		
	Two-hour written examination	60%
	Coursework	40%

GROUP B: THE PHYSICAL ENVIRONMENT

GGEO3201 GEOMORPHIC PROCESSES AND LANDFORMS
(4 credits) Semester 2 Level III

Prerequisite: GEOG2201 **or** GEOL2003

Syllabus: An advanced course in the study of landforms and geomorphic processes, with particular emphasis on Caribbean examples. Limestone geomorphology, volcanic geomorphology, coastal geomorphology,

applied geomorphology, geomorphological field and laboratory techniques.

Evaluation:	Two-hour written examination	60%
	Coursework	40%

GGEO3203 CLIMATE CHANGE IN THE TROPICS
(4 credits) Semester 2 Level III

Prerequisites: GEOG2202 **or** GEOL2003 **or** GEOL2004 **or** HOD permission

Syllabus: A theoretical and practical basis for understanding present-day tropical environments and the causes of global environmental change, as well as for assessing the scale of human interference in natural environmental processes.

Evaluation:	Two-hour written examination	60%
	Coursework	40%

GROUP C: TECHNIQUES AND APPLICATIONS

GGEO3301 INTRODUCTION TO GEOGRAPHICAL INFORMATION SYSTEMS AND REMOTE SENSING
(4 credits) Semester 1 Level III

Prerequisites: Any **two** from [GEOG2101, GEOG2102, GEOG2201, GEOG2202], **or** any **two** from [GEOL2001, GEOL2002, GEOL2003, GEOL2004], **or** HOD permission

Syllabus: An introduction to the concepts, techniques and applications of Geographical Information Systems (GIS) and Remote Sensing (RS). The course provides a background for further enquiry into GIS and RS technologies, as well as equipping students with practical expertise needed for operational GIS and image processing. The course has three main parts: first, the theory and principles of GIS and RS are covered in a lecture setting; secondly, supervised hands-on practical exercises are run in the laboratory; and, thirdly, projects are undertaken by students to apply the knowledge and skills to a specific problem. Areas covered by the course include (but are not limited to) data acquisition and processing, data automation, database management, spatial analysis, image processing, mapping and modelling.

Evaluation:	Two-hour written examination	50%
	Lab exercises	40%
	Project	10%

GEOG3302 URBAN AND REGIONAL PLANNING
(4 credits) Semester 2 Level III

Prerequisites: GEOG2101 **or** GEOG2102

Syllabus: The origin and growth of urban and regional planning. Planning, principles and methods. Emphasis is on the contribution of geographic theory and methods to the planning process.

Evaluation:		
	Two-hour written examination	60%
	Coursework	40%

GGEO3302 DISASTER MANAGEMENT
(4 credits) Semester 2 Level III

Prerequisites: GEOG2201 **or** GEOG2202 **or** GEOL2004 **or** HOD permission

Syllabus: An introduction to the basic principles and techniques in disaster management. A study of theory, hazards, vulnerability, response capability, risk assessment, disaster scenarios, disaster management, preparedness, prevention, emergency response, and simulation. Basic concepts of geology, geomorphology, tectonics and geophysics in the study of natural hazards, with special reference to the Caribbean. Hazards and risks related to volcanic activity, earthquakes, landslides, hydrometeorological processes; flooding and hurricanes. Hazard mapping. Approaches to natural hazard loss-reduction.

Evaluation:		
	Two-hour written paper	60%
	Coursework (extended essays, tests, lab work, field project, etc.)	40%

GEOLOGY COURSES

CODES	TITLES	CREDIT	SEMESTER OFFERED	Level	PREREQUISITES
LEVEL I					
GEOL1101	**Earth Science I: Earth Materials & Plate Tectonics**	3 credits	Semester 1	1	Two Science subjects at CAPE or equivalent
GEOL1102	**Earth Science II: Earth Processes & Earth History**	3 credits	Semester 1	1	Two Science subjects at CAPE or equivalent
GEOL1103	**Earth Science III: Minerals & Mineral Deposits**	3 credits	Semester 2	1	Two Science subjects at CAPE or equivalent
GEOL1104	**Earth Science IV: Geological Maps & Environmental Geology**	3 credits	Semester 2	1	Two Science subjects at CAPE or equivalent
LEVEL II					
GEOL2001*	**Palaeontology**	4 credits	Semester 2	2	[GEOL1001 **and** GEOL1002] **or** [BIOL1063 **and** BIOL1015]
GEOL2002*	**Sedimentology**	4 credits	Semester 1	2	GEOL1001 **and** GEOL1002
GEOL2003*	**Igneous & Metamorphic Petrology**	4 credits	Semester 1	2	GEOL1001 **and** GEOL1002
GEOL2004*	**Structural Geology & Geological Mapping**	4 credits	Year-long	2	GEOL1001 **and** GEOL1002
LEVEL III					
GEOL3001*	**Research Project in Field Geology**	4 credits	Year-long	3	GEOL2004 **and** at least **two** of [GEOL2001, GEOL2002, GEOL2003]
GEOL3002*	**Caribbean Geology**	4 credits	Semester 1	3	**Two** of [GEOL2001, GEOL2002, GEOL2003, GEOL2004]
GEOL3003	**Engineering Geology & Hydrogeology**	4 credits	Semester 1	3	**One** of [GEOL2001, GEOL2002, GEOL2003, GEOL2004] **or** GEOG2201 **or** HOD permission
GEOL3004	**Applied Sedimentology & Petroleum Geology**	4 credits	Semester 2	3	GEOL2004
GEOL3005	**Marine Geology & Geophysics**	4 credits	Semester 2	3	**Two** of [GEOL2001, GEOL2002, GEOL2003, GEOL2004]
GEOL3010	**Hydrogeology**	4 credits	Semester 1	3	GEOL2002 **or** [GEOL1001 **and** GEOG2201]
GEOL3011	**Engineering Geology**	3 credits	Semester 1	3	GEOL2004 **or** GEOG2201 **or** HOD permission
GGE03201	**Geomorphic Processes & Landforms**	4 credits	Semester 2	3	GEOG2201 **or** GEOL2003
GGEO3203	**Climate Change in the Tropics**	4 credits	Semester 1	3	GEOG2202 **or** GEOL2003 **or** GEOL2004 **or** HOD permission

CODES	TITLES	CREDIT	SEMESTER OFFERED	Level	PREREQUISITES
GGEO3301	**Introduction to GIS & Remote Sensing**	4 credits	1	3	**Two** of [GEOG2101, GEOG2102, GEOG2201, GEOG2202] **or two** of [GEOL2001, GEOL2002, GEOL2003, GEOL2004] **or** HOD permission
GGEO3302	**Disaster Management**	4 credits	2	3	GEOG2201 **or** GEOG2202 **or** GEOL2004 **or** HOD permission

GEOLOGY COURSE DESCRIPTIONS

PART I

GEOL1101 EARTH SCIENCE I: EARTH MATERIALS AND PLATE TECTONICS

(3 credits) Semester 1 Level I

Prerequisites: Passes in at least two science subjects at CAPE or equivalent

Syllabus: A course in physical geology which introduces the study of earth materials and earth systems. The foundation for understanding how basic earth processes work and how rocks and minerals are formed. Introduces topics such as the structure of the Earth, its internal processes, and basic earth materials, minerals and rocks. A central focus is on plate tectonics, now seen as the unifying concept linking earth processes and materials in the rock cycle. Practical instruction will provide the basic skills of mineral and rock identification, and will also cover volcanic and seismic processes on broader regional and global scales.

Evaluation:

Two-hour theory examination	50%
Two-hour practical examination	30%
One-hour in-course test	10%
Field trip (assessment of field questionnaire)	5%
Two tutorial assignments	5%

GEOL1102 EARTH SCIENCE II: EARTH PROCESSES AND EARTH HISTORY

(3 credits) Semester 1 Level I

Prerequisites: As for GEOL1101

Syllabus: A course in physical geology involving the study of the different physical and chemical processes that operate within different environments and produce a range of geomorphological features on the Earth. Introductory aspects of physical geology, including: weathering and erosion; landforms (rivers, slopes, coastlines, arid lands, glaciated environments); and the use of topographic maps. An appreciation of the processes acting on the Earth's surface and how they can be used to interpret Earth history is central to understanding the global distribution of rocks, geological features and earth resources. An introduction to historical geology – origin of the Earth, origin of life on Earth, the geological timescale – with an emphasis on using present geological processes to interpret the past.

Evaluation:	Two-hour theory examination	50%
	Two-hour practical examination	30%
	Coursework	10%
	Field trip exercise	5 %
	Two tutorial assignments	5%

GEOL1104 EARTH SCIENCE IV: GEOLOGICAL MAPS AND ENVIRONMENTAL GEOLOGY

(3 credits) Semester 2 Level I

Prerequisites: As for GEOL1101

Syllabus: A course in physical geology/earth science providing students with skills to understand structural geology and geological maps, as well as providing an introduction to environmental geology, geological hazards, and basic concepts of environmental pollution. In structural geology, the student will learn how to describe, measure and analyze planar and linear features in rocks, including folds, faults and fabrics. Geological map interpretation will allow the recognition of how rock relationships are depicted on maps, and practical classes will concentrate on the construction of geological cross-sections and the interpretation of geological histories. In environmental geology, the student will be introduced to the natural and anthropogenic physical and chemical factors that affect the environment, with topics including climatic change and the combustion of fossil fuels; ocean pollution; toxic and radioactive waste disposal; land use management; geological hazards; water resources; and energy resources.

Evaluation:	Two-hour theory examination	50%
	Six laboratory exercises	36%
	Two tutorial assignments	5%
	Field trip (assessment of field notebook)	9%

PART II

GEOL2001 PALAEONTOLOGY

(4 credits) Semester 2 Level II

Prerequisites: [GEOL1001 **and** GEOL1002] **or** [BIOL1063 **and** BIOL1015]

Syllabus: Introduction to palaeobiology and palaeoecology; biostratigraphy; phylogenetic systematics; macroevolution; extinction and speciation in the fossil record.

Evaluation:	Two-hour written paper	50%
	Two-hour practical exam	50%

GEOL2002 SEDIMENTOLOGY
(4 credits) Semester 1 Level II

Prerequisites: GEOL1001 **and** GEOL1002

Syllabus: Sedimentology and sedimentary petrology.

Evaluation:		
	Two-hour written paper	50%
	Two-hour practical exam	50%

GEOL2003 IGNEOUS AND METAMORPHIC PETROLOGY
(4 credits) Semester 1 Level II

Prerequisites: GEOL1001 **and** GEOL1002

Syllabus: Petrogenesis; tectonomagmatic setting of igneous rocks; classification of volcanic and plutonic rocks. Basis of metamorphic petrology; facies and facies series; metamorphic textures and mechanisms; description of important metamorphic rock groups.

Evaluation:		
	Two-hour written paper	50%
	Two-hour practical exam	50%

GEOL2004 STRUCTURAL GEOLOGY AND GEOLOGICAL MAPPING
(4 credits) Year-long Level II

Prerequisites: GEOL1001 **and** GEOL1002

Syllabus: Fracture analysis (joints and faults); extensional tectonics; compressional tectonics; strike-slip faults; analysis of folds, foliations, and lineations; use of stereographic projections in structural analysis.
Geological maps, their construction and interpretation; geological expression of structural styles and terrane histories; cross-section construction; application of subsurface data in the preparation of structural contours. Principles of field mapping; measurement of stratigraphic sections; preparation of geological maps.

Evaluation:		
	Coursework (laboratory exercises)	40%
	Fieldwork	60%

Note: *This course is run in the last six weeks of Semester 1 and the first six weeks of Semester 2, with one week of fieldwork in the vacation preceding Semester 2.*

GEOL3001 RESEARCH PROJECT IN FIELD GEOLOGY
(4 credits) Semester 2 Level III

Prerequisites: GEOL2004 **and** at least **two** of [GEOL2001, GEOL2002, GEOL2003]

Syllabus: A field-based research project to be undertaken in the summer preceding the final year of the programme, followed by laboratory analyses and report writing. The completed project report and an oral presentation will be required in Semester 2 of the final year.

Evaluation:		
	Project report	90%
	Oral examination (end of Semester 2)	10%

GEOL3002 CARIBBEAN GEOLOGY
(4 credits) Semester 1 Level III

Prerequisites: **Two** of [GEOL2001, GEOL2002, GEOL2003, GEOL2004]

Syllabus: Geological evolution of the Caribbean; geology of Caribbean mainland and island countries, and the Caribbean seafloor.

Evaluation:		
	Two-hour written paper	70%
	Research paper	30%

GEOL3004 APPLIED SEDIMENTOLOGY AND PETROLEUM GEOLOGY
(4 credits) Semester 2 Level III

Prerequisite: GEOL2002

Syllabus: Advanced sedimentology; facies analysis; petroleum geology.

Evaluation:		
	Two-hour written paper	50%
	Two-hour practical exam	50%

GEOL3005 MARINE GEOLOGY AND GEOPHYSICS
(4 credits) Semester 2 Level III

Prerequisites: **Two** of [GEOL2001, GEOL2002, GEOL2003, GEOL2004]

Syllabus: Morphology of ocean basins; ocean circulation; nearshore and offshore processes; marine deposits. Aspects of pure, applied and exploration geophysics; seismic methods and seismology.

Evaluation:		
	Two-hour written paper	60%
	Written coursework assignment	20%
	Field/lab projects	20%

GEOL3010 HYDROGEOLOGY
(4 credits) Semester 1 Level III

Prerequisites: GEOL2002 **or** [GEOL1001 **and** GEOG2201]

Syllabus: An in-depth study of the hydrological cycle, evaporation/transpiration, rainfall-runoff relationships, and statistical methods in hydrogeology.

Evaluation:		
	Two-hour written paper	50%
	Two-hour practical exam	30%
	In-course test	20%

GEOL3010 HYDROGEOLOGY
(4 credits) Semester 1 Level III

Prerequisites: GEOL2002 or [GEOL1101 **and** GEOG2201]

Syllabus: An in-depth study of the hydrological cycle, evaporation/transpiration, rainfall-runoff relationships, and statistical methods in hydrogeology. The nature and origin of different types of aquifers, their geological properties, the various types of groundwater flows to wells, and the flows within aquifers under steady/nonsteady conditions. Techniques of hydrogeological investigation, including drilling and pump testing, computer-based groundwater modelling, and the evaluation of groundwater resources. The hydraulics of surface water systems and seasonal variability of flow patterns in streams and rivers. Basic concepts of solute transport in groundwater systems and of groundwater quality analysis. Modelling techniques applied to groundwater pollution and pollutant transport problems. Special emphasis on the water resources of Jamaica and other Caribbean islands.

Evaluation:		
	Two-hour written exam	50%
	In-course test	20%
	Two-hour practical exam	30%

GEOL3011 ENGINEERING GEOLOGY
(3 credits) Semester 1 Level III

Prerequisites: GEOL2004 or GEOG2201 or HOD approval

Syllabus: A review of the principles and techniques of geology, geomorphology and geophysics as applied to engineering geology, with special emphasis on the tropics and small island states of the Caribbean. Engineering properties of earth materials, including soils and rocks. Practical work will cover typical engineering geological investigations, the representation of engineering geological data, and report writing. Caribbean case histories and field visits will be used to show how

engineering geology data can inform decision-making processing in engineering site selection, construction planning, and specifications. Established codes of ethics and legal aspects of engineering geology practices will be discussed.

Evaluation:		
	Two-hour theory exam	50%
	Mid-semester test	20%
	Field reports	20%
	Seminar presentation	10%

GGEO3201 GEOMORPHIC PROCESSES AND LANDFORMS
(4 credits) Semester 2 Level III

Prerequisite: GEOG2201 **or** GEOL2003

Syllabus: An advanced course in the study of landforms and geomorphic processes, with particular emphasis on Caribbean examples. Limestone geomorphology, volcanic geomorphology, coastal geomorphology, applied geomorphology, geomorphological field and laboratory techniques/

Evaluation:		
	Two-hour written examination	60%
	Coursework	40%

GGEO3303 CLIMATE CHANGE IN THE TROPICS
(4 credits) Semester 1 Level III

Prerequisite: GGEO2202 **or** GEOL2003 **or** GEOL2004 **or** HOD permission

Syllabus: A theoretical and practical basis for understanding present-day tropical environments and the causes of global environmental change, as well as for assessing the scale of human interference in natural environmental processes.

Evaluation:		
	Two-hour written examination	60%
	Coursework	40%

GGEO3301 INTRODUCTION TO GEOGRAPHICAL INFORMATION SYSTEMS AND REMOTE SENSING
(4 credits) Semester 1 Level III

Prerequisites: Any **two** of [GEOG2101, GEOG2102, GEOG2201, GEOG2202] **or** any **two** of [GEOL2001, GEOL2002, GEOL2003, GEOL2004] **or** HOD permission

Syllabus: An introduction to the concepts, techniques and applications of Geographical Information Systems (GIS) and Remote Sensing (RS).

The course provides a background for further enquiry into GIS and RS technologies, as well as equipping students with practical expertise needed for operational GIS and image processing. The course has three main parts: first, the theory and principles of GIS and RS are covered in a lecture setting; secondly, supervised hands-on practical exercises are run in the laboratory; and, thirdly, projects are undertaken by students to apply the knowledge and skills to a specific problem. Areas covered in the course include (but are not limited to) data acquisition and processing, data automation, database management, spatial analysis, image processing, mapping and modelling.

Evaluation:		
	Two-hour written examination	50%
	Practical assignments	40%
	Project	10%

GGEO3302 DISASTER MANAGEMENT

(4 credits) Semester 2 Level III

Prerequisites: GEOG2201 **or** GEOG2202 **or** GEOL2004 **or** HOD permission

Syllabus: An introduction to the basic principles and techniques in disaster management. A study of theory, hazards, vulnerability, response capability, risk assessment, disaster scenarios, disaster management, preparedness, prevention, emergency response, and simulation. Basic concepts of geology, geomorphology, tectonics and geophysics in the study of natural hazards, with special reference to the Caribbean. Hazards and risks related to volcanic activity, eqrthquakes, landslides, hydrometeorological processes; flooding and hurricanes. Hazard mapping. Approaches to natural hazard loss-reduction.

Evaluation:		
	Two-hour written examination	60%
	Coursework	40%

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 **&** **BIOL1018**	**CELLS BIOLOGY** **MOLECULAR BIOLOGY & GENETICS**	3 Credits 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 **&** **BIOL1263**	**LIVING ORGANISMS I** **LIVING ORGANISMS II**	3 Credits 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 Week 1-6	BOTN2401- Plant Form and Systematics	**BIOL2401- Research Skills and Practices in Biology**	BIOL2402- Fundamentals of Biometry
Semester 1 Week 7-12	BIOL2405- Eukaryotic Microbiology		AGSL2401- Soil and Water Management
Semester 2 Week 1-6	BIOL2404- Genetics	**BIOL2403- Principles of Ecology**	ZOOL2401- Animal Form
Semester 2 Week 7-12	BOTN2402- Physiology of Plants		ZOOL2402- Animal Function

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 Experimental Biology major/ Botany major	**B1 Experimental Biology major/ Zoology major**	**B2 Environmental Biology major/ Botany major**	**C1 Environmental Biology/Marine Biology major**	**C2 NEW Tropical Horticulture Courses I**	**D1 NEW Tropical Horticulture Courses II**
BOTN3016 Plant Biotechnology	ZOOL3015 Parasitology	BOTN3017 Principles of Horticulture	BIOL3014 Marine Ecology 1	AGCP2004 Ornamental Horticulture	AGCP2003 Mechanization for Crop Production
BOTN3015 Principles of Plant Breeding	ZOOL3020 Insect Biology Systematics	BOTN3014 Forest Ecology, Agroforestry	BIOL3015 Marine Ecology 2	AGBU3007 New Venture Creation and Management	AGSL3001 Irrigation and Drainage Technology
SEMESTER 2					
BIOL3017 Virology	ZOOL3017 Immunology	BIOL3121 Freshwater Ecology	ZOOL3019 Fisheries and Aquaculture	AGCP3005 Landscape and turf grass Management	AGCP3007 Post-Harvest Technology

BOTN3018 Medicinal and Economic Botany	ZOOL3021 Pest Management	BIOL3020 Conservation Biology	BIOL3023 Coral Reef Biology	AGRI2001 Tropical Crop Protection	AGCP3006 Principles of Fruit Crop Production
Tues 2-5Thurs 10-1 /Mon & Fri 10-1 Labs	**Friday/Monday Labs**	**Friday/ Friday Labs**	**Monday/ Monday Labs**	**Monday Labs**	**Wed. 2 - 5 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
- Explain 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
- BIOL2405 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
- BIOL2405 Eukaryotic Microbiology
- BIOL3403 Oceanography and Plankton
- BIOL3404 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 and Genetics
- BIOL1018 Molecular Biology
- 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
- BIOL3403 Oceanography
- BIOL3404 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
- GEOL3XXX 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
- BOTN2404 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
- BIOL2405 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
- BIOL3407 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
- BOTN2402 Physiology of Plants

Semester 2

- BIOL2403 Principles of Ecology
- BIOL2404 Genetics
- BIOL2405 Eukaryotic Microbiology
- 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	BIOL3403 Oceanography and Plankton
AGCP3007 Post-Harvest Tech.	BOTN3402 Introduction to Plant Breeding	ZOOL3402 Terrestrial Vertebrates and Conservation	ZOOL3402 Terrestrial Vertebrates and Conservation	BIOL3404 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

BIOL2406- Diving Technology for Aquatic Sciences

LIFE SCIENCES COURSE DESCRIPTIONS

PRELIMINARY COURSES

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

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:	50%
One 2-hour comprehensive paper	
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:	24	12
(Inclusive of case study presentation and discussion).		
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

(NB: Practical Work involves exercises in solving statistical problems using 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: (Inclusive of case study presentation and discussion).	24 hours	12
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 1 Level 2

Pre-requisites: BIOL1017, BIOL1018, BIOL1262, BIOL1263 or equivalent, **and** a minimum of 24 credits from Level 1, 18 of which must be 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	18	18
Tutorials	6	6
Laboratory sessions	30	15
Total	54	39

Note: 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 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:

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. U$113.60

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 arel 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:

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:

2. The nature of the intertidal and sub-tidal benthic environment
3. The communities associated with sandy shores
4. The communities associated with rocky shores
5. Mangrove swamp communities
6. Seagrass communities
7. Meiofauna
8. Symbioses in the sea
9. 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

BL31A/BIOL3013 COASTAL MANAGEMENT
(4 credits) Semester 2 Level III

Aim: To introduce the investigation of natural coastal processes, human interference with natural processes and how plans and actions may protect conserve and restore coastal environments.

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

1. identify the limits, types and contents of the coastal zone
2. know the physical regime and natural processes of the coastal zone
3. evaluate the activities, demands and uses of the coastal zone
4. outline and evaluate management frameworks applicable to the coastal zone.

Pre-requisite: BL20N/BIOL2014
Co-requisite: BL31F/BIOL3015 OR BL31G/BIOL3023

Course Content:

- Coastal Resources
  An examination of the natural resources associated with beaches, reefs, wetlands, estuaries, harbours and off-shore features.
- An examination of the kinds of pollution affecting coastal resources especially organic, oil, pesticide, heavy metal,

physical and thermal pollution, their sources, effects and remedies.

- Resource Management Practices
  Coastal surveys, environmental monitoring, water quality criteria, zoning, legislation and enforcement.
  Marine Parks and Conservation Areas
  Their purpose, criteria, development and management.

Mode of Delivery:

24 hours of lecture, 6 hours of tutorials, 36 hours of field and laboratory exercises to illustrate the principles of coastal management.

Evaluation:

One 3-hour theory paper	60%	
Course Work	40%	
Consisting of one 2-hour practical test		10%
Laboratory and field reports		20%
Research and oral presentation		10%

Prescribed text: Beatley, T. Brower, D.J. and Schwab, A.K. 2002. An Introduction to Coastal Zone Management 2nd Edition. ISBN 1559639156.

Yvan Breton, David Brown, Brian Davy, Milton Haughton, and Luis Ovares. 2006. Coastal resource management in the wider Caribbean. Resiliance, Adaptation and Community Diversity. ISBN 9-76637-262-4

BL31G/BIOL3023 CORAL REEF BIOLOGY
(4 credits) Summer 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/ BIOL1261*OR* 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%
Which Consists 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			
AGCP2004AC38A	**Ornamental Horticulture**	**4**	1
AGCP2003/AC26B	**Mechanization for Crop Production**	**4**	1
AGBU3007/AM37A	**New Venture Creation and Management**	**4**	1
AGSL3001/AS31A	**Irrigation and Drainage Technology**	**4**	1
AGBU3012/AM312	**Research Project**	**4**	Year-Long
AGCP3005/AC32H	**Landscape and Turf Grass Management**	**4**	2
AGCP3007/AC33A	**Post-Harvest Technology**	**4**	2
AGRI2001/AG21C	**Tropical Crop Protection**	**4**	2
AGCP3006/AC32J	**Principles of Fruit Crop Production**	**4**	2
Electives:			
BOTN3016/BT38B	Plant Biotechnology	4	1
BIOL3016/BT37Q	Plant Health	4	2
ZOOL3021/Z32G	Pest Management	4	2

BOTN3015/BT34A	Principles of Plant Breeding	4	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.

MATHEMATICS COURSES
LIST OF UNDERGRADUATE COURSES

CODES	TITLES	CREDIT	SEMESTER OFFERED	Level	PREREQUISITES
PRELIMINARY LEVEL					
M08B/MATH0100	**PRE-CALCULUS**	6-P Credits	Semester 1	0	CXC Mathematics or equivalent
M08C/MATH0110	**CALCULUS AND ANALYTICAL GEOMETRY**	6-P Credits	Semester 2	0	CXC Mathematics or equivalent
LEVEL 1					
MATH1141	**INTRODUCTORY LINEAR ALGEBRA AND ANALYTIC GEOMETRY**	3 Credits	Semester 1 and 2	1	CAPE or GCE A-Level Mathematics, or M08B/MATH0100 and M08C/MATH0110 or equivalent.
MATH1142	**CALCULUS I**	3 Credits	Semester 1	1	CAPE or GCE A-Level Mathematics, or M08B/MATH0100 and M08C/MATH0110 or equivalent.
MATH1151	**CALCULUS II**	3 Credits	Semester 2	1	Calculus I, MATH1142.
MATH1152	**INTRODUCTION TO FORMAL MATHEMATICS**	3 Credits	Semester 2	1	CAPE or GCE A-Level Mathematics, or M08B/MATH0100 and M08C/MATH0110 or equivalent.
MATH1185	**CALCULUS FOR SCIENTISTS AND ENGINEERS**	3 Credits	Semester 1	1	CAPE or GCE A-Level Mathematics, or M08B/MATH0100 and M08C/MATH0110 or equivalent.
STAT1001	**STATISTICS FOR THE SCIENTISTS**	3 Credits	Semester 1 and 2	1	CAPE or GCE A-Level Mathematics, or M08B/MATH0100 and M08C/MATH0110 or equivalent.
M10A/MATH1140	**BASIC INTRODUCTORY MATHEMATICS**	6 Credits	Semester 1	1	CAPE or GCE A-Level Mathematics, or M08B/MATH0100 and M08C/MATH0110 or equivalent.
M10B/MATH1150	**FUNCTIONS OF REAL VARIABLES**	6 Credits	Semester 2	1	CAPE or GCE A-Level Mathematics, or M08B/MATH0100 and M08C/MATH0110 or equivalent.
M10C	**MATHEMATICS FOR PURE AND APPLIED SCIENCES**	6 Credits	Semester 2	1	CAPE or GCE A-Level Mathematics, or M08B/MATH0100 and M08C/MATH0110, or equivalent
MATH 1180	**ENGINEERING MATHEMATICS I**	3 Credits	Semester 1	1	CAPE or GCE A-Level Mathematics, or M08B/MATH0100 and M08C/MATH0110, or equivalent
LEVEL 2					
M20A/MATH2100	**ABSTRACT ALGEBRA**	4 Credits	Semester 2	2	MATH1141, MATH1142, MATH1151, MATH1152 (or M10A/MATH1140 and M10B/MATH1150)

CODES	TITLES	CREDIT	SEMESTER OFFERED	Level	PREREQUISITES
M20B/MATH2110	**LINEAR ALGEBRA**	4 Credits	Semester 1	2	MATH1141, MATH1142, MATH1151, MATH1152 (or M10A/MATH1140 and M10B/MATH1150)
M21Q/MATH2125	**INTRODUCTION TO MATHEMATICAL ANALYSIS**	4 Credits	Semester 1	2	MATH1141, MATH1142, MATH1151, MATH1152 (or M10A/MATH1140 and M10B/MATH1150)
MATH2300	**INTRODUCTION TO ORDINARY DIFFERENTIAL EQUATIONS**	4 Credits	Semester 2	2	MATH1141, MATH1142, MATH1151, MATH1152 (or M10A/MATH1140 and M10B/MATH1150)
MATH2301	**MATHEMATICAL METHODS**	4 credits	Semester 2	2	MATH1141, MATH1142, MATH1151, MATH1152 (or M10A/MATH1140 and M10B/MATH1150)
M25A/MATH2140	**PROBABILITY THEORY**	4 Credits	Semester 1	2	MATH1141, MATH1142, MATH1151, MATH1152 (or M10A/MATH1140 and M10B/MATH1150)
M25B/MATH2150	**STATISTICAL INFERENCE**	4 Credits	Semester 2	2	M25A/MATH2140
M27A/MATH2210	**MATHEMATICS OF FINANCE**	4 Credits	Semester 1	2	MATH1141, MATH1142, MATH1151, MATH1152 (or M10A/MATH1140 and M10B/MATH1150) **This course is available only to actuarial science students and final year students.**
M27B/MATH2320	**INTRODUCTION TO ACTUARIAL MATHEMATICS**	4 Credits	Semester 2	2	M21Q/MATH2125(which replaces M21A/MATH2120), M25A/MATH2140 and M27A/MATH2210
MATH 2230	**ENGINEERING MATHEMATICS II**	3 Credits	Semester 1	2	MATH 1180
MATH2302	**LINEAR PROGRAMMING**	4 Credits	Semester 1	3	MATH1141, MATH1142, MATH1151, MATH1152 (or M10A/MATH1140 and M10B/MATH1150)
LEVEL 3					
M30B/MATH3350	**APPLIED ALGEBRA II**	4 Credits	Semester 2	3	M20A/MATH2100
M30Q/MATH3360	**MATRIX THEORY**	4 Credits	Semester 1	3	M20A/MATH2100, M20B/MATH2110
M31E/MATH3341	**APPLIED STATISTICS**	4 Credits	Semester 1	3	M20B/MATH2110, M25A/MATH2140 and M25B/MATH2150
M32A/MATH3120	**NUMERICAL ANALYSIS**	4 Credits	Semester 2	3	M21Q/MATH2125
M32C/MATH3370	**TOPICS IN OPERATIONS RESEARCH**	4 Credits	Semester 1	3	M21Q/MATH2125
M32Q/MATH3340	**SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS**	4 Credits	Semester 1	3	M21Q/MATH2125, M21B/MATH2160**,** M20B/MATH2110
M33Q/MATH3380	**ELEMENTARY NUMBER THEORY**	4 credits	Semester 1	3	M20A/MATH2100, M20B/MATH2110, M21Q/MATH2125

CODES	TITLES	CREDIT	SEMESTER OFFERED	Level	PREREQUISITES
M33R/MATH3490	**COMPLEX ANALYSIS**	4 credits	Semester 1	3	M21Q/MATH2125
MATH3700	**INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS**	4 credits	Semester 1	3	(MATH2300 and MATH2301)or(M21B/MATH2160)
MATH3701	**PROBABILITY AND STOCHASTIC MODELLING**	4 credits	Semester 2	3	M25A/MATH2140
MATH3702	**RESEARCH PROJECT IN MATHEMATICS**	4 credits	Semester 2	3	MATH 2125, MATH2300, Courses prescribed by the supervisor with the nature of the project.
M34Q/MATH3310	**LIFE CONTINGENCIES**	4 credits	Semester 2	3	M25A/MATH2140, M25B/MATH2150, M27B/MATH2320
M34R/MATH3320	**RISK THEORY**	4 Credits	Semester 2	3	M21Q/MATH2125**,** M21B/MATH2160(or MATH2300), M25A/MATH2140, M25B/MATH2150
M35R/MATH3321	**PRINCIPLES OF ASSET/ LIABILITY MANAGEMENT FOR ACTUARIAL SCIENCE**	4 credits	Semester 2	3	M 27A/MATH2210, MS28D/MGMT2023, MS38H/MGMT3048
M33D/MATH3280	**INTRODUCTION TO MATHEMATICAL MODELLING I**	4 credits	Semester 2	3	MATH2300 or M21B/MATH2160, M21Q/MATH2125
M33A/MATH3250	**FLUID DYNAMICS I**	4 credits	Semester 2	3	M21Q/MATH2125, MATH 2160 (M 21B) or MATH 2300
M36Q/MATH3390	**METRIC SPACES AND TOPOLOGY**	4 Credits	Semester 2	3	M21Q/MATH2125, M20B/MATH2110

Department of Mathematics

The Department of Mathematics currently offers 2 B.Sc Options Mathematics with Education and Actuarial Science), one B.Sc double major (Mathematics and Modelling Processes), one B.Sc major (Mathematics) and one minor (Mathematics).

Mathematics with Education and Actuarial Science Options

Detailed Programmes structure is given in front pages

Double Major in Mathematics and Modelling Processes

A double major in Mathematics and Modelling Processes requires passes in **MATH1141, MATH1142, MATH1151, MATH1152 (or M10A/MATH1140 and M10B/MATH1150) at Level I, and** a total of 64 credits from Part II these must include 32 credits from level II and 32 credits from level III courses, these must include the following courses:

M20B/Math2110	Linear Algebra
M20A/MATH2100	Abstract Algebra
M21Q/MATH2125	Introduction to Mathematical Analysis
MATH2300	Introduction to Ordinary Differential Equations
M25A/MATH2140	Probability Theory
M25B/MATH2150	Statistical Inference
MATH2302	Linear Programming
MATH2301	Mathematical Methods
MATH3700	Partial Differential Equations
M32A/MATH3120	Numerical Methods
M33R/MATH3490	Complex Analysis
MATH3280	Mathematical Modelling I
MATH3702	Research Project in Mathematics

The Mathematics Major

A major in Mathematics requires passes in **MATH1141, MATH1142, MATH1151, MATH1152 (or M10A/MATH1140 and M10B/MATH1150) at Level I,** M20A/MATH2100, M20B/MATH2110, M21Q/MATH2125 and MATH2300 (which replaces M21B/MATH2160), as well as sixteen (16) credits from other Part II Mathematics courses. At least eight (8) of these sixteen credits must be obtained at Level III. Certain courses, as noted individually, cannot count towards the major.

The Mathematics Minor

A minor in Mathematics requires passes in **MATH1141, MATH1142, MATH1151, MATH1152 (or M10A/MATH1140 and M10B/MATH1150) at Level I,** eight (8) credits in any Level II and eight (8) credits in any Level III Mathematics courses.

OPTION

(a) MATHEMATICS WITH EDUCATION

Part I

Twenty-four (24) credits from **two** subject areas in the Pure and Applied Sciences divided equally between the two so as to provide the prerequisite for Part II courses. One of the subject areas must be Mathematics. Required courses are MATH1141, MATH1142, MATH1151, MATH1152 (or M10A/MATH1140 and M10B/MATH1150). Foundations of Education courses (see A below) may also be taken with Part I courses from the Faculty of Pure and Applied Sciences.

Part II

Thirty-two (32) credits from Part II Mathematics courses, including:

(i) M20A/MATH2100, M20B/MATH2110, M21B/MATH21260 or MATH2300 [replaces M21B], and M21Q/MATH2125

(ii) Two courses from Level 3, and two other courses from Levels 2 or 3

MATH EDUCATION COURSES

Initial Teacher Training

Year	Semester I	Semester II
1	**EDTL 1020 (ED10T)** – Introduction to Teaching and Learning **EDPS1003 (ED10C)** – Psychological Issues in the Classroom ***EDTK2025 (ED20Y)** – Introduction to Computer Technology in Education	**EDTL1021 (ED10U)** – Planning for Teaching
2	**EDMC2213 (ED22M)** – Children Learning Mathematics **EDMC2214 (ED22N)** – The Nature and Scope of Mathematics **EDTL2021 (ED20U)** – School Based Experience I *** EDMC2213 (ED20M) –** Children Learning Mathematics or **EDTK3004 (ED30D)** – Educational Technology	**EDMA2216 (ED22P)** – Analysis & Teaching of Mathematics
3	**EDMA3206 (ED32F)** – Investigation & Problem Solving **EDMA3217 (ED32Q)** – Pedagogical Issues in the Teaching of Mathematics **EDTL3017 (ED30Q)** – School Based Experience II	**EDME3205 (ED32E)** – Teaching Mathematics in Grades **EDRS3019 (ED30S)** – Report

*core courses

Teacher Trained

Year	Semester I	Semester II
1	**EDMC2213 (ED22M)** – Children Learning Mathematics **EDMC2214 (ED22N)** – The Nature and Scope of Mathematics ***EDTK2025 (ED20Y)** – Introduction to Computer Technology in Education	**EDMA2216 (ED22P)** – Analysis & Teaching of Mathematics
2	**EDMA3206 (ED32F)** – Investigation & Problem Solving **EDMA3217 (ED32Q)** – Pedagogical Issues in the Teaching of Mathematics ***EDMC2213 (ED20M**) – Children Learning Mathematics *or* **EDTK3004 (ED30D)** – Educational Technology	**EDME3205 (ED32E)** – Teaching Mathematics in Grades
3	**EDTL3020 (ED30T)** – Pre-Practicum **EDTL3021 (ED30U)** – Field Study	**EDRS3019 (ED30S)** - Report

* core courses

OPTION
ACTUARIAL SCIENCE

Part I

Code	Names	Credits
MATH1141	Intro. Linear Algebra and Analytic Geometry	3
MATH1142	Calculus I	3
MATH1151	Calculus II	3
MATH1152	Introduction to Formal Mathematics	3
COMP1110	Mathematics for Computing	3
COMP1120	Computing and Society	3
COMP1126	Introduction to Computing I	3
COMP1127	Introduction to Computing II	3
EC10C/ECON1001	Introduction to Microeconomics	3
EC10E/ECON1002	Introduction to Macroeconomics	3
MS15D/ACCT1005	Introduction to Financial Accounting	3
MS15B/ACCT1003	Intro. to Cost & Management Accounting	3

Part II Compulsory

M20A/MATH2100	Abstract Algebra	4
M20B/MATH2110	Linear Algebra	4
M21Q/MATH2125	Introduction to Mathematical Analysis	4
MATH2300	Introduction to Ordinary Differential Equations	4
or		
M21B/ MATH2160	Analysis and Mathematical Methods II)	4
M25A/MATH2140	Probability Theory	4
M25B/MATH2150	Statistical Inference	4
M27A/MATH2210	Mathematics of Finance	4
M27B/MATH2320	Introduction to Actuarial Mathematics	4
MS28D/MGMT2023	Financial Management I	3
MS38H/MGMT3048	Financial Management II	3
M31E/MATH3341	Applied Statistics	4
M34Q/MATH3310	Life Contingencies	4
M34R/MATH3320	Risk Theory	4
M35R/MATH3321	Principles of Asset/Liability Management	4

A minimum of eleven (11) additional credits should be selected from:

M30Q/MATH3360	Matrix Theory	4
M32A/MATH3120	Numerical Analysis	4
M32C/MATH3370	Topics in Operation Research	4
M33R/MATH3490	Complex Analysis	4
MATH3700	Introduction to Partial Differential Equations	4
MATH3701	Probability and Stochastic Modelling	4
M34T/MATH3311	Survival Models/Construction of Tables	4
M36Q/MATH3390	Metric Spaces and Topology	4

CS22Q/COMP2140	Software Engineering	4
CS35Q/COMP3110	Information Systems	4
SY35B/SOCI3018	Demography I (Population Trends and Policies)	3

COURSE DESCRIPTIONS

PRELIMINARY COURSES

Throughout the preliminary sequence, topics will be treated with a minimum of rigour, but with an emphasis on the understanding of the concepts involved.

M08B/MATH0100 PRE-CALCULUS
(6 P-Credits) Semester 1 Level 0

Pre-requisite: **CSEC Mathematics or equivalent**

Syllabus:
Algebra: Real numbers, surds; complex numbers; linear, quadratic, and polynomial equations; inequalities; functions and their graphs; transformations and periodic functions; inverse functions; logarithms and exponentials.

Trigonometry: The six trigonometric functions and their interrelations; the addition formulas; the double- and half-angle formulas; trigonometric identities; the inverse trigonometric

Functions; the solution of triangles.

Evaluation:	One 3-hour paper	70%
	Two Midterm Exams	30%

M08C/MATH0110 CALCULUS AND ANALYTICAL GEOMETRY
(6 P-Credits) Semester 2 Level 0

Pre-requisite: **CSEC Mathematics or equivalent**

Syllabus: Function theory: limits, continuity; implicitly defined functions; review of inverse function theory;

Differentiation: Definition of the derivative, examples; the derivative of a sum, difference, product, and quotient of two functions; the chain rule; derivatives of polynomials, the trigonometric functions, logs, exponentials, and the inverse trigonometric functions; higher-order derivatives; first-order separable differential equations.

Applications of the derivative: Local maxima and minima; the second-derivative test; global maxima and minima; maximization on a closed interval; curve sketching.

The Definite Integral: Definition of the integral, examples; the Fundamental Theorem of Calculus; antiderivatives; u-du

substitutions; integration by parts; changes of variable for the definite integral.

Applications of the integral: Volumes by cross sections and cylindrical shells; arc-length; surface areas of revolution.

Evaluation:	One 3-hour paper	70%
	Two Midterm Exams	30%

Successful completion of M08B/MATH0100 and M08C/MATH0110 is not sufficient for entry to the BSc Degree programme in Engineering. Students can apply for a transfer to the Faculty of Engineering on the successful completion of M10A/MATH1140 and
M10B/MATH1150.

PART I COURSES

MATH1141 INTRODUCTORY LINEAR ALGEBRA AND ANALYTIC GEOMETRY

(3 Credits) Semester 1 and 2 Level I

Pre-requisites: CAPE or GCE A-Level Mathematics, or M08B/MATH0100 and M08C/MATH0110, or equivalent.

Syllabus**:**

Function: Definition, inverse function, graphs of some elementary functions and elementary transformations of the graphs.

Systems of linear equation: solutions of systems of linear equations, the Gauss-Jordan elimination algorithm; inconsistent and over determined systems; homogeneous systems of equations; row and column vectors.

Matrices: elementary matrix operations, determinant, Cramer's rule and linear systems of equations.

Vector geometry: Vectors in 2 and 3 dimensions; vector equations of lines and planes; dot products, cross products.

Evaluation:	One 2-hour paper	70%
	Course work	30%

MATH1142 **CALCULUS I**
(3 Credits) Semester 1 Level I

Pre-requisites: CAPE or GCE A-Level Mathematics, or M08B/MATH0100 and M08C/MATH0110, or equivalent.

Syllabus:

Limits and Continuity: limit of function, continuity and properties of continuous functions.

Differentiability and Application of Derivatives: derivatives of functions, product, quotient and chain rule, application of derivatives, L'Hospital's rule, Taylor's formula and Taylor polynomials; maxima, minima and inflection points; detailed investigation of a function and construction of its graph.

Integration: the definite integral as a Riemann sum and properties of the definite integral; fundamental theorem of calculus, the indefinite integral; methods of integration; applications of integration: areas and volumes.

Evaluation:	One 2-hour paper	70%
	Course work	30%

MATH1151 **CALCULUS II**
(3 Credits) Semester 2 Level I

Pre-requisites: Calculus I (MATH1142)

Syllabus:

More methods of integration: integration of expressions containing radicals, integration of expressions containing trigonometric functions and trigonometric substitution; application of integration in solving first order differential equations.

Partial differentiation: functions of several variables, gradient vector, directional derivatives, and the tangent plane, variation of parameters; polar, cylindrical and spherical coordinate; constrained and unconstrained optimization, including Lagrange multipliers;

Multiple integrals: double integrals, heuristics and reversing the order of integration; line, surface and volume integrals;

Evaluation:	One 2-hour paper	70%
	Course work	30%

MATH1152 INTRODUCTION TO FORMAL MATHEMATICS
(3 Credits) Semester 1 Level I

Pre-requisites: CAPE or GCE A-Level Mathematics, or M08B/MATH0100 and M08C/MATH0110, or equivalent.

Syllabus:

Formal Symbolic Logic: statement, negation, truth tables, case-by-case analysis, proof by contradiction. Sets, Relations and Equivalence Relations: basic set theory, relations and their properties, equivalence relations, equivalence classes.

Binary operations: operations as mappings, associativity and commutativity, identity elements and inverses.

Natural numbers: the axioms, addition, multiplications of natural numbers, elementary proofs, the Principle of Mathematical Induction.

The integers: the axioms, elementary proofs, divisibility, the unique prime factorization of an integer, reminder classes.

The Real numbers: the axioms of addition and multiplications, the distributive law, the axioms of order and completeness.

Evaluation:	One 2-hour paper	60%
	Course work	40%

MATH1185 CALCULUS FOR SCIENTISTS AND ENGINEERS
(3 Credits) Semester 1 and 2 Level I

Pre-requisites: CAPE or GCE A-Level Mathematics, or M08B/MATH0100 and M08C/MATH0110, or equivalent.

Syllabus: Limits, Continuity and Differentiability. Application of derivatives.
Integration. Ordinary differential equations. Functions of several variables. Multiple integrals. Series.

Evaluation:	One 2-hour paper	70%
	Course work	30%

STAT1001 STATISTICS FOR THE SCIENTISTS
(3 Credits) Semester 1and 2 Level I

Pre-requisites: CAPE or GCE A-Level Mathematics, or M08B/MATH0100 and M08C/MATH0110, or equivalent.

Syllabus: Summarising and Interpreting Data. Random Variables.

Probability and Probability Distribution. Elementary ideas of sampling methods. Sampling and Estimation. Confidence Intervals. Hypothesis Testing. Chi-square Test. Introduction to Simple Linear Regression

Evaluation:	One 2-hour paper	60%
	Course work	40%

MATH 1180 **ENGINEERING MATHEMATICS I**
(3 Credits) Semester 1 Level I

Pre-requisite: CAPE or GCE A-Level Mathematics, or M08B/MATH0100 and M08C/MATH0110, or equivalent

Syllabus: Calculus and Algebra -- functions of one variable: limits, continuity, differentiation, integration, mean value theorems; Taylor and Maclaurin expansions. Functions of two variables. Vectors: dot, cross and mixed products; geometrical problems-lines, planes. Matrices: properties, solution of linear equations. Complex Numbers: polar presentation. Ordinary differential equations: first order equations, separation of variables, integrating factor, second order linear equations with constant coefficients. The Laplace transform: step functions and derivatives, the inverse transform.

Evaluation:	One 2-hour paper	75%
	Two Midterm Exams	25%

This course is designed for students *majoring in Electronics Engineering* only**.**

PART II

M20A/MATH2100 **ABSTRACT ALGEBRA**
(4 Credits) Semester 2 Level II

Pre-requisites: MATH1141, MATH1142, MATH1151, MATH1152 (or M10A/MATH1140 and M10B/MATH1150)

Syllabus: Elements of set theory: elements of proof theory, relations and functions; groups, including fine permutation groups; rings and the Euclidean algorithm; homomorphisms; fields.

Evaluation:	One 2-hour written paper	80%
	One in-course test	20%

M20B/MATH2110 LINEAR ALGEBRA
(4 Credits) Semester 1 Level II

Pre-requisites: MATH1141, MATH1142, MATH1151, MATH1152 (or M10A/MATH1140 and M10B/MATH1150)

Syllabus: Matrices: rank and nullity; vector spaces and bases; linear transformations; determinants; inner product spaces; eigenvalues and eigenvectors.

Evaluation:
One 2-hour written paper 80%
One in-course test 20%

M21B/MATH2160 ANALYSIS AND MATHEMATICAL METHODS II
(4 Credits) Semester 2 Level II

Pre-requisite: MATH1141, MATH1142, MATH1151, MATH1152 (or M10A/MATH1140 and M10B/MATH1150)

Syllabus: Ordinary linear differential equations: Existence and uniqueness theorems (no proofs), Wronskians; solution in series for first and second order non-singular and regular singular equations; methods of Frobenius.

Fourier Series: two-dimensional separable linear partial differential equations; solutions by separation of variables and Fourier series.

Functions of a Single Complex Variable: Continuity, differentiability, Cauchy-Riemann equations; analyticity, power series; Cauchy's Theorem and applications to evaluation of integrals.

Evaluation:
One 2-hour written paper 80%
One in-course test 20%

M21Q/MATH2125 INTRODUCTION TO MATHEMATICAL ANALYSIS
(4 Credits) Semester 1 Level II

Pre-requisites: MATH1141, MATH1142, MATH1151, MATH1152 (or M10A/MATH1140 and M10B/MATH1150)

Syllabus: Sequences: Convergence, limit theorems; monotone sequences; Cauchy sequences.

Continuity: Limits and limit laws; continuity; the intermediate-value theorem; uniform continuity.

Differentiability: The derivative and its properties; Rolle's theorem, the Mean-Value theorem.

Integration: Introduction to the theory of the Riemann integral; Riemann sums; the Fundamental theorem of Calculus; improper integrals; functions defined by integrals.

Series:Comparison, ratio, root, etc., tests; absolute convergence; alternating series; Cauchy criterion for convergence.

Series of functions: Uniform convergence of sequences and series of functions; convergence of power series; Abel's and Weierstrass's tests; functions defined by power series; Taylor series.

Evaluation:	One 2-hour written paper	60%
	Two Midterm Exams	20%
	Five Written Assignments	20%

MATH2300 INTRODUCTION TO ORDINARY DIFFERENTIAL EQUATIONS

(4 Credits) Semester 2 Level II

Pre-requisites: MATH1141, MATH1142, MATH1151, MATH1152 (or M10A/MATH1140 and M10B/MATH1150)

Syllabus: Differential equations and classifications - First order differential equations – The existence and uniqueness theorem - Second and higher order differential equations - Power series solutions – Legendre polynomials – Bessel functions - Numerical methods.

Evaluation:	One 2-hour written paper	60%
	Two Midterm Exams	20%
	Five Written Assignments	20%

MATH2301 MATHEMATICAL METHODS

(4 Credits) Semester 2 Level II

Pre-requisites: MATH1141, MATH1142, MATH1151, MATH1152 (or M10A/MATH1140 and M10B/MATH1150)

Syllabus: Fourier series - Vector Calculus - Laplace transforms – Fourier transforms - Special functions.

Evaluation:	One 2-hour written paper	60%
	Two Midterm Exams	20%
	Five Written Assignments	20%

M25A/MATH2140 PROBABILITY THEORY
(4 Credits) Semester 1 Level II

Pre-requisite: MATH1141, MATH1142, MATH1151, MATH1152 (or M10A/MATH1140 and M10B/MATH1150)

Syllabus: Basic probability theory: Laws of probability, conditional probability, independence, Bayes formula, random variables, discrete and continuous distributions, expectations, moments, moment generating functions, functions of random variables.

Special distributions: binomial, geometric, negative binomial, Poisson, hypergeometric, uniform, exponential, gamma, normal, Laws of large numbers, the Central Limit Theorem.

Evaluation:	One 2-hour written paper	80%
	One in-course test	20%

M25B/MATH2150 STATISTICAL INFERENCE
(4 Credits) Semester 2 Level II

Pre-requisite: M25A/MATH2140

Syllabus: Sampling distributions including χ^2, t *and* F; order statistics; estimation of parameters, likelihood, sufficiency, significance tests, simple linear regression and correlation; analysis of variance; non-parametric procedures, elementary principles of experimental design.

Evaluation:	One 2-hour written paper	80%
	One in-course text	20%

M27A/MATH2210 MATHEMATICS OF FINANCE
(4 Credits) Semester 1 Level II

Pre-requisites: MATH1141, MATH1142, MATH1151, MATH1152 (or M10A/MATH1140 and M10B/MATH1150)

This course is available only to final-year students or those in the Actuarial Science Option.

Syllabus: Introduction to actuarial science; measurement of interest; solutions of problems in interest, basic annuities; more general annuities, yield rates, amortization schedules and sinking funds, bonds and other securities, practical applications.

Evaluation:
One 2-hour written paper	80%
Course work (or in-course test)	20%

M27B/MATH2320 INTRODUCTION TO ACTUARIAL MATHEMATICS
(4 Credits) Semester 2 Level II

Pre-requisites: M21Q/MATH2125(which replaces M21A/MATH2120), M25A/MATH2140 and M27A/MATH2210

Syllabus: Survival distributions and life tables, utility theory. life insurance, life annuities, commutation functions, net premiums and premium reserves, introduction to multiple life functions.

Evaluation:
One 2-hour written paper	80%
Course work (or in-course test)	20%

MATH 2230 ENGINEERING MATHEMATICS II
(3 Credits) Semester 1 Level II

Pre-requisite: MATH 1180

Syllabus: Ordinary differential equations: power series solution, Legendre's equation, Bessel's equation. Laplace transform: convolutions theorem, application to simple initial problems and integral equations; periodic functions. Fourier series. Partial differential equations: wave, diffusion, Laplace equation, Vector calculus: scalar and vector fields, vector calculus. Line integrals; surface integral. Stroke theorem and divergence theorem.

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Evaluation:	One 2-hour paper	75%
	Two Midterm Exams	25%

This course is designed for students *majoring in Electronics Engineering* only.

MATH 2302 LINEAR PROGRAMMING

(4 Credits) Semester 1 Level III

Pre-requisites: MATH1141, MATH1142, MATH1151, MATH1152 (or M10A/MATH1140 and M10B/MATH1150)

Note: cannot be credited with EC337 or its equivalent

Syllabus: Linear programming and duality; mathematical Modeling, mathematical structure of the primal programme; equivalent linear programmes; the simplex tableau and revised simplex techniques, dual linear programmes; complimentary slackness, the duality theorem; networks; computations involving computers and software; sensitivity analysis.

Evaluation:	One 2-hour written paper	70%
	Two in-course tests	30% (15% each)

M30B/MATH3350 APPLIED ALGEBRA II

(4 Credits) Semester 2 Level III

Pre-requisite: M20A/MATH2100

Syllabus: Finite fields, shift registers, algebraic coding theory.

Evaluation:	One 2-hour written paper	80%
	One in-course test	20%

M30Q/MATH3360 MATRIX THEORY

(4 Credits) Semester 1 Level III

Pre-requisites: M20A/MATH2100, M20B/MATH2110

Syllabus: Projections in Rn and Cn; the adjoint of a matrix; special classes of matrices (Hermitian, positive definite, normal and unitary); polynomials of matrices; the Jordan canonical form; the singular value decomposition.

Evaluation: One 2-hour paper 80%
One in-course test 20%

M31E/MATH3341 APPLIED STATISTICS
(4 Credits) Semester 1 Level III

Pre-requisites: M20B/MATH2110, M25A/MATH2140 and M25B/MATH2150

Syllabus: Study is continued on the applied aspects of M25B/MATH2150 such as analysis of variance, regression analysis, design of experiments and categorical data analysis, time series analysis, stochastic processes and decision theory.

Evaluation: One 2-hour written paper 80%
Course work (or in-course test) 20%

M32A/MATH3120 NUMERICAL ANALYSIS
(4 Credits) Semester 2 Level III

Pre-requisites: M21Q/MATH2125

Syllabus: Types of error, finite differences and interpolation, numerical evaluation and integrals, numerical solution of differential equations; roots of equations; linear systems and matrices; construction of algorithms for computation.

Evaluation: One 2-hour written paper 70%
One in-course test 30%

M32C/MATH3370 TOPICS IN OPERATIONS RESEARCH
(4 Credits) Semester 1 Level III

Pre-requisite: M21Q/MATH2125

Note: cannot be credited with EC34L/ECON3037 or EC34M/ECON3038 or its equivalent

Syllabus: Theory of inventory, replacement, sequencing, queuing theory, decision theory and theory of games, simulation, discussion and use of computer software.

Evaluation: One 2-hour written paper 80%
One Midterm Exam 20%

M32Q/MATH3340 SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS

(4 Credits) Semester 1 Level III

Pre-requisite: M21Q/MATH2125, M20B/MATH2110
M21B/MATH2160

Syllabus: First order differential equations, separable and homogeneous types; Pfaffian forms in 2 variables; Bernoulli and Riccati types; existence and uniqueness theorems for the initial-value problem; higher-order equations; Theory of the Wronskian and linear independence of solutions of higher order linear equations. The Euler equation; First order linear systems; Matrix formulation of first order systems for both normal and defective matricies. Fundamental matricies, matrix valued functions and computation of e A; The Laplace Transform; Theory of the Laplace Transform and its use in the solution of differential equations.

Evaluation:

One 2-hour written paper	80%
Course work	20%

M33A/MATH 3250 FLUID DYNAMICS I

(4 Credits) Semester 2 Level III

Pre-requisites: (M 21B) MATH 2120 (M 21A) or M21Q/MATH2125 and MATH 2160 or MATH 2300

Syllabus: Vector analysis: gradient, divergence, curl, Orthogonal curvilinear coordinates: Cartesian, Cylindrical and spherical. ine, surface, volume integrals, Introduction to tensors, kinematics and equations of motion for inviscid fluids, simple inviscid fluids, viscous flows

Evaluation:

One 2-hour paper	75%
Course work	25%

M33D/ MATH 3280 INTRODUCTION TO MATHEMATICAL MODELLING 1

(4 Credits) Semester 2 Level III

Pre-requisites: MATH2300 or M21B/MATH2160, M21Q/MATH2125

Syllabus: Idea of modelling real life situations using Mathematics. Theory of ordinary differential equations (eigenvalues and

eigenvectors) and the linear stability. Application to Medicine (e.g. testing of diabetics). Predator-Prey models (struggle for survival between two species). Epidemiology (e.g. model of the spread of gonorrhoea). A theory of war.

Evaluation:	One 2-hour paper	75%
	Course work	25%

M33Q/MATH3380 ELEMENTARY NUMBER THEORY

(4 Credits) Semester 1 Level III

Prerequisite: M20A/MATH2100, M20B/MATH2110, M21Q/MATH2125

Syllabus: Prime numbers; Unique Factorization in Z and k[x]; arithmetic functions, m, d, w and lattice points; congruence; chinese remainder theorem; quadratic reciprocity law; algebraic numbers and algebraic integers; transcendental numbers; finite fields; diophantine equations; distribution of prime numbers; Chebyshev Theorem; the Riemann-Zeta Function.

Evaluation:	One 2-hour written paper	70%
	Two in-course tests	30%

M33R/MATH3490 COMPLEX ANALYSIS

(4 Credits) Semester 1 Level III

Pre-requisites: M21Q/MATH2125

Syllabus: Differentiability, analyticity; contour integrals, Cauchy's Theorem and its consequences; Taylor series, Laurent series; residue calculus.

Evaluation:	One 2-hour paper	80%
	One in-course test	20%

MATH3700 INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS

(4 Credits) Semester 1 Level III

Pre-requisites: (MATH2300 and MATH2301) or (M21B/MATH2160)

Syllabus: Partial differential equations and classifications – Well-posed problems, classical solutions, initial and boundary value problems - First order linear and quasi-linear partial differential equations – Method of characteristics – Conservation laws – Classification of general second order operators – The wave

equation – D'Alembert method of solution – Laplace's equation – The maximum principle – The heat equation – Separation of variables – Boundary value problems and Sturm-Liouville theory.

Evaluation:
One 2-hour written paper	60%
Two Midterm Exams	20%
Five Written Assignments	20%

MATH3701 PROBABILITY AND STOCHASTIC MODELING

(4 Credits) Semester 2 Level III

Pre-requisites: M25A/MATH2140

Syllabus: Stochastic processes: definition and classification. Modelling with stochastic processes. Markov chains and applications, Theoretical aspects of stochastic simulation, Counting processes and applications, Queues and applications, Practical aspects of stochastic simulation.

Evaluation:
One 2-hour paper	60%
One in-course test	20%
One group project	20%

M34Q/MATH3310 LIFE CONTINGENCIES

(4 Credits) Semester 1 Level III

Pre-requisites: M25A/MATH2140, M25B/MATH2150, M27B/MATH2320

Syllabus: Multiple life functions, multiple decrement model; insurance models including expenses; nonforfeiture, benefits and dividends; valuation theory for pension plans.

Evaluation:
One 2-hour paper	80%
One in-course test	20%

M34R/MATH3320 RISK THEORY

(4 Credits) Semester 2 Level III

Pre-requisites: M21Q/MATH2125, M21B/MATH2160 or MATH2300, M25A/MATH2140, M25B/MATH2150

Syllabus: Review of earlier statistical work; individual risk theory; other frequency distributors; mixed distributions; stop-loss insurance; ruin theory.

Evaluation: One 2-hour paper 80%
One in-course test 20%

M35R/MATH3321 PRINCIPLES OF ASSET/LIABILITY MANAGEMENT FOR ACTUARIAL SCIENCE

(4 Credits) Semester 2 Level III

Pre-requisites: M27AMATH2210,MS28D/MGMT2023, MS38H/MGMT3048

Credits from this course cannot count towards the 16 non-core credits required for a major in Mathematics

Syllabus: Review of Macroeconomics; characteristics of the various types of investments used to fund financial security programmes; traditional techniques of financial analysis used in selecting and managing investment portfolios. The course builds on the material in courses MS28D and MS38H/MGMT3048, introducing further tools and techniques of asset/liability management, general product design, as well as issues of pricing and valuation and asset management.

Evaluation: One 2-hour written paper 80%
Course work (or in-course test) 20%

M36Q/MATH3390 METRIC SPACES AND TOPOLOGY

(4 Credits) Semester 2 Level III

Pre-requisites: M21Q/MATH2125, M20B/MATH2110

Syllabus: Metric spaces, examples; continuity; completeness; topological spaces; compactness; Hausdorffness; connectedness.

Evaluation: One 2-hour paper 72%
One in-course test 28%

MATH3702 RESEARCH PROJECT IN MATHEMATICS

(4 Credits) Semester 2 Level III

Pre-requisites: MATH 2125, MATH2300, Courses prescribed by the supervisor with the nature of the project.

Syllabus: Project topics will be decided upon by faculty members of the Department of Mathematics, if appropriate with input from students. Topics should reflect the area of expertise of the faculty member who will act as supervisor, the interests of the student, and the

objectives of the student's theoretical or computational construction of a model for a developed in the course of the chosen major. Projects may require the investigation of a mathematical topic, the real-world phenomenon using skills students' studies.

Evaluation:	Written thesis	70%
	Oral examination	30%

DEPARTMENT OF PHYSICS

LIST OF UNDERGRADUATE COURSES

CODES	TITLES	CREDIT	SEMESTER	PREREQUISITES
PRELIMINARY				
PHYS0411	PRELIMINARY CONCEPTS IN MECHANICS	3-P	1	CXC/CSEC Physics or GCE "O" Level Physics
PHYS0412	PRELIMINARY CONCEPTS IN OSCILLATIONS AND HEAT	3-P	1	CXC/CSEC Physics or GCE "O" Level Physics
PHYS0421	PRELIMINARY CONCEPTS IN ELECTRICITY AND MAGNETISM	3-P	2	CXC/CSEC Physics or GCE "O" Level Physics
PHYS0422	PRELIMINARY CONCEPTS IN NUCLEAR PHYSICS AND OPTICS	3-P	2	CXC/CSEC Physics or GCE "O" Level Physics
LEVEL 1				
PHYS1411	MECHANICS	3	1	CAPE/A-Level Physics or PHYS0411/0412 and PHYS0421/0422 or CXC Physics with CAPE/ A-Level Maths or MATH0100 and MATH0110
PHYS1412	WAVES, OPTICS AND THERMODYNAMICS	3	1	
PHYS1421	ELECTRICITY AND MAGNETISM	3	2	
PHYS1422	MODERN PHYSICS	3	2	
ELET1400	INTRODUCTION TO ELECTRONICS	3	2	
ELET1405	PRACTICES IN BASIC ELECTRONICS	3	2	Co-requisite: ELET1400
LEVEL 2				
P29A/PHYS2290	INTRODUCTION TO MEDICAL PHYSICS AND BIOENGINEERING	3	1	PHYS1411/1412 and PHYS1421/1422 and MATH0100, MATH0110 or Equivalent
P23E/PHYS2350	MODERN PHYSICS I	3	1	PHYS1411/1412 and PHYS1421/1422 and MATH0100, MATH0110 or Equivalent
P23I/PHYS2385	ELECTRICITY, MAGNETISM AND OPTICS	3	2	PHYS1411/1412 and PHYS1421/1422 and MATH0100, MATH0110or Equivalent
P23J/PHYS2395	COMPUTER APPLICATIONS IN PHYSICS	3	1 & 2	PHYS1411/1412 and PHYS1421/1422 and MATH0100, MATH0110 or Equivalent
P25F/PHYS2560	MATERIALS SCIENCE I	3	1	PHYS1411/1412 and PHYS1421/1422 and MATH0100, MATH0110 or Equivalent
P26A/PHYS2670	FLUID DYNAMICS	3	2	PHYS1411/1412 and PHYS1421/1422 and MATH0100, MATH0110 or Equivalent
ELET2405	PRACTICES IN ELECTRONICS I	3	1	ELET1400 and ELET1405
ELET2415	PRACTICES IN ELECTRONICS II	3	2	ELET1400 and ELET1405
P24J/ELET2410	ANALYSIS AND DESIGN OF ANALOG ELECTRONICS	3	2	PHYS1411/1412 and PHYS1421/1422 and MATH0100, MATH0110 or Equivalent
P24L/ELET2420	SEMICONDUCTOR DEVICES	3	2	PHYS1411/1412 and PHYS1421/1422 and MATH0100, MATH0110 or Equivalent
P24K/ELET2430	DIGITAL CIRCUITS AND MICROPROCESSORS	3	1	PHYS1411/1412 and PHYS1421/1422 or COMP1110 and COMP1120
ELET2450	EMBEDDED SYSTEMS	3	2	ELET2430 or COMP2120
P24F/ELET2460	SIGNALS AND SYSTEMS	3	1	PHYS1411/1412 and PHYS1421/1422 and MATH0100, MATH0110 or Equivalent

CODES	TITLES	CREDIT	SEMESTER	PREREQUISITES
P24G/ELET2470	ELECTRICAL CIRCUIT ANALYSIS	3	1	PHYS1411/1412 and PHYS1421/1422 and MATH0100, MATH0110 or Equivalent
P24H/ELET2480	MODERN COMMUNICATIONS SYSTEMS	3	2	PHYS1411/1412 and PHYS1421/1422 and MATH0100, MATH0110 or Equivalent
LEVEL 3				
P33E/PHYS3350	MODERN PHYSICS II	3	2	PHYS2350
P33K/PHYS3385	ELECTROMAGNETISM	3	2	ELET2480 or PHYS2385
P33L/PHYS3395	ASTRONOMY & COSMOLOGY	3	1	PHYS1411/1412 and PHYS1421/1422 and MATH0100, MATH0110 or Equivalent
PHYS3397	MEDICAL RADIATION PHYSICS AND IMAGING	3	2	PHYS 2290
P39A/PHYS3390	FURTHER MEDICAL PHYSICS AND BIOENGINEERING	3	2	PHYS 2290
P33M/PHYS3399	RESEARCH PROJECT (NON ELECTRONICS)	3	1 & 2	HOD Permission
P35F/PHYS3560	MATERIALS SCIENCE II	3	2	PHYS2560
P35G/PHYS3570	MATERIALS SCIENCE III	3	2	PHYS2560
P36C/PHYS3670	SOLAR POWER	3	1	PHYS3660
P36D/PHYS3680	WIND AND HYDRO POWER	3	1	PHYS2670 and PHYS3660
P36B/PHYS3660	ATMOSPHERE AND CLIMATE	3	2	PHYS1411/1412 and PHYS1421/1422 and MATH0100, MATH0110 or Equivalent; Co-requisite (recommended): PHYS2670
P34L/ELET3412	INSTRUMENTATION AND MEASUREMENTS	3	2	ELET2450
P34K/ELET3420	MICROPROCESSORS	3	1	ELET2430 or COMP2120
ELET3450	SATELLITE COMMUNICATION AND GLOBAL NAVIGATION SATELLITE SYSTEMS	3	2	ELET2460 and ELET2480
P34F/ELET3460	DIGITAL SIGNAL AND IMAGE PROCESSING	3	2	ELET2460
ELET3470	WAVE TRANSMISSION AND FIBER OPTICS	3	1	PHYS2385 or ELET2480
P34G/ELET3480	WIRELESS COMMUNICATION SYSTEMS	3	1	ELET2480
ELET3485	INTRODUCTION TO ROBOTICS	3	2	ELET2450 and ELET2430
P34P/ELET3490	ELECTRONICS PROJECT	3	2	ELET3405 **AND** (ELET2410 or ELET2430 or ELET2450)
P36E/ELET3610	INTEGRATING ALTERNATIVE ENERGY	3	2	ELET2420; Co-requisites: PHYS3670 and PHYS3680

Students majoring in Physics are strongly urged to register for M10C

It's that time of the year again. The Faculty handbook for the upcoming academic year is to go into production. Of such we would like your department to update the current information (attached) to reflect the correct departmental offerings for the next academic year.

For the education option you are asked to leave out the specific education courses and include a note directing such students to the Faculty of Humanities & Education. There are three possible entry qualification (pre-trained, trained –single option science & trained -double option science) for the Science with Education options. The courses they will pursue to fulfill the education requirements for graduation varies and hence it best advised not to include the education courses among our departmental courses. We would appreciate the updated info by the end of April.

Requirements for Majors and Minors

	Major *requires 32 Part II credits as outlined below*		**Minor** *requires 16 Part II credits as outlined below*	
	Core	**Electives**	**Core**	**Electives**
General Physics	MATH 2000, ELET 2420, PHYS 3350, PHYS 3385, PHYS 3395, PHYS 3300 PHYS 2350, PHYS 2385, PHYS 2395 PHYS 2300	PHYS 3399 Any other PHYS course Any level2/3 Electronics	MATH 2000, PHYS 3350 PHYS 3385, PHYS 2350 PHYS 2385, PHYS2395	PHYS 3399 Any other PHYS course Any level 2/3 ELET Course
Energy and Environmental Physics	PHYS 2670, PHYS 3660, PHYS 3670, PHYS 3680, ELET 3610, PHYS 2600, PHYS 3600, PHYS 2350, PHYS2385, PHYS2395, PHYS 2300	**Any one of the following** Math 2000 GGE03203 (with Head's permission) PHYS 3399 Any other PHYS Course Any level 2/3 Electronics	PHYS 3660, PHYS 3670, PHYS 2600, PHYS 2350, PHYS2385, PHYS2395	**Any one of the following** Math 2000 GGE03203 (with Head's permission) PHYS 3399 Any other PHYS Course Any level 2/3 Electronics
Medical Physics	PHYS 2290, PHYS 2670, PHYS 3290, PHYS 3297, PHYS 2200, PHYS 3200, PHYS 2350, PHYS 2385, PHYS 2395, PHYS 2300	**Any one of the following** Math 2000 PHYS 3399 Any other PHYS Course Any level 2/3 Electronics	PHYS 2290, PHYS 3290, PHYS 3297, PHYS2200, PHYS 2350, PHYS2385, PHYS2395	Math 2000 PHYS 3399 Any other PHYS Course Any level 2/3 Electronics
Materials Science	PHYS 2560, PHYS 2670, PHYS 3560, PHYS 3570, PHYS 2500, PHYS 3500, PHYS 2350, PHYS 2385, PHYS 2395	**Any one of the following** Math 2000 PHYS 3399 Any other PHYS Course Any level 2/3 Electronics	PHYS 2560, PHYS 3560, PHYS 2500, PHYS 2350, PHYS2385, PHYS2395	Math 2000 PHYS 3399 Any other PHYS Course Any level 2/3 Electronics

Electronics	ELET2405, ELET2415, ELET2470, ELET2430, ELET2410, ELET3405, ELET3490	*and any four of the following - at least two must be from Level 3* ELET 2460, ELET 2480, ELET 2450, ELET 3450, ELET 3480, ELET 3470, ELET 3460, ELET 3412, ELET 3485	ELET2405, ELET2415, ELET2470, ELET2430, ELET2410	and any other ELET course

Note that ELET2420 is a pre-requisite for ELET3610

All students desirous of registering for any level 2 ELET courses must have passes in ELET1400 and ELET1405. These are strict prerequisites for all level 2 electronics courses.

Some of the new level 3 ELET courses will not be offered in 2010/2011 and will only come on stream in the following year.

For the laboratory components of Preliminary and Level 1 courses, candidates are required to present their practical notebooks for inspection by the examiners at the end of the semester.

Candidates are required to obtain a passing grade for practical work as well as a passing grade for theory for all courses except PHYS3399/P33M and ELET3490/ P34P which are projects. Candidates who do not obtain a passing grade for practical work during the semester will be required to sit a practical exam at the end of the semester. The mark obtained in the practical exam will be combined with the practical course work mark to arrive at the final practical mark.

COURSE DESCRIPTIONS

PRELIMINARY COURSES

PHYS0411 PRELIMINARY CONCEPTS IN MECHANICS

(3 P-Credits) Semester 1 Level 0

Pre-requisite: CXC/CSEC Physics or GCE "O" Level Physics

Syllabus: This is a pre-calculus course covering fundamental of Mechanics.

Mechanics (18 Lectures):

- **Physical Quantities and Units**: Physical quantities and their units with mass, length, time and temperature as fundamental (base) quantities. The nature of the physical quantities: scalars and vectors, components of a vector, addition and subtraction of vectors by means of components.

- K**inematics in One Dimension:** Definitions in displacement, speed (average and instantaneous), velocity (average and instantaneous), acceleration (average and instantaneous). Displacement-time and velocity-time graphs. Graphical interpretation of velocity and acceleration. Distance travelled as area under the velocity-time graph. Derivation of kinematic equations for constant acceleration and their application to solving problems.

- **Projectile Motion:** Introduction to projectile motion as a combination of two one-dimensional motions. Derivative of range, maximum height and time of flight. Derivation of the equation for a parabolic path. Application of the equations for projectile motion. Forces & Newton's Laws of Motions; Concepts of force, mass and inertia. Statement of Newton's Laws. Vector nature of Newton's Second Law of Motion ($\Sigma F_x = ma_x$,$\Sigma F_y = ma_y$).

- **Types of Forces:** Static and kinetic frictional forces. Tension. Gravitational forces. Newton's laws of gravitation. Moment of a force. Equilibrium and conditions for equilibrium. Forces on an object immersed in a fluid. Pressure and upthrust. Archimedes' principle and its derivation using a cubical object. Simple battery hydrometer. Viscosity. Statement of Stokes' law and the concept of terminal velocity.

- **Dynamics of Uniform Circular Motion**: Introduction to the concept of centripetal acceleration and force. Centripetal force and motion around a curve. Satellites in circular orbits.

- **Work and Energy:** Concepts of work and power. Kinetic and potential energies. Work-Energy Theorem. Definition of conservation of force. The principle of conservation of mechanical energy. Concepts of energy conversion and

applications with special references to renewable energy sources such as solar, wind, geothermal and wave.

- **Impulse and Momentum:** Definition of impulse and linear momentum. Impulse-Momentum theorem. The principle of conservation of linear momentum including the derivation using the impulse-momentum theorem. Application to collisions.

Evaluation:	One 2-hour theory examination paper	60%
	Two 1-hour in-course tests (15% each)	30%
	Laboratory work (average of 6 labs)	10%

PHYS0412 INTRODUCTION TO OSCILLATIONS AND HEAT

(3 P-Credits) Semester 1 Level 0

Pre-requisite: CXC/CSEC Physics or GCE "O" Level Physics

Syllabus: This is a pre-calculus course covering fundamental topics in Oscillations and Heat.

Oscillations(6 Lectures)

- **Simple Harmonic Motion:** Introduction to Hooke's Law and definition of simple harmonic motion. Treatment of light spring-mass system as simple harmonic oscillator. The displacement-time graph for SHM and the application of $x = A\cos(\omega t)$ or $x = A\sin(\omega t)$ to interpret the results. Expressions for velocity, acceleration and period for SHM. Energy considerations and conservation for SHM. The Simple Pendulum.

Heat (12 lectures)

- **Temperature and Thermometers:** Thermal equilibrium and the Zeroth law of thermodynamics. Thermal expansion. The Gas laws and absolute temperature. The ideal gas law. The ideal gas law in terms of molecules. Avogadro's number. Kinetic theory. Real gases and change of phase. Vapour pressure and humidity.

- **Heat and internal energy.** Specific heat capacity. Latent heat. Calorimetry. Heat transfer: Conduction, convection and radiation. First law of thermodynamics. First law applied to simple processes including isobaric and isothermal processes.

Evaluation:	One 3-hour theory examination paper	60%
	Two 1-hour in-course tests or equivalent	30%
	Practical work	10%

PHYS0421 INTRODUCTION TO ELECTRICITY AND MAGNETISM

(3 P-Credits) Semester 2 Level 0

Pre-requisite: CXC/CSEC Physics or GCE "O" Level Physics

Syllabus: This is a pre-calculus course covering fundamental topics in Electricity and Magnetism.

Electricity and Magnetism (18 Lectures):

- **Electric field and potential**: Definition of point charge. Coulomb's law. The electric field E. Force on a charge q in electric field E. Electric potential. Charge q traversing electric potential ΔV. Definition of the electron volt. Electric potential energy. Charge q in a conducting sphere. Resulting E and V.

- **Capacitors:** $Q=CV$**.** Capacitance of the parallel plate capacitor and the electric field between charged plates. Dielectrics. Energy stored in a charged capacitor and energy density in terms of E. Capacitors in series and parallel.

- **Ohm's Law:** Resistors in series and parallel. Emf, internal resistance and terminal potential difference of a battery. Kirchhoff's laws and applications. Electric power for DC and AC voltages.

- **Magnetism:** Force on current-carrying wire in a magnetic field. Definition of magnetic field B. Force due to B on charge q moving with velocity v. B due to a long straight current-carrying wire and a solenoid. Force between current-carrying conductors. Definition of the Coulomb and Ampere.

- **Electromagnetic Induction:** Faraday's law of electromagnetic induction. Lenz's law. Motional emf. The inductance L. Energy stored in an inductor and energy density in terms of B. Electric generators.

- **Logic Gates and their truth tables.** P-type and n-type semiconductors. Diodes.

Evaluation:	One 3-hour theory examination paper	60%
	Two 1-hour in-course tests or equivalent	30%
	Practical work	10%

PHYS0422 INTRODUCTION TO NUCLEAR PHYSICS AND OPTICS

(3 P-Credits) Semester 2 Level 0

Pre-requisite: CXC/CSEC Physics or GCE "O" Level Physics

Syllabus: This is a pre-calculus course covering fundamental topics in Nuclear Physics and Optics.

Optics (11 Lectures):

- **Light as Electromagnetic Wave:** The electromagnetic spectrum. The speed of light. Wavefronts and rays. Laws of reflection. Image formation by Concave and convex mirrors. Refraction of light. Index of refraction. Snell's law. Total internal reflection and the critical angle. Examples of application of TIR.

- **Lenses:** Thin converging and diverging lenses. Image formation by lenses using ray diagrams. Linear magnification. Derivation of the lens equation and sign convention. Lenses in combination.

- **Human Eye:** Anatomy of the human eye. Image formation by the eye of objects at varying distances. Defects of vision (nearsightedness and farsightedness) and their correction by lenses.

- **Telescopes and Microscopes:** Angular magnification. Simple and compound microscopes and their angular magnification**.** Astronomical and Galilean telescopes and angular magnification.

Nuclear Physics (7 Lectures)

- **Nuclear Model of the Atom:** Geiger-Marsden experiment. Nuclear structure. The fundamental forces. Binding energy and mass defect. Atomic mass unit. Nuclear stability and natural radioactivity. Fission and fusion.

- **Radioactivity:** Radioactive decay and its equation. Activity. Radioactive dating. Medical and other applications of radioactivity. X-ray production and spectrum. Simple radioactive detectors.

Evaluation:	One 3-hour theory examination paper	60%
	Two 1-hour in-course tests or equivalent	30%
	Practical work	10%

LEVEL I COURSES

PHYS1411 MECHANICS

(3 credits) Semester 1 Level I

Pre-requisites: CAPE/A-Level Physics or (PHYS 0411, PHYS 0412, PHYS 0421 and PHYS 0422) or (CSEC Physics with CAPE/A-Level Maths or MATH0100 and MATH0110)

Syllabus: This is a ***calculus-based*** course covering the basic laws and phenomena in Mechanics

Mechanics (18 Lectures)

- **Scalars and Vectors:** Scalar and Vector products. Vectors and their components. Unit vectors. Vector algebra in terms of their components.

- **Vector Treatment of Motion:** Position vector and particle trajectory. Average and instantaneous acceleration. Application to uniform circular motion. Derivation of a = -w2r. Relative velocity.

- **Work and Kinetic Energy:** General definition of work. Work done by a variable force. One-dimensional analysis. Interpretation of work as area under graph of F vs. x. Proof of Work-Kinetic Theorem.

- **Conservation of Energy:** Conservative Forces. General definition of potential energy and examples of its calculation. Mechanical Energy. Proof of conservation of Mechanical Energy. Non-conservative forces. Conservation of total energy.

- **System of Particles:** Centre of mass for systems of particles and extended objects. Newton's Second Law for systems of particles and extended objects and consequences. Proof of conservation of linear momentum.

- **Rotation:**Description of rotation using θ, w and α . Kinematic equations. Kinematic energy of rotation. Rotational inertia and its calculation for some symmetrical objects. Parallel and Perpendicular Axes Theorem. Torque $\tau = r \times F$ and $\tau = Iw$. Work and Torque.

- **Rolling:**Definition of Rolling. Rolling as a combination of rotation and translation. Rolling as pure rotation about an instantaneous axis. Role of friction in rolling. Kinetics and dynamics of rolling. Definition of Angular Momentum. Newton's Second Law in angular form. Angular momentum for a system of particles. Conservation of angular momentum and its application.

- **Simple Harmonic Motion:**Equation of Linear SHM in differential form and solution as $x = A \sin(\omega t + \theta)$. Definition of angular SHM in terms of torque and angular displacement. Differential equation of motion and its solution. Examples such as physical pendulum (and limiting case of simple pendulum) and suspended oscillating disc.

Evaluation:	One 2-hour theory examination paper	60%
	Two 1-hour in-course tests (15% each)	30%
	Laboratory Report (average of 6 labs)	10%

PHYS1412 WAVES, OPTICS AND THERMODYNAMICS

(3 credits) Semester 1 Level I

Pre-requisites: CAPE/A-Level Physics or (PHYS 0411, PHYS 0412, PHYS 0421 and PHYS 0422) or (CSEC Physics with CAPE/A-Level Maths or MATH0100 and MATH0110)

Syllabus: This is a ***calculus-based*** course covering the basic laws and phenomena in Waves, Optics and Thermodynamics

Waves and Optics (11 lectures)

- **Waves on a String**: Transverse and longitudinal waves; The wave equation. Phase velocity. The sine wave. Power transmission. Superposition principle. Interference. Standing waves and Resonance.

- **Sound waves**: Wave speed (without derivation). Displacement and pressure waves. Beats. Doppler effect for sound waves.

- **Optics**: Huygen's Principle (eg. in Refraction). The electromagnetic wave.

- **Coherence**: Young's experiment. Intensity in double slit interference. Thin film interference (including wedge films and Newton's rings).

- **The Phasor Method**: Single slit diffraction. The diffraction grating.

Heat and Thermodynamics (7 lectures)

- **Temperature. Heat and the First Law**: Measuring temperature. Constant olume gas thermometer. Ideal gas temperature. Measurement of thermodynamic temperature. Absorption of heat by solids and liquids. Molar specific heat. Heat and Work. Calculation of work done by an ideal gas at constant temperature. Differential form of First Law of Thermodynamics and application to selected cases.

- **Kinetic Theory of Gases**: RMS speed, pressure, translational kinetic energy and pressure. Adiabatic equation of an ideal gas.

- **Entropy and the Second Law**: Entropy and the second law of Thermodynamics. Heat engines and refrigerators

Evaluation:	One 2-hour theory examination paper	60%
	Two 1-hour in-course tests (15% each)	30%
	Laboratory Report (average of 6 labs)	10%

PHYS1421 ELECTRICITY AND MAGNETISM

(3 credits) Semester 2 Level I

Pre-requisites: CAPE/A-Level Physics or (PHYS 0411, PHYS 0412, PHYS 0421 and PHYS 0422) or (CSEC Physics with CAPE/A-Level Maths or MATH0100and MATH0110)

Syllabus: This is a ***calculus-based*** course covering the basic laws and phenomena in Electricity and Magnetism.

Electricity & Magnetism (20 Lectures)

- Electric field and potential: The electric field E due to extended charge distributions; Integral and differential expressions relating the electric potential V to the E field; Potential due to a dipole and other extended charge distributions.

- Gauss' Law: Application to problems with spherical, cylindrical and rectangular symmetry.

- Capacitance: Calculation of the capacitance of various capacitors; Energy stored in a capacitor; RC circuits; Time constant

- Magnetism: Magnetic force on current-carrying wire and its application to cases needing calculus treatment; Magnetic torque on a current loop; Magnetic moment of a current loop; The Hall-Effect; Biot-Savart Law and Ampere's Law, and their application to long current-carrying wire, loop, and solenoid.

- Electromagnetic Induction: Faraday's Law and Lenz's Law; Electro-magnetic induction and its applications; Self Induction; Inductance; RL circuits

- Electromagnetic Oscillations and Alternating Currents: LC Oscillation; Damped oscillation in an RLC circuit; Alternating current; Forced oscillation; RLC circuits; Power in AC circuits; the Transformer; Introduction to the Electromagnetic wave.

Evaluation:	One 2-hour theory examination paper	60%
	Two 1-hour in-course tests (15% each)	30%
	Laboratory Report (average of 6 labs)	10%

PHYS1422 ELECTRICITY AND MAGNETISM

(3 credits) Semester 2 Level I

Pre-requisites: CAPE/A-Level Physics or (PHYS 0411, PHYS 0412, PHYS 0421 and PHYS 0422) or (CSEC Physics with CAPE/A-Level Maths or MATH0100 and MATH0110)

Syllabus: This is a ***calculus-based*** course covering the basic laws and phenomena in Modern Physics**.**

Modern Physics (18 Lectures):

- Bohr Atom: Spectral series for hydrogen, Bohr's postulates, derivation of energy levels, blackbody radiation and quantized energy levels (qualitative)

- Waves & Corpuscles: Wave-particle duality; photo-electric effect; Compton-effect; energy, momentum and wavelength of a photon, deBroglie's equation, wave function, particle in a box.

- Special Relativity: Galilean relativity; Einstein postulates; Lorentz transformation; simultaneity; time dilation; length contraction; derivation of velocity transformations, the equation $E^2 = p^2c^2 + m_o^2c^4$ and its applications.

- Particle Physics and the Big Bang: Elementary particles; Three groups; Conservation Laws; Eightfold way; Quarks; Fundamental interactions and their unification; The standard model; The history of the universe.

Evaluation:		
	One 2-hour theory examination paper	60%
	Two 1-hour in-course tests (15% each)	30%
	Laboratory Report (average of 6 labs)	10%

ELET1400 PRACTICES IN BASIC ELECTRONICS I

(3 credits) Semester 2 Level I

Pre-requisites: CAPE/A-Level Physics or (PHYS 0411, PHYS 0412, PHYS 0421 and PHYS 0422) or (CSEC Physics with CAPE/A-Level Maths or MATH0100 and MATH0110)

Syllabus:

Electricity and Magnetism (20 Lectures)

- Electric field and potential: The electric field E due to extended charge distributions; Integral and differential expressions relating the electric potential V to the E field; Potential due to a dipole and other extended charge distributions.

- Gauss' Law: Application to problems with spherical, cylindrical and rectangular symmetry.

- Capacitance: Calculation of the capacitance of various capacitors; Energy stored in a capacitor; RC circuits; Time constant.

- Magnetism: Magnetic force on current-carrying wire and its application to cases needing calculus treatment; Magnetic torque on a current loop; Magnetic moment of a current loop; The Hall-Effect; Biot-Savart Law and Ampere's Law, and their application to long current-carrying wire, loop, and solenoid.

- Electromagnetic Induction: Faraday's Law and Lenz's Law; Electro-magnetic induction and its applications; Self Induction; Inductance; RL circuits.

- Electromagnetic Oscillations and Alternating Currents: LC Oscillation; Damped oscillation in an RLC circuit; Alternating current; Forced oscillation; RLC circuits; Power in AC circuits; the Transformer; Introduction to the Electromagnetic wave.

Modern Physics (16 Lectures)

- Bohr Atom: Spectral series for hydrogen, Bohr's postulates, derivation of energy levels, blackbody radiation and quantized energy levels (qualitative).

- Waves & Corpuscles: Wave-particle duality; photo-electric effect; Compton-effect; energy, momentum and wavelength of a photon, deBroglie's equation, wave function, particle in a box.

- Special Relativity: Galilean relativity; Einstein postulates; Lorentz transformation; simultaneity; time dilation; length contraction; derivation of velocity transformations, the equation $E^2 = p^2c^2 + m_o^2c^4$ and its applications.

- Particle Physics and the Big Bang: Elementary particles; Three groups; Conservation Laws; Eightfold way; Quarks; Fundamental interactions and their unification; The standard model; The history of the universe.

Evaluation:	One 3-hour theory examination paper	70%
	Two 1-hour in-course tests	20%
	Laboratory Report	10%

ELET1405 PRACTICES IN BASIC ELECTRONICS II

(3 credits) Semester 2 Level I

Pre-requisites: CAPE/A-Level Physics or (PHYS 0411, PHYS 0412, PHYS 0421 and PHYS 0422) or (CSEC Physics with CAPE/A-Level Maths or MATH0100 and MATH0110)

Syllabus:

- Week 1: Measuring electronic circuit parameters using oscilloscopes and multimeters:
- Week 2: Determining the characteristics curve of a p-n junction diode and the half wave rectifier.
- Week 3: Evaluating the operation of Full Wave rectifiers and Zener diodes on Voltage regulation
- Week 4: Investigating Transistor circuits: Logic operation; LED drivers
- Week 5: Semiconductor circuit design project. (in-class)
- Week 6: Verifying truth tables of logic gates and combinational circuits
- Week 7: Designing combinational circuit for special applications
- Week 8: Digital circuit design project (in-class)
- Week 9: Investigating circuit theorems
- Week 10: Investigating Op Amp Circuits
- Week 11: Investigating AM and FM communication circuits / systems
- Week 12: Analog Circuit Design Project (in-class)

Evaluation:		
	Nine Laboratory reports (equal weighting)	15%
	Three design projects (3 x 15%)	45%
	One 2-hour final examination paper	40%

LEVEL II COURSES

P23E/PHYS2350 MODERN PHYSICS I

(3 credits) Semester 1 Level II

Pre-requisites: PHYS 1411, PHYS 1412, PHYS 1421, PHYS 1422 and MATH0100, MATH0110 or Equivalent

Syllabus:

Quantum Mechanics (12 Lectures)

- Operators & Eigenfunctions.
- Sch. Equation. Wave Function ψ. Meaning of ψ. Properties of ψ.
- Solution of Sch. Equation: Infinite Potential Well.
  Step Potential.
  Potential Barrier & Tunneling.
  Finite Square Well Potential Well.

Nuclear Physics_(12 Lectures)

- Basic Properties of the Nucleus.
- Liquid Drop Model of the Nucleus.
- α Decay & QM Tunneling.
- Nuclear Reactions
- Interactions of Particles with Matter
- Radiation Detectors
- Radioactive Dating

Evaluation:		
	5 Surprise Quizzes	10%
	2 Pre-announced Tests	10%
	Practicals (6 expts + lab test)	20%
	2-hour Final Exam	60%

P23I/PHYS2385 ELECTRICITY, MAGNETISM AND OPTICS

(3 credits) Semester 2 Level II

Pre-requisites: PHYS1410/P14A, PHYS1420/P14B and MATH0100/M08B, MATH0110/M08C or Equivalent

Syllabus:

Electricity and Magnetism
Electric fields in matter.
D and P vectors
Displacement current, Integral form of charge conservation.
Magnetism in matter
H and M vectors
Maxwell's equations in integral form.
Electromagnetic waves
The plane wave equation.
Poynting vector.

Optics
Polarization of electromagnetic waves
Temporal and spatial coherence.
Visibility of fringes
The diffraction grating.
Resolution of diffraction patterns
Fresnel diffraction and the zone plate.

Evaluation:		
	One 2-hour theory examination paper	70%
	One 1-hour in-course test or equivalent	20%
	Practical work	10%

P23J/PHYS 2395 COMPUTER APPLICATIONS IN PHYSICS

(3 credits) Semester 2 Level II

Pre-requisites: PHYS1410/P14A, PHYS1420/P14B and MATH 0100/M08B, MATH 0110/M08Cor Equivalent

Syllabus**:** Consists of six sections each of which is an introduction

i. to the chosen programming environment and language,
ii. to basic computational methods, including roots of equations, integration and differentiation, the Taylor series, series approximation and limits of accuracy,
iii. to topics in physics which can be readily solved by computers including
    - Projectile Motion
    - Radioactive Decay
    - Gravity and Planetary Motion
    - Oscillations and Waves
    - Gas Laws

iv. to the computational analysis of the above topics. The above topics will require the use of the aforementioned computational methods and an introduction to the computational treatment of first and second order differential equations. For some topics the computational approach will also permit a more realistic analysis, e.g., with the introduction of air friction in projectile motion and 3-body gravitational interaction,
v. to data analysis,
vi. to modelling of physical systems, such as simple climate models, Van der Waals gas.

Evaluation: Overall Theory and Practical to be passed separately:

One 2-hour theory examination paper	60%
One 1-hour in-course test or equivalent	20%
Practical work	20%

ELET2405 **PRACTICES IN ELECTRONICS DESIGNS I**
(3 credits) Semester 1 Level II

Prerequisites: ELET1400 and ELET1405

Co-Requisite: Any level 2 Semester 1 Electronics or Electronics Engineering course

Syllabus: Design and synthesis of digital circuits and microprocessor systems using a hardware descriptive language such as VHDL.
Verification of circuit network theorems and their applications to circuit designs for maximum power transfer and impedance matching.
Application of circuit simulation tools (PSPICE, Workbench, Multisim) to the design and analysis of electronic circuits.
Exploration of interface circuit designs for microcontrollers and their application to embedded system.
Exploration of the behavior of various signals and systems using Mathlab software tool.

Evaluation:

One Design Project	70%
6 Laboratory Reports	30%

ELET2415 **PRACTICES IN ELECTRONICS DESIGNS II**
(3 credits) Semester 1 Level II

Prerequisites ELET1400 and ELET1405

Co-Requisite: Any level 2 Semester 1 Electronics or Electronics Engineering course

Syllabus: Design and analysis of analogue circuits via hardware designs and software simulations;
An interactive web-based design and analysis of a motor controller to perform a specific task.
Application of mathematical modeling to the design of control circuits.
Design and analyses of digital communication circuits and systems.
The use of spectrum analyzers and oscilloscopes to analyze electrical communication signals.
Development and verification of electrical models for semiconductor devices.
Performance analyses of semiconductor devices and circuits via simulation software (PSPICE) and hardware designs.

Evaluation:

Six Laboratory reports (equal weighting)	30%
One major design project	70%

P24F/ELET2460 **SIGNALS AND SYSTEMS**
(3 credits) Semester 1 Level II

Pre-requisites: ELET1400 and ELET1405 and MATH0100/ M08B, MATH0110/ M08C or Equivalent

Syllabus: Terminology and basic concepts used in signals and systems.
Introduction to continuous time systems.
Mathematical functions used to describe continuous time signals. Convolution integral.
Properties of linear time invariant continuous time systems.
Linearity and causality. System differential equations.
Properties and applications of
(i) Fourier Series
(ii) The Fourier Transform
(iii) The Laplace Transform
(iv) Transfer Functions.

The frequency response of systems. System stability.
Application to filters.
State space representation of continuous time systems.

Evaluation:	One 2-hour theory examination paper	60%
	One 1-hour in-course test or equivalent	20%
	Practical work	20%

P24G/ELET2470 ELECTRICAL CIRCUIT ANALYSIS

(3 credits) Semester 2 Level II

Pre-requisites: ELET1400 and ELET1405 and MATH0100/M08B, MATH0110/M08C or Equivalent

Syllabus:

Techniques of Circuit Analysis

Nodal Analysis. Mesh Analysis. Application of the principles of linearity and superposition. Source transformations.
Thevenin's theorem and its use.
Norton's theorem and its application.

Response of Electrical Circuits

The simple RL and RC circuits. Exponential response. The unit-step forcing function.
Natural and forced response of RL and RC circuits.
The source-free parallel RLC circuit and its properties. Overdamping, underdamping and critical damping.
The source-free series RLC circuit and its properties.

Evaluation:	One 2-hour theory examination paper	60%
	One 1-hour in-course test or equivalent	20%
	Practical work	20%

P24H/ELET2480 COMMUNICATIONS SYSTEMS

(3 credits) Semester 1 Level II

Pre-requisites: ELET1400 and ELET1405 and MATH0100/M08B, MATH0110/M08C or Equivalent

Syllabus:

Noise

Noise and Distortion. Noise Temperature and Bandwidth.
Noise Factor and Noise Figure.
Signal to Noise Ratio.

Analog Modulation

Amplitude modulation (AM) and demodulation.
Single sideband systems.
Frequency modulation (FM) and phase modulation.
Carson's rule and its uses.
FM discriminators.
The Phase Locked Loop (PLL).
FM transmitters and receivers.

Digital Modulation
Sampling and Bit rates.
Bandwidth requirements.
Pulse Code Modulation (PCM).
Pulse Width Modulation (PWM).
Delta Modulation (DM).
Time Division Multiplexing.

Wireless Communication
Propagation loss in a simple wireless link.
Principles of Radio and Television. Facsimile and Cellular telephones.
Use of geo-stationary satellites. Global Positioning Systems (GPS).

Evaluation:

One 2-hour theory examination paper	60%
One 1-hour in-course test or equivalent	20%
Practical work	20%

P24J/ELET2410 DESIGN AND ANALYSIS OF ANALOG ELECTRONICS
(3 credits) Semester 2 Level II

Pre-requisites: ELET1400 and ELET1405 and MATH0100/M08B, MATH0110/M08C or Equivalent

Syllabus:

Amplifiers
Review of amplifier characteristics.
Design and analysis of op-amp circuits including inverting, non-inverting and buffer amplifiers. Integrating and differentiating amplifiers. Logarithmic and exponential amplifiers.

Comparators
Design and use of zero-crossing and level-sensing comparator circuits. Schmitt trigger and window-detecting circuits.

Active Filters
Frequency and phase response of different filter types.
Design and use of multiple Butterworth low-pass and high-pass filters. Design and analysis of both low-Q and high-Q bandpass and band-rejection filters.

Power Supplies
Design of simple linear power supplies with capacitor filtering. Simple regulator circuits using op-amps. Principle, design and analysis of switch-mode power supplies.

Oscillators
Conditions for oscillation in a circuit. Design and analysis of oscillators using devices such as timers and PLLs.

Evaluation:	One 2-hour theory examination paper	60%
	One 1-hour in-course test or equivalent	20%
	Practical work	20%

P24K/ELET2430 DIGITAL CIRCUITS AND MICROPROCESSORS
(3 credits) Semester 1 Level II

Pre-requisites: ELET1400 and ELET1405 OR COMP1110/CS11A and COMP1120/CS11B

Note: **This course is the same as CS21S. Students will not receive credit for both courses. Course credits can count towards a major in either Computer Science or Electronics, not both.**

Syllabus:

Number Systems and Codes
Binary, Decimal, Octal and Hexadecimal Systems and their Conversion.
Binary-Coded-Decimal (BCD) code.
Alphanumeric Codes. ASCII.

Combinational Logic Circuits
Sum-of-products expression used in designing logic circuits.
Boolean Algebra and the Karnaugh Map used to simplify and design logic circuits.
Parity generation and checking. Enable-disable circuits.

Flip-Flops and their Applications
RS flip-flops, JK flip-flops, D flip-flops.
Timing Waveforms.
Synchronous and Asynchronous Systems.
Counters and Registers and their uses.

Memory and Programmable Devices
ROM Architecture and Timing.
Programmable ROM.
Flash Memory.
Programmable Logic Devices.
RAM Architecture and Timing.

Evaluation:	One 2-hour theory examination paper	60%
	One 1-hour in-course test or equivalent	20%
	Practical work	20%

ELET 2450 **EMBEDDED SYSTEMS**
(3 credits) Semester 2 Level III

Pre-requisite: ELET2430/P24K or COMP2120/CS21Q or CS21S

Syllabus:
Introduction to the micro-controller.
Digital control with the micro-controller.
Programmer's model and block diagram of the micro-controller.
Programming for real time applications. Assembly language. Instructions set. Data testing and Bit manipulation instructions.
Real time interrupt handling instructions.
Timing system. E-clock. Free-running timer.
Software tools. Hardware simulation programme.
Interfacing analog and control signals to the micro-controller.
Selected Instrumentation modules.
Selected Communication modules.
Selected Robotics modules.

Evaluation:

One 2-hour theory examination paper	60%
One 1-hour in-course test or equivalent	20%
Practical work	20%

P24L/ELET 2420 **SOLID STATE ELECTRONIC DEVICES**
(3 credits) Semester 2 Level II

Pre-requisites: ELET1400 and ELET1405 and MATH0100/M08B, MATH0110/M08C or Equivalent

Syllabus:

The Bipolar Junction Transistor (BJT)
Physical Structure and modes of operation.
Analysis of BJT Amplifier Circuits.

Field Effect Transistor/(FETs)
Structure and physical properties. I-V characteristics.
MOSFETs and JFETs.
Analysis of FET amplifier circuits.

Regulating Devices
Structure and characteristics of Zener diodes, Schottky diodes and SCRs.

Microwave Diodes
The structure, principle of operation and characteristics of:
Gunn diodes
Impatt diodes
Trapatt diodes
Laser diodes.

Evaluation:	One 2-hour theory examination paper	60%
	One 1-hour in-course test or equivalent	20%
	Practical work	20%

P25F/PHYS2560 **MATERIALS SCIENCE I**

(4 credits) Semester 1 Level II

Pre-requisites: PHYS1410/P14A, PHYS1420/P14B and MATH0100/M08B, MATH0110/M08C or Equivalent

Syllabus: Classification of materials. Modern materials needs.

Atomic Structure & Inter-Atomic Bonding

Atomic structure. Electron configurations.
Periodic table and the concepts of electro-negativity and electro-positivity. Bonding forces and energies.
Primary inter-atomic bonds: ionic, covalent and metallic.
Secondary bonding or Van der Waal's bonding.
Fluctuating induced dipole bonds, polar molecule-induced dipole bonds, permanent dipole bonds.

Crystalline Structure

Concept of unit cells. Metallic crystal structures, face-centred cubic structure, body-centred cubic structure, hexagonal close-packed structure.
Crystal systems and lattice parameters. Crystallographic directions and planes.
Crystalline and non-crystalline materials.
X-ray diffraction. Bragg's law and diffraction techniques.
Imperfections in solids: point defects, impurities, dislocations, linear defects.
Diffusion: steady-state diffusion and Fick's First Law.
Factors influencing diffusion.

Theory of Elasticity

Concepts of stress and strain. Stress-strain behaviour and moduli of elasticity.
Anelasticity (qualitative). Plastic deformations.
Tensile properties: yield strength, tensile strength, ductility, resilience, toughness.

Evaluation:	One 2-hour theory examination paper	70%
	One 1-hour in-course test or equivalent	20%
	Practical work	10%

P26A/PHYS 2670 **FLUID DYNAMICS**

(4 credits) Semester 1 Level II

Pre-requisites: PHYS1410/P14A, PHYS1420/P14B and MATH0100/M08B, MATH0110/M08C or Equivalent

Syllabus:

Vector Analysis and Basic Mathematical Tools

Physical characteristics of the fluid state. Introduction to laminar and turbulent flows.

Kinematics and Dynamics of Fluid Motion: Equation of Continuity

Definitions of in-compressible and compressible fluids. Euler's equations of motion. Bernoulli's equation. Simple applications of Bernoulli's equation. Momentum equation for steady fluid flow. Momentum theory of a propeller and a wind turbine. Introduction to Navier-Stokes equation, without derivation. Concept of boundary layer and turbulence. Derivation of logarithmic wind velocity profile. Transport processes in the boundary layer: Vertical transport of kinetic energy, mass, heat, moisture and pollutants. Atmospheric dynamics-Apparent forces (Coriolis and centrifugal) in rotating coordinate systems and their effects. Geostrophic flows. Qualitative introduction to Ekman layer. Basic treatment of Rossby waves and Kelvin waves.

Evaluation:

One 2 -hour theory examination paper	60%
One 1-hour in-course Test or equivalent	20%
Practical work	20%

P29A/PHYS2290 **INTRODUCTION TO MEDICAL PHYSICS AND BIOENGINEERING**

(4 credits) Semester 2 Level II

Pre-requisites: PHYS1410/P14A, PHYS1420/P14B and MATH0100/M08B, MATH0110/M08C or Equivalent

Syllabus:

Bone: skeleton, properties, structure, biomechanics.
Muscle: function, structure, contraction, biomechanics.
Cardiovascular system: structure, function, biomechanics of the heart.
Nervous system: structure, function, biophysics of conduction.
Feedback: control system in the body, homeostasis.
Biomedical potentials, electroculogram, electroencephalogram and electromygram, recording, amplification, equivalent circuits, sensing, visual and auditory systems.
Medical radiation sources: application of radionuclide sources and radioisotope generators in medicine.

Radiation interaction and energy loss with matter. Attenuation of gamma and X-rays.
Radiation safety.

Evaluation:	One 2-hours theory examination paper	60%
	One 1-hour in-course test or equivalent	20%
	Practical coursework	20%

LEVEL III COURSES

P33E/PHYS3350 MODERN PHYSICS II
(4 credits) Semester 2 Level III

Pre-requisite: PHYS2350/P23E

Syllabus:

Relativity
Einstein's postulates.
Derivation of Lorentz transformation equations.
Events in relativity. Simultaneity, time dilation, length contraction. Addition of velocities. Minkowski's space-time diagram. Space-time interval. Twin paradox. Four-vector formalism. Doppler effect.

Derivation of relativistic mass. Momentum and kinetic energy. Relativistic collisions. Creation and decay of particles.

Quantum Mechanics
Operators and commutators.
Born's interpretation of probability density.
3-D infinite potential well. Solution for simple harmonic oscillator. Hydrogen-like atom. Perturbation theory: non-degenerate and degenerate. Variational principle.

Evaluation:	One 2-hour theory examination paper	70%
	One 1-hour in-course test or equivalent	20%
	Practical work	10%

P33K/PHYS 3385 ELECTROMAGNETISM
(4 credits) Semester 2 Level III

Pre-requisites: ELET2480/P24H or PHYS2385/P23I

Syllabus**:**

Review of Vector Analysis and Vector Calculus
Derivation of Maxwell's equations in differential form.
Equation of continuity. Poisson's equation.
Derivation of the electro-magnetic wave equation.
Solution for plane waves in dielectrics.
Electro-magnetic nature of light.

Energy flow and the Poynting vector. Boundary conditions. Reflection and refraction of electro-magnetic waves at dielectric boundaries. Derivation of Snell's law. Fresnel's equations. Total reflection. Brewster's angle. Transmission and reflection co-efficients.
Propagation of electro-magnetic waves in conducting media.
Skin depth. Energy flow in conductors. Reflection of Electro-magnetic waves by a conductor.
Dispersion of electro-magnetic waves in various media.
Sources of electro-magnetic waves.

Evaluation: (Overall Theory and Practical to be passed separately):

One 2-hour theory examination paper	70%
One 1-hour in-course test or equivalent	20%
Practical work	10%

P33L/PHYS3395 ASTRONOMY & COSMOLOGY

(4 credits) Semester 1 Level III

Pre-requisites: PHYS1410/P14A, PHYS1420/P14B and MATH0100/M08B, MATH0110/M08C or Equivalent

Syllabus**:** The celestial sphere. Celestial mechanics. Co-ordinate systems. Sidereal Time.
Telescopes and their capabilities.
The Solar System.
Stellar Radiation, Magnitudes, Classification. Stellar Structure. Binary Stars.
Distance measurements and the distance ladder. HR diagram.
Stellar Evolution and Endpoints.
The Milky Way. Other galaxies.
Cosmological Distance methods.
The structure of the Universe.
Introductory Cosmology.
Simple Cosmological Models.
Observational Cosmology.
The Age of the Universe.
The Big Bang.

Evaluation: (Overall Theory and Practical to be passed separately):

One 2-hour theory examination paper	70%
One 1-hour in-course test or equivalent	20%
Practical work	10%

P33M/PHYS3399 RESEARCH PROJECT (NON ELECTRONICS)

(4 credits) Semester 1 or 2 Level III

Pre-requisites: Students must (i) qualify for one of the Physics Majors offered by the department; (ii) get permission from the Head, and (iii) satisfy any additional criteria deemed necessary by the department.

Syllabus: Students will consult staff members with whom they wish to work about possible topics. If pre-requisites are met and permission granted, the staff member will be assigned to supervise the student. Staff member will assign reading list and meet weekly with the student. Staff members may assign research tasks to teach particular skills. Written report and oral presentation as a seminar on the approved topic are required at end of course.

Evaluation:		
	Course Work (Assignments)	30%
	Oral Presentation	10%
	Written Report	60%

P34F/ELET3460 DIGITAL SIGNAL PROCESSING

(4 credits) Semester 2 Level III

Pre-requisite: ELET 2460/P24F

Syllabus:
Overview of a Digital Signal Processor.
Transfer Functions of Filters.
FIR vs. IIR. Linear phase FIR.
All Pass filters.
Implementing FIR filters.
Window approach.
Linear phase types 1-4.
Optimal fit Algorithms.
Implementing IIR filters.
Bi-linear and Impulse Invariant Transforms.
Direct Form 1 & 2 Structures.
Effects of Finite Number Operations.
Use of second order sections.
Noise and instability.
Generating signals with DSPs.
Structure use of Adaptive Filters.
Implementing of FFT on a Digital Signal processing platform.

Evaluation:		
	One 2-hour theory examination paper	60%
	One 1-hour in-course test or equivalent	20%
	Practical work	20%

P34G/ELET3470 **EM TRANSMISSION AND PROPAGATION**
(4 credits) Semester 2 Level III

Pre-requisite: ELET2420/P24L or ELET2480/P24H

Syllabus:

Transmission Lines
Distributed circuit co-efficients. EM waves on a line. Characteristic impedance. Reflection co-efficient. Standing Wave Ratio. Input impedance of a line.
Half-Wave and Quarter-Wave Transformers. Matching stubs.

Wave-Guides
Wave-Guide Modes and Guide Wavelength. Cut-off frequency. The Wave-Guide equation. Group and phase velocity in Wave-Guides. E and B fields in Wave-Guides.
Optical Fibres. Single and multi-mode fibres. Dispersion and loss in fibres.

Antennas
The elementary dipole. Near and far field. Radiated power. Radiation resistance. Radiation pattern. Power gain. Effective aperture.
The half-wave dipole and other harmonic antennas. Effect of ground reflection. Directors and reflectors. Yagi antennas. Travelling wave antennas. V antennas. Loop antennas and other common antennas.
Matching antenna and transmission line. T match, Gamma match and Delta match.

Propagation
Ground Wave propagation. Tropospheric scatter. Sky wave propagation.
The structure of the ionosphere and its effect on propagation.
The need for satellite communication.

Evaluation:

One 2-hour theory examination paper	60%
One 1-hour in-course test or equivalent	20%
Practical work	20%

P34H/ELET3150 **DIGITAL COMMUNICATIONS**
(4 credits) Semester 1 Level III

Pre-requisites: ELET2460/P24F and ELET2480/P24H

Syllabus:

Source Coding
Discrete information source.
Source entropy.
Huffman coding.

LZW and other coding methods.
Continuous information source.
Sampling and quantization.
Companding.
Linear predictive coding.
Model coding.
Transform coding.
Channel coding.
Run length coding.
Error correction coding.

Waveform Generation
Binary vs. M-ary waveforms.
Bandpass vs. baseband waveforms.
Modulation schemes.
BPSK and MPSK. QAM. BFSK and MFSK. MSK.

Channel Properties
Noise. Bandwidth and inter-symbol interference.
Frequency and delay distortion.

Detection and Decision
Envelope detection.
Co-herent detection.
Hard and soft decisions.
Run length and error decoding.

Spread Spectrum Methods
Direct sequence spread spectrum.
Frequency hopped spread spectrum.
Multiple access methods TDMA and CDMA.

Practical Applications of Digital Communications
The global telephone network.
Data modems.
Cable modems.
ADSL systems.
Terrestrial microwave networks.
Satellite networks.
Optical fibre networks.
Computer LANs and WANs.

Evaluation:	One 2-hour theory examination paper	60%
	One 1-hour in-course test or equivalent	20%
	Practical work	20%

P34K/ELET3420 **MICRO-PROCESSORS**
(4 credits) Semester 1 Level III

Pre-requisite: ELET2430/P24K or COMP2120/CS21Q or CS21S

Syllabus: Classification of micro-processors. CISC processors, RISC processors, Superscalar processors, Multi-threaded processors and Data flow processors.

The Central Processor.
Processor Organization.
Processor Architecture.
Real Architectures.
Intel Processors.
Motorola Processors.
Other Processors.
Low-level Programming, Intel Assembly language. I/O interfaces and PC Architecture. Principles and case studies.

Evaluation:

One 2-hour theory examination paper	60%
One 1-hour in-course test or equivalent	20%
Practical work	20%

P34L/ELET3430 **INSTRUMENTATION**
(4 credits) Semester 2 Level III

Pre-requisite: ELET 2410/P24J

Syllabus: Industrial measuring systems.
Analog and Digital Signal conditioning.
Data acquisition:
The principle, structure and use of
– Thermal sensors
– Pressure sensors
– Load cells and Strain gauges
– Position sensors
– Flow sensors
– Optical sensors
– Intelligent sensors.

Evaluation:

One 2-hour theory examination paper	60%
One 1-hour in-course test or equivalent	20%
Practical work	20%

P34P/ELET 3490 **ELECTRONICS PROJECT**
(4 credits) Semesters 1 and 2 Level III

Pre-requisite: ELET2410/P24J or ELET2411/P24K or ELET2450

Syllabus: Projects will normally be selected from a list approved by the academic staff.

A supervisor is assigned to each project which requires about 100 hours of work done over two semesters. Design, testing and construction of selected electronics hardware and/or software may be included in the work.

Evaluation:		
	On-the-job performance	60%
	Written report	30%
	Oral presentation	10%

P35F/PHYS3560 **MATERIALS SCIENCE II**
(4 credits) Semester 2 Level III

Pre-requisite: PHYS2560/P25F

Syllabus:

Fracture Mechanics
Fracture energy and structure strength. Fracture toughness. Interpretation of experimental results.
Weibull modulus and quality control. Influence of micro-structure.
Fatigue, stress intensity relationship. Safe-life prediction.

Thermodynamics of Solids
Single and multi-phase materials. Free energy. Gibbs phase rule, equilibrium phase relationships.
Eutectic, peritectic, eutectoid and peritectoid reactions. Ternary phase diagrams. Solidification processes and solidification defects.
Mechanics of diffusion. Self and mutual diffusion.

Evaluation:		
	One 2-hour theory examination paper	70%
	One 1-hour in-course test or equivalent	20%
	Practical work	10%

P35G/PHYS3570 **MATERIALS SCIENCE III**
(4 credits) Semester 2 Level III

Pre-requisite: PHYS2560/P25F

Syllabus:

Metal Physics
Ferrous engineering alloys, iron-carbon system.

Heat treatment of steels, austenitizing conditions, isothermal and continuous cooling transformation, tempering and hardening ability.
Non-ferrous engineering alloys. Refractory metals and their uses. Corrosion of engineering materials, electro-chemical nature of corrosion. Methods of corrosion abatement.

Ceramics, Polymeric Materials and Composites
Structural and electronic ceramics. Grain growth, sintering and vitrification. Mechanical, thermal, electrical and magnetic properties.
Organic and in-organic polymers. Structural considerations. Mechanical behaviour of polymers.
Principles of fibres and particle reinforcement. Matrix considerations. Concrete, asphalt and wood.

Evaluation:		
	One 2-hour theory examination paper	70%
	One 1-hour in-course test or equivalent	20%
	Practical work	10%

P36B/PHYS3660 ATMOSPHERE AND CLIMATE
(4 credits) Semester 2 Level III

Pre-requisites: PHYS1410/P14A, PHYS1420/P14B and MATH0100/M08B, MATH0110/M08C or Equivalent

Co-requisite (recommended): PHYS2670/P26A

Syllabus**:**

Survey of the Atmosphere
Composition of the lower, middle and upper atmosphere.
Diffusive equilibrium.
Photo-chemical processes.
Thermal structure.

Atmospheric Thermodynamics
Dry air-adiabatic processes, potential temperature, entropy, equation of state.
Moist air-Clausius-Clapeyron equation, virtual temperature, vapours pressure, relative humidity, condensation.
Atmospheric aerosols, clouds-formation and growth.

Radiative Transfer
Absorption and emission of radiation by molecules.
Greenhouse effect, global warming.
Absorption by ozone.
Quantitative description of radiation.

Atmospheric Dynamics (qualitative derivations)
Apparent forces in a rotating co-ordinate system.
Real forces.
Horizontal equations of motion.
Geostropic approximation.
Gradient wind.

General Circulation of the Tropics
Brief overview of general circulation.
Hadley and Walker cells.
ITCZ. El Nino-Southern Oscillation, trade winds, climate variability.

Evaluation:		
	One 2-hour theory examination paper	60%
	One 1-hour in-course test or equivalent	20%
	Practical work	10%
	Term paper	10%

P36C/PHYS3670 **SOLAR POWER**
(4 credits) Semester 1 Level III

Pre-requisite: PHYS3660/P36B

Syllabus**:**

Solar Radiation
Solar Spectrum.
Measurements.
Global Distribution.
Solar Radiation distribution in Jamaica, seasonal variation.
Effect of Tilt Angle.

Flat Plate Collection and Systems
Analysis of Heat Transfer and Efficiency in a Flat-plate Solar Thermal Collector.
Passive Solar Design.

Photovoltaic Cells
Semi-conductor Physics.
Spectral response of Solar Cells.
PV Cell Characteristics.
Single Cell Design, Construction and Efficiency.
Amorphous Silicon Cells.
Thin Film Technologies.
Multi-junction Cells.
Modules and Arrays.
Manufacturing Techniques and Costs.
Applications.
System Sizing.

System Performance.
Electrical Integration.
Building Integration.
Feasibility Study.

Other Applications
OTEC.
Absorption Refrigeration.

Evaluation:		
	One 2-hour theory examination paper	55%
	One 1-hour in-course test or equivalent	15%
	Practical work	10%
	Project report & presentation	20%

P36D/PHYS3680 WIND AND HYDRO POWER
(4 credits) Semester 1 Level III

Pre-requisites: PHYS2670/P26A and PHYS3660/P36B

Syllabus:

Wind Power
Brief overview of global wind power.
Introduction to boundary layer. Turbulence, roughness length and wind velocity profiles (without proof).
Origin and nature of atmospheric winds. Wind types (breezes and relief). Beaufort wind scale and wind classes.
Wind resource assessment: Anemometry and site prospecting.
Introduction to basic statistics: Weibull and Rayleigh distributions.
Wind energy and power density calculations.
Components and basic operation of WEC (Wind Energy Conversion) systems and turbine types.
Introduction to conversion of wind power to electrical power.

Turbine Performance
Air-foil lift, drag and stall. Capacity factor, expected energy, efficiency, power losses and turbulence, tip losses. Effect of blade pitch and stall on performance.
Planning aspects of wind farms: Investment strategies. Estimation of cost of electricity from a typical stand alone turbine or wind farm.
Environmental assessment: Noise, visual impact, and other environmental impacts.
Grid and rural power: large and small turbines.
Introduction to wind hybrid systems (solar, diesel, hydro) for small communities.
Application of wind power to water pumping and irrigation.

Energy Storage: Batteries and flywheels.

Basics of Hydro-Power
Introduction to hydrologic (water) cycle, and a brief overview of global hydro-power.
Hydro-resource assessment.
Brief treatment of the principle of Pelton, Francis and Kaplan Turbines.
Introduction to conversion of hydro-power to electrical power.
Turbine characteristics, losses.

Energy Storage: Pumped storage facilities.

Evaluation:

One 2-hour theory examination paper	60%
One 1-hour in-course test or equivalent	15%
Practical work	15%
Case study (hydro-power)	10%

P36E/ELET3610 INTEGRATING ALTERNATIVE ENERGY
(4 credits) Semester 2 Level III

Pre-requisites: ELET2420/P24L

Co-requisites: PHYS3670/P36C and PHYS3680/P36D

Syllabus:

Stand Alone versus Grid Connected Power Generation
Integrating problems.
Structure of electrical energy systems.
Requirement for multiple voltages.

Generator Characteristics and Usage
Synchronous generator (SG) operating range and control capabilities.
Active power characteristic of SGs and stability.
The induction generator equivalent circuit and operating range.
Comparison between synchronous and induction generators for renewable energy (RE) applications.

Networking
Apparent, active and reactive power in alternating current (AC) systems.
Transmission line characteristics and equivalent circuits.
Transfer of power over high and low voltage transmission lines.
The load angle.
Connection of alternative energy (AE) Sources to Large Networks.

Control
Load flow analysis.
Frequency control of large and of stand alone systems.
Reactive power and voltage control.
Automatic voltage regulators.

Reactive power management.
The control of AE generators.

Power Electronic Interfaces
Power semi-conductor devices.
Diode bridge rectifier.
Thyristor bridge.
Three-phase converters.
DC-DC converters.
Converter control systems.
Inverters.

Introduction to Policies
Laws regulating supply of electricity.
Environmental Impact Assessment.
The Kyoto Protocol and Emission Targets.
Carbon Trading.
Energy scenarios.
Energy generation and distribution in Jamaica.

Introduction to Economics
Life Cycle Analysis.
Economic tools and valuation.
Wholesale and Retail Prices.
Tracking Energy Costs.

Evaluation:		
	One 2-hour theory examination paper	60%
	One 1-hour in-course test or equivalent	15%
	Field trip reports	15%
	Practical work	10%

P39A/PHYS3390 FURTHER MEDICAL PHYSICS AND BIOENGINEERING
(4 credits) Semester 2 Level III

Prerequisite: PHYS2290/P29A

Syllabus:

Biomechanics in Orthopaedics
Examination of the action of forces on Bone and Tissue with a heavy focus on the Spine.
Mechanical aspects of Fractures: Occurrence and Repair
Joint Replacement
Analysis of Gait
Biomechanics and Orthopaedic Disorders

Biomechanics in Cardiology
The role of Biomechanics in Cardiology
Mechanics of Blood Vessels and Cardiac Muscles
Artificial Heart Valves

Biomaterials
The need for biomaterials and their use
Properties of different biomaterials
Preparation of biomaterials for implantation

Radiation
Interaction with matter. Medical radiation sources and their pplications in diagnosis and therapy (focus on detectors, scanners and image processing in the medical environment)

Nuclear medicine - radioisotope tracer studies and system modelling. Radiation safety. Kinetic and blood flow studies.

Evaluation: One 2-hour theory examination paper
One 1-hour in-course test or equivalent
Practical work

PHYS 3397 MEDICAL RADIATION PHYSICS AND IMAGING
(4 credits) Semester 2 Level III

Pre-requisites: PHYS2290/P29A

Syllabus: **Physics of X-ray Diagnostic Radiology:**
X-ray Production and interaction with matter
Operation and diagnostic of X-ray tubes, Instrumentation for X-ray imaging,
X-ray Computed Tomography,

Radioactivity and Nuclear Medicine:
Physics of Nuclear medicine,
Radioactivity and radionuclides,
Single Photon Emission Computed Tomography,
Positron Emission Tomography

Physics and Instrumentation of diagnostic medical ultrasonography:
Principles of ultrasonic imaging,
Instrumentation for diagnostic ultrasonography,
Image characteristics,
Medical applications of ultrasound.

Physics of Magnetic Resonance imaging:
Quantum mechanics and nuclear magnetism,
Instrumentation,
Magnetic Resonance Imaging,
Magnetic resonance angiography,
Medical applications.

Radiation dosimetry and protection:
Principles of radiation protection,
Units of exposure and dose,
Radiation detection and measurement.

Evaluation:

One 2-hour paper	50%
One 1-hour Theory Coursework	10%
Practical Coursework	40%

BACHELOR OF SCIENCE IN ELECTRONICS ENGINEERING

Years of Study: 3 years

Minimum number of credits for graduation: 103 credits (including 9 credits from 3 FD courses)

Admission Requirements:
In addition to fulfilling general requirements for admission into the Faculty of Pure and Applied Sciences, applicants must have passes in both units of Mathematics and Physics at CAPE or Advanced level with no less than a Grade 3 or C; or passes in PHYS0410/P04A, PHYS0420/P04B, MATH0100/M08B and MATH0110/M08C with no less than a B; or equivalent qualification from a community college, CASE, UTECH or another university with GPA of 3 or higher.

GPA Requirements
As is consistent with the Faculty of Pure and Applied Sciences, upon completion of the required courses for the degree, candidates must possess a GPA of 1 or greater in order to satisfy the graduation requirements. The GPA for this engineering option is calculated from ALL COURSES from Level 1 to Level III that constitute the candidate's degree. The actual GPA will determine the class of degree received and is consistent with the other programmes within the Faculty of Pure and Applied Sciences.

Overview of the Programme:
The Bachelor of Science degree in Electronics Engineering is designed to serve students who are desirous of pursuing a career path in Telecommunications and Industrial Instrumentation. This three (3) year programme is structured in such a way that during the first year, students are exposed to foundation courses in electronics and electrical engineering, physics, computer science, engineering mathematics, ethics and professional practices. The second year courses provide the core courses required for this engineering discipline. All students are required to complete a 1-year extensive project during the final year along with the introduction to engineering

management and accounting systems course, and electromagnetism. Students must select only one option - Telecommunications or Industrial Instrumentation.

During each semester of this 3-year program, a teaching laboratory and project design course must be taken by each student. The practical application and testing of the concepts presented in the theoretical classes for that semester will be explored in these lab sessions. Engineering students learn through a combination of design and lab work. This mix of theory and practical application allows students to think things through and then apply their ideas in a variety of real life situations. Students also learn to diagnose problems and develop a variety of solutions.

Definition Course Codes

ECNG	Electrical and Computer Engineering (St Augustine Campus)
ELNG	Electronics Engineering (Mona)
ENGR	Faculty of Engineering (St. Augustine)
ELET	Electronics (Mona)
COMP	Computer Science (Mona)
MATH	Mathematics
PHYS	Physics (Mona)
MGMG	(Management Studies (Mona)

Note: The letter 'E' or 'C' preceding the credit allocation indicates Examination by written papers or by course work, respectively.

COURSE OUTLINE

LEVEL 1

Semester 1 (16 Credits)

Course Code	Title	Number of credits
ECNG 1000	Electrical Circuits	E 3
ECNG 1009	Introduction to Programming	C 3
ECNG 1012	Engineering Science and Technology	C 4
MATH 1180	Engineering Mathematics 1	E 3
FOUN 1001	English for academic Purposes	E 3

Semester 2 (16 Credits)

Course Code	Title	Number of credits
ENGR 1000	Introduction to Engineering	E 3
ELET 1400	Introduction to Electronics	E3
ELET 1405	Practices in basic Electronics	C/E 3
ELNG 1101	Physics for Engineers	E3
COMP 2160	Object Oriented Programming	E4

Note: The other Foundation Courses may be taken at any time during the undergraduate course of study.

LEVEL 2

Semester 1 (15 Credits)

Course Code	Title	Number of credits
ELET 2405	Practices in Electronics 1	C3
ELET 2430	Digital Circuits and Microprocessors	E3
ELET 2450	Embedded Systems	E3
ELET 2460	Signals and Systems	E3
MATH 2230	Engineering Mathematics 2	E3

Semester 2 (15 Credits)

Course Code	Title	Number of credits
ELET 2415	Practices in Electronics 2	C3
ELET 2410	Analysis and Design of Analogue Circuits	E3
ELET 2420	Semiconductor Devices	E3
ELET 2480	Modern Communications	E3
ECNG 2009	Control Systems	E3

Summer Apprenticeship Internship in Approved Industry (between Level 2 and Level 3)

Summer Apprenticeship is meant to expose students to the practical applications of the concepts learnt in classes and is expected to be a source of motivation and inspiration. It also provides an opportunity to identify potential projects.

LEVEL 3 (35 credits)

Students taking Level 3 courses must

1. Register for all courses listed as compulsory and core (for chosen option).
2. Select one of the following options: Telecommunications or Industrial Instrumentation

COMPULSORY COURSES

YEAR-LONG (6 Credits)

Course Code	Title	Number of credits
ELNG 3010	Special Project	C6

One Semester (11 Credits)

Course Code	Title	Number of credits
ECNG 3021	Introduction to Engineering Management and Accounting Systems	E4
MGMG	New Venture Creation and Entrepreneurship	E3
PHYS3385	Electromagnetism	E4

Core Courses (12 credits)

Option 1: Telecommunications

Course Code	Title	Number of credits
ELET 3480	Wireless Communication Systems	E 3
ELET 3470	Wireless Transmission & Fiber-Optics	E 3
ELNG 3050	Broadband Networks	E 3
ELNG3015	Practical Analysis of Telecommunication Circuits and Systems	C 3

Option 2: Industrial Instrumentation

Course Code	Title	Number of credits
ELET 3412	Instrumentation and measurements	E 3
ELNG 3030	Power Electronics and Protection Circuits	E 3
ELNG 3040	Industrial Automation	E 3
ELNG 3025	Practical Analysis of Industrial Controllers	C 3

Electives (6 credits)

Choose any two of the following:

Course Code	Title	**Number of credits**
ELET 3485	Introduction to Robotics	E 3
ECNG 3016	Advanced Digital Electronics	E 3
ELET 3460	Digital Signal Processing	E 3
ELNG 3060	Power Plant Instrumentation	E 3
ECNG 3028	Introduction to Process Control	E 3
ELET 3450	Satellite Communication & Global Navigation Satellite Systems	E 3

Some Rules and Regulations:

i. In addition to other requirements, all three (3) Foundation courses must be passed before the student is allowed to graduate
ii. A minimum of 104 credits (including 9 credits from the three foundation courses) is required to graduate from the Electronics Engineering BSc. Programme
iii. The maximum course loading normally allowed per semester is 18 credits
iv. Registration for Level 3 courses will not be approved until credits for all level 1 courses and have been attained. Additionally, all required prerequisite level 2 courses must be completed (passed).

COURSE DESCRIPTIONS

LEVEL I COURSES

ECNG1000 **ELECTRICAL CIRCUITS**
(3 credits) Level I

Prerequisites:

Syllabus: Introduction to signals and systems, modeling of electrical systems and devices, network theorems, nodal and loop analysis, circuits with reactances. Transient response, AC steady state, phasor analysis of single phase systems. Lab exercises will be assigned in the ECNG1012 electrical laboratory sessions.

Evaluation:

One 3hr final exam	90%
One in-course exam	10%

ENGR 1000 **INTRODUCTION TO ENGINEERING**
(3 credits) Level I

Prerequisites:

Syllabus: An introduction to the following: historical development of engineering; formation of the engineer; roles and functions of engineers and professional organizations; creative and critical thinking; technical communication; Ethics; liability; safety; legal forms of association; contracts, company law; intellectual property; engineering economics and business operations; infrastructure; energy systems and economics, environment and sustainable development; approaches to design.

ECNG 1009 **INTRODUCTION TO PROGRAMMING**
(3 credits) Level I

Prerequisites:

Syllabus: Standard algorithms and general problem-solving using algorithms. Number representations and binary number manipulation. Algorithm coding on a language independent platform and in C++

Evaluation:

Six (6) lab base course work	24%
Two (2) in-course assessment	46%
Ten (10) tutorials/assignment	30%

ECNG 1012 **ENGINEERING SCIENCE AND TECHNOLOGY**
(4 credits) Level I

Prerequisites:

Syllabus: Engineering Science and Technology is a partial-laboratory course and is assessed solely through coursework. This course has five modules:

- Electrical Labs and Design Project:
  Four lab exercises (with simulations) and a design project based around the ECNG1000 course.

- Science of Materials:
  Metals, polymers, ceramics and composites, semiconductor and superconductors, piezielectrics

- Engineering Graphics:
  Use of instruments, orthographic projections, pictorial views, and freehand sketching.

- Mechanical Workshop Technology:
  Safety orientation, screw driver design project – cutting of material, hot forging, marking off and filing, construction of handle and collar, assembly, pinning and fastening of collar, handle and stainless steel blade, testing; Arc welding training – construction of a T-joint.

- Mechanics of Fluids:
  Properties of fluids, hydrostatics, fluid dynamics – types of fluid flow, continuity equation, Bernoulli's equations and its applications, momentum equation; Laminar and turbulent flow; rotational machines – pump characteristics, centrifugal pumps under system load, pumps in series and in parallel; one laboratory exercise.

Evaluation:

Four (4) Electrical Lab exercises with reports	20%
One Electrical Circuit design (Practical Exam & report)	20%
Six in-class Engineering Graphics exercises	10%
One mechanics of Fluids in-course exam	15%
One mechanics of Fluids Lab Exercise & Report	5%
One Science of Materials In-Class Exam	10%
Mechanical Workshop Technology	20%

MATH 1180 **ENGINEERING MATHEMATICS 1**

(3 credits) Semester 1 Level I

Prerequisites:

Syllabus: Functions of one variable: Limits, continuity, differentiation and integration; common functions and inverse functions. Mean value theorems; Taylor and Maclaurin expansions.

Function of two variables: Limits, continuity and differentiations.

Vectors: Dot, cross and mix products; geometrical problems - lines, planes.

Matrices: Definitions, properties, solution of linear equations. Complex Number: Polar representation.

Ordinary Differential Equations: Introductions: First order equations, separation of variables, equation of homogeneous coefficients, integrating factors; Second order linear equations and its general solution; Second order equations with constant coefficients, undetermined coefficients, variations of parameters.

The Laplace Transform: Transforms of elementary functions, step functions and derivatives; Derivatives of transforms; The inverse transform; Shift theorems.

ELNG 1101 **PHYSICS FOR ENGINEERS**

(3 credits) Level I

Prerequisites:

Syllabus: Mechanics : Scalars and Vector, Rotation; Rotational inertia and its calculation for some symmetrical objects; Parallel and perpendicular axis theorem. Torque; work done by torque. Simple Harmonic Motion; Angular SHM in terms of torque and angular displacement; Differential equation of motion and its solution; application to pendulum and rotating disc.

Waves and Optics: Waves on Strings; the wave equation; phase velocity, the sine wave; power transmission; superposition principle; interface; standing waves and resonance.

Sound Waves: Wave speed; displacement and pressure waves; beats; Doppler effect. Optics: Huygen'Principle; the electromagnetic wave; coherence; Young's experiment; Thin

film interference: Single and double slit diffraction; the phasor method; the diffraction grating.

Lasers: What are lasers? Introduction to the basic principle of operation; laser application in engineering.

Electricity and Magnetism: Electric field and potential: The electric field E due to extended charge distributions; Integral and differential expressions relating the electric potential V to the E field; Potential due to a dipole and other extended charge distributions.

Gauss' Law: Application to problems with spherical, cylindrical and rectangular symmetry.

Capacitance: Calculation of the capacitance of various capacitors; Energy stored in a capacitor; RC circuits; Time constant, Magnetism: Magnetic force on current-carrying wire and its application to cases needing calculus treatment; Magnetic torque on a current loop; Magnetic moment of a current loop; The Hall-Effect; Biot-Savart Law and Ampere's Law, and their application to long current-carrying wire, loop, and solenoid.

Electromagnetic Induction: Faraday's Law and Lenz's Law; Electro-magnetic induction and its applications; Self Induction; Inductance; RL circuits. Electromagnetic Oscillations and Alternating Currents: LC Oscillation; Damped oscillation in an RLC circuit; Alternating current; Forced oscillation; RLC circuits; Power in AC circuits; the Transformer; Introduction to the Electromagnetic wave.

Modern Physics: Bohr Atom: Spectral series for hydrogen, Bohr's postulates, derivation of energy levels, blackbody radiation and quantized energy levels (qualitative).

Waves & Corpuscles: Wave-particle duality; photo-electric effect; Compton-effect; energy, momentum and wavelength of a photon, DeBroglie's equation, wave function, particle in a box, nanocrystallites and quantum dots.

Electrical Conduction in Solids: Energy Levels in Crystalline solids; Insulators; Conductors; Semi-conductors; Doped Semiconductors; p-n junction.

Evaluation:	One 3-hour theory examination paper	70%
	Two 1-hour in-course tests (15 % each)	30%

COMP 2160 **OBJECT ORIENTED PROGRAMMING**
(4 credits) Semester 1 Level II

Prerequisites: ECNG1009

Syllabus: Class of objects; methods; members; message passing; encapsulation and information hiding; separation of behavior and implementation. Imperative control structures, assignment state, parameter passing models. Inheritance; polymorphism; class hierarchies. Interface vs. multiple inheritance. Templates/generics. Using APIs; class libraries. Module/packages; name space solution; primitive types; array, string processing; I/O processing; pointers and references; linked structures; strategies for choosingthe right data. Collection classes and iteration protocols; event-driven and concurrent programming; exception handling; Introduction to GUI programming; thread programming. OO testing; debugging tools.

Object-Oriented Methods: analysis and design, design for re-use; modeling tools, comparison of OOD and top-down/bottom-up design; intro to the concept and use of design patterns.

Evaluation:

One 2-hour written exam	60%
One in-course test	10%
Assignments	30%

ELET1400 **INTRODUCTION TO ELECTRONICS**
(3 credits) Semester 2 Level I

Prerequisites:

Course Structure: Introduction to Semiconductor Theory and the P-N Junction (13 Hrs):
Review of the atomic structure and bonding; Energy level diagrams; Intrinsic and Extrinsic semiconductors; Electrical properties; the Fermi Dirac Distribution function; The P-N Junction and the diode; light emitting diodes (LED); The Bipolar Junction Transistor (BJT); the Field Effect transistor; Biasing the transistor circuit; DC Transistor circuits.

Introduction to Digital Electronics (13 Hrs):
Analog and digital concepts; binary digits and logic levels; digital waveforms; logic gates and truth tables; Boolean algebra and logic simplification; DeMorgan's theorem; Circuit minimization; Terminologies used in logic designs; Combinational logic circuits: BCD; Latches, Flip-Flops;

Memory circuits and devices; Simple programmable arrays: ADC and DAC Circuits.

Introduction to Analog Electronics and Communication Systems (13 hrs):
Introduction to alternating current (AC); Frequency dependent RLC circuits; Bandwidth and half-power. The Operational Amplifier and its applications; Fundamentals of analog and digital Communication Systems;

Evaluation:	One 2-hour theory examination paper	60%
	Two 1-hour in-course tests (2 x 20%)	40%

ELET1405 **PRACTICES IN BASIC ELECTRONICS**
(3 credits) Semester 2 Level I

Co-Requisite: ELET1400

Course Structure:
Week 1: Using lab equipment, resistor colour codes, lab safety.
Week 2: Diode characteristics and application to power supply circuits
Week 3: Transistor characteristics and circuit applications
Week 4: Optical semiconductor devices and their circuit application
Week 5: Semiconductor circuit design test. (in-class)
Week 6: TTL Logic and Boolean algebra
Week 7: Functions of Combinational Logic Circuit: Decoders
Week 8: Flip Flop and the 555 Timers
Week 9: Digital circuit design test (in-class)
Week 10: Ac operation of RLC Circuits
Week 11: Op Amp Circuits
Week 12: Investigating AM and FM communication circuits / systems
Week 13: Analogue Circuit Design test (in-class)

Evaluation:	Nine Laboratory reports (equal weighting)	15%
	Three design projects (3 x 15%)	45%
	One 2-hour final examination paper	40%

LEVEL II COURSES

ECNG 2009 **CONTROL SYSTEMS**

Prerequisites: ELET2460 Signal and Systems; MATH1180 Engineering Mathematics 1

Syllabus: Classical control of dynamic linear systems; solutions of linear differential equations using Laplace transform;, transfer function system representation, system response characteristics, error performance and tracking, the Evans root locus method for design of PID, lead and lag compensators, frequency response method using Bode, Nyquist and Nichols plots and stability margin issues.

Lab exercise in ELET2415.

MATH 2230 **ENGINEERING MATHEMATICS 2**
(3 credits) Level II

Prerequisites: MATH1180 Engineering Mathematics I

Ordinary differential equations; power series solution, Legendre's equation, Bessel equation. Laplace transform: convolution theorem; application to simple initial value problems and integral equations; periodic function.

Fourrier series: Euler's formulae; even and odd functions; half range expressions; solutions to some ordinary differential equation.

Partial differential equation: classification; tehone-dimension wave equation, the heat conduction and diffusion equation; Laplace's equation in cylindrical and spherical polar coordinates.

Vector calculus: scalar and vector fields; vector calculus; curves; arc length, tangent, curvature and torsion; directional derivatives, divergences and curl of a vector field; line integrals; surface integrals; Stoke's theorem and divergence theorem.

ELET2405 **PRACTICES IN ELECTRONICS DESIGNS I**
(3 credits) Semester 1 Level II

Prerequisites ELET1400 and ELET1405

Co-Requisite: Any level 2 Semester 1 Electronics or Electronics Engineering course

Course Structure: ***Investigative labs***:
Six lab exercises will be assigned that are consistent with the electronics courses that the student has undertaken fro semester

1. A report of the results, analyses and discussions must be handed in at the end of each lab session.

Design Project:
A major electronics design project will be assigned to each student during the first two lab sessions. In some cases students will be required to work in pairs. In addition to working on their project during the assigned lab sessions, students are also expected to do the necessary background/research work outside of classes. A complete project report and demonstration of prototype must be formally presented at the end of the semester.

Evaluation:	Six Laboratory reports (equal weighting)	30%
	One major design project	70%

ELET2415 **PRACTICES IN ELECTRONICS DESIGNS II**
(3 credits) Semester 2 Level II

Prerequisites**:** ELET1400 and ELET1405

Co-Requisite: Any level 2 Semester 2 Electronics or Electronics Engineering course

Course Structure: *Investigative labs*:
Six lab exercises will be assigned that are consistent with the electronics courses that the student has undertaken for semester 2. A report of the results, analyses and discussions must be handed in at the end of each lab session.

Design Project:
A major electronics design project will be assigned to each student during the first two lab sessions. Students will be required to work in groups of 2 or 3. In addition to working on their project during the assigned lab sessions, students will be required to do the necessary background/research work outside of class times. A complete project report and demonstration of prototype must be formally presented at the end of the semester.

Evaluation:	Six laboratory exercise and reports	30%
	One major design project	70%

ELET2410 **ANALYSIS AND DESIGN OF ANALOG CIRCUITS**
(3 credits) Semester 2 Level II

Prerequisites: PHYS1410 and PHYS1420 (or equivalent), ELET1400, and CAPE Mathematics (or equivalent)

Syllabus: Basic Concepts of Analog Circuits and Signals

Review of Diodes and their applications

Transistor circuits**:** AC analysis of transistor amplifiers, Feedback, multistage, RF, and Audio amplifiers; Differential amplifiers; Voltage regulation and regulator circuits

Operational Amplifiers: Op-Amp Responses, Op-Amp Circuits, Active Filters, instrumentation amplifiers

Linear integrated circuits: The phase lock loop, the 555 timer IC, Other linear ICs

Oscillators: Principles of oscillation, types of oscillators

Special-Purpose Amplifiers

Data conversion circuits

Evaluation:		
	One 2-hour final exam	60%
	One 1-hour in-course tests	20%
	Take home assignments	10%
	One technical paper	10%

ELET2420 **SEMICONDUCTOR DEVICES**
(3 credits) Semester 2 Level II

Prerequisites: PHYS1410 and PHYS1420 (or equivalent), ELET1400, and CAPE Mathematics (or equivalent)

Syllabus: Semiconductor Fundamentals: General introduction to semiconductor; Carrier modeling, energy quantization and probability concepts; energy bands structure, density of states, statistical mechanics; Semiconductor in equilibrium; Carrier transport and excess carrier phenomenon; Carrier Modeling; Carrier Action; Basics of device fabrications.

PN Junctions: PN Junction electrostatics; PN Junction Diode, I-V Characteristics, small signal admittance, Transient response; Optoelectronic Devices; microwave diodes – tunnel, IMPATT, Gunn. Bipolar Junction Transistors (BJT): BJT fundamentals, static characteristics, dynamic response modeling- equivalent circuits, transient response. PNPN Devices: Silicon controlled rectifiers (SCRs); TRIACS, DIACS. Metal Semiconductor contacts and the Schottky Diode. Circuit application examples for PN junction devices

Field Effect Devices: The JFET and the MESFET; The Metal Oxide Semiconductor Field Effect Transistor (MOSFET)- theory of operation, ID-VD relationships, Threshold considerations; Non Ideal MOSFETs, Modern FET structures. Circuit application examples for Field Effect Devices

Evaluation:		
	One 2-hour final exam	60%
	One 1-hour in-course tests	20%
	Take home assignments	10%
	One technical paper	10%

ELET2430 **DIGITAL CIRCUITS AND MICROPROCESSORS**
(3 credits) Semester 1 Level II

Prerequisites: PHYS1410 and PHYS1420 (or equivalent), ELET1400, and CAPE Mathematics (or equivalent)

Syllabus: Digital Logic Design: Brief review of Combinational logic**;** Flip-Flops and Latches: Synchronous, Asynchronous, Single bit Memory elements, Counters & Shift Registers and Timing; System specification using State Diagrams; System design using state diagrams and flip-flops; The design of multidimensional memory arrays using flip-flops

Computer Arithmetic: Unsigned and Signed Integer Representation; Signed Magnitude Representation; One's Complement Representation; Two's Complement Representation; Floating-Point Representation; Fractions; Floating-Point Addition, Multiplication and Division

Processor Organization: Overview – RISC, CISC, Data Path, Control Unit; Operand Types; Addressing Modes; Instruction Types; Instruction Formats– zero, one, two and three address machines; Micro-program Control - Hardware and Software implementation, Data Path manipulation

Cache memory: Cache Design Basics; Mapping Function - Direct Mapping, Associative Mapping and Set-Associative Mapping; Policies; Write Policies; Cache management - Locating a Block and Replacement Policies

Parallelism: Pipeline - Basic Concepts; Handling Resource Conflicts; Hazards; Register Forwarding; Register Interlocking; Handling Branches - Delayed Branch Execution, Branch Prediction and Performance Enhancements; Superscalar Processors; Superpipelined Processors; Very Long Instruction

Word Architectures; Example Implementations - Pentium and SPARC Processors; Vector processors

Interrupts: A Taxonomy of Pentium Interrupts; Hardware and Software Interrupts; Example implementations – Pentium and SPARC Processors

Evaluation:

One 2-hour final exam	60%
One 1-hour in-course tests	20%
Take home assignments	10%
One technical paper	10%

ELET2450 **EMBEDDED SYSTEMS**

(3 credits) Semester 1 Level II

Prerequisites: PHYS1410 and PHYS1420 (or equivalent), ELET1400, and CAPE Mathematics (or equivalent)

Syllabus: Embedded Systems Overview*:* Introduction and Background; Embedded System-On-Chip (SOC) and in VLSI Circuits. Microcontroller Overview: Basic Layout; Components; Memory and Register; Instruction Set; The AVR 8-Bits Microcontrollers.

Assembly Programming & Simulation: Assembly Language Structure; Branch, Call and time delay loops; AVR Studio: Editor, Assembler, Simulator, Debugger and Hex Programmer; Simulation of Written Code; STK500 Hardware: Description and Operation; Actual Microcontroller Programming.

Digital & Analog Capabilities: Digital Input/Output Capabilities; Configuration and Operation of I/O Ports; Digital I/O Port Programming; Analog Input/Output Capabilities; Configuration and Operation of I/O Pins/Ports; Analog-to-Digital Conversion; Analog Peripheral Programming.

Interrupt Subsystem; Timing Subsystem; Serial Communication Subsystem. C Language for Embedded Systems: Operating Parameters & Interfacing:

Design & Development: Design Plans (Project Specifications, etc.; Sourcing and Selection of Controllers and Components; Designing Circuits; Flowcharts and Programs; Implementation and Packaging; Documentation. Communication Technology: Introduction to IrDA; Introduction to USB; USB Packets; USB Physical Interface; Implementing USB Interface

Evaluation:	One 2-hour final exam	60%
	One 1-hour in-course tests	20%
	Take home assignments	10%
	One technical paper	10%

ELET2460 **SIGNALS AND SYSTEMS**
(3 credits) Semester 1 Level II

Prerequisites: PHYS1410 and PHYS1420 (or equivalent), ELET1400, and CAPE Mathematics (or equivalent)

Syllabus:

CONTINUOUS-TIME SIGNALS AND SYSTEMS
Continuous-Time Elementary Signals: The Unit Step, the Unit Impulse, the Unit Ramp, Sinusoidal Signal. Signal Transformations: Continuity, Piece-wise continuity; Time shifting, time scaling, time reversal; Convolution; Convolution and Impulse Response. Introduction to systems; Frequency Domain Representation of Signals and Systems. Transform Domain Representation of Systems; Time Domain Analysis of Systems.

DISCRETE-TIME SIGNALS AND SYSTEMS
Mathematical Representation of Discrete-Time Signals; Frequency Domain Representation of Discrete-Time Signals; Comparison of Fourier Transforms. Time Domain Representation of Discrete-Time Systems: Transform Domain Representation of Discrete-Time Systems; Discrete-Time Systems; Stability of Discrete-Time Systems; Time Steady State Response; Filter Design: Analog Filters; Digital Filters (FIR and IIR Filters)

Evaluation:	One 2-hour final exam	60%
	One 1-hour in-course tests	20%
	Take home assignments	10%
	One technical paper	10%

ELET2470 **CIRCUIT ANALYSIS**
(3 credits) Semester 1 Level II

Prerequisites: PHYS1410 and PHYS1420 (or equivalent), ELET1400, and CAPE Mathematics (or equivalent)

Syllabus: Concepts in basic electrical quantities: electronic charge, current, voltage, power, energy; Introduction to circuit theory; Simple circuits; Kirchhoff's voltage and current laws. Series and parallel circuit networks; Structured Circuit Theory.

Network theorems: Superposition, Thevenin's, Norton's; Solution using structured approach; Network analysis: branch, loop, node; Source types; Maximum power transfer theorem

Capacitive and inductive circuits; Laplace models; Steady state and dynamic responses of simple networks; AC steady state analysis; Circuit Theory in Laplace domain

Transient and steady state solutions Complex number models; Complex power; Power factor correction

Evaluation:		
	One 2-hour final exam	60%
	One 1-hour in-course tests	20%
	Take home assignments	10%
	One technical paper	10%

ELET2480 **MODERN COMMUNICATION SYSTEMS**
(3 credits) Semester 2 Level II

Prerequisites: PHYS1410 and PHYS1420 (or equivalent), ELET1400, and CAPE Mathematics (or equivalent)

Syllabus: Modulation Techniques: Amplitude Modulation; Angle Modulation; Sampling & Digital Modulation.

Baseband Data Transmission: Baseband transmission of digital data; Inter-symbol Interference (ISI); The Nyquist Channel; Baseband transmission of M-ary Data; The Eye Pattern; Bandpass modulation techniques; Binary Amplitude-Shift Keying; Phase-Shift Keying; Frequency-Shift Keying; M-ary digital modulation schemes

Random Signals and Noise: Probability and random variables; Gaussian random variables; Random processes; Gaussian processes; White noise; Narrowband noise Noise in Analog Communications; Noise in Digital Communications:

Wireless Communication: Propagation loss in a simple wireless link; Principles of Radio and Television; Facsimile; Cellular technology and Global Positioning Systems (GPS); Brief Introduction to GSM technology

Evaluation:		
	One 2-hour final exam	60%
	One 1-hour in-course tests	20%
	Take home assignments	10%
	One technical paper	10%

LEVEL III COURSES

Please note that all Level III courses will be offered in the 2011/2012 academic year.

Prerequisites will be announced at a later date

ELNG 3010 **SPECIAL PROJECT**
6 credits Year-Long Level III

Prerequisites:

Syllabus: Special project will be undertaken by all students under the supervision and direction of academic staff in conjunction with an engineering supervisor from an associated Industry. The project will be Industry based and students work very closely with their industrial partners. Project details are provided in the Project Handbook.

ECNG 3021 **INTRODUCTION TO ENGINEERING MANAGEMENT AND ACCOUNTING SYSTEMS**
4 credits Level III

Prerequisites:

Syllabus: Accounting and finance: Introduction to finance accounting, financial statements and analysis; time values of money; NPV and DCF; capital budging cash flows and techniques. Management and Organizational Theory: Theory of organization; motivation; leadership; communication; human resource development/strategic planning; organizational development and change. Production management, planning and control; project management, PERT, CPM, project evaluation; quality management. Introduction to Business Law: Formation of companies and general legal requirements; general principles of Contract and Tort; Law of Agency; Sale of goods and Hire Purchase Act.

MGMG 3136 **NEW VENTURE CREATION AND ENTREPRENEURSHIP**
3 credits Level III

Prerequisites:

Syllabus: This course deals with one of the most challenging issues confronting developing countries. It focuses on understanding and appreciating the entrepreneurial mindset in relation to the

ability to create new ventures successfully. The course also focuses on "intrapreneurship" or in the reinvigoration of existing enterprises with an attitude of innovation, responsiveness and receptivity to change, and it considers entrepreneurship in an international context.

PHYS 3385 **ELECTROMAGNETISM**
4 credits Level III

Prerequisites: ELNG1101 and MATH2230

Syllabus: Derivation of Maxwell's equations in differential form. Equation of continuity. Poisson's equation. Derivation of the electro-magnetic wave equation. Solution for plane waves in dielectrics. Electro-magnetic nature of light. Energy flow and the Poynting vector. Boundary conditions. Reflection and refraction of electro-magnetic waves at dielectric boundaries. Derivation of Snell's law. Fresnel's equations. Total reflection. Brewster's angle. Transmission and reflection co-efficients. Propagation of electro-magnetic waves in conducting media. Skin depth. Energy flow in conductors. Reflection of Electro-magnetic waves by a conductor. Dispersion of electro-magnetic waves in various media. Sources of Electromagnetic waves.

ELET 3480 **WIRELESS COMMUNICATION**
3 credits Level III

Prerequisites: ELET2480

Syllabus: Introduction to wireless communication systems; Modern Wireless communication systems: 2G, 2.5G and 3G technologies; intro to 4G technologies; The cellular concept: system design fundamentals. Mobile radio propagation: Large scale path loss; small scale fading and multi-path. Modulation techniques for mobile radio; Equalization, Diversity and Channel coding; Speech Coding; Multiple access techniques for wireless communications; Wireless networking; Wireless systems and standards. (Text: Wireless Communications: Principles and Practice – by T.S Rapapport; Prentice Hall Publications, 2002)

ECNG 3016 **ADVANCED DIGITAL ELECTRONICS**
3 credits Level III

Prerequisites: ELET2430

Syllabus: Master timing issues in digital systems. Rationale for techniques employed in implementing digital systems on FPGAs. Arithmetic circuits in digital systems. VHDL in IP cores, effective use of Xilinx ISE and Modelsim in FPGA implementations.

ELNG 3050 **BROADBAND NETWORKS**
3 credits Level III

Prerequisites: ELET2480

Syllabus: Orthogonal Frequency Division multiplexing and other block based transmissions; Multiple input – multiple output antenna systems (MIMO); Ultrawideband systems; Medium Access control; Mobility Resource Management; Routing protocols for multi-hop wireless broadband networks; Radio resource management foe wireless broadband networks; Quality of service for multimedia services; Long tern evolution of Cellular networks; Wireless broadband networking with WIMAX; Wireless Local Area Network; Convergence of networks (Text: Wireless Broadband Networks – by David Tung Chong Wong, et al; Wiley and Sons – 2009))

ECNG 3028 **INTRODUCTION TO PROCESS CONTROL**
3 credits Level III

Pre/Co-Requisites: ELNG3040

Syllabus: Process identification: Sizing pumps and control valves to meet plant specifications; model based tuning of PID Controllers; Modeling and control strategies for common industrial operation units; analysis and design of advanced control systems. Feedback control of systems with large deadtime and inverse response; feed forward and ratio control; inferential control; design of control systems for multivariable processes. Synthesis of alternative control configuration for multiple-input, multiple-output processes. Interaction and decoupling of control loops; design of control schemes for complete plants; computer simulation of open- and closed-loop systems

ELNG 3040 **INDUSTRIAL AUTOMATION**

3 credits Level III

Prerequisites: ECNG2009 and ELET2450

Syllabus: Plant wide Control Systems and Automation Strategy: Evolution of instrumentation and control, Role of automation in industries, Benefits of automation; Automation tools PLC, DCS, SCADA, Hybrid DCS/PLC, Automation strategy evolution, Control system audit, performance criteria, Safety Systems. Advance Applications of PLC and SCADA: PLC programming methods as per IEC 61131, PLC applications for batch process using SFC, Analog Control using PLC, PLC interface to SCADA/DCS using communication links (RS232, RS485) and protocols (Modbus ASCII/RTU). Instrumentation Standard Protocols. Distributed Control Systems (DCS) Basics: DCS introduction, functions, advantages and limitations, DCS as an automation tool to support Enterprise Resources Planning, DCS Architecture of different makes, Latest trends and developments. Distributed Control Systems Engineering and Design. Application development and Automation for industry verticals: Application development and automation for following industries. Power, Water and Waste Water Treatment, Food and Beverages, Cement, Pharmaceuticals, Automobile and Building Automation.

ELNG 3060 **POWER PLANT INSTRUMENTATION**

3 credits Level III

Pre/Co-Requisites: ELNG3040

Syllabus: Power plant: Unit, overview, Types of boiler, Exhaust Gas Boilers and Incinerators, turbine generators, condensers, material handling systems. Comparison of thermal power plant, hydroelectric power plant, Nuclear power plant, solar power plant, Wind power plant. Boiler Instrumentation: Control and optimization, Combustion control, air to fuel ratio control, 3-element drum level control, steam temperature and pressure control, oxygen/CO2 in flue gases, furnace draft, boiler interlocks, sequence event recorder, supervisor control, data acquisition controls, burner management systems and controllers. Start-up and shut-down procedures, Boiler safety standard, Boiler inspection procedures. Boiler load calculation, boiler efficiency calculation. Instrumentation for Boiler ancillaries viz. water treatment, electro-static precipitator, soot blower, economizer, de aerator, super heater, chemical dosing systems, air pre-heater, coal and ash handling systems, fuel storage and distribution, Bag House Filters. Turbine instrumentation and control, start-up and shut-down , thermal

stress control, condition monitoring & power distribution instrumentation. Synchronous, Induction generators. Hydroelectric power generation, regulation & monitoring of voltage & frequency of output power. Pollution & effluent monitoring & control. Energy Management, electrical sub-station controls. Power Generation using non-conventional energy sources viz. Wind Power, solar Power, Tidal Power, Plant safety & redundancies. Nuclear Power Generation & control Station. Diesel Generator Controls

FACULTY SCHOLARSHIPS AND AWARDS

DEPARTMENT OF CHEMISTRY

THE CHEMISTRY DEPARTMENT PRIZE
THE CEDRIC HASSALL PRIZE
THE WILFRED CHAN AWARD
THE GARFIELD SADLER AWARD
THE L. J. HAYNES AWARD
THE PAVELICH/HONKAN PRIZE
THE GERALD LALOR SCHOLARSHIP
THE KENNETH MAGNUS SCHOLARSHIP
THE EARLE ROBERTS SCHOLARSHIP
THE TARA DASGUPTA SCHOLARSHIP

DEPARTMENT OF GEOGRAPHY AND GEOLOGY

GEOGRAPHY

THE BARRY FLOYD PRIZE FOR LEVELS 1 and 2 GEOGRAPHY
GEOLOGY

THE GEOLOGICAL SOCIETY OF JAMAICA SCHOLARSHIP
THE HARRY KUARSINGH MEMORIAL PRIZE

DEPARTMENT OF LIFE SCIENCES

PRELIMINARY LEVEL LIFE SCIENCES DEPARTMENTAL PRIZE
INTRODUCTORY LEVEL LIFE SCIENCES DEPARTMENTAL PRIZE
SECOND YEAR ZOOLOGY PRIZE
DON SKELDING PRIZE
L. B. COKE PRIZE IN PLANT PHYSIOLOGY
VINCENT HUGH McKIE PRIZE

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCES

MERVILLE CAMPBELL PRIZE (LEVELS 1 and 2)
UNIVERSITY LODGE/EUCLID KING PRIZE

DEPARTMENT OF PHYSICS

JOHN LODENQUAI PRIZE (LEVEL 1)
LEVEL 2 DEPARTMENTAL AWARD
FRANCIS BOWEN BURSARY
MICHAEL THARMANATHAN PHYSICS BURSARY
PROJECT PRIZE (FINAL YEAR)