UNIVERSITY of GUYANA

Faculty of Earth and Environmental Sciences

Department of Environmental Studies

UNDERGRADUATE
STUDENT HANDBOOK

THE FACULTY
OF EARTH AND ENVIRONMENTAL SCIENCES

The Environmental Studies Unit (ESU) was established in 1993, with technical and financial support from the European Union, for the purpose of promoting teaching and research and providing guidance to decision-makers and national agencies in the areas of natural resources management and environmental conservation.

One of the primary objectives if the Unit was to offer a degree of Bachelor of Science in Environmental Studies.

The first batch of students was enrolled in January 1994. The ESU continued until 2005 when the School of Earth & Environmental Sciences (SEES) was established through a merger of the ESU and the Department of Geography (DoG).

This merger expanded the areas of focus to include teaching and research in spatial planning and development, geographical information system (GIS) and remote sensing; the latter two being perceived as newly emerging and pivotal academic fields in Guyana during that time. The School was re-designated to Faculty of Earth and Environmental Sciences (FEES) on October 1, 2016.

The Faculty's overall goal is to provide quality tertiary education in the Earth and Environmental Sciences and to conduct interdisciplinary/multidisciplinary research and extension services (to those who are not enrolled in the regular programmes) in areas such as environmental management, sustainable land use planning, natural resources management, housing and settlement development, and earth surface dynamics.

It accomplishes this through two Departments, one of which is that of Environmental Studies.

MISSION STATEMENT

To produce graduates with the technical skills, knowledge, and attitudes required to support community and national development in a highly reputable and intellectually stimulating learning environment.

VISION STATEMENT

The vision is for a community of staff and students dedicated to the provision of exciting learning experiences characterised by high-quality teaching, research, and community service that positively impact the development goals of society.

CORE VALUES

- Excellence – Performance of staff and students is of the highest standard
- Sustainability – Standards and capacity to deliver remain unwavering
- Stewardship – Championing responsible use and protection of the environment
- Integrity – Professionalism remains unquestionable
- Leadership – Trust and reliability are engendered
- Engagement – Involvement in the Faculty's/University's interest
- Visibility - Tasks handled with confidence and dexterity

ABOUT THE DEPARTMENT OF ENVIRONMENTAL STUDIES

The Department of Environmental Studies seeks to offer programmes that are relevant and current in such a way that it makes a lasting impact on our students. Guyana has a rich diversity of people and natural resources that form part of our environment. Managing our natural resources for economic development that meet this needs of our diverse population today and tomorrow is the impetus driving our programmes. Our programmes therefore utilise active and collaborative learning strategies to engage and motivate our students to adopt practices and action for the environment. In this way, our students are able to experience the challenges and complexities of managing our environment for a people of diverse needs. These experiences are nurtured through critique and reflection to foster an understanding of the importance of exercising evaluative judgement in the design of practical solutions for national development.

Our programmes expose students to learning from the natural and social sciences. From the natural sciences, students learn experimental techniques and methods of analysis needed to make accurate observations, to document change, and to understand the dynamics of healthy landscapes and functioning ecosystems. From the social sciences and humanities, students gain insights into human behaviour as it relates to the natural environment and the workings of social, political, legislative, and economic institutions in the context of environmental and natural resource management.

More than 90% of our courses include field exercises where students journey to hot spots in Guyana to gain hands on experience.

Our curriculum therefore offers a wide variety of courses such as Environment and Development for Guyana and the Caribbean, Environmental Health, Environmental Chemistry, Practical Environmental Chemistry, Environmental Policy and Governance, Energy and the Environment, Aquatic Sciences, Environmental Toxicology, Environmental Management for Oil and Gas, Occupational Safety and Health, Introduction to Problem Solving, Introduction to Environmental Modelling, Geographical Information Systems, Environmental Impact Assessment, Environmental Law, and Environmental Leadership, Innovation, and Entrepreneurship.

Students are also able to do courses external to the department in a wide variety of areas inclusive of Soil and Water Management and Conservation, Forest Management and Planning, Wildlife Management, Environmental Geology, and The Study of Society.

Our students are taught by academics with expertise in the theoretical and practical underpinning of their content. Our courses are delivered in a blended mode making use of the learning management system, Moodle, to enhance engagement within our teaching and learning environment. Students are able to make use of our array of field kits to tests water, soil, and air quality. Students are also able to interface with stakeholders in an attempt to understand their challenges or to gain their perspectives on new policy directives or to learn from their best practices. Compulsory in all of our programmes is an internship, which offers students an opportunity to continue learning while gaining work experience; and the element of research, which draws on knowledge and skills acquired throughout the programme.

Our students are also in extracurricular activities through The EcoTrust Society, an environmental club attached to the Department. Students active in this club gain leadership, communication, and organisation skills.

They learn how to work in teams to foster change. The EcoTrust Society is at the heart of all of our observances of international events/occasions such as World Water Day, Earth Day, World Environment Day and World Soil Day.

Annually they collaborate with World Wildlife Fund for Nature to observe Earth Hour.

Our graduates are employed at several of the national environment related agencies such as Environmental Protection Agency, Guyana Geology and Mines Commission, Protected Areas Commission, Guyana Forestry Commission, Ministry of Natural Resources and Ministry of Agriculture. Our graduates are also employed at United Nations Development Programme, Conservation International Guyana, World Wildlife Fund for Nature, and Iwokrama International Centre for Rainforest Conservation and Development. Our graduates have little difficulty furthering their studies with several being the recipient of international and regional scholarships such as Chevening, Nuffic, Fulbright, Commonwealth Share, and CARPIMS.

THE DEPARTMENT OF ENVIRONMENTAL STUDIES OFFERS

TWO UNDERGRADUATE PROGRAMMES:

- ✓A Bachelor of Science in Environmental Studies
- ✓A Bachelor of Science in Environmental Science

Programme:

Bachelor of Science in Environmental Studies

The goal of the BSc Environmental Studies is to provide learning opportunities that will enable students to discover, generate, disseminate and apply knowledge of the highest standard, as mandated in the University of Guyana's mission. The degree is designed to be interdisciplinary in nature with a broad generalist scope that allows students to acquire a range of cognitive, generic and transferable skills. It provides the necessary academic foundation and skills training to allow the student to pursue further graduate studies in related fields of environmental studies or function competently across a variety of career pathways related to managing the environment and natural resources.

The goal is to achieve a deliberate curriculum design that places significant emphasis, yet a subtle balance on interdisciplinary scope and exposure. Students must gain knowledge, skills and perspective from the natural sciences, social sciences and humanities. So too, the curriculum must, in the context of the needs of greening our economies in Guyana and the Caribbean, offer a balance of courses that enable knowledge to be developed and utilised to adapt to environmental change and also mitigate the impacts.

The specific programme goals are:

- To offer a general programme of study in environmental studies that uses perspectives from multiple disciplines to train leaders capable of solving complex societal challenges brought about by the interaction between the natural and man-made environments;
- To promote rigorous study and analysis of society (national, regional and international) and the surrounding environment both built and natural;
- To equip the national workforce with knowledge and skills to meet the complex environmental challenges that arise through economic development and progress, with special emphasis on the Green Development Pathways on which Guyana has embarked;
- To create an integrated and innovative educational and learning experience for students interested in broad environmentally related subjects; and to provide them with a solid grounding for further specialized environmental studies;
- To provide students with an understanding of the way in which the various sciences disciplines contribute to the study, solution and prevention of environmental problems; an understanding of the social, economic, and political aspects of environmental issues;
- To develop a national workforce of professionals able to conduct problem analysis and problem solving regarding the natural environment and to communicate orally and in written reports with other professionals, policy makers and the general public.

Entry Requirements:

- Passes in five (5) subjects with Grades I or II prior to 1998 or III from 1998 at the CSEC (General Proficiency Examinations) or GCE 'O-Level' grades A - C. Subjects must include English Language, Mathematics and two (2) Science subjects one of which must be Chemistry or Integrated Science. Agricultural Science is also accepted for admission to the Programme.
- Diploma in Agriculture from the Guyana School of Agriculture.

- An Ordinary Diploma in Science (ODS) – Chemistry from the Government Technical Institute.
- A Secondary Trained Teachers Certificate or Associate Degree in Education (Pure Sciences, Agriculture Science, Social Studies) from Cyril Potter College of Education.
- A Diploma in Forestry from the University of Guyana.
- Mature applicants (a minimum of 26 years of age) who do not possess these qualifications may be considered for admission provided they have a good general education, creditable work experience in the field and a passing grade at the University of Guyana's Entrance Examination. The Faculty will consider each application on its merit.
- Any other qualification equivalent to any of the above.

Programme Structure

The four (4) year BSc in Environmental Studies which was first approved by the University in 1993 has seen several revisions over the years to ensure its alignment with national development. It is structured in such a way that students are required to accumulate a minimum of 126 credits. This is based on the 3 or 4 credits course loading design for all courses except the final year Research Project which is 6 credits. In year III students have an opportunity to select six (6) courses offered by any of the Faculties/School/College that align with their specific areas of interest and that would best inform their research project.

Table 1

Programme Profile for the BSc in Environmental Studies

Year I Semester I	Credits	Year I Semester II	Credits
ENV 1102 Environment and Development in Guyana and the Caribbean	3	**ENV 1201** Tropical Ecology and Environmental Systems	3
ENV 1103 Fundamentals of Environmental Science I	4	**ENV 1202** Fundamentals of Environmental Science II	4
MTH 1101 Algebra	4	**ENV 2206** Environmental Education	3
GEO 1106 Computer Applications for Geoscientists	3	**GEO 1206** Foundations of Physical Geography	3
ENG 1105 Introduction to the Use of English	4	**ENG 1203** Technical Communication	4
Total	18		17
Total Year I Credits			35

Year II Semester I		Year II Semester II	
ENV 2102 Environmental Health	3	**ENV 2204** Energy and the Environment	3
GEO 1108 Field Methods and Techniques	4	**ENV 2205** Introduction to Environmental Technology	3
GEO 2104 Human Geography: Population and Human Settlement	3	**GEO 3206** Fundamentals of Climate Change	3
GEO 2109 Introduction to Geographic Information System	4	**ENV 2207** Nature Conservation and Management	3
AST 1102 Introduction to Indigenous People of Guyana	4	**GEO 2206** Introduction to Quantitative Methods	3
		ENV 3300 Internship	4
Total	18		19
Total Year II Credits			37

Year III Semester I		Year III Semester II	
ENV 3107 Introduction to Environmental Management Systems	3	**ENV 3205** Research Methods	4
ENV 3105 Introduction to Environmental Policy and Governance	3	**BIO 4215** Coastal Zone Management	3
Select three electives in each semester from the list below or any other relevant elective from programmes offered by the University with the approval of the Head of Department.			
GEO 3110 Fundamentals of Land Use Planning	3	**ENV 3206** Introduction to Solid Waste Management	3
ENV 3108 Environmental Chemistry I	3	**GEO 3208** Introduction to Remote Sensing	4
ENV 3109 Environmental Toxicology	3	**ENV 3207** Environmental Chemistry II	3
ENV 3110 Occupational Safety and Health	3	**ENV 3211** Practical Environmental Chemistry	3
ENV 3111 Introduction to Environmental Modelling	3	**ENV 3209** Introduction to Scientific Problem Solving	3
ENV 3112 Environmental Management for Oil & Gas	3	**ENV 3210** Aquatic Sciences	4
ECN 1100 Introductory Micro-Economics	4	**GEM 2208** Environmental Geology	4
FOR 2106 Introductory Forestry	3	**ECN 1200** Introductory Macro - Economics	4
SOC 1100 The Study of Society	3	**TST 1201** Principles and Development of Eco-Tourism	4
		SOC 1200 Introduction to Sociological Theory	3
Total	**15/18**		**16/19**
Total Year III Credits			**31/37**

Year IV Semester I		Year IV Semester II	
ENV 4105 Introduction to Environmental Impact Assessment	4	**ENV 4203** Environmental Leadership/Innovation /Entrepreneurship	3
GEO 4108 Natural hazards and disaster management	3	**ENV 4204** Introduction to Environmental Economics	4
ENV 4106 Research Project	6	**ENV 4205** Introduction to Environmental Law	3
Total	**13**		**10**
Total Year IV Credits			**23**
Total Credits for the BSc in Environmental Studies			**126/132**

Selecting Electives

The list on the profiles is not exhaustive. Students are able to pursue courses of interest in other Faculties/School/College. In choosing courses, student are encouraged to seek out the respective Heads of Departments or Assistant Deans for the Faculty/School/College from which the course was selected to ensure that there are no prerequisites, that it will be offered, and in which semester. ***The Department's approval is sought via the SRMS registration submission.*** Students are advised the pay careful attention to their programme profiles to ensure that they are not attempting to choose electives that are subsequent core subjects in their programmes.

Programme:

Bachelor of Science in Environmental Science

The BSc in Environmental Science provides students with an understanding of the science underpinning earth's environmental processes and the major environmental issues such as climate change, biodiversity loss, and air and water pollution. These students will fill an existing gap to respond effectively to the human capital needs of a green economy. Importantly, the programme is intended to provide an opportunity for students to combine skills and knowledge from a variety of subjects such as Biology, Chemistry, Mathematics, Geography and Physics, plus Geographic Information System and communication to explore and develop multiple perspectives to build a better understanding of natural and human environments and their interactions and make informed decisions about environmental issues and problems.

The specific goals are:

- To offer a general programme of study in Environmental Science that explores an interdisciplinary environmental curriculum to train leaders capable of solving complex societal challenges such as global climate change, energy, biodiversity loss, and land, air and water pollution brought about by the interaction between the human beings and the environment;
- To create an integrated and innovative educational and learning experience for students interested in broad environmentally related subjects; and to provide them with a solid grounding for further specialized environmental sciences;
- To provide students with an understanding of the way in which the various sciences disciplines contribute to the study, solution and prevention of environmental problems;
- To develop professionals capable of conducting problem analysis and problem solving regarding the natural environment and to communicate orally, graphically, and in written reports, with other professionals, policy makers and the general public.

ENTRY REQUIREMENTS

- At least 5 subjects with grades 1 and 11 prior to 1998 or 111 from 1998 at the CSEC (General Proficiency Examinations) or GCE 'O-Level' grades A-C. Subjects must include English Language, Mathematics, and two Science subjects (one of which must be Chemistry). Integrated Science is not considered as a Science subject for this programme.

- Mature applicants (a minimum of 26 years of age) who do not possess these qualifications may be considered for admission provided they have a good general education, creditable work experience in the field and a passing grade at the University of Guyana's Entrance Examination. The Faculty will consider each application on its merit.
- Any other qualifications deemed acceptable by the Faculty.

Programme Structure

The BSc in Environmental Science was first approved in 2017 by the University. The programme is structured in such a way that students are required to accumulate a minimum of 133 credits. The programme has a four (4) year duration of study (i.e. 9 Semesters) and provides students with a solid foundation in the biological and physical sciences necessary for the pursuit of independent research that tackles real-world problems at various scales (local, national, regional and global).

Table 2			
Programme Profile for the BSc in Environmental Science			
Year I Semester I	**Credits**	**Year I Semester II**	**Credits**
ENV 1102 Environment and Development in Guyana and the Caribbean	3	GEO 1206 Foundations of Physical Geography	3
CHM1102 Introduction to General Chemistry	3	CHM1205 Introduction to Physical Chemistry	3
CHM1103 Laboratory I – General Chemistry	1	CHM1206 Introduction to Inorganic and Organic Chemistry	3
BIO1102 Introduction to the Biology and Ecology of Living Organisms	3	CHM1207 Laboratory 2- Introduction To Physical, Inorganic and Organic Chemistry	1
BIO1100 Laboratory & Field Biology I	1	ENV 1201 Tropical Ecology and Environmental Systems	3
MTH 1101 Algebra	4	ENG 1203 Technical Communication	4
Total	15		17
Total Year I Credits			32
Year II Semester I	**Credits**	**Year II Semester II**	**Credits**
PHY 1104 Fundamentals of Physics	4	ENV 2204 Energy and the Environment	3
PHY 1191 Physics Laboratory I	1	ENV 2205 Introduction to Environmental Technology	3
BIO 2106 Biology of Plants	3	GEM 2208 Environmental Geology	4
BIO2100 Laboratory and Field Biology III	1	AGR 2203 Fundamentals of Soil Science	4
GEO 2109 Introduction to Geographic Information System	3	MTH 1202 Calculus I	4
MST 1102 Basic Statistics	4		
Total	16		18
Total Year II Credits			34
Year III Semester I	**Credits**	**Year III Semester II**	**Credits**
Students must do 3 core courses plus any 2 electives			
Core Courses		**Course Courses**	
ENV 3111 Introduction to Environmental Modelling	3	ENV 3205 Research Methods	4
ENV 3108 Environmental Chemistry I	3	GEO 3206 Fundamentals of Climate Change	3
ENV 3109 Environmental Toxicology	3	ENV 3209 – Introduction to Scientific Problem Solving	3

		ENV 3300 Internship	4
Electives		**Electives**	
SSC 4101 Soil and Water Management and Conservation	4	ENV 3206 Introduction to Solid Waste	3
ENV 3107 Introduction to Environmental Management Systems	3	ENV 3207 Environmental Chemistry II	3
ENV 3110 Occupational Safety and Health	3	ENV 3210 Aquatic Sciences	4
ENV 3112 Environmental Management for Oil and Gas	3	ENV 3211 Practical Environmental Chemistry	3
GEO 3111 Geomorphology and Hydrology	3	GEO 3208 Introduction to Remote Sensing	4
GEO 3113 Wetland Environments	3	SSC 4203- Soil Environmental Chemistry	4
SSC 4103 Soil Chemistry	4	FOR 2203 Forest Management and Planning	3
FOR 2104 Forest Ecology	3		
FOR 3103 Forest Protection	3		
FOR 3105 Forest Conservation	3		
Total	19-20		20-22
Total Year III Credits			39-43
Year IV Semester I	**Credits**	**Year IV Semester II**	**Credits**
Students must do 5 core courses plus any 3 electives			
Core Courses		**Core Courses**	
ENV 4105 Introduction to Environmental Impact Assessment	4	BIO 4215 Coastal Zone Management	3
GEO 4108 Natural Hazards and Disaster Management	3		
ENV 3105 Introduction to Environmental Policy and Governance	3		
ENV 4106 Research Proposal	6		
Elective		**Elective**	
FOR 4102 Wildlife Management	3	FOR 4204 Biodiversity and Conservation	4
SSC 4104 Tropical Climatology & Meteorology	4	CHM 4208 Introduction to Bioenergy	4
Students may do any other elective approved by the Faculty			
Total	16		12-15
Total Year IV Credits			28-31
Total Credits for the BSc in Environmental Science			133/140

Undergraduate Course Descriptions

Year I Semesters I and II

ENV 1102 Environment and Development in Guyana and the Caribbean.

In this course, we will examine the interface between human development and the environment in the national and Caribbean contexts. Various perspectives will be explored to link environmental issues to wealth, poverty, consumption, population growth, and economic globalisation. The course starts with discourse around the philosophical and historical underpinnings of regional development and the role of the natural environment and its resources to the modern concepts of sustainable development. Later on the course scans several for the critical and illustrative sectorial and cross-cutting challenges in agriculture, industry, settlements and climate change providing students with a broad view of the range of issues and their implications for development. Lastly, the course introduces the debate of economy versus environment, the complexity of the environmental issues of today and an overview of the regional and national frameworks within which plans and strategies towards solutions are constructed. This is done within the framework of sustainable development which has emerged on the international political agenda as the dominant approach for reconciling the goals of economic development, environmental quality and social equity. Case studies focusing on Guyana and the Caribbean will be used to illustrate linkages.

ENV 1103 Fundamentals of Environmental Science

Environmental science is the study of patterns and processes in the natural world and their modification by human activity. This course offers the scientific basis for understanding many of the components and interactions that make up natural systems. It covers basic concepts and principles across the biological, chemical, physical, and earth sciences so that students can understand current environmental problems. In this Part I of a two course series, students are introduced to the evolution of what is now termed 'environmental science' and how, as scientists, we consider data, information and evidence in the natural world. Starting with scientific concepts and explanations of matter, energy and thermodynamics, the course moves into the conversion of energy, organic matter and life at different scales; inorganic matter as fundamental components of the environment, then the concept of biomes and organismal life. Lastly, there is some discussion of how human disturbance can alter natural balance and equilibrium.

ENV 1201 Tropical Ecology and Environmental Systems

This course takes a systems approach to understanding the dynamics of tropical ecosystems and the services they provide. The systems approach emphasizes not only the ecosystem components but also the interconnections and relationships between them and system inputs and outputs. The focus of the focus will be on the unique terrestrial and aquatic ecosystems found in the tropical latitudes, particularly the Caribbean and Guyana. In the terrestrial ecosystems, students learn about soil components and processes, nutrient cycling and soil as the basis for forest productivity. Concepts of productivity, succession and carbon sequestration are introduced. While most of the course covers forest ecosystems given the Guyanese context, some attention is also paid to the importance of marine and coastal ecosystems including mangrove forests.

Later in the course students are introduced to the main impacts on tropical ecosystems including the forestry industry, agriculture and farming and deforestation. The evolution of the human interface with forests and ecosystem resources is introduced leading up to the concepts of agro-ecosystems. Additional attention is paid to the impacts of climate change on tropical ecosystems, adaptation strategies being employed and forests as carbon sinks.

ENV 1202 Fundamentals of Environmental Science II

Environmental science is the study of patterns and processes in the natural world and their modification by human activity. This course offers the scientific basis for understanding many of the components and interactions that make up natural systems. It covers basic concepts and principles across the biological, chemical, physical, and earth sciences so that students can understand current environmental problems. Fundamentals of Environmental Science II builds on and complements the students' learning in part I. Here, the focus will be on scientific basis of physical, physico-chemical and biochemical processes occurring in the natural environment either through human induced interaction or by nature. Students are therefore taken through the science behind geological processes, weather and climate followed by several weeks of fundamental chemistry including reactions and processes of naturally occurring elements in various media and chemical contaminants as well as microbial activity. Throughout the course efforts are made to link scientific material to actual situations, events and occurrences (e.g. pollution events) from around Guyana and the Caribbean region, that resonate with students.

Year II Semesters I and II

ENV 2102 Environmental Health

Environmental health refers to how both the natural and built environment affect human health. Human health here refers to the individual, community and population levels. It looks at the impact of physical, chemical and biological factors external to humans. Those working in environmental health fields are concerned with preventing diseases or other illnesses by assessing and controlling environmental factors that pose a threat to human health whether it involves air quality, natural hazards, radiation, water quality, UV exposure, indoor air pollutants, climate change, healthy communities and work environments, or the effects of toxic substances. More and more we are also understanding the direct and indirect impacts of climate change on human and ecosystem health and disease. Chemicals, diseases, and invasive species threaten to alter ecosystem function and societal progress.

Maintaining health, whether ecosystem or human arguably presents one of the greatest challenges of the day, in general maintaining optimal ecosystem function is essential for continued survival of all species including humans.

In this course, the environment is treated as one of the determinants of health since many adverse health outcomes can be directly linked to environmental exposures. The course provides an introduction to the basic principles and methods by which health risks associated with exposure to chemical and physical agents are determined.

ENV 2204 Energy and the Environment

This course covers basic issues surrounding the environment, the global energy economy, and major socio-political problems associated with global energy geo-politics. It commences with scientific and quantitative concepts as well as historical and social ones as they relate to Caribbean and Guyanese energy production and consumption. A continuing theme throughout the course will be an emphasis on energy efficiency and the basic laws of thermodynamics

ENV 2205 Introduction to Environmental Technology

The course provides an introduction to the application of basic scientific and technology skills to environmental protection.

It covers the fundamentals of material and energy cycles in nature and the consequences of human intervention. It recognizes the methods for evaluating the quality of natural environments, gaseous, liquid and solid, and for the quantification of pollutant emissions. Technology solutions will be introduced in terms of measurement and monitoring as well as mitigation and abatement and pollution prevention and control. The course covers aspects of air, water and soil pollution abatement technology. It also introduced the concepts of greenhouse gas monitoring and technology and instrumentation used in measurement. Some introduction to the concepts of best available technology (BAT) for pollution mitigation and abatement are also introduced. Topics include identifying and selecting available technologies for the treatment of gaseous and liquid effluents and of solid wastes, and for the remediation of contaminated environments; and integrating these skills in the framework of economic activities.

ENV 2206 Environmental Education

Environmental education has been widely recognized as an effective tool for improving the capacity of society to address sustainable development issues. It is education geared towards changing people's attitudes so that they have the capacity to assess and address their sustainable development concerns. It is also critical for achieving environmental and ethical awareness, values and attitudes, skills and behaviour consistent with sustainable development and for effective public participation in decision-making. Importantly, this course also pays attention to climate change education as increasingly, more and more, it is being recognised as a salient dimension of environmental education needed to meet current and future challenges.

It is a means of enhancing capacity to generate innovative solutions to increasing complex challenges such as climate change and developing a low carbon economy. This course, therefore, deals with issues related to the holistic nature of environmental education as a process. It looks at the history and philosophy of environmental education, the key concept, methodologies, trends, problems, and UN Sustainable Development goals in the context of education.

An environmental education foundation is vital in communicating an inherent respect for nature in the society and in enhancing public environmental awareness, as well as safeguarding future protection of the environment, eradication of poverty, minimization of inequalities and assurance of sustainable development.

ENV 2207 Nature Conservation and Management

With an increasing and growing interest in development policies, programmes and plans to minimize the potential damages on man's surroundings, the need for effective conservation methods and prudent resource management have taken on greater urgency. Indications within Guyana, the Caribbean, and the international arena demonstrate that policy-makers are becoming cognizant of these requirements. However, while some degree of progress has been achieved, there are still vast areas for improvement. This course applies the fundamentals of applied ecology, forestry and environmental sciences to the management of natural resources and particularly, those valued in the Guyana context.

Year III Semesters I and II

ENV 3105 Introduction to Environmental Policy and Governance

This course examines environmental policymaking at the national level with reference to the regional and Caribbean contexts. The course is designed to take students through the fundamental theories of policy-making to its present form and modern practices. Emphasis is also placed on the essential role of policy in the national and global environmental governance contexts. Students are introduced to principles of policy process and governance models through discourse on relevant conditions, positions and case studies in the Guyanese and regional contexts.

Policy fields such as forestry, biodiversity, climate change, industrial development, mining and several others serve as important examples for citing in the policy discourse. There is strong focus on climate change policy making and implementation as a central requirement for sustainable development. This topic also serves to coalesce much of the learning as students are encouraged to consider policy from several perspectives and from multidisciplinary perspectives. Further, another key area of coverage across the course is the science-policy interface and the usage of robust science and data to aid in all aspects of policy development and governance regimes. The case study approach is particularly important in providing students with opportunities to explore multiple approaches and solution options.

ENV 3107 Introduction to Environmental Management Systems

An Environmental Management System (EMS) ensures that an organisation has identified, and is managing, its environmental

risks in a systematic manner.

It facilitates reduced impact on the environment; sound (effective and efficient) environmental performance; continuous improvement; meeting legal and other environmental obligations; and a due diligence approach to environmental management for the organisation and its staff.This course introduces students to the wide range of tools used in environmental management and for environmental decision making.To conclude the course, the evolution of environmental management from being a side issue for firms to becoming a core issue and newer approaches are discussed. Examples of firms that are attempting to practice sustainable management will be showcased and discussed.

ENV 3108 Environmental Chemistry I

The environment can be divided into a number of components or `spheres'. This course provides an in-depth study of one of these spheres, namely the hydrosphere.

The course starts by defining environmental chemistry and outlining chemical cycles in the hydrosphere. Next, the fundamentals of aquatic chemistry are explained. The main chemical reaction types that occur in water and the effects of micro-organisms on the chemistry of water are examined; these topics include processes of oxidation and reduction, aquatic biochemical processes such as bacterial growth, the degradation of organic matter and the microbial transformation of metals and metalloids. The last section of the course deals with applied problems such as water pollution and water treatment. Skill training is through the practical laboratory course, ENV 3208: Practical Environmental Chemistry. This course is the foundation for a more advanced course, ENVS 3202: Environmental Chemistry II

ENV 3109 Environmental Toxicology

Toxicology is the branch of science devoted to research into possible harmful interrelations between chemicals and living organisms. Growth in concern for environment and health in the 1960s began with a demonstration of the fundamental principle of toxicology, dose-response: A minute dose of DDT created a devastating response with respect to the health of animal and human populations. This course introduces students to the basic concepts of toxicology as well as the mechanisms of action of toxins and their effect on man and his environment. Topics covered include dose-response relationships, absorption, distribution, metabolism, excretion, mechanisms of toxicity, and the effects of selected environmental toxicants on various organ systems.

This course provides an introduction to the study of the fate and effects of chemicals. It is concerned primarily with human diseases or toxicities caused by environmental chemicals, collectively termed xenobiotics. The course thus provides students with a conceptual framework for understanding the broad spectrum of toxicological problems that affect human beings, and enables students to apply basic biochemical, pathological and physiological knowledge in an effort to understand why substances in the environment disrupt biological systems causing various degrees of toxic effects.

ENV 3110 Occupational Safety and Health

In developing countries such as Guyana and elsewhere in the Caribbean region, the workplace can be hazardous to human health through injuries, and many workers, whether in the factory, field, office or vehicle, are unaware of the potential dangers present. The course introduces students to public health issues in the workplace that are derived from the nature of the work (occupational) and the environmental space in which work takes place (the natural and man-made environments).The course begins by developing the idea of prevention rather than control in public health, and develops an epidemiology of occupational environmental health and safety. Topical treatment of specific issues such as occupational injuries, toxicology, stress, drug impairment and policy ideas such as wellness programmes, emergency response planning and ergonomics are introduced. The course is relevant to the many natural resource-intensive work activities in which large sections of the population are involved. In Guyana, these include agriculture, forestry, transportation and manufacturing among others.

There are also clear intersects with other aspects of environmental studies, especially in terms of exposure to pollution in air, water, soil etc. all of which can eventually take a toll on productivity and jeopardize sustainable development in the long term

ENV 3111 Introduction to Environmental Modelling

Computer based models are widely used in Environmental Sciences. The course is intended to give introductory knowledge and an overview of methods for environmental modelling. The concepts of model development, model calibration, uncertainty analysis and validation will be introduced through lectures and practical classes. The course provides an insight into the use of computer models and it will give the student a good understanding of the strengths and limitations of models required for critical analysis of model predictions.Students will also be exposed to examples of modelling water quality, global and local element cycles, and ecosystem dynamics. Examples may also be drawn from atmospheric science and climate science.

ENV 3112 Environmental Management for Oil and Gas

Since Guyana gained its independence in 1966, the country's chief economic assets have been its natural resources. In May, 2015 Guyana added to its wealth of natural resources with the discovery of high quality hydrocarbons, including crude oil. The exploration of oil, like the exploitation of Guyana's other natural resources, comes with both positive and negative impacts.

This course provides an overview of the environmental issues and the technical and management approaches necessary to achieve effective environmental management in the exploration and production of oil and gas. It introduces the student to the different stages of the oil & gas sector (upstream, midstream & downstream); management systems and practices, technologies and procedures as well as the role of government in setting and enforcing regulations that prevent and minimize impacts.

ENV 3205 Research Methods

This course introduces students to selected research methods, elements of research design, and guides them through the various steps needed to formulate and prepare a viable research proposal.It involves learning how to select and apply data collection methods appropriate to a field-based environmental studies research project. Students learn elements of good project design, and are guided through the preparation of a formal individual research proposal tailored to their specific area of interest. This proposal, once approved by the examiners, forms the basis for their independent research project undertaken in ENV 4106 Research Project, in Year IV.

The course provides detailed exposure to research questions, research design and methodology, secondary data sources and relevant literature, data collection techniques which require the use of sampling theory, sampling design, and spatial and non-spatial sampling methods.

The essentials of questionnaire design and their use in sample surveys are covered together with training in selected qualitative elicitation techniques such as focus groups and expert interviews.

The research methods are assimilated through practical classes and associated assignments and involve learning how to use software such as SPSS to analyse questionnaire data. The research proposal is to be prepared and submitted using the guidelines provided. By the end of the course, students are expected to be familiar with the main conceptual and organizational issues likely to be faced in conducting their Year IV, ENV 4106 Research Project.

ENV 3206 Introduction to Solid Waste Management

Solid waste is a product of economic development, societal growth and attendant domestic, commercial and industrial activities. The management of solid waste in Guyana is important from environmental and public health perspectives because significant resources and efforts are required in its effective management. This course introduces students to the study of the nature and magnitude of the problem of solid waste in modern societies, and its treatment and management from environmental and resource perspectives. Firstly, the course introduces the concept and properties of solid waste, before examining in-depth the problem of collection, recycling and transformation for different types of solid waste.

Students learn that ineffective solid waste management (SWM) can be associated with negative environmental impacts such as pollution to air and water resources, accident hazards, increases in rodent and insect vectors of disease, and adverse effects on land values among others. Policy measures such as landfill engineering, regulation of solid waste and regulatory agencies are examined in detail with appropriate examples and case studies.

Students learn that the problems associated with solid waste management require an integrated approach that is concerned with the production side of solid waste (from society and activities), and its disposal (including treatment and the reduction recycling aspects).Thus solid waste can often be considered a raw material or resource which can be sustainably utilized

ENV 3207 Environmental Chemistry II

This course provides an in-depth study of the chemistry of two of the components of the physical environment, the atmosphere and the geosphere. The main focus is on the atmosphere and atmospheric chemistry. Firstly, these are examined in relation to processes such as energy transfer and mass transfer, and the various processes which underpin meteorology and weather. It provides an understanding of the composition and structure of the atmosphere and the major chemical and photochemical reactions occurring in the atmosphere, and a detailed study of atmospheric particles.

The course proceeds by examining in-depth the problems associated with the many sources and types of atmospheric pollution, and their effects on human health and the biosphere.

These include sulphur dioxide, nitrogen oxide, acid rain, ozone and photochemical smog and carbon monoxide and carbon dioxide. Each is considered in relation to methods on controlling atmospheric pollution, concentrating specifically on the sources of atmospheric pollutants, their chemical transformations in the atmosphere, and their significance to human welfare.

The final section examines the geosphere and geochemistry, with particular emphasis on soil chemistry.

ENV 3210 Aquatic Sciences

Aquatic science is the multidisciplinary study of aquatic systems which covers freshwater and marine systems. It includes wetlands, freshwater and marine aquatic systems and their boundaries. This course provides students with knowledge of the physical, chemical and biological components of inland and marine coastal aquatic ecosystems; and differences between lakes and rivers. Students learn how to analyse and compare the physical and chemical characteristics among different freshwater systems in various geomorphologic regions, and the diversity of different biota and their growth characteristics. Learning through local case studies that involve practical activities as integral parts of field work and site visits is an important feature of the course.

Overarching topical themes include considering the effects and impacts of climate change on freshwater aquatic systems and major pollution problems associated with inland water bodies.

ENV 3211 Practical Environmental Chemistry

Issues concerning environmental pollution have become increasingly important in recent years. The "greenhouse effect", heavy metal poisoning and acid rain are only a few controversial issues that regularly concern the public at large and environmental protection agencies.

Often, in discussions of these phenomena, "facts" are (intentionally or unintentionally) misrepresented, exaggerated or taken out of context. It becomes difficult to weigh the importance of much of this information except through rigorous, accurate and transparent scientific testing with approved methods, instruments and acceptable levels of quality control from sampling to interpretation of results. This course provides a comprehensive set of real-world environmental laboratory experiments that support and extend on much of the scientific information students have already encountered in the programme, especially in the environmental chemistry related subjects. Here students have the opportunity to focus on building their practical skills in a laboratory testing setting. The course focuses on environmental, i.e. "dirty" samples, stresses critical concepts like analysis techniques and documentation, includes water, air, and sediment experiments and introduces pollutant fate and transport modelling.

ENV 3300 Internship

The Internship is designed to form a nexus between academic studies and the work environment by offering academic credit for environmentally focused work experience. A well-designed internship should help students to develop professional skills, gain work experience, evaluate career opportunities, and begin building a professional network. Every student of the programme must complete an internship of 160 hours or 4 weeks. It is the responsibility of the student to identify an internship opportunity from among the many opportunities sourced by the Department. Students will be encouraged to choose an internship that is related to an intended career (and/or graduate school) interest and that will allow them to apply knowledge and skills gained in coursework. Students are expected to demonstrate increased proficiency in at least three technical (e.g., air/water/soil quality laboratory techniques, environmental management, data analysis, etc.) and/or transferrable (e.g., communication, time management, organization, leadership, etc.) professional skills at the conclusion of the internship.

Year IV Semesters I and II

ENV 4105 Introduction to Environmental Impact Assessment

The course introduces the field of Environmental Impact Assessment (EIA). The course examines the role of Environmental Impact Assessment in the management of the natural and man-made environment and natural resources, and provides a working knowledge of current environmental and social impact assessment methods.Students learn how to design and implement an EIA, especially as pertains to its application in national and regional development contexts. This includes defining the purpose and aims of EIA, the administration and practice of EIA, concepts of associated assessment processes, key elements of the EIA process, how to undertake an EIA, the role of public participation, the stages that follow EIA and the costs and benefits of undertaking EIA. The strengths and limitations of EIA procedures and methods are emphasised.

Through sector and local level case studies, students learn about the potential impacts of development activities on the integrity of the natural environment, ecology and quality. Students learn the techniques and procedures which can be used to determine how impacts can be quantified and analysed. The course also covers the use, potential and evolution of the EIA methods, tools and techniques especially in relation to how EIA outcomes are used in broader socio-economic decision making purposes; and how the EIA practice intersects with broader conceptualisations of integrated planning and development

ENV 4106 Research Project

This course is the cornerstone of the Environmental Studies Major in which students undertake a substantive research project, written up in the form of an undergraduate thesis. The project involves individual, in-depth empirical research on an environmental studies topic of specific interest to a student, or in a field in which a student may wish to pursue a career.

Students conduct this independent field research through self-directed learning and enquiry, under the guidance of a supervisor.

The course involves progression through the various stages in the execution of an environmental studies research project, such as data collection and data analysis, and culminates in an oral presentation of results and the submission of a thesis. The research proposal which forms the basis of the research is carried forward from ENV 3205: Research Methods in Year 3. Each student is assigned two supervisors who monitor the progress of the research project.Initially, the student fine-tunes and operationalizes the research design and methodology of the project, before conducting primary data collection.

The student consults with his/her supervisors for advice and guidance throughout the research process; data collection, data analysis, and drafting the report.

The course demands critical engagement with academic literature and policy documents, and an ability to conceive and implement a research project, limited by time and budget. It requires an ability to manage time while working independently with minimal guidance from academic supervisors. It offers students creative opportunities for independent study in pursuit of a research topic of their own selection. Individual transferable skills learned include how to select and use appropriate data collection and data analysis techniques, and how to compile and write a well-argued thesis, at another level, the course requires students to demonstrate competence in timely project management. The subject-specific and transferable skills used in this course help prepare the environmental studies graduate for the professional world of work, and are a springboard for students wishing to advance into postgraduate studies.

ENV 4203 Environmental Leadership/Innovation / Entrepreneurship

This course provides some of the skills and competencies that students need to transition from the competent and knowledgeable technical professional/practitioner to an environmental leader. It addresses the issues of what leadership competencies students need to work with multidisciplinary teams and to guide organizations so they can effectively address complex environmental problems in an ever changing world. Students are challenged to remain relevant and competitive in creating solutions to old and new problems, in an interconnected world that shares a global marketplace and is coping with a fragile biosphere. This course bridges a student's scientific and technical training with enhanced knowledge and practice of inventive, creative, empathetic and conceptual thinking potential.

The key to making a positive impact in today's professional world is to have the leadership capacity to build relationships and work in teams capable of creating the ideas, know-how, innovation, knowledge, and expertise to solve complex environmental problems. This course introduces students to successful leadership principles and practices that offer a decisive difference for success. Students are groomed across a variety of theories, practices, tools and applications that will enable them to eventually step up,into environmental leadership roles in a broad spectrum of economic activities and career pathways including the public and private sectors, academia and research, cross-sectorally and internationally. The course has three main themes. The first is developing environmental leadership and professionalism, the second deals with self-management and responsibility as an environmental professional and the third covers the cultivation of professional confidence and creativity.

ENV 4204 Introduction to Environmental Economics

This course familiarizes students with the foundational theoretical and empirical tools used in environmental economics. The theory of externalities and market failure provides the basis for applying microeconomic concepts to the study of environmental improvement.

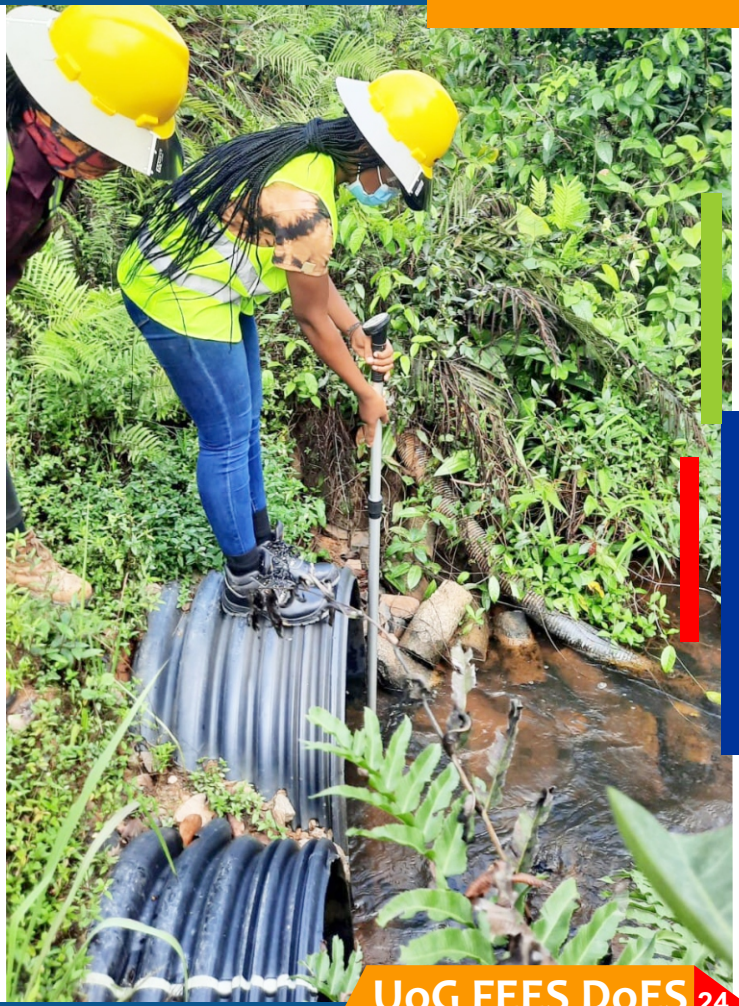
The main concepts covered in this course include externalities, public goods, property rights, non-market valuation and social cost-benefit analysis.

Each of these concepts are discussed in the contexts of current policy questions of global, regional and national interest such as air and water pollution regulations, the costs of climate change, energy efficiency and incentivizing environmental innovation.

In this course, students have the opportunity to build their conceptualization of societal environmental and ecological issues from an informed economic logic perspective and to use the tools and applications in applied fields such as benefit-cost analysis and measuring environmental damage, to formulate assessment and evaluation strategies to aid in development and implementation of environmental policy mechanisms.

The course provides in-depth analysis of the principles and tools needed to address pressing climate change and related issues facing Guyana and the Caribbean region.

There is an important focus on learning through case studies, and extended examples from the field of environmental economics which can help in problem-solving at national, regional and global levels



ENV 4205 Introduction to Environmental Law

This course introduces students to the foundational principles of environmental law in Guyana and the Commonwealth Caribbean. It is designed to examine the methods and legal framework limiting adverse anthropogenic impact on the environment.

Particular emphasis will be placed on the shift from common law control to regulatory means established by statute; through international legislation and conventions. Students are introduced to the scope, development, and limits of the common law and equity (both substantive and procedural) in protecting the environment; regulatory means of controlling the environment, established primarily by statute and through conventions; and policy issues in the exploitation of resources and protection of the environment.

Modes of Delivery

Courses will be delivered through face-to-face, blended, and/or hybrid modes.

Online Delivery Mode:

Technology Requirements and Skills Needed

In the online delivery mode, students will require access to a computer or a device with:

- Internet access, preferably with a high-speed connection
- A web browser (For the best experience, use Chrome, Mozilla Firefox, or Safari. Internet Explorer is not recommended.)
- Adobe Acrobat Reader (free)
- Adobe Flash Player (free)
- Microsoft Office, or the ability to work with Word, Excel, and PowerPoint documents
- Skype/Zoom video conferencing software for potential use during office hours (free at http://www.skype.com/http://www.zoom.us)
- Speaker, microphone, and webcam
- Access to technology to create and upload videos for assessment and feedback
- Sending and receiving emails and/or attachments via emails

Minimum Software Requirements

- Windows 8 or Above
- OS 19.13 or Above
- Additional software may be required (See the course syllabus)

Technology Backup

It is the students' responsibility to have a backup mechanism to secure their work and ensure that course assignments are saved at all times.

Plagiarism

The University of Guyana has a zero tolerance policy on plagiarism. Students who engage in plagiarism may be placed before the disciplinary committee where the penalty of expulsion is a possibility (see p. 25 of The University of Guyana Student Guide).

The Faculty supports this policy and requires lecturers to make use of the software Turnitin which reviews student assignments and provides a similarity report. A similarity report with a score of above 15% that demonstrates clear evidence of plagiarism is penalised using a three (3) strikes rule:

✓ **Strike 1**
The University of Guyana Student Guide and the Course Outline will serve as a warning.

✓ **Strike 2**
The assignment that is above the limit will earn zero.

✓ **Strike 3**
If this recurs again, then the student will be placed before the Disciplinary Committee of the Faculty of Earth and Environmental Sciences.

UNIVERSITY of GUYANA

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