THE UNIVERSITY OF THE WEST INDIES

CAVE HILL CAMPUS

FACULTY OF PURE AND APPLIED SCIENCES REGULATIONS & SYLLABUSES

GRADUATE INFORMATION GUIDE

2009-2010

WWW.CAVEHILL.UWI.EDU/GRADSTUDIES

Every attempt has been made to ensure that the information in this booklet is accurate at the time of printing. Students should consult their programme coordinator where clarification is required.

It is intended for students entering programmes in academic year 2009 - 2010. Continuing students must refer to their programme coordinator for guidance.

Please note that any semester information given should be used as a guide as it is subject to change.

MISSION STATEMENT

The enduring mission of The University of the West Indies is to propel the economic, social, political and cultural development of West Indian society through teaching, research, innovation, advisory and community services and intellectual leadership.

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Dean's Message

This Faculty has a proud history, having evolved from the Faculty of Natural Sciences which commenced teaching at Mona, Jamaica, in 1949. We welcome you as a graduate student in the Faculty whether as a research student, registered for the MPhil or PhD degree, or as an MSc student in one of our taught Masters programmes. Our research degree track record is well established with the Faculty's first MPhil degree awarded in 1976 and the first PhD graduand in 1983. Our CERMES MSc in Natural Resource & Environmental Management has produced over 250 graduates who today are key decision-makers in the environmental sector throughout the region and beyond.

By comparison the MSc in Electronic Commerce is a new programme and the first of its kind in the English-speaking Caribbean. It provides graduates with the skills required for implementing, maintaining and developing Electronic Commerce services in the region.

Whatever your programme, we wish you an enjoyable and productive time with us in the Faculty of Pure & Applied Sciences.

Faculty of Pure & Applied Sciences
University of the West Indies

About the Faculty of Pure & Applied Sciences

This Faculty was formerly known as the Faculty of Natural Sciences and later the Faculty of Science & Technology before its current designation as the Faculty of Pure & Applied Sciences. Our full-time Academic Staff are mainly Caribbean nationals but we are also very much an international Faculty with about one third of our lecturers drawn from countries far and wide. Our degree programmes are well-respected regionally and internationally with many of our graduates working or pursuing further studies overseas.

The Faculty comprises two Departments and a Centre:-

- Department of Biological & Chemical Sciences – undergraduate & graduate programmes
- Department of Computer Science, Mathematics & Physics – undergraduate & graduate programmes
- Centre for Resource Management and Environmental Studies (CERMES), - graduate programmes

The Faculty of Pure & Applied Sciences at Cave Hill offers two distinct types of graduate programmes. Taught Masters programmes provide specific skill sets and training while MPhil and PhD Research degrees provide research opportunities under the supervision of a full-time member of the Academic Staff for those wishing to pursue careers in Science. The Faculty offers two taught MSc programmes: the well-established MSc in Natural Resource and Environmental Management and the MSc in Electronic Commerce.

The MSc in Natural Resource and Environmental Management is mounted by the Centre for Resource Management and Environmental Studies (CERMES) and is offered in five specialisations:-

- Coastal and Marine Resource Management
- Climate Change
- Waste Management
- Applied Meteorology*
- Water Resources Management

* In collaboration with the Caribbean Institute for Meteorology and Hydrology.

The taught MSc in Electronic Commerce, the first of its kind in the Caribbean, aims to provide training to graduates in Electronic Commerce, Ebusiness, Internet law, web technologies, security and marketing.

The research interests in the Faculty are diverse, addressing both fundamental questions in Science as well as finding scientific solutions to real-life problems facing Caribbean people. Faculty members also constitute an unmatched source of expertise to Governments, Non-Governmental Organisations and the Private Sector in providing technical advice.

DEAN AND HEADS OF DEPARTMENTS OF PURE AND APPLIED SCIENCES

Faculty Office

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DEPUTY DEAN:	**Depradine, Colin** BEng, MSc (Lond), PhD (UWI)
DEPUTY DEAN: **(Graduate Studies)**	**Scantlebury-Manning, Thea** BSc, PhD (Concordia)
Administrative Assistant (Projects)	**Corbin, Natasha** BSc, MSc (UWI)

Centre for Resource Management and Environmental Studies (Cermes)

Tel:	**(246) 417-4339**
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Professor and Director & Coordinator of Research programmes	**Mahon, Professor Robin** BSc (UWI), MSc, PhD (Guelph)
Coordinator of MSc Natural Resource & Environmental Management	**Selliah, Neetha** BSc (Surrey), MSc (UWI),

The Caribbean Institute for Meteorology & Hydrology*

*This is an Affiliate Institution whose Faculty members teach the Applied Meteorology stream of the CERMES Master of Science degree programme in Natural Resource and Environmental Management

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Coordinator of MSc Electronic Commerce	**Gittens, Curtis** BSc (UWI), MSc, PhD (UWO)

GENERAL REGULATIONS FOR GRADUATE STUDIES

Admission

1. An applicant for graduate study must go before the Board for Graduate Studies and Research, through the Faculty Sub-Committee.

2. An applicant may be:

   (i) Admitted without a qualifying Examination,

   (ii) Required to pass a qualifying Examination before being fully registered for graduate studies, or;

   (iii) Refused admission.

3. The nature of the qualifying examination shall be determined by the Department to which the candidate is seeking admission but shall be subject to the approval of the Faculty Subcommittee on Graduate Studies. A candidate who fails a required qualifying examination will not normally be permitted to re-sit the examination.

4. All graduate students seeking a research degree are normally required to register first for the MPhil degree.

5. Later transfer to the PhD may be made if the student's supervisor and the departmental Graduate Supervision Committee recommend it, and if the recommendation is supported by the Faculty's Sub-Committee on Graduate Studies and approved by the Board for Graduate Studies and Research.

6. Students may be registered for full-time or part-time studies. No research student may be registered for full-time studies if he/she spends an average of twelve or more hours a week in paid employment.

7. Regulations concerning the length of periods of study for the award of postgraduate degrees to part-time students are given in the relevant sections below. In every other respect, e.g. qualifications for admission, attendance at seminars, conditions of award of the degree etc., part-time students are subject to the same regulations as full-time students.

8. Wherever possible each Department or appropriate unit within a Department shall have a Graduate Supervision committee.

9. The Graduate Supervision Committee shall propose to the Faculty Sub-Committee for Graduate Studies a Supervisor or Supervisors of experience appropriate to the proposed field of study of each candidate.

10. Research students are required to consult with their supervisor(s) in person, at intervals to be specified by the Supervisor(s) but normally not less than once a semester. However, a candidate not resident the same territory as his supervisor(s) may be permitted to report in writing, except that a candidate who does not already hold a degree from the University is required to reside in one of the territories for the first year of registration.

11. Dissertation and theses presented for a graduate degree in this Faculty must be written according to the stylistic conventions as set out in the University Thesis Guide.

Oral Examination

12. The oral examination of the candidate presenting a thesis will be chaired by the Chairman of the Faculty Sub-Committee for Graduate Studies, or nominee who will also be responsible for seeing that a report on the examination is drawn up. The report shall be signed by all the Examiners present and by the Chairman of the Examination and forwarded to the Board for Graduate Studies and Research.

Qualifying Candidates

13. Candidates for admission to the degree programmes may be required by the Board for Graduate Studies and Research (BGSR) to take qualifying courses and to write examinations in these courses. Such candidates shall be registered as qualifying students and not as candidates for the degree. The qualifying courses shall be recommended by the Institute's Entrance Committee for approval by the Campus Committee.

14. Students cannot proceed to register for a degree programme unless they have successfully completed the required qualifying courses at a prescribed level of performance.

THE MASTER OF PHILOSOPHY (MPhil) DEGREE

1. The MPhil Degree is a research degree and shall be awarded on the basis of a thesis:

2. It is open to students with at least an Upper Second Class Honours Degree.

3. A candidate who does not satisfy this requirement may be admitted in the first instance as a qualifying student, and must satisfy specified requirements before being finally admitted to the MPhil Degree.

4. A candidate will be required to undertake a minimum of six (6) credits of coursework and present two (2) seminars. The candidate will be required to pass specified departmental examinations. Such requirements for each candidate shall be determined by the department and must be approved by the Faculty Sub-Committee at the time of registration of the student.

5. A candidate registered for full-time studies shall be required to present a dissertation on an approved subject not less than 3 years and not more than five (5) full calendar years after registration.

6. Part-time candidates shall be required to present their dissertation not less than 5 years and not more than seven (7) calendar years after registration.

7. The length of the dissertation shall be in accordance with specifications laid down by the departments of the Faculty but should not normally exceed 50,000 words excluding footnotes and appendices.

8. A candidate, after consideration of his dissertation by the Board of Examiners and, where relevant, the oral examination, may be:

   (a) Recommended to Senate for the award of the degree;

   (b) Required to re-submit the dissertation and repeat the oral examination on one subsequent occasion within 18 months from the decision of University Board for Graduate Studies and Research; or

   (c) Failed outright

THE DOCTOR OF PHILOSOPHY (PhD) DEGREE

1. The PhD Degree is a research degree and shall be awarded on the basis of a thesis.

2. It is normally open to students with at least an Upper Second Class honours degree who have completed appropriate Graduate qualification or who are on transfer from the MPhil research degree.

3. A candidate will be required to undertake a minimum of nine (9) credits of courses during the period of registration. He/she may be required to write examinations. Such requirements must be approved by the Faculty Sub-Committee at the time of registration of the student.

4. A candidate will be required to register for and present three (3) seminars during the period of registration.

5. A candidate registered for full-time studies will be required to present a thesis on an approved subject not less than 6 semesters, and not more than six calendar years after full registration.

6. Part-time candidates shall be required to present their thesis not less than 8 semesters and not more than eight calendar years after full registration.

7. The length of the thesis shall be in accordance with specifications laid down by the Departments of the Faculty in which the student is registered, but shall not exceed 80,000 words excluding footnotes and appendices. The Board for Graduate Studies and Research may in special circumstances give permission for its limit to be exceeded.

8. A thesis will not be deemed adequate unless:

   (a) It is judged to be a new contribution to knowledge,

   (b) It shows clear evidence of original research, and

   (c) It is worthy of publication.

9. A candidate for the PhD will be required to take an oral examination on a general field of study and on the thesis submitted. Wherever possible, the External Examiner should be present at the oral examination. In his absence, his written report shall be made available to the examiners present.

10. A candidate, after consideration of his thesis by the Examiners and after oral examination may be:

    (a) Recommended to Senate for the award of the degree,

    (b) Required to re-submit the thesis within 18 months,

    (c) Required to re-submit his thesis and repeat the oral examination on one subsequent occasion within eighteen (18) months from the decision of the Board for Graduate Studies and Research,

    (d) Required to make corrections to thesis within six (6) months from the decision of the Board for Graduate Studies and Research, or

    (e) Failed outright.

MPhil/PhD Upgrade Seminar

Candidates for the MPhil degree who have:

- Successfully defended a Thesis Proposal of a scope and depth deemed worthy of an upgrade, and
- Consistently produced work of a standard, in the opinion of their Supervisor, to merit an upgrade,

may be allowed to transfer to the PhD programme.

Procedures governing this are contained in the Manual of Procedures available from the School for Graduate Studies and Research or on-line at www.cavehill.uwi.edu/gradstudies/documentlibrary.htm..

GENERAL FACULTY REGULATION

Requirement to withdraw

Candidates in any programme who fail two or more courses in any semester will normally be required to withdraw from that programme.

THE DEPARTMENT OF BIOLOGICAL & CHEMICAL SCIENCES

MPhil/PhD DEGREES

Entry Requirements

MPhil Candidates require at least an Upper Second Class Honours degree with a strong background in the discipline into which entry is being sought. All research students must register initially for the MPhil degree but may later, with suitable progress, be upgraded to register for the PhD degree. In cases where the candidate already has an MPhil degree (or equivalent), direct entry to the PhD is possible.

Availability of Expertise and Resources

Admission is contingent upon whether candidates have a thesis proposal compatible with the expertise and resources available in the Department of Biological and Chemical Sciences.

Areas of Study

Major research interests of staff members in this department are:-

Biological Sciences

- Molecular Biology,
- Ecology,
- Behavioural Ecology,
- Conservation Biology,
- Marine Biology
- Malacology
- Sports Agronomy,
- Post-Harvest Physiology,
- Biochemistry of Diabetes/ Obesity,
- Microbiology,
- Microbial Ecology,
- Microbial Biochemistry,
- Food Microbiology,
- Genetics,
- Horticulture,
- Plant Pathology.

Chemical Sciences

- Natural Products Chemistry,
- Transition Metal Chemistry,
- Organo-Metallic Chemistry,
- 2-D NMR, Spectroscopy,
- Environmental Chemistry,
- Organic Synthesis.
- Computational Chemistry

Course of study

Students in the MPhil and PhD degree programme are required to successfully:

1. Complete a minimum of six (6) credits of coursework for MPhil/nine (9) credits of coursework for PhD,
2. Present seminars (2 for MPhil/3 for PhD), and
3. Submit a thesis.

Courses

Students in the MPhil and PhD degree programme should discuss with their supervisor suitable courses which would satisfy the credit requirements. Courses should be completed in the first year.

Compulsory Seminar Presentations

For each seminar, candidates are required to write and present a paper to be photocopied and distributed before hand on a topic arising out of their research, as well as to field questions put to them afterwards.

Thesis

Candidates are required to present and defend a Thesis of acceptable scope and quality for the degree. The Thesis must follow the guidelines set out in the University's Thesis guide.

Award of the Degree

The successful completion of the required coursework, the compulsory Seminar presentations and the Thesis will lead to the award of the Degree.

LIST OF COURSES

Core for all students

FPAS 6000	Scientific Literature Review

Core for all students depending on their programme

GRSM 7001	MPhil Research Seminar 1
GRSM 7002	MPhil Research Seminar 2
BIOC 7000	MPhil Biochemistry Thesis
BIOL 7000	MPhil Biology Thesis
CHEM 7000	MPhil Chemistry Thesis
ECOL 7000	MPhil Ecology Thesis
MICR 7000	MPhil Microbiology Thesis
GRSM 8001	PhD Research Seminar 1
GRSM 8002	PhD Research Seminar 2
GRSM 8003	PhD Research Seminar 3
BIOC 8000	PhD Biochemistry Thesis
BIOL 8000	PhD Biology Thesis
CHEM 8000	PhD Chemistry Thesis
ECOL 8000	PhD Ecology Thesis
MICR 8000	PhD Microbiology Thesis

Research Students may also be permitted (with the approval of their Supervisor) to take courses from other offerings within the Faculty.

THE DEPARTMENT OF COMPUTER SCIENCE, MATHEMATICS & PHYSICS

MSc ELECTRONIC COMMERCE

Introduction

The MSc in Electronic Commerce provides training in e-commerce, e-business, law and ethics, web technologies, security and marketing. It is the only programme of its kind offered in the region and has been developed in response to a growing recognition of the need for investment in information and communication technology (ICT) to facilitate national economic growth and social development, with electronic commerce being vital for entry into regional and international markets.

Objectives

1. To provide a thorough understanding of e-commerce and e-business
2. To comprehend the legal and ethical framework required for these initiatives
3. To plan and market e-commerce initiatives;
4. To solve common e-commerce and e-business problems using new and existing technologies;
5. To comprehend the constraints involved in the development of e-commerce initiatives in the Caribbean region and to formulate creative workarounds;
6. To evaluate existing e-commerce initiatives, based on factors such as security, performance, design and usability and provide comprehensive recommendations to improve them;
7. To create or extend existing e-commerce tools; and
8. To create new e-commerce initiatives.

Entry Requirements

Students accepted to the MSc programme must be eligible for matriculation under the matriculation requirements of the University of the West Indies. The normal entry requirement for admission will be an Honours degree or equivalent in Computer Science or Information Technology. Graduates with a Pass degree and significant industry experience will be considered for acceptance on a case-by-case basis.

Successful applicants who are not computer proficient but who hold B.Sc. degrees in a discipline other than Computer Science or Information Technology are required to audit COMP 1105 – Introduction to Computer Programming on commencement of the programme.

Duration

The programme is delivered over a 15-month period (from September to November).

Course of Study

To be awarded the MSc degree, students are required to complete 40 credits constituted from the following:

i. Up to eight (8) credits from the two foundation courses

ii. Sixteen (16) credits from four (4) compulsory courses

iii. Eight (8) credits from the Project/Internship courses

And the remaining credits (to total 40) from the electives.

Distinction

For the award of the degree with distinction the candidate must pass all courses at first sitting, and the average mark of all courses should not be less than **70%**. The candidate must also achieve a mark of **70%** or over in the Research Project.

LIST OF COURSES

Foundation Courses

COMP 6115	Web Technologies
COMP 6125	Introduction to Electronic Commerce

Compulsory Courses

COMP 6205	Electronic Commerce Law and Ethics
COMP 6215	E-Business and Internet Marketing
COMP 6225	Security and Electronic Payment Systems
COMP 6235	Electronic Commerce Laboratory

Electives

COMP 6305	Electronic Commerce in the Caribbean
COMP 6315	Database Technologies and Knowledge Management
COMP 6325	Advanced Web Technologies
COMP 6335	Mobile Commerce
COMP 6345	Special Topics in Electronic Commerce
COMP 6355	Advanced Software Engineering

Project/Internship

COMP 6505	Electronic Commerce Project/Internship

MPhil/PhD DEGREES

Entry Requirements

MPhil Candidates require at least an Upper Second Class Honours degree with a strong background in the discipline into which entry is being sought. All research students must register initially for the MPhil degree but may later, with suitable progress, be upgraded to register for the PhD degree. In cases where the candidate already has an MPhil degree (or equivalent), direct entry to the PhD is possible.

Availability of Expertise and Resources

Admission is contingent upon whether candidates have a thesis proposal compatible with the expertise and resources available in the Department of Computer Science, Mathematics and Physics.

Areas of Study

Major research interests of staff members in this department are:-

Computer Science

- Parallel and Distributed Algorithms,
- Self-stabilization,
- Artificial Intelligence and Expert Systems,
- Database Management,
- Information Systems,
- Software Engineering,
- Networks and Communications,
- Data Modeling,
- Visualization,
- Climate Modelling.

Electronics

- Digital Communication,
- Microcontroller Applications,
- Control Electronics.

Mathematics

- Graph Theory and Combinatorics;
- Approximation Theory;
- Foundations of Mathematics;
- Measure Theory;
- Biostatistics;
- Arithmetic Functions,
- Mathematical Statistics,

Meteorology

- Limited Area Modeling,
- Tropical Hurricane Studies,
- Statistical Short-Term Forecasting.

Physics

- Water Resources,
- Climate Change,
- Karst aquifer modeling,
- Statistical Physics,
- Solar Energy,
- Liquid Crystals,
- Computational Physics.

Course of study

Students in the MPhil and PhD degree programme are required to successfully:

1. Complete a minimum of six (6) credits of coursework for MPhil/ nine (9) credits of coursework for PhD,
2. Present seminars (2 for MPhil/3 for PhD), and
3. Submit a thesis.

Courses

Students in the MPhil and PhD degree programme should discuss with their supervisor suitable courses which would satisfy the credit requirements. Courses should be completed in the first year.

Compulsory Seminar Presentations

For each seminar, candidates are required to write and present a paper to be photocopied and distributed before hand on a topic arising out of their research, as well as to field questions put to them afterwards.

Thesis

Candidates are required to present and defend a Thesis of acceptable scope and quality for the degree. The Thesis must follow the guidelines set out in the University's Thesis guide.

Award of the Degree

The successful completion of the required coursework, the compulsory Seminar presentations and the Thesis will lead to the award of the Degree.

LIST OF COURSES

Core for all students

FPAS 6000	Scientific Literature Review

Core for all students depending on their programme

GRSM 7001	MPhil Research Seminar 1
GRSM 7002	MPhil Research Seminar 2
COMP 7000	MPhil Computer Science Thesis
ELET 7000	MPhil Electronics Thesis
MATH 7000	MPhil Mathematics Thesis
METE 7000	MPhil Meteorology Thesis
PHYS 7000	MPhil Physics Thesis
GRSM 8001	PhD Research Seminar 1
GRSM 8002	PhD Research Seminar 2
GRSM 8003	PhD Research Seminar 3
COMP 8000	PhD Computer Science Thesis
ELET 8000	PhD Electronics Thesis
MATH 8000	PhD Mathematics Thesis
METE 8000	PhD Meteorology Thesis
PHYS 8000	PhD Physics Thesis

Research Students may also be permitted (with the approval of their Supervisor) to take courses from other offerings within the Faculty.

THE CENTRE FOR RESOURCE MANAGEMENT AND ENVIRONMENTAL STUDIES (CERMES)

MSc NATURAL RESOURCE AND ENVIRONMENTAL MANAGEMENT

Introduction

The MSc Natural Resource and Environmental Management Programme seeks to provide graduate students with advanced training in techniques, mechanisms and policies for sustainable use and management of natural resources in the Caribbean.

Objectives

The overall objective of the Masters Programme in Natural Resource and Environmental Management is to contribute to sustainable development in the Caribbean region by training professionals in environmental and natural resource management.

Entry Requirements

A Bachelor's degree in a discipline appropriate to the MSc with a minimum Grade Point Average of 2.8 or Lower Second Class Honours or its equivalent is required for entry to the programme. The minimum level of the degree required may be re-assessed for candidates with extensive professional experience in an appropriate discipline.

Duration

The Programme is to be delivered full-time in 13 months. This includes a nine-month period for course delivery and examination, and four month period for the research project. Courses are taught as two to three week modules with examinations following the completion of each module, where applicable.

Method of Assessment

Assessment varies among courses, but most courses are assessed by a combination of course assignments and a final examination. For the research project, assessment will be based on a research paper and student performance.

Course of Study

The MSc consists of seven core courses (six for the Applied Meteorology stream), four specialisation stream courses (five for the Applied Meteorology stream), and a research paper.

Core courses consist of 24 hours of lectures and an average of 12 hours of practical work. Specialisation courses are worth four credits each and consist of 36 hours of lectures and an average of 18 hours of practical work.

The research paper is worth eight credits. Students must therefore obtain a total of 45 or 46 credits as follows: 18 (Applied Meteorology) or 21 credits (other streams) from core courses 20 (Applied Meteorology) or 16 credits (other streams) from courses in the stream of specialization 8 credits from a research project.

Students may be exempted from one or more core courses depending on their qualifications on entry to the Programme.

SPECIALISATION STREAMS

Coastal and Marine Resource Management

This stream will provide students with the knowledge and skills in concepts, policies, tools and techniques necessary for fishery and coastal zone management, and with a clear appreciation of the transdisciplinary approach required to be either effective fishery and coastal zone managers or effective advisors and consultants to organisations whose activities impact on the coastal zone. Emphasis will be on Caribbean case studies, with ample opportunity for practical experience.

Climate Change

This stream will provide students with an understanding of the causes of climate change globally and within the Caribbean, with knowledge of current climate trends and projections for the Caribbean, with an appreciation of potential impacts of climate change on natural and socio-economic systems in the region, with a knowledge of adaptive and mitigative measures available

to buffer the impacts, with an understanding of the regional and international policy framework within which climate change is addressed, and with the negotiation skills required to make significant contributions at regional and international climate change meetings and Conventions.

Waste Management

This stream is delivered on-line. Students will access the coursework via the UWI Distance Learning Network (WebCT) where the main texts as well as other reading materials will be stored. There will also be weekly interactive tutorials where students and lecturer will engage in discussions related to specific topics or other relevant materials using the Chat Room provided.

Applied Meteorology

This stream is offered through CERMES, in collaboration with the Caribbean Institute for Meteorology and Hydrology (CIMH). It will provide students with training in advanced techniques for the analysis for meteorological and hydrological data and their application in several key sectors of the economy. The primary objective of this stream is to contribute to the sustainable development of the region through the provision of professionals trained in the application of meteorology.

Water Resources Management

This stream prepares graduates to address technical, social, economic and political dimensions of water resources management, especially in Small Island Developing States. The specialisation courses will cover the physical and organizational dimensions of water supply, distribution and wastewater management and the variety of issues facing water services managers. They will provide training in hydrological and geohydrological (groundwater) analysis techniques and their application.

NB: This specialisation stream shares courses with two other streams: ENVT 6220 Water and Wastewater Management (Waste Management Stream), and ENVT 6200 Hydrology (Applied Meteorology Stream).

Orientation

A mandatory orientation day is held before classes start as an introduction to the MSc in Natural Resource and Environmental Management. During this period, students are introduced to CERMES staff and are given tours of the facilities at CERMES and the University.

Field Trips

For all specialisation streams, students may be given the opportunity to go on one week field trips which are typically within the wider Caribbean region. Students may be asked to contribute up to half of all travel costs towards the trips.

Distinction

For the award of the degree with Distinction, the candidate must obtain an average of at least 70% for all courses as well as in the Research Project. Students who have failed a course are not eligible for the award of the degree with distinction.

LIST OF COURSES

Core (3 credits each)

ENVT 6000	Concepts and Issues for Environmental Managers
ENVT 6001*	Introduction to Environmental Planning and Management
ENVT 6002	Professional Skills for Environmental Management
ENVT 6100	Environmental Impact Assessment
ENVT 6101	Geographic Information Systems
ENVT 6102*	Resource Economics

CORE FOR ALL STREAMS EXCEPT APPLIED METEOROLOGY (3 credits)

ENVT 6120	Measurement and Analysis in Natural Resource Management

CORE FOR APPLIED METEOROLOGY ONLY (3 credits)

ENVT 6144	Meteorological Impacts

COASTAL AND MARINE RESOURCE MANAGEMENT SPECIALISATION (4 credits each)

ENVT 6122	Fisheries Biology and Management
ENVT 6123	Sustainable Tourism in the Coastal Zone
ENVT 6124	Coastal Ecology and Dynamics
ENVT 6125	Managing Coastal and Marine Resources and Biodiversity

CLIMATE CHANGE SPECIALISATION (4 credits each)

ENVT 6130	Climate Dynamics and Modeling
ENVT 6131	Policy Response to Climate Change
ENVT 6132	Vulnerability to Climate Change and Impact Assessment
ENVT 6133	Climate Change Impacts: Mitigation and Adaptation

WASTE MANAGEMENT SPECIALISATION (4 credits each)

ENVT 6149*	Solid Waste Classification, Composition and Collection
ENVT 6150*	Waste Disposal, Treatment and Diversion
ENVT 6148*	Managing the Impacts of Waste on the Environment
ENVT 6220*	Water & Waste Water Management (offered jointly with Water Resources Management Specialisation)

APPLIED METEOROLOGY SPECIALISATION (4 credits each)

ENVT 6140	Atmospheric Physics and Weather Systems
ENVT 6141	Climatology and Agro-meteorology
ENVT 6143	Applied Statistics
ENVT 6200	Hydrology (offered jointly with Water Resources Management)

WATER RESOURCES MANAGEMENT SPECIALISATION (4 Credits each)

ENVT 6200	Hydrology (offered jointly with Applied Meteorology Specialisation)
ENVT 6220*	Water & Wastewater Management (offered jointly with Waste Management Specialisation)
ENVT 6210	Groundwater Resources
ENVT 6230	Water Management & the Environment

* Online courses

RESEARCH PROJECT OR RESEARCH INTERNSHIP (July – Oct all students)

ENVT 6900	Research Project (8 credits)

MPhil/PhD DEGREES

Entry Requirements

MPhil Candidates require at least an Upper Second Class Honours degree with a strong background in the discipline into which entry is being sought. All research students must register initially for the MPhil degree but may later, with suitable progress, be upgraded to register for the PhD degree. In cases where the candidate already has an MPhil degree (or equivalent), direct entry to the PhD is possible.

Availability of Expertise and Resources

Admission is contingent upon whether candidates have a thesis proposal compatible with the expertise and resources available in the CERMES.

Areas of Study

Major research interests of staff members in this department are:-

- Natural Resource Governance Systems
- Coastal Zone Management and Planning
- Fisheries
- Water Resources
- Climate Change.

Course of study

Students in the MPhil and PhD degree programme are required to successfully:

1. Complete a minimum of six (6) credits of coursework for MPhil/ nine (9) credits of coursework for PhD,
2. Present seminars (2 for MPhil/3 for PhD), and
3. Submit a thesis.

Courses

Students in the MPhil and PhD degree programme should discuss with their supervisor suitable courses which would satisfy the credit requirements. Courses should be completed in the first year.

Compulsory Seminar Presentations

For each seminar, candidates are required to write and present a paper to be photocopied and distributed before hand on a topic arising out of their research, as well as to field questions put to them afterwards.

Thesis

Candidates are required to present and defend a Thesis of acceptable scope and quality for the degree. The Thesis must follow the guidelines set out in the University's Thesis guide.

Candidates should also determine whether the materials for the thesis, or a substantial part thereof, are available either in the Library here at Cave Hill or elsewhere locally or regionally. The candidate should also determine whether it may be necessary to travel abroad in pursuit of these objectives and how the necessary financial support to accomplish this might be obtained.

Conferment of the Degree

The successful completion of the required coursework, the compulsory Seminar presentations and the Thesis will lead to the award of the Degree.

LIST OF COURSES

Core for all students

FPAS 6000	Scientific Literature Review

Core for all students depending on their programme

GRSM 7001	MPhil Research Seminar 1
GRSM 7002	MPhil Research Seminar 2
ENVT 7000	MPhil Environmental Studies Thesis
NARM 7000	MPhil Natural Resource Management Thesis
GRSM 8001	PhD Research Seminar 1
GRSM 8002	PhD Research Seminar 2
GRSM 8003	PhD Research Seminar 3
ENVT 8000	PhD Environmental Studies Thesis
NARM 8000	PhD Natural Resource Management Thesis

Research Students may also be permitted (with the approval of their Supervisor) to take courses from other offerings within the Faculty.

COURSE DESCRIPTIONS

COURSES LISTED IN ALPHANUMERIC ORDER BY COURSE CODE

COURSE CODE: BIOC 7000
TITLE: MPhil Biochemistry Thesis
CREDITS: 0

Description
Students produce a thesis of approximately 50,000 words under the supervision of a member of Faculty.

Assessment
Pass/Fail

COURSE CODE: BIOC 8000
TITLE: PhD Biochemistry Thesis
CREDITS: 0

Description
Students produce a thesis of approximately 80,000 words under the supervision of a member of Faculty.

Assessment
Pass/Fail

COURSE CODE: BIOL 7000
TITLE: MPhil Biology Thesis
CREDITS: 0

Description
Students produce a thesis of approximately 50,000 words under the supervision of a member of Faculty.

Assessment
Pass/Fail

COURSE CODE: BIOL 8000
TITLE: PhD Biology Thesis
CREDITS: 0

Description
Students produce a thesis of approximately 80,000 words under the supervision of a member of Faculty.

Assessment
Pass/Fail

COURSE CODE: CHEM 7000
TITLE: MPhil Chemistry Thesis
CREDITS: 0

Description
Students produce a thesis of approximately 50,000 words under the supervision of a member of Faculty.

Assessment
Pass/Fail

COURSE CODE: CHEM 8000
TITLE: PhD Chemistry Thesis
CREDITS: 0

Description
Students produce a thesis of approximately 80,000 words under the supervision of a member of Faculty.

Assessment
Pass/Fail

COURSE CODE: COMP 6115
TITLE: Web Technologies
CREDITS: 4
SEMESTER: 1

Description
This module equips students with the fundamentals of Web Technologies, both hardware and software aspects.

Topics include:
• The Internet and the World Wide Web; • Network topology, protocols (TCP/IP) and architecture; • (Client/Server and Peer-to-Peer); • ISO OSI Reference model; • Routers, switches, hubs and bridges; • Fast Ethernet; • DNS, POP/IMAP email protocols; • Utilities: FTP, Telnet; • Web Client/Server and e-commerce application software; • Web site authoring using HTML, DHTML and XML, site management; • Web site design; usability and usability testing; • Search engines; • Client-side scripting using Java Script; • Server-side scripting using PHP; • Cookies and style sheets; • Multimedia; and • Introduction to the use of Java Applets

Assessment
70% In-course tests/assignments, 30% Final Theory Examination

COURSE CODE: COMP 6125
TITLE: Introduction to Electronic Commerce
CREDITS: 4
SEMESTER: 1

Description
This module introduces the student to the field of e-commerce and e-Business.

Topics include:
• The Internet and the World Wide Web; • Business-to-Business, Business-to-Consumer, Consumer-to-Consumer, Business-to-Government e-commerce; • E-Business; • Security and Payment systems; • Marketing and E-Marketing; • Building a Web presence; • E-Commerce and Internet Law; and • IT Project management and e-commerce planning and strategy

Assessment
70% In-course tests/assignments, 30% Final Theory Examination

COURSE CODE: COMP 6205
TITLE: Electronic Commerce, Law and Ethics
PREREQUISITE: COMP 6125
CREDITS: 4
SEMESTER: Summer

Description
This module exposes students to the legal and ethical issues of Web sites and Web site technology.

Topics include:
• Ethics: Acts and moral implications; • Data Protection Act, Communication Decency Act, Digital Millennium Copyright Act, Federal Telephone Consumer Protection Act and Children's Online Privacy Protection Act; • Intellectual property: copyright, trademarks (trademark dilution and infringement), servicemarks, patents (business method patents) and trade secrets; • Digital rights management (DRM); • Contracts, digital signatures; • Defamation, data privacy, email privacy, Spam; • Legal restrictions on linking frames and inlining; disclaimers, terms of use, trademarks and meta tags, cookies; • Domain name disputes, name changing, name stealing and cybersquatting; • Jurisdiction; • E-crime: detection, prevention and legal sanctions; Eterrorism; and • Software development agreements and warrantees

Assessment
40% In-course tests/assignments, 60% Final Theory Examination

COURSE CODE: COMP 6215
TITLE: E-Business and Internet Marketing
PREREQUISITE: COMP 6125
CREDITS: 4
SEMESTER: 2

Description
E-Business may be defined as the connection of critical business systems and its parts via intranets, extranets and the Internet. This module explores E-Business and presents current methods used by businesses to market their products and services on the Internet.

Topics include:
• Transaction cost, return on investment, Revenue models; • Intranets, extranets and virtual private networks (VPNs); • Electronic Data Interchange (EDI); • Value chains and supply chain management; • Business plans; • Marketing strategies; market segmentation; Branding; • Permission, viral, affiliate, one-to-one marketing; mass media marketing; • Business processes supporting buy/sell activities; and • Inventory planning

Assessment
70% In-course tests/assignments, 30% Final Theory Examination

COURSE CODE: COMP 6225
TITLE: Security and Electronic Payment Systems
PREREQUISITES: COMP 6125 and COMP 6115
CREDITS: 4
SEMESTER: 2

Description
From a business point of view the selection and payment of goods and services is paramount. However, obstacles such as the security of the payment system or the supporting network may deter potential on-line buyers. In this module the student is exposed to a wide variety of payment systems, how they work, their security, and their advantages and disadvantages.

Topics include:
• Cryptography, block and stream ciphers; • DES, RSA; • MAC, message hashes; • Public/private key, secret keys; • Key distribution and recovery and Trusted Third Parties; • Digital signatures and certificates; • Modular Inverses and Public Key Mathematics; • Operating syste`m and web application vulnerabilities; attacks; • Network security, Web application and operating system security; • PGP, X.509, SSL, IPsec, secure e-mail; • Viruses, virus protection, worms, Trojan horses, Adware, Spyware, firewalls, software patches; • Payment systems (including Credit/Debit/Smart cards, CyberCash,

E-Wallets, CheckFree, eCASH); • SETS, SwiftNet, Electronic Fund Transfer and Automated Clearinghouse; and • Writing secure code

Assessment
40% In-course tests/assignments, 60% Final Theory Examination

COURSE CODE: COMP 6235
TITLE: Electronic Commerce Laboratory
PREREQUISITE: COMP 6125 and COMP 6115
CREDITS: 4
SEMESTER: 2

Description
This is a hands-on module that gives students the opportunity to build a Web site from the ground up. The student will be instructed on the building and configuring of a network, the installation of Web server, browser and e-commerce software and the creation and maintenance of a Web site. The student will also learn how to use Web tools to support the creation and maintenance of Web site activities. In addition, the student will learn about the outsourcing of the Web hosting activity.

Topics include:
• Creating and configuring Client/Server networks; • Creating VPNs and Intranets; • Installing firewalls and virus protection software; • Outsourcing the hosting activity; ISP identification; • Installing of Web Client and Web Server software; • Installing and using Web design/multimedia tools such as Microsoft FrontPage, Dreamweaver and Macromedia Flash and open source tools such as Nvu; • The use of network administration tools; • Linux/Windows system administration • Apache/Microsoft IIS Server; and • Payment systems

Assessment
100% coursework

COURSE CODE: COMP 6305
TITLE: Electronic Commerce in the Caribbean
PREREQUISITE: COMP 6125
CREDITS: 4
SEMESTER: 2

Description
This module examines the penetration of electronic commerce in the Caribbean, current and required legislation and obstacles.

Topics include:
• Legislation: Data Protection Act and Telecoms deregulation; • Trusted Third Parties, digital signatures; • E-commerce in Tourism; • Merchant accounts and financial institutions; • Hindrances to the growth of e-commerce; • Payment systems in the Caribbean; • The effect of CSME on e-commerce in the Caribbean; • The readiness of businesses in the Caribbean; and • Case studies

Assessment
100% Coursework

COURSE CODE: COMP 6315
TITLE: Database Technologies and Knowledge Management
PREREQUISITES: COMP 6125 and COMP 6115.
CREDITS: 4
SEMESTER: 2

Description
This module exposes the student to methods used to share data between organisations and to manage Web site content.

Topics include:
• RDMS, Data normalisation, SQL; • Database access using Java/MySQL, ASP/MySQL and PHP/MySQL; • Knowledge representation and discovery; data mining; • Information representation and sharing; XML/EDI and other XML standards; • Content Management Systems; and • Emerging technologies for supporting the Semantic Web such as the Resource Description Framework (RDF)

Assessment
40% In-course tests/assignments,
60% Final Theory Examination

COURSE CODE: COMP 6325
TITLE: Advanced Web Technologies
PREREQUISITES: COMP 6125 and COMP 6115.
CREDITS: 4
SEMESTER: 2

Description
This module exposes the student to web programming for the enterprise.

Topics include:
• Java 2 Enterprise Edition and the Microsoft .NET framework; • Database access; • Network programming; • Middleware; • Advanced server-side scripting; • Java, Perl, PHP, JSP/ASP

Assessment
40% In-course tests/assignments,
60% Final Theory Examination

COURSE CODE: COMP 6335
TITLE: Mobile Commerce
PREREQUISITES: COMP 6125 and COMP 6115.
CREDITS: 4
SEMESTER: 2

Description
This module exposes the student to wireless technologies and demonstrates how these technologies are used for m-commerce. In addition, the student will learn how to program mobile devices.

Topics include:
• Wireless communication technologies: PDAs, Cell phones, WLAN (wireless LAN), SMS, WPAN (Wireless personal area networks); • 2.5G and 3G technologies; • AMPS (Advance mobile phone service), GSM (Global system for mobile communication); • CDMA (Code Division Multiple Access), TDMA (Time division multiple access); • WML (Wireless Markup Language), WMLScript, XHTML Basic, J2ME (Java 2 Micro Edition), BREW (binary runtime for wireless); • Palm and Palm OS, Microsoft Windows CE; • Legal and social issues; • Security; • M-business and m-payments; and • Multimedia content delivery over wireless networks: Audio, video and speech recognition

Assessment
40% In-course tests/assignments,
60% Final Theory Examination

COURSE CODE: COMP 6345
TITLE: Special Topics in Electronic Commerce
PREREQUISITES: All compulsory modules in MSc Electronic Commerce.
CREDITS: 4
SEMESTER: 2

Description
This module provides the student with the opportunity to research a current topic in the field of electronic commerce

Assessment
100% Research Paper

COURSE CODE COMP 6355
TITLE Advanced Software Engineering
PREREQUISITES: COMP2145 (Software Engineering) or equivalent
CREDITS 4
SEMESTER: 2

Description
This intensive module provides a practical, in-depth study of software engineering with a special look at the development of Web-based projects. Throughout the course the student will be required to project manage a product which has multiple versions requiring maintenance. The student will be responsible for obtaining requirements from the client, designing the system, implementing the system, testing the system and releasing the system to the client. In addition the student will be required to maintain the system by tracking reporting and fixing bugs. The student will also be responsible for making enhancements to multiple versions of the product and storing the product in a version control system. Customer facing and developer documentation will also have to be maintained. Automated tools will be used to test the product, both at the unit level and the system level.

Topics include:
• Software Development Process; • Software Development Methodologies; • Software metrics; • Requirements Gathering – Use Cases analysis; • Software Inspections; • Object Oriented Analysis, Design and Programming; • Design Patterns; • UML and modeling tools such as Rational Rose and Poseidon; • Managing Web based Projects; • Software Testing; • Software Testing Frameworks; • Automated Unit Testing, such as JUnit; • Automated Testing and Test Tools, such as. Mercury WinRunner; • Bug reporting and tracking; • Web site testing, e.g. stress and usability testing; • Authoring technical documents; • Release and Configuration Management; • Version Control Systems, such as CVS; and • Careers in Web-based software engineering

Assessment
40% In-course tests/assignments,
60% Final Theory Examination

COURSE CODE COMP 6505
TITLE Electronic Commerce Project/ Internship
PREREQUISITES: All compulsory modules in MSc Electronic Commerce
CREDITS 8
SEMESTER: 2

Description
This module provides the student with the opportunity to research a current topic in the field of electronic commerce.

Assessment
80% Final Report, 20% Oral Presentation

COURSE CODE: ECOL 7000
TITLE: MPhil Ecology Thesis
CREDITS: 0

Description
Students produce a thesis of approximately 50,000 words under the supervision of a member of Faculty.

Assessment
Pass/Fail

COURSE CODE: ECOL 8000
TITLE: PhD Ecology Thesis
CREDITS: 0

Students produce a thesis of approximately 80,000 words under the supervision of a member of Faculty.

Assessment
Pass/Fail

COURSE CODE: ENVT 6000
TITLE: Concepts and Issues for Environmental Managers
CREDITS: 3
SEMESTER: 1

Description
This course provides, an overview of the key concepts and issues that students are expected to be knowledgeable about, and may consider in greater detail later in their academic work and careers. The topics are examined largely from a Caribbean perspective within the global context. These topics, which may vary from year to year as new ideas and issues arise, include: environmental statistics, social-ecological system concepts, ecosystem-based management, global and regional governance through multilateral agreements, sustainable development, poverty and globalisation. Specific areas of attention include biodiversity, fisheries and coastal management, environmental impact assessment, climate change, sustainable tourism, law and various environmental management and planning tools.

Assessment
100% coursework

COURSE CODE: ENVT 6001
TITLE: Introduction to Environmental Planning and Management
CREDITS: 3
SEMESTER: 1

Description
The purpose of this course is to introduce environmental planning and management in the Caribbean. It therefore explores the nature of the inter-relationship between environmental systems and human systems, and examines the complexity of environmental policy, planning and management. Topics include perspectives on environmental management and planning, international and regional agreements and administrative arrangements for environmental planning, policy design, physical planning, spatial planning and management, implementation and evaluation management strategies, issues and dynamics, and people-centred practices in planning and management.

Assessment
100% coursework

COURSE CODE: ENVT 6002
TITLE: Professional Skills for Environmental Management
CREDITS: 3
SEMESTER: 1

Description
This course equips students with a portfolio of skills that will allow them to present themselves, and to conduct and present their work, in a professional manner. It starts by addressing fundamental issues of verbal and non-verbal communication geared at enhancing the students' ability to share information in a range of settings. The improvement of writing skills, an introduction to research, data handling, the preparation of well-structured technical proposals and reports, and the delivery of professional and persuasive presentations are all topics covered in this course.

Assessment
100% coursework

COURSE CODE: ENVT 6100
TITLE: Environmental Impact Assessment
CREDITS: 3
SEMESTER: 2

Description
This course introduces students to the practice of EIA in the Caribbean. Topics covered include: what is EIA; steps in an EIA; preparation of terms of reference; baseline studies; mitigation measures; comparison of alternatives; public involvement and the review process.

Assessment
100% Coursework

COURSE CODE: ENVT 6101
TITLE: Geographic Information Systems
CREDITS: 3
SEMESTER: 1

Description
This course focuses on the application of GIS in natural resource management. It seeks to give students an understanding of the key principles of GIS and a practical understanding of the application of GIS for visualisation and analysis through both theoretical and practical activities. Additionally, students will get a functional understanding of at least one GIS software package. Topics include: data capturing techniques, spatial data and data models, cartographic techniques, GIS design, implementation and the issues associated with managing a GIS project.

Assessment
70% coursework, 30% Final Examination

COURSE CODE: ENVT 6102
TITLE: Resource Economics
CREDITS: 3
SEMESTER: 1

Description
This course surveys a wide range of economic issues relating to natural resource and environmental policy. It commences with an introduction to elementary concepts of economic theory, i.e. the consumer, the firm, supply and demand and criteria for economic efficiency. This is followed by consideration of: environmental economic efficiency, environmental economics, the economics of natural resource depletion, economic valuation methods, poverty and natural resources, and natural resource accounting.

Assessment
40% Coursework, 60% Final Exam

COURSE CODE: ENVT 6120
TITLE: Measurement and Analysis in Natural Resource Management
CREDITS: 3
SEMESTER: 1 & 2

Description
This course will provide hands-on practical experience in field data collection techniques, laboratory procedures and statistical analysis and interpretation of biological and socio-economic data relevant to the management of natural resources. Measurement and analysis experience will cover the full range from broad-scale rapid assessment, and expert judgment through to detailed finescale, long-term monitoring using standard protocols. Topics covered include design and implementation of a conservation and monitoring programme for an endangered species (sea turtles); rapid assessment techniques (gully ecological survey); guidelines for socio-economic data collection; marine and potable water quality assessment and monitoring techniques; long-term monitoring of marine community health and productivity (coral reefs, sea grasses, mangroves); and parametric and non-parametric statistical testing and interpretation.

Assessment
100% Coursework

COURSE CODE: ENVT 6122
TITLE: Fisheries Biology and Management
CREDITS: 4
SEMESTER: 2

Description
This course introduces students to biological assessment techniques for fishery resources and focuses on management needs and a critical analysis of fishery management tools and their application to Caribbean fisheries. Topics include: importance and state of world fishery resources and management; introduction to ocean biogeography and productivity patterns; traditional and genetic-based stock identification techniques; stock dynamics (growth, mortality, reproduction/ recruitment rates of individuals and populations); introduction to yield prediction modelling and interpretation; framework of international law and fisheries policy; influence of NGOs and market demand (eco-labelling); prioritising

management goals and objectives; choice of management tools (quotas, gear restrictions, minimum size, limited entry, closed seasons, MPAs). Emphasis will be on tropical species and Caribbean case studies.

Assessment
30% Coursework, 70% Final Examination

COURSE CODE: ENVT 6123
TITLE: Sustainable Tourism in the Coastal Zone
CREDITS: 4
SEMESTER: 2

Description
This course provides students with information and exposes them to resources and experiences through which they will develop analytical and practical skills for the efficient management of natural and cultural resources as part of the tourism product. It looks at the emergence of sustainable tourism and its use as a strategy for both development and conservation and critically assesses the elements of the tourism industry thereby evaluating possible directions for the future of sustainable tourism in the Caribbean. Topics covered are: the historical development of tourism in the Caribbean; the social, economic and environmental impacts of tourism; the structure and sectors of the industry standards in the tourism industry; community-based tourism; heritage tourism; sports tourism and sustainable tourism.

Assessment
40% Coursework, 60% Final Examination

COURSE CODE: ENVT 6124
TITLE: Coastal Ecology and Dynamics
CREDITS: 4
SEMESTER: 2

Description
This course examines the distribution, ecology and dynamics of critical coastal marine communities and non-living coastal resources of the Caribbean with emphasis on the biophysical processes that shape them, and the linkages and interactions among them. Topics will include: a basic overview of ocean currents and Caribbean circulation; structure and function of critical coastal ecosystems (coral reef, seagrass and mangroves), sensitivity to natural and anthropogenic stresses and appropriate mitigative measures; sea level changes; wind-generated waves and their properties, including refraction, diffraction and reflection; coastal erosion, transport, deposition and resultant geomorphologic features; the sediment budget and beach stability; and a review of coastal management tools examining their advantages and disadvantages. These tools will include the use of water quality standards, harvest and use controls and coastal protection structures.

Assessment
30% Coursework, 70% Final Examination

COURSE CODE: ENVT 6125
TITLE: Managing Coastal and Marine Resources and Biodiversity
CREDITS: 4
SEMESTER: 2

Description
This course examines institutional and organisational arrangements for integrated management of coastal and marine resources and biodiversity at international, national and local scales. These are considered in the context of current and emerging models for governance of natural resource systems. The course provides the technical base for biodiversity conservation and integrates this topic with management of fisheries, oceans and coastal zones. Topics include: Governance of complex systems, management implications of international and regional conventions, ecosystembased management; determination and application of coastal setbacks, zoning, regulatory regimes in coastal zone management, co-management; the precautionary approach; origin and value of biodiversity; and causes, magnitude and impacts of biodiversity loss. There will be a one-week field trip. In recent years this has been to the Grenadine Islands.

Assessment
45% Coursework, 55% Final Examination

COURSE CODE: ENVT 6130
TITLE: Climate Dynamics and Modeling
CREDITS: 4
SEMESTER: 2

Description
This course develops knowledge and skills for modelling and simulating climate and interpreting the results from climate models. It demonstrates the contribution and relevance of interdisciplinary research and policy considerations as inputs to climate modelling. Topics include: constituents, structure and primary atmospheric processes; weather, climate and climate variability; climate driving forces, including greenhouse gases and their effects; anthropogenic aerosols and volcanic eruptions; ultraviolet radiation, ozone and

CFCs; global energy balance including oceanic circulation; numerical modelling and climate models; scaling issues and limitations of General Circulation Models; climate sensitivity; monitoring, observation and modelling of past climates and trends; global warming, hurricanes and El Nino Southern Oscillation (ENSO); future climate trends and changes.

Assessment
30% Coursework, 70% Final Examination

COURSE CODE: ENVT 6131
TITLE: Policy Response to Climate Change
CREDITS: 4
SEMESTER: 2

Description
This course evaluates a broad suite of policy approaches to GHG reduction and climate stabilization, in the context of the United Nations Framework Convention on Climate Change (UNFCCC), and the Kyoto Protocol. It develops knowledge and skills for policy formulation, and for strengthening negotiating capacity to protect regional interests in the global climate change debate. Topics include: the international policy response: UNFCCC, Berlin Mandate and Kyoto Protocol as instruments for atmospheric stabilization; policy approaches of developed and developing countries; negotiating positions of major UN Groups: European Union (EU), Japan-United States-Canada-Australia-New Zealand (JUSCANZ), Group of 77 and China (G77), Environmental Integrity Group (EIG), Organization of Petroleum Exporting Countries (OPEC), and the Alliance of Small Island States (AOSIS); application of key negotiating tenets, including the precautionary principle and common but differentiated responsibilities; exploring elements of a CARICOM negotiating position.

Assessment
40% Coursework, 60% Final Examination

COURSE CODE: ENVT 6132
TITLE: Vulnerability to Climate Change and Impact
Assessment
CREDITS: 4
SEMESTER: 2

Description
This course will adopt a problem-solving approach to climate impacts and vulnerability assessments in the Caribbean. It will draw on lessons from the hazard and disaster management community, the UNEP Country Studies, IPCC Common Methodology, and other methodologies and studies appropriate to the circumstances of the Caribbean and Small Island Developing States. From these an integrated approach to assessing impacts, vulnerability and adaptation will be developed. Themes will include: variability, extreme events (e.g. hurricanes, storm surge, droughts, floods) and their link to climate change; methods and tools in climate impact assessment; use of scenarios in vulnerability and impact assessments; impact of projected climate change and sea-level rise on key socio-economic sectors in the Caribbean; types and treatment of uncertainty; risk assessment and management; decision making based on outputs from vulnerability and risk assessments.

Assessment
50% Coursework, 50% Final Examination

COURSE CODE: ENVT 6133
TITLE: Climate Change Impacts: Mitigation and Adaptation
CREDITS: 4
SEMESTER: 2

Description
This course will examine current trends and approaches to climate change mitigation and adaptation. Methodologies, broad strategies and specific options will be discussed and their efficacy at the global, regional and local scales will be evaluated. Among the topics to be discussed are: objectives of the UNFCCC and the Kyoto Protocol and their implications for mitigation and adaptation in the Caribbean; costs and benefits of emissions reductions; economic instruments for promoting mitigation including taxes, insurance schemes and tradable emission permits; carbon sequestration in soils and vegetation; types of adaptation – autonomous, anticipatory and planned; constraints to the implementation of adaptation options and strategies; timing of adaptation; technologies for energy efficiency and their application to the Caribbean: small hydro, solar thermal, photovoltaics, wind, ocean thermal energy conversion (OTEC), and no-carbon fuels; equity issues and their implications for adaptation in small vulnerable states.

Assessment
40% Coursework, 60% Final Examination

COURSE CODE: ENVT 6140
TITLE: Atmospheric Physics and Weather Systems
CREDITS: 4
SEMESTER: 2

Description
This course provides an understanding of the basic characteristics of the atmosphere and of the physical and dynamical processes which play a role in the motions of the atmosphere. It also includes a description of some local, mid-latitude and tropical weather systems.

Assessment
25% Coursework, 75% Final Examination

COURSE CODE: ENVT 6141
TITLE: Climatology and Agrometeorology
CREDITS: 4
SEMESTER: 2

Description
This course develops an understanding of the drivers of climate as well as global and Caribbean climatology. It examines the role of climate in vegetation distribution and agriculture. An understanding of the influences of weather parameters on plant and animal production and activity, and how this knowledge can aid in improving and sustaining agricultural production will also be provided.

Assessment
25% Coursework, 75% Final Examination

COURSE CODE: ENVT 6143
TITLE: Applied Statistics
CREDITS: 4
SEMESTER: 2

Description
Considerable amounts of weather and water data have been collected over the last 100 years. Usage of such data for many applications requires skill in special statistical methods. The course begins with topics including probability distributions, regression and correlation theory, multivariate analysis, analysis of variance and sampling, estimation and decision theory. Emphasis is given to statistical methods widely used for analysis of climatic and hydrological data including multiple regression, time series analysis, extreme value analysis and statistical treatment of rainfall and associated events especially low flows, droughts and floods.

Assessment
40% Coursework, 60% Final Examination

COURSE CODE: ENVT 6144
TITLE: Meteorological impacts
CREDITS: 3
SEMESTER: 1

Description
This course provides background knowledge of the damaging effects of weather phenomena such as floods, droughts, strong winds and low temperatures and extreme weather events in all economic sectors, but particularly in agriculture and water resources. The course includes topics such as contamination of surface water and groundwater, saltwater intrusion into rivers and aquifers; pollution displacement, strong winds and impacts on agriculture; forest and bush fires and weather related hazards (pest and diseases) on agriculture. Also included in this course are some mitigative and protective strategies to combat these negative impacts.

Assessment
25% Coursework, 75% final Examination

COURSE CODE: ENVT 6148
TITLE: Managing the Impacts of Waste on the Environment
CREDITS: 4
SEMESTER: 2

Description
This course provides an overview of the key concepts and issues related to the environmental impacts of waste including definitions of waste, assessing the potential impacts using an EIA approach and littering and illegal disposal. The role of multilateral environmental agreements in waste management and that of activism will be presented along with the regional and local management and mitigation initiatives. Students will be introduced to the regional public sector, private sector and NGO initiatives; international funding agencies and projects in the South Eastern Caribbean, inter-agency and cross-cutting sectoral initiatives, and waste management in the context of natural disasters with emphasis on mitigation.

Assessment
100% Coursework

COURSE CODE: ENVT 6149
TITLE: Solid Waste Classification, Composition and Collection
CREDITS: 4
SEMESTER: 2

Description
In this course students are introduced to the environmental implications of inadequate management of solid waste and provided information on the tools and methodologies for undertaking waste classification and developing mechanisms for efficient collection of municipal solid waste. Topics will include classification and composition of municipal solid waste in which students will learn about the different categories of waste, methods of analyzing waste and for determining generation rates on a per capita basis; collection systems; designing a collection system, including methodologies for calculating the cost associated with operation of the collection fleet.

Assessment
100% Coursework

COURSE CODE: ENVT 6150
TITLE: Waste Disposal, Treatment and Diversion
CREDITS: 4
SEMESTER: 2

Description
Students are introduced to solid waste master planning and alternatives; the development and design of engineered landfills, containment and cover systems; water balance calculations in landfills; predictions of contaminant transport in subsurface environment using EPA models; bioreactor landfill design and leachate re-circulation; landfill gas management and utilization; composting of organic waste; solid waste incineration; solid waste recycling; and medical waste management.

Assessment
100% Coursework

COURSE CODE: ENVT 6200
TITLE: Hydrology
CREDITS: 4

Description
Hydrology is the study of the occurrence and movement of water in the environment and is essential to the understanding of water quantity and quality issues for those involved in the management of water resources in any way. This course will provide an understanding of hydrological processes and a knowledge of the techniques used to assess water resources. It starts from a basic understanding of the hydrological cycle and its processes and an introduction to rivers, flood plains and wetland environments. The course will cover hydrological parameters such as rainfall, evaporation and surface run-off, stream processes and systems the measurement of these parameters and their use in modeling. Water quality and related pollution issues associated with surface waters such as streams, rivers and other water bodies will be covered. The interactions between surface water and groundwater will be introduced. Data gathering, monitoring programmes and data analysis approaches will be presented. Techniques used to assess water resources such as modeling, remote sensing and GIS will be introduced to give an overview of their use and potential. Other topics that will form part of the course will include: the hydrology of dams covering catchment characteristics, reservoir yields and sedimentation; aspects of urban hydrology; pluvial and fluvial flooding and the interaction between hydrological and ecological processes.

Assessment
50% Coursework, 50% Final Examination

COURSE CODE: ENVT 6210
TITLE: Groundwater Resources
CREDITS: 4
SEMESTER 2

Description
Many of the freshwater resources on the Earth are in the form of groundwater and as a result they are increasingly under stress from over abstraction and pollution. The sustainable management of groundwater is critical for current and future generations. In the Caribbean groundwater resources are the primary source of freshwater not just for domestic use but for agriculture, tourism and industry, on many islands such as Barbados whole economies depend on it. The purpose of this course is to provide a comprehensive introduction to groundwater systems and their management. It will start with the origins, nature and behaviour of aquifers and subsurface waters and how it fits into the wider natural environment. Themes and concepts related to groundwater flow, including Darcy's law and the continuity equations, parameterization and related concepts will be covered. The techniques of hydrogeological investigation, evaluation of groundwater resources and monitoring including groundwater quality and groundwater modeling will be

presented. The principles of solute transport will be discussed. The vulnerability of subsurface waters to the effects of land use change, pollution, over-abstraction and climate change will be explored along with coastal hydrogeology, groundwater management and its place in integrated water resources management.

Assessment
50% Coursework, 50% Final Examination

COURSE CODE: ENVT 6220
TITLE: Water and Wastewater Management
CREDITS: 4
SEMESTER: 2

Description
The focus of this course is on the technical, managerial and organizational aspects of making water resources available to consumers and the removal, treatment and disposal of wastewater. Students will be provided with an understanding of the issues surrounding aspects of water and wastewater management such as water collection and treatment, transportation and distribution of water; water demand estimation, supply and demand management; water distribution in urban and rural areas; water quality standards and measurement; definitions and characteristics of wastewaters; the potential environmental and public health concerns; sanitation, different wastewater collection and wastewater treatment and disposal systems; green-, grey- and black- water recycling and reuse; residuals management; storm-water drainage and management in urban and coastal areas; policy, legislation and regulations; financial mechanisms and institutional arrangements. In addition the potential impact of climate change on water and wastewater management and the range of responses, adaptations and mitigations measures will be explored.

Assessment
100% Coursework

COURSE CODE: ENVT 6230
TITLE: Water Management and the Environment
CREDITS: 4
SEMESTER: 2

Description
Integrated water resources management considers how water should be managed by considering the multiple viewpoints and factors that need to be taken account of when making decisions and taking actions. The competing uses of water in the natural, social and economic environment requires knowledge and expertise from across many different disciplines. The aim of this course will be to examine the varying aspects that constitute water resources management in island and non-island countries in the Caribbean region and the relationships between the technical, natural, social, economic and political environment, particularly those issues facing SIDS. The course places an emphasis on the economics of water and water resources as well as on legal and policy perspectives. Course material will cover: concepts of catchment/ watershed management, integrated water resources management; national and international laws and institutional arrangements that impact on water management; economics; the political ecology of water; the impacts of water resources developments including land/ marine interaction issues, decision support tools and development pressures.

Assessment
100% Coursework

COURSE CODE: ENVT 6900
TITLE: Research project
CREDITS: 8
SEMESTER: Summer
PREREQUSITES: Completion of all other courses in MSc Natural Resource & Environmental Management

Description
The full-time 4-month research project or is usually undertaken immediately after semester II, in July to October. Students are required to submit a research report paper at the end of this period for examination. Research projects will be supervised by CERMES faculty and will be in priority research areas relevant to the students' specialisation stream. Students from non-campus countries will be encouraged to conduct their research in these countries, providing that adequate supervision arrangements can be made.

Assessment
100% Coursework

COURSE CODE: ENVT 7000
TITLE: MPhil Environmental Studies Thesis
CREDITS: 0

Description
Students produce a thesis of approximately 50,000 words under the supervision of a member of Faculty.

Assessment
Pass/Fail

COURSE CODE: ENVT 8000
TITLE: PhD Environmental Studies Thesis
CREDITS: 0

Description
Students produce a thesis of approximately 80,000 words under the supervision of a member of Faculty.

Assessment
Pass/Fail

COURSE CODE: FPAS 6000
TITLE: Scientific Literature Review
CREDITS: 3

Description
The course will formally teach MPhil and PhD students how to prepare an extensive review of the literature pertaining to a scientific topic. This will guide students on how to study and evaluate the literature on a given topic and write a comprehensive essay on it. The course will also demonstrate the use of pertinent search engines, discipline-specific traditional reference sources, as well as software for managing reference lists and creating bibliographies.

Assessment
Pass/Fail based on satisfactory attendance at the lectures and computer laboratory classes and on the adequacy of the written literature review and research proposal.

COURSE CODE: GRSM 7001 (common to all MPhil students)
TITLE: MPhil Research Seminar 1
CREDITS: 0

Description
This is the first of two research seminars to be presented by the MPhil student.

Assessment
Pass/Fail

COURSE CODE: GRSM 7002 (common to all MPhil students)
TITLE: MPhil Research Seminar 2
CREDITS: 0

Description
This is the second of two research seminars to be presented by the MPhil student.

Assessment
Pass/Fail

COURSE CODE: GRSM 8001 (common to all PhD students)
TITLE: PhD Research Seminar 1
CREDITS: 0

Description
This course is the first of three research seminars to be presented by the PhD student.

Assessment
Pass/Fail

COURSE CODE: GRSM 8002 (common to all PhD students)
TITLE: PhD Research Seminar 2
CREDITS: 0

Description
This is the second of three research seminars to be presented by the PhD student.

Assessment
Pass/Fail

COURSE CODE: GRSM 8003 (common to all PhD students)
TITLE: PhD Research Seminar 3
CREDITS: 0

Description
This is the last of three research seminars to be presented by the PhD student.

Assessment
Pass/Fail

COURSE CODE: MICR 7000
TITLE: MPhil Microbiology Thesis
CREDITS: 0

Description
Students produce a thesis of approximately 50,000 words under the supervision of a member of Faculty.

Assessment
Pass/Fail

COURSE CODE: MICR 8000
TITLE: PhD Microbiology Thesis
CREDITS: 0

Description
Students produce a thesis of approximately 80,000 words under the supervision of a member of Faculty.

Assessment
Pass/Fail

COURSE CODE: NARM 7000
TITLE: MPhil Natural Resource Management Thesis
CREDITS: 0

Description
Students produce a thesis of approximately 50,000 words under the supervision of a member of Faculty.

Assessment
Pass/Fail

COURSE CODE: NARM 8000
TITLE: PhD Natural Resource Management Thesis
CREDITS: 0

Description
Students produce a thesis of approximately 80,000 words under the supervision of a member of Faculty.

Assessment
Pass/Fail