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M I S S I O N S T A T E M E N T

The Mission of the Faculty of Engineering is to be the provider of a world quality education in Engineering, Geoinformatics and Geosciences and research and development programmes in support of Caribbean business, industry and infrastructure, with its graduates, staff and facilities being at the forefront in propelling growth, development and innovation in the region.

MESSAGE FROM THE DEAN

Welcome to all new and returning Postgraduate students to the 2009/2010 Academic Year and thanks for making The University of the West Indies your choice for further study.

Last year 277 undergraduate students graduated from the Faculty of Engineering with 46 at First Class level, 187 at Second Class Level, 9 at Third Class Level and 35 with a Pass Degree. At the postgraduate level, the Faculty granted 11 Diplomas, 59 MSc degrees with 12 of these being distinctions and 2 PhD degrees. The Faculty has worked hard at improving its facilities over the past year. The Department of Chemical Engineering is now housed on the Northern sector of the renovated Block 13. The Block also houses classroom facilities and a 400-seat auditorium on the southern side of the building. Much of the finishing works have been completed in-house. Significantly, some of this work was conducted by recent graduates of the Department of Electrical and Computer Engineering. This is in keeping with a new service learning approach by the Faculty and the University, an approach that provides learning through experience for both staff and student alike and visibly expresses confidence in our graduates' capability to perform.

The University has also made efforts to enhance the resources required to support your studies. A key example is the library that has now expanded its access to global online databases in engineering. These provide access to standards, technical papers and journals as well as other information that may be relevant to your course of study or Master's Degree project.

We know that there are many reasons why students choose to continue on to postgraduate studies. Many do so for career advancement, particularly candidates for Master's Degrees and Postgraduate Diplomas which do not have a substantial research component. Others do so simply for self gratification. Yet others choose this path as it is a requirement for their career choice. For example, academic careers require a research degree such as a Master of Philosophy (MPhil) or Doctor of Philosophy (PhD). Non-research postgraduate degrees are, in many ways extensions to the undergraduate offering, providing greater depth in selected areas and some breadth of learning as well. MPhil and PhD degrees require increasing levels of independent and individual research into the scientific unknown. They represent the peak of academia where new knowledge and understanding are discovered and shared for the benefit of mankind.

It should also be noted that under our current system of accreditation, professional registration at the equivalent of a UK Chartered Engineer, as is required by Boards of Engineering across the Caribbean, is now dependent upon completion of an approved Masters' level degree course to complete the required educational base. This route is offered in Civil and Environmental Engineering as well as Mechanical and Manufacturing Engineering.

By their very nature, all postgraduate options are quite demanding, particularly for the majority of our postgraduate students who are part-time and must balance their studies with the needs of the work place. This is why we suggest that students think carefully before proceeding unto postgraduate study. In particular, those who have just completed their undergraduate study should consider gaining at least a year's experience in the world of work before registering for a postgraduate programme in their discipline. We are doing the best we can to facilitate your learning and your interest in furthering your qualifications. Just as you pride yourselves on the high quality of professional work that we know you are capable of, we pride ourselves on



the continuing success and reputation of the UWI, built upon a solid foundation of quality input, quality delivery and quality output. Together, we must therefore work hard to maintain and even enhance this.

What you may have not considered is the vital contribution you are making to the development of your respective countries by virtue of your postgraduate registration. Indeed, an increase in the pool of appropriately trained and educated postgraduates would, if properly utilised, enhance any country's ability to produce goods, negotiate and engage with external professionals, earn much needed income and support a healthier GDP. This is all the more reason why you should strive to do well in your chosen field of study.

Apart from your present qualifications, there are two key requirements for success in your respective programmes: you need a **sense of motivation** and you need **to plan your work**. THEN you must **work your plan**. Manage your time well – as a rough guide you should spend the same time you spend in class or in the labs in self study. Be prepared to change your plan if it is not working. If you suspect that your personal circumstances at work or at home may impede your performance please do not hesitate to contact the Postgraduate representative in your Department - there are far too many cases of students who wait until they clock a poor exam record, when it is far too late, to apprise us of personal circumstances.

Finally, you should utilise all the resources available to you – consult with lecturers and other course support staff. Resist the trap of allowing conflicts in personalities to block you from accessing the learning support that we have provided for you. Above all, **take responsibility for your own learning**. As Paul Robinson noted in his popular book, *What smart students know: Maximum Grades. Optimum Learning. Minimum Time*, "A" students are not so much those who have high IQs as those who place full responsibility for their academic success on themselves, not their teachers. I highly recommend this book to all who are in need of additional guidance.

We wish you the greatest success for the 2009/2010 Academic Year.

Brian Copeland
BSc (Eng), MSc (Toronto), PhD (USC)
Professor and Dean, Faculty of Engineering

AN HISTORICAL NOTE

The University of the West Indies was founded in 1948 at Mona, Jamaica as a College in special relationship with the University of London, to serve the British territories in the Caribbean area. It achieved full University status by Royal Charter in 1962, thereby becoming a degree-granting institution in its own right.

A second campus of the University was established in 1960 when the Imperial College of Tropical Agriculture (ICTA) at St. Augustine, Trinidad was incorporated into the University College. On August 25, 1959, a Plan of Operation was signed which provided for a United Nations Special Fund allocation and a Government counterpart contribution for the establishment of a Faculty of Engineering. The then Vice-Chancellor and Principal of the University College, Nobel Laureate Sir Arthur Lewis had the overall responsibility of securing funding for the financing of the Engineering buildings and for expediting the final decision to locate the Faculty of Engineering at St. Augustine.

The initial layout comprised five (5) blocks with a total of 5,400 square metres of floor space of which the laboratories occupied 3,030 square metres.

Construction commenced in 1961 and was completed by the end of 1962. During the 1961/62 Academic Year (the first year of teaching), the Faculty was housed in temporary accommodation on the campus. The formal opening of the new buildings of the Faculty took place on February 1, 1963.

Initially, undergraduate and graduate research degrees were offered in the main branches of Engineering - Chemical, Civil, Electrical and Mechanical. The Faculty steadily grew over the years with a major expansion of both physical infrastructure and academic programmes in the 1980s with additional disciplines at the BSc level and several specialist MSc degrees. Floor space now occupies close to 50,483 square metres of classrooms, laboratories and offices, with expansion continuing almost on a yearly basis.

The semester system was introduced on a phased basis in 1990 at the undergraduate level, followed by the MSc programmes at a later date.

From a modest beginning of 28 students in the Academic Year 1961/62, the Faculty has produced, up to Semester 2 of the 2008/2009 Academic Year, 6707 graduates in the fields of Chemical (1002), Civil (1380), Civil with Environmental (35), Electrical and Computer (1647), Agricultural (79), Industrial (373), Mechanical (1689), Mechanical with Biosystems (21), Petroleum (48) and Surveying and Land Information (348). In 2001/2002, the Faculty introduced its BSc (Hons) programme in Petroleum Geoscience, graduating 85 students up to June 2008/2009. The Faculty of Engineering continues to dedicate its considerable resources towards the pursuit of excellence in teaching, research and community service.



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Dip Mang Stud (UWI), EMBA (UWI)
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INDUSTRY LIAISONS

Carabon, Linford

Industrial Gases Limited

Ng Chow, Michael

Neal & Massy Motors

Brown, Hayden

PCS Nitrogen Trinidad Limited

Tiah, Eugene

President
Phoenix Park Gas Processors Limited

Mr. Sennen Matabadal

Powergen

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Blaize, Colvin

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Charles, Ainsley

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Part-time Lecturer
(Graphic and Design Studio and Design for Development)

Thomas, Deborah Heather-Dawn

BA, MSc (Oxford Polytechnic), PhD (Cambridge)
(Planning & Development)

POSTGRADUATE STUDIES IN THE FACULTY OF ENGINEERING

1.1 INTRODUCTION

- 1.1.1 It is generally accepted that a Bachelor's degree is only the first step in the learning process that a professional person should continue throughout his/her career.
- 1.1.2 A first degree is an indication of a basic ability to understand and apply the concepts underlying that discipline. It does not indicate competence as a practitioner of the associated profession. That can only come with experience and training within the profession itself.

1.2 FURTHERING KNOWLEDGE - MPhil, PhD

- 1.2.1 One important element of any profession is that one should be devoted to furthering the knowledge and understanding contained within the concepts that define the discipline.
- 1.2.2 The task of furthering the frontiers of knowledge normally falls upon those in academic fields and specifically upon those undertaking postgraduate studies towards research degrees.
- 1.2.3 It is therefore critical to both industry and the University that graduates pursue research studies; this is reflected in continuing active enrolment for the MPhil and PhD research degree programmes.
- 1.2.4 The Faculty of Engineering offers MPhil and PhD research degrees in the following subjects:-
 - i. Agricultural Engineering
 - ii. Chemical & Process Engineering
 - iii. Civil Engineering
 - iv. Civil with Environmental Engineering
 - v. Construction Engineering
 - vi. Construction Engineering & Management
 - vii. Construction Management
 - viii. Electrical & Computer Engineering
 - ix. Food Science & Technology
 - x. Geoinformatics
 - xi. Geoscience
 - xii. Industrial Engineering
 - xiii. Mechanical Engineering
 - xiv. Petroleum Engineering
 - xv. Petroleum Geoscience
 - xvi. Surveying & Land Information
 - xvii. Urban and Regional Planning

- 1.2.5 It should be noted that these research degrees are not normally considered to be qualifications for professional practice in the broader sense, as they may not necessarily allow for registration as a professional engineer.
- 1.2.6 As a consequence, the Faculty of Engineering may allow suitably qualified non-engineering graduates, who obtained their degrees at the Honours level, to register for higher degrees by research.
- 1.2.7 However, such students may be required to take a qualifying examination within the Department concerned, on topics that would enhance the student's academic competence in the area of the proposed research.
- 1.2.8 Applicants wishing to register for the PhD who do not already have a Master's degree by research will be required to register for the MPhil first and may be allowed to upgrade their registration to the PhD upon satisfying the appropriate regulations.
- 1.2.9 Candidates who have obtained a Master of Science (MSc) degree with distinction maybe allowed to register for the PhD provided a substantial part of the MSc project has been carried out in the relevant area.

1.3 In Career Training - Diploma, MSc, MASc

- 1.3.1 It has often been demonstrated that the emphasis of the work undertaken by professional engineers changes as their careers progress. Normally their work becomes either more specifically technical within a closely defined subject area, or it becomes more oriented towards management responsibilities rather than technical ones. Sometimes it involves both.
- 1.3.2 As a result, professionals often require retraining or further training during the course of their careers. For this purpose, it is important to industry that there is a wide ranging and active programme of postgraduate studies available at the University.
- 1.3.3 To this end, the Faculty of Engineering offers a range of MSc and Postgraduate Diploma courses which are primarily taught courses. The details of these are included in this booklet.
- 1.3.4 The Faculty of Engineering currently offers the following Postgraduate Diploma programmes through examination by written papers and a project:
 - i. Coastal Zone Processes
 - ii. Construction Engineering & Management
 - iii. Construction Management (with a major in Operations)
 - iv. Construction Management (with a major in Building)
 - v. Food Science & Technology
 - vi. Land Administration
 - vii. Petroleum Engineering

1.3.5 The Faculty of Engineering currently offers the following MSc degree programmes through examination by written papers and a project:-

- i. Chemical & Process Engineering
- ii. Chemical & Process Engineering with Management
- iii. Chemical & Process Engineering with Environmental Engineering
- iv. Civil Engineering
- v. Civil with Environmental Engineering
- vi. Coastal Zone Engineering & Management
- vii. Construction Management (with a Major in Operations)
- viii. Construction Management (with a Major in Building)
- ix. Electrical & Computer Engineering (MSc)
- x. Engineering Asset Management
- xi. Engineering Management
- xii. Environmental Engineering
- xiii. Food Science & Technology
- xiv. Geoinformatics
- xv. Manufacturing Engineering
- xvi. Petroleum Engineering
- xvii. Production Engineering & Management
- xviii. Production Management
- xix. Project Management
- xx. Reservoir Engineering
- xxi. Urban and Regional Planning

1.3.6 Normally, entry to such programmes is available to those who have a Lower Second Class honours degree or its equivalent in the specified subject area or in a related area with a record of experience in the subject area.

1.3.7 Students with Third Class or Pass degrees or equivalent in the relevant field of study shall only be accepted for admission to an MSc/Diploma programme provided they have obtained at least two years experience in the field and have a satisfactory confidential reference from their employer.

1.4 Course of Study - MSc/MASc/Diploma

1.4.1 The courses of advanced study for a postgraduate Diploma or a Master's degree by examination by written papers include, in addition to the courses of instruction, supervised research development or industry-oriented work culminating in the submission of a Project Report. Guidelines for submission of Project Reports are indicated under the relevant programmes.

1.4.2 Full-time MSc/MASc/Diploma students must normally submit their Project Reports nine (9) months after completion of the written examinations, while part-time MSc/MASc/Diploma students are required to do so within twelve (12) months.

(MRP) students must normally submit their Project Reports three (3) months after completion of their final semester assessment exercises. Candidates who fail to submit their Reports in good time shall be removed from the Register of Postgraduate Students.

-Candidates are required to pass both written examinations and coursework of the MSc/MASc/Diploma programmes at the first attempt. Candidates failing the coursework or written examination at the first attempt may be allowed a second attempt at the examination on the recommendation of the Board of Examiners.

-Candidates permitted a second attempt at a course, having failed either the coursework or the written examination at the first attempt, will be required to rewrite only that component (written examination or coursework) failed, unless the Campus Committee in any particular case otherwise decides. Marks allotted to the component passed at the first attempt will be credited to the candidate at his or her second attempt at the course.

-No candidate will be permitted to repeat the examination in any one course on more than one occasion, unless the Board for Graduate Studies and Research in any particular case otherwise decides.

1.4.3 Candidates are not normally allowed an oral examination in more than two (2) full courses per semester.

1.4.4 A proportion of the marks which make up the final result of a particular course examined by a written Paper may be derived from the candidate's performance in course work assignments, in course tests, etc. All such assignments must be completed and submitted to the examiners before the date of the written examination.

1.4.5 Candidates whose work is at any time reported by their Supervisors to be unsatisfactory or who do not satisfy the Examiners on Courses or Project Reports that form part of the postgraduate programme may be removed from the Register of Postgraduate Students.

1.4.6 Such students shall not normally be readmitted for at least two years thereafter. Students readmitted to MSc/MASc/Diploma programmes shall be eligible for credits for those courses passed creditably during their previous registration, provided that not more than five years have elapsed since the applicants withdrew from the University and that the course content has not changed significantly in the interval.

1.5 Distinctions - MSc/MASc/Diploma

- 1.5.1 A Distinction may be awarded for a Postgraduate Diploma, MASc or MSc degree provided that the candidate obtains 70% or more in EACH component of the course of study, i.e.,
(i) written Papers and (ii) Research Project.
- 1.5.2 Candidates who repeat the examination in any course shall not be eligible for the award of a diploma or degree with distinction.

Completion Time - MPhil/PhD

- 1.6.1 A candidate for the MPhil degree shall submit a thesis for examination within five (5) calendar years of initial registration for full-time studies, or seven (7) calendar years for part-time studies.
- 1.6.2 A candidate for the PhD degree shall submit a thesis for examination within six (6) calendar years of initial registration for full-time studies, or eight (8) calendar years for part-time studies.

Research Seminars

- 1.7.1 All students registered for an MPhil degree must satisfactorily complete at least two (2) research seminars, prior to submission of the MPhil thesis. Students registered for the PhD degree must satisfactorily complete three (3) such seminars. Assessment of the students' seminars must be included in their Progress Reports.
- 1.7.2 This seminar is assessed normally by the Supervisor of the student's studies and is reported as being satisfactory or unsatisfactory on the student's annual Progress Report. It is intended to:
- provide a forum for the critical appraisal of the objectives, methodology, direction and progress of the research being undertaken.
 - create a wider awareness in the University community of the research activities within the Faculty.
 - provide additional means of monitoring the progress of postgraduate students doing research theses.
 - create and foster an appropriate research culture within the Faculty.

1.8 Procedural Guidelines for the Upgrading of an MPhil to the PhD

- 1.8.1 Postgraduate students who are registered for the MPhil Degree and who are contemplating the upgrading of their registration status to that of the PhD are required to do so within two (2) or three (3) years of first registration.

1.8.2 The following are the procedural guidelines for upgrading of one's registration status:

- The student should consult with his Supervisor(s) on this matter.
- The student will apply through his Supervisor(s) to the Head of Department, formally seeking upgrading, copying both the Assistant Registrar (Graduate Studies and Research) and the Chairman, Faculty Sub-committee on Graduate Studies.
- The Head of Department, if in agreement, consults with the Supervisor and Chairman, Faculty Sub-Committee on Graduate Studies and Research and establishes an Upgrading Assessment Committee.
- The Upgrading Assessment Committee should normally comprise the Supervisor(s) plus two independent Assessors.
- Assessors should be chosen on the basis of their knowledge and experience at the appropriate level in the area of the student's research and may be drawn from outside of The University of the West Indies.
- The Chairman, Faculty Sub-Committee requests from the student, a copy of his Proposal for upgrading for each of the Assessors, and a mutually agreed date is set for the oral presentation by the student of his:
 - Report on work done under MPhil registration,
 - and
 - Research proposal to upgrade the work to PhD.
- The Chairman, Faculty Sub-Committee chairs the oral presentation by the student of his Research proposal and later receives from each Assessor, a report with a recommendation regarding the requested upgrading.
- The Faculty Sub-Committee reviews the Reports and forwards a recommendation on upgrading to the Campus Committee on Higher Degrees, through the Faculty Board.

1.9 Theses and Project Reports

- 1.9.1 The form of presentation of Theses and Project Reports must conform to the University's General Regulations governing Higher Degrees. Students should consult the University Library on this matter as well as the University's publication "Theses and Research Papers."

1.9.2 The maximum length of theses/Project Reports shall be as follows: -

- Ph.D. - 500 pages including Appendices.
- M.Phil. - 250 pages including Appendices.
- M.Sc./Diploma Project Reports 125 pages including Appendices
- PG Diploma Project Reports 100 pages including Appendices

1.9.3 Essential elements/components/constituents of the proposed MSc Project Report should include the following:

- Introduction
- Background
- Motivation
- Scope and limitations
- Underlying principles/literature review/theory and fundamentals
- Methods/approach adopted/used and why
- Results
- Discussion of results/review of methodology
- Conclusions and recommendations
- Closure/comment on the significance of the findings from work, its contribution to knowledge in the area, and the lessons that should be learned from the project experience

The above items are listed in typical sequence. The sequence itself is not fixed, and may be adjusted to some extent as appropriate to each particular case.

1.10 Prizes

1.10.1 Prizes are awarded for excellent performance in Postgraduate Programmes as follows:

Construction Engineering & Management & Project Management

Geotech Associates Ltd. Prize (\$1,000)
 Highest mark in Foundations Technology

FINCOR Prize (\$1,000)
 Highest mark in Contract Management & Construction Law

Scotia Trust & Merchant Bank Prize (\$1,500)
 Highest mark in Construction Accounting & Finance

NIPDEC Prize (\$1,500)
 Highest mark in Human Resources & Industrial Relations in Construction

PTSC Prize (\$1,000)
 Highest mark in Maintenance & Facilities Management

JCC Prize (\$1,000)
 Highest mark in Structure & Operation of the Construction Sector

Coosal's Construction Prize (\$1,000)
 Highest mark in Construction Equipment

CEP Prize (\$1,500)
 Highest mark in Structural Design

Harricrete Ltd. Prize (\$1,000)
 Highest mark in Construction Materials

Leonard Prize (\$1,000)
 Highest mark in Construction Project Management

PMI Southern Caribbean Chapter Prize (\$1,200)
 Best student in the Research Project/Practicum component in the MSc Project Management

Alpha Engineering & Design (2002) Limited Prize (\$1,000)
 Highest mark in Construction Economics

Consulting Engineers Associates Limited Prize (\$1,500)
 Highest mark in Infrastructure, Planning and Development

Trinidad Cement Limited Prize (\$1,500)
 Highest mark in Materials Technology

Urban Development Corporation of Trinidad & Tobago (UDECOTT) Prize (\$2,000)
 Highest mark in Organisation & Management of Construction

Food Science & Technology

Associated Brands Industries Limited Prize (\$1,000)
 Highest mark in Food Microbiology

Diana Candy Company Limited Prize (\$1,000)
 Highest Mark in Food Quality Assurance

The Cooperative Citrus Growers' Association of Trinidad & Tobago Limited Prize (\$1,000)
 Highest mark in Food Chemistry

Universal Foods Limited Prize (\$1,000)
 Highest mark in Food Process Engineering

DEPARTMENT OF CHEMICAL ENGINEERING

Research

The Department of Chemical Engineering is part of the single campus Faculty of Engineering with a commitment to providing national and regional service to the process industries. These industries include the full spectrum available in the Caribbean including petroleum and petrochemicals, bauxite, sugar and food-processing. The Units of Food Science & Technology and Petroleum Engineering are included in the Department of Chemical Engineering with specific remits to serve those industries.

The Department recognises the need to promote industrial linkages, applied research, fundamental research and the continuing education of persons in the relevant disciplines. The research efforts are essentially geared to the solving of problems relevant to the region as a whole.

Research in the Department of Chemical Engineering is aimed at the development of the indigenous resources of the Caribbean region. The broad areas of research in the Department are as follows:

- Agricultural Crop Processing
- Biochemical Engineering
- Enhanced Oil Recovery
- Food Science & Technology
- Heavy Oil Recovery
- Industrial Pollution Control
- Mineral Processing
- Natural Gas Engineering
- Petroleum Processing Technology
- Process Design, Optimisation and Control
- Reaction Engineering
- Reservoir Engineering
- Sugar Technology
- Utilisation of Biomass

The Department offers programmes of study by research leading to the MPhil and PhD degrees in Chemical Engineering.

PROGRAMMES IN CHEMICAL & PROCESS ENGINEERING

MSc (Eng) in Chemical and Process Engineering

MSc (Eng) in Chemical and Process Engineering with Management

MSc (Eng) in Chemical and Process Engineering with Environmental Engineering

The Aims and Objectives

Technical deepening and broadening beyond the level covered by the BSc Honours Degree:

- To allow students to engage in creative and innovative development of Engineering technology.
- To gain experience in team-working while broadening the knowledge base through research and experimentation.
- To meet the full requisites of UK SPEC for eventual registration of our graduates as Chartered Engineers.

Structure of Programmes Offered Part-time

Duration of Study

A minimum of 12 months and a maximum of 36 months.

No. of Credits Required

Route 1-42 Credits

Route 2-39 Credits

ENTRY REQUIREMENTS

There are two routes of admission:

Route 1: Four (4) continuous years of study leading to the award of the BSc Honours and MSc (Eng) Degrees. These students would be expected to undergo a Co-op Industrial Attachment (June - August) before entering the programme in September.

Route 2: Successful completion of the BSc Honours Degree in Chemical & Process Engineering followed by two (2) years of initial Professional Development in the workplace.

Based on the route of admission taken, students are required to take the following courses:

Compulsory Requirement prior to entry into the Programme (Route 1)

Course Code	Course Title	Number of Credits
CHNG 6000	June - August Co-op Industrial Attachment	C3

COURSE LISTING

SEMESTER 1		15 CREDITS
Course Code	Course Title	Number of Credits
CHNG 6001	Advanced Process Dynamics & Controls	C4
CHNG 6002	Numerical Methods & Computing	E4
MENG 6506	Project Management	E3
CHNG 6003	Process Synthesis, Analysis & Optimisation	E4

SEMESTER 2		13 CREDITS
Course Code	Course Title	Number of Credits
CHNG 6101	Advanced Chemical Engineering Thermodynamics	E3
CHNG 6102	Advanced Chemical Reaction Engineering	E4

Together with two (2) optional courses to be chosen from one (1) of the three (3) streams:

Chemical & Process Engineering Stream

Course Code	Course Title	Number of Credits
CHNG 6201	Biochemical Engineering II	E3
CHNG 6202	Food Technology	E3
CHNG 6203	Petroleum Processing Technology	E3
CHNG 6204	Utilities Engineering	E3
CHNG 6205	Sugar Technology	E3
MENG 6507	Entrepreneurship & Innovation	E3

Management Stream

Course Code	Course Title	Number of Credits
MENG 6402	Human Resource Management I	E3
MENG 6405	Total Quality Management	E3
MENG 6502	Financial Management	E3
MENG 6507	Entrepreneurship & Innovation	E3

Environmental Engineering Stream

Course Code	Course Title	Number of Credits
ENGR 6005	Pollution Prevention, Cleaner Production & Industrial Waste Abatement	E3
ENGR 6006	Water & Wastewater Engineering	E3
ENGR 6007	Air Pollution Control	E3
ENGR 6018	Energy & The Environment	E3
MENG 6507	Entrepreneurship & Innovation	E3

In addition, existing graduate courses in the Faculty can be taken but approval has to be obtained from the Department and Faculty prior to doing so.

Project:

Semester 3		12 CREDITS
Course Code	Course Title	Number of Credits
CHNG 6302	Chemical Engineering MSc Part 1: Project Proposal (Literature Review & Theory where applicable) Part 2 (Experimental; Practical; Computational)	C9
ENGR 6701	Management & Leadership Seminars	C3

SYLLABUSES IN CHEMICAL ENGINEERING

SEMESTER: 1

COURSE CODE: CHNG 6001

COURSE TITLE: ADVANCED PROCESS DYNAMICS & CONTROLS

NO. OF CREDITS: 4

PREREQUISITES:

SYLLABUS: Analysis and design of advanced control systems, feedback control of systems with large dead time or inverse response, control systems with multiple loops, feed forward and ratio control, adaptive and inferential control systems, design of control systems for multivariable processes, synthesis of alternative control configurations for multiple-input, multiple-output processes, interaction and decoupling of control loops, design of control systems for complete plants, process control using digital computers, transition from continuous to discrete-time systems, z-transforms, discrete-time response of dynamic systems, design of digital feedback controllers, process identification.

SEMESTER: 1

COURSE CODE: CHNG 6002

COURSE TITLE: NUMERICAL METHODS & COMPUTING

NO. OF CREDITS: 4

PREREQUISITES:

SYLLABUS: Solution of linear and non-linear equations, solving sets of equations, interpolating polynomials, numerical differentiation and numerical integration, numerical solution of ordinary differential equations, boundary-value problems, numerical solution of elliptic, parabolic and hyperbolic differential equations, applications in heat transfer, fluid mechanics and reactor design.

SEMESTER: 1

COURSE CODE: CHNG 6003

COURSE TITLE: PROCESS SYNTHESIS, ANALYSIS & OPTIMISATION

NO. OF CREDITS: 4

PREREQUISITES:

SYLLABUS: Process design principles: heuristics, shortcut methods. Synthesis of process flow diagrams: reactors, separators, recycle, process control. Process optimisation: basic concepts, standard techniques, advanced techniques (topological optimisation, parametric optimisation). Pinch technology: basic concepts, heat exchanger network design, mass exchange networks. Analysis of process performance: input/output models, tools for evaluating process performance, application to multiple units.

SEMESTER: 1

COURSE CODE: MENG 6506

COURSE TITLE: PROJECT MANAGEMENT

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Project identification in context of investment programme at national and sectorial level, pre-investment studies, detailed project preparation, development and evaluational project organisation, project analysis and evaluation (technical, economic, financial, social and environmental). Project implementation (procurement/contracts programming and control); ex-post evaluation.

SEMESTER: 2

COURSE CODE: CHNG 6018

COURSE TITLE: ENERGY & THE ENVIRONMENT

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Energy conservation, principles and definitions of renewable energy and sustainable energy practice, reducing the impact of energy use through renewable energy, solar thermal conversion: principles and practice, solar photovoltaic: introduction, principles and practice, wind turbines: characterising the wind, wind turbine principles, hydro-power principles, biomass characterisation and direct use of biomass, hydrogen and fuel cells. Global case studies: discussion and application in the Caribbean area.

SEMESTER: 2

COURSE CODE: CHNG 6101

COURSE TITLE: ADVANCED CHEMICAL ENGINEERING THERMODYNAMICS

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Review of classical thermodynamics. Applications to phase equilibrium: equation of state approach and mixed equation of state/activity coefficient model approach. Applications to reaction equilibrium. Application to process problems: equilibrium flash calculations, distillation problems, multiphase reaction equilibrium, reactive distillation.

SEMESTER: 2

COURSE CODE: CHNG 6102

COURSE TITLE: ADVANCED CHEMICAL REACTION ENGINEERING

NO. OF CREDITS: 4

PREREQUISITES:

SYLLABUS: Flow models and reactor performance. Heterogeneous catalysis: kinetics of solid catalysed gaseous reactions. Catalyst types, characterisation, manufacture and industrial applications. Biochemical kinetics and applications. Polymerisation kinetics and reactors. Gas/solid non-catalytic reactions, kinetics and applications. Gas/liquid reactions and industrial applications. Reactor modelling. Fixed-bed catalytic reactors, tower and bubble (tank) reactors, fluidised bed reactors. Survey/analysis of existing reactors.

SEMESTER: 2

COURSE CODE: CHNG 6201

COURSE TITLE: BIOCHEMICAL ENGINEERING II

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Application and analysis of advanced biological systems, biochemical engineering for graduate level students, selected bioprocesses - bioremediation, introduction to bio-process control - use of bio-sensors, design and implementation of bio-processes, advances in biochemical engineering, bioprocess laboratory project/research paper, management of bio-processes.

SEMESTER: 2

COURSE CODE: CHNG 6202

COURSE TITLE: FOOD TECHNOLOGY

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Fundamentals of food processing with special reference to pasteurisation, sterilisation, chilling and freezing, dehydration, fermentation, curing and smoking and radiation. Food packaging: metal, glass and flexible packaging. Food quality control.

SEMESTER: 2

COURSE CODE: CHNG 6203

COURSE TITLE: PETROLEUM PROCESSING TECHNOLOGY

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Structure of the international petroleum industry. Analysis and test methods for crude petroleum including condensate and natural gas. Processing structure of petroleum refineries for the manufacture of fuel products. Lubricants and petrochemical precursors. Processing of petrochemical feedstocks - oxidation, hydrogenation, chlorination, nitration, polymerisation, sulphonation and esterification, alkylation, synthesis of CO-H₂ mixtures. Refinery fuel products and lubricants specifications and test methods. Crude topping, distillate fractionation and vacuum distillation - heaters, heat exchange equipment and distillation towers. Conversion processes - cracking and reforming. Treatment processes - desulphurisation, dewaxing, etc. Factors affecting investment decision in petroleum processing, scheduling. Process economics.

SEMESTER: 2
COURSE CODE: CHNG 6204
COURSE TITLE: UTILITY ENGINEERING
NO. OF CREDITS: 3
PREREQUISITES:

SYLLABUS: Introduction to plant operation, plant start up prime movers, steam engines, steam turbines, internal combustion engines, gas turbines, air compression C.S.A.B. - 52 Lubrication. Heating and air-conditioning systems and accessories, refrigeration systems. ASME Code Section 1, calculations of cylindrical components, tubing, piping, stayed and unstayed surfaces, openings and compensation, safety valves. Water treatment impurities, internal and external treatment, analytical methods, industrial waste treatment, gas turbines, types, components, applications. Fuels, furnaces, design, ash handling, fluid gas treatment, draft, fan types, fan control, draft calculations, steam turbines, principles of operation, construction, control, maintenance, commissioning, condensing equipment, alternators, pressure vessels and components inspection, safety, hazards. Operation and maintenance, piping, support, expansion, methods of connecting. Pumps, types, construction compressors, types, accessories, operation, maintenance, applications.

SEMESTER: 2
COURSE CODE: CHNG 6205
COURSE TITLE: SUGAR TECHNOLOGY
NO. OF CREDITS: 3
PREREQUISITES:

SYLLABUS: The sugarcane industry: geographical distribution, cane production, economics and marketing. Cane preparation. Milling: theory of extraction, mill feeding, imbibition. Diffusion processes. Chemical and biological reactions in sugar processing properties of sugar, inversion, action of micro-organism. Treatment of mixed juices, clarification. Evaporation: multi-effects units, steam economy. Crystallisation: theory, sugar boiling systems. Centrifugal filtration. Sugar storage and handling. Quality control and instrumentation. Refining. By-products.

SEMESTER: 2
COURSE CODE: ENGR 6005
COURSE TITLE: POLLUTION PREVENTION, CLEANER PRODUCTION & INDUSTRIAL WASTE ABATEMENT
NO. OF CREDITS: 3
PREREQUISITES:

SYLLABUS: Preventative environmental strategies vs. end-of-pipe treatment, environmentally-friendly product design, low-waste production technologies, efficient use of energy and raw materials, optimisation of existing technologies, operational safety, integrated approach to waste minimisation. In plant survey. Waste minimisation through volume and strength reduction process modification, separation and segregation, recycle and reuse technology. Characterisation of liquid, solid and gaseous wastes from important industries of the country or region. Treatment of wastes from different industries - case studies. Combined treatment plant for small-scale industries.

SEMESTER: 2
COURSE CODE: ENGR 6006
COURSE TITLE: WATER & WASTEWATER ENGINEERING
NO. OF CREDITS: 3
PREREQUISITES:

SYLLABUS: Water quality and beneficial uses. Water quality criteria and drinking water guidelines and standards. Water quality indices. Physicochemical processes for water and wastewater treatment, sedimentation, flotation, chemical coagulation and flocculation, filtration, ion exchange, adsorption, precipitation, disinfection, aeration, membrane processes, water demand and distribution. Wastewater quantities, wastewater collection system and characteristics of municipal wastewater. Preliminary, primary, secondary and tertiary treatment of wastewater. Reactor kinetics, reactor types and their analyses. Aerobic and anaerobic process design. Activated sludge and its modification, trickling filter, rotating biological contractors, suspended and attached growth anaerobic systems. Stabilisation ponds, aerated lagoons, etc. Sludge treatment and disposal. Treated effluent disposal in inland waters and marine environment. On-site waste treatment.

SEMESTER: 2
COURSE CODE: ENGR 6007
COURSE TITLE: AIR POLLUTION CONTROL
NO. OF CREDITS: 3
PREREQUISITES:

SYLLABUS: Introduction/sources of air pollution, air pollution, effects, air pollution control laws and regulations, air pollution control philosophies, air pollution measurements, emission estimates, meteorology for air pollution control engineers, air pollutant concentration models, general ideas in air pollution control, the nature of particulate pollutants, control of primary particulates, control of volatile organic compounds (VOCs), control of sulphur oxides, control of nitrogen oxides, the motor vehicle problem, air pollution and the global climate. Control devices and strategies.

SEMESTER: 2
COURSE CODE: MENG 6402
COURSE TITLE: HUMAN RESOURCE MANAGEMENT I
NO. OF CREDITS: 3
PREREQUISITES:

SYLLABUS: Formal and informal organisation, the bureaucratic model, the organisational environment, modern organisation theory, the individual in the organisation, SKAO, theories of motivation and leadership industrial relations, IRA, RSBA, communication in organisations, performance appraisal systems.

SEMESTER: 2
COURSE CODE: MENG 6405
COURSE TITLE: TOTAL QUALITY MANAGEMENT
NO. OF CREDITS: 3
PREREQUISITES:

SYLLABUS: Philosophy and principles of total quality management, customer satisfaction, quality systems, quality tools, continuous improvement, employee involvement and empowerment, supplier partnerships, benchmarking, quality function deployment, statistical process control, Taguchi's quality engineering, experimental design.

SEMESTER: 2

COURSE CODE: MENG 6502

COURSE TITLE: FINANCIAL MANAGEMENT

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Analysis of financial statements, financial forecasting and planning, risk, return and valuation, capital budgeting, financial structure and leverage, cost of capital, financing mix decisions, current asset management, cash, marketable securities, accounts receivables, inventory and short-term financing, long-term financing, common stock, debt, preferred stock, term loans and leasing, dividend policy.

SEMESTER: 2

COURSE CODE: MENG 6507

COURSE TITLE: ENTREPRENEURSHIP & INNOVATION

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Entrepreneurship (theory and practice). Entrepreneurship in small businesses, entrepreneurial ventures. Creative design and innovation. Patterns of creativity and innovation. Design, marketing and consumers; diffusion and transfer of technology and innovation. Strategic planning (business planning and new ventures).

SEMESTER: 3

COURSE CODE: ENGR 6701

COURSE TITLE: MANAGEMENT & LEADERSHIP SEMINARS

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Active participation in seminars and discussions on topics including: Project management, case studies in human resource management, business processes and marketing, new venture and product development, supply chain management, HSE and other related areas.

PROGRAMMES IN FOOD SCIENCE & TECHNOLOGY

MSc in Food Science & Technology

MPhil in Food Science & Technology

PhD in Food Science & Technology

The Aims and Objectives

- a) To accommodate the useful application of knowledge to the developmental needs of the food industry in the Caribbean, to the real world of commerce and public need.
- b) To foster scholastic achievement in academics and the conduct of research by both applied and theoretical methods, in order to produce individuals equipped for research and production in the food industry, government institutions, other universities and research institutions, development agencies, other teaching and technical establishments and in libraries and information centres.

FOOD SCIENCE & TECHNOLOGY UNIT REGULATIONS

MSc IN FOOD SCIENCE & TECHNOLOGY

The Regulations for the MSc in Food Science & Technology are the same as the General Regulations for the MSc (Eng) in the Faculty of Engineering, except that candidates applying for registration should normally have either:

- a. A Bachelor's Degree in Food Science & Technology, Natural Science or Nutrition (with Mathematics and/or Statistics and Chemistry at the Preliminary and Introductory Level) or Agriculture, or Chemical Engineering or Agricultural Engineering;
or
- b. An equivalent academic or professional qualification acceptable to the Faculty of Engineering.

MPhil IN FOOD SCIENCE & TECHNOLOGY

The Regulations for the MPhil in Food Science & Technology are the same as the General Regulations for the MPhil except that candidates applying for registration should normally have either:

- a. A Bachelor's Degree in Food Science & Technology,
or
- b. A Master's Degree in Food Science & Technology,
or
- c. An equivalent academic or professional qualification acceptable to the Faculty of Engineering.

PHD IN FOOD SCIENCE & TECHNOLOGY

The Regulations for the PhD in Food Science & Technology are the same as the University and Faculty of Engineering regulations for the degree of Doctor of Philosophy except that candidates applying for registration should normally have either:

- a. A Master of Philosophy Degree in Food Science & Technology of The University of the West Indies, or
- b. An equivalent academic or professional qualification acceptable to the Faculty of Engineering.

ENTRY REQUIREMENTS

Candidates for registration in this programme must first hold a degree in any of the following subjects:

- Food Science & Technology;
- Chemistry or Applied Chemistry;
- Chemical, Biochemical or Agricultural Engineering;
- Agriculture;
- Nutrition;
- Home Economics with a major in Nutrition or Food Technology or other relevant qualifications acceptable to the Faculty of Engineering.

STRUCTURE OF PROGRAMMES

Offered part-time and full-time

- a) Part-time students: - must normally submit their Project Reports twelve (12) months after completion of the written examinations
- b) Full-time students: - must normally submit their Project Reports nine (9) months after completion of the written examinations

Candidates who fail to submit their Reports in good time shall be removed from the Register of Postgraduate students.

MSC PROGRAMME - COURSE OF STUDY

Following the pattern established by the Institute of Food Technologists in the United States and the Institute of Food Science & Technology in the United Kingdom, students will be required to pursue an appropriate course of study as determined by the Graduate School, UWI, St. Augustine and the Food Science & Technology Unit, Department of Chemical Engineering.

No. of Credits Required:

Minimum of 30 credits of successful graduate study coursework. Candidates must also conduct a six (6) credit research paper project (FOST 6019) under the supervision of an academic member of the Food Science & Technology Unit.

Students should demonstrate proficiency in Food Science & Technology by satisfactory completion of at least 30 credits of coursework, fifteen (15) of which must be the following core courses:

COURSE LISTING

Course Code	Course Title	Course Credit
FOST 6003	Food Chemistry	3
FOST 6005	Food Microbiology	4
FOST 6006	Food Quality Assurance	4
FOST 6000	Fundamentals of Food Process Engineering	4

The remaining credits may be selected from the following options depending on the availability of teaching staff for that academic year:

Course Code	Course Title	Course Credit
FOST 6001	Sanitation in Food Processing	3
FOST 6002	Food Packaging	2
FOST 6004	Food Processing Laboratories	3
FOST 6007	Preservation & Processing of Meat & Poultry	3
FOST 6008	Preservation & Processing of Fruits and Vegetables	3
FOST 6009	Food Analysis	3
FOST 6010	Dairy Chemistry & Dairy Products Technology	3
FOST 6011	Beverage Processing	3
FOST 6012	Industrial Management	3
FOST 6013	Chemistry of Food Colours	3
FOST 6014	Chemistry & Processing of Fats & Oils	3
FOST 6015	Principles of Nutrition	3
FOST 6016	Preservation & Processing of Seafood	3
FOST 6017	Sensory Evaluation of Food	3
FOST 6018	Literature Survey	3

OTHER INFORMATION

The Food Science and Technology Unit is equipped with science laboratories which include a processing hall containing a range of small-scale equipment suitably instrumented for the systematic study of operations involved in the food industry; a food microbiology and quality control laboratory.

Areas of current research include food analysis, food preference and sensory studies, food fermentations, milk, meat, fish, fruit and vegetables microbiology and technology, root crop processing-dehydration, extrusion, food product development (food formulation from novel components).

The Unit maintains links with industry particularly in the area of food manufacture. Staff is also involved in scientific and technical societies, in particular, the Institute of Food Technologists (USA), the Canadian Institute of Food Science & Technology and the Institute of Food Science & Technology (UK). Staff members also have connections with overseas institutions which they visit and in which they participate. There are links with national and international development agencies.

Graduates of this programme have found employment in the food industry, mainly in research and development, quality control and production management. Some are pursuing research in government and industry-sponsored research organisations. Some are on the academic staff of universities.

Other opportunities arise in the catering and pharmaceutical industries, in teaching, in libraries and information centres and with overseas institutions and development agencies.

Candidates failing the examination in any course of the MSc Programme may be allowed a second attempt at the examination on the recommendations of the Examiners to the Board for Graduate Studies.

Candidates will not be normally permitted to repeat the examination in any one course on more than one (1) subsequent occasion.

SYLLABUSES IN FOOD SCIENCE & TECHNOLOGY

SEMESTER: 2

COURSE CODE: FOST 6000

COURSE TITLE: FUNDAMENTALS OF FOOD PROCESS ENGINEERING

NO. OF CREDITS: 4

PREREQUISITES: Mathematics

SYLLABUS: Mathematics is important in food engineering. Material and energy balances in food processing. Flow of fluids under laminar and turbulent conditions. Flow of liquids in pipelines, fittings and pumps. Heat transfer by conduction, convection and radiation. Principles of evaporation, equipment and applications. Psychrometry. Drying of foods using heated air, hot surfaces and freeze drying. Refrigeration. Freezing, equipment and applications. Thermal processing of foods. Reaction kinetics in foods. Separation operations including centrifugation, filtration, extraction and crystallisation. General principles of size reduction of solids, and equipment for slicing, dicing, shredding and pulping.

SEMESTER: 1

COURSE CODE: FOST 6001

COURSE TITLE: SANITATION IN FOOD PROCESSING

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Principles and practices of food plant sanitation. Cleaning and sanitising. Control and evaluation of microbial, insect and rodent contamination. Organisation of a sanitation control programme. Personal hygiene. Waste treatment and disposal. GMPs, SOPs, SSOPs and HACCP. Government and public health regulations.

SEMESTER: 2

COURSE CODE: FOST 6002

COURSE TITLE: FOOD PACKAGING

NO. OF CREDITS: 2

PREREQUISITES:

SYLLABUS: Formulation of materials. Basic uses of packaging materials. Packaging design. Physical and chemical properties of packaging materials. Limitations of packaging materials. Test methods. Shipping forms.

SEMESTER: 1

COURSE CODE: FOST 6003

COURSE TITLE: FOOD CHEMISTRY

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Chemistry and physics of the major food constituents. Composition and structure of foods. Chemical reactions involved in food processing, storage and handling.

SEMESTER: 2

COURSE CODE: FOST 6004

COURSE TITLE: FOOD PROCESSING LABORATORIES

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Laboratory exercises in the preservation and processing of meat, poultry, seafood, dairy products and fruits and vegetables. Processes will include thermal processing (canning), batch and HTST pasteurisation of milk, fruit juices and beverages. Dehydration of fruit purees. Production of soya products and comminuted meat products. Production of jams, jellies and marmalades. Spray-drying and extrusion processing. Meat curing and smoking. Production of fermented foods, e.g., yoghurt.

SEMESTER: 1

COURSE CODE: FOST 6005

COURSE TITLE: FOOD MICROBIOLOGY

NO. OF CREDITS: 4

PREREQUISITES:

SYLLABUS: Introductory microbiology. Microorganisms important in food microbiology. Principles of contamination, preservation and food spoilage. Microorganisms in the production of foods. Food intoxications and infections. Microbiology in food plant sanitation. Methods for detection, enumeration and identification of spoilage and pathogenic microorganisms.

SEMESTER: 2

COURSE CODE: FOST 6006

COURSE TITLE: FOOD QUALITY ASSURANCE

NO. OF CREDITS: 4

PREREQUISITES:

SYLLABUS: General principles. Quality attributes, colour, flavour, kinesthetics, shape, size and defects. Taste-testing. Sampling and inspection. Recording and reporting. Grades and standards. Production control.

SEMESTER: 1

COURSE CODE: FOST 6007

COURSE TITLE: PRESERVATION & PROCESSING OF MEAT & POULTRY

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: The study and applications of the principles and techniques involved in processing meat and poultry products. Structure, physical and chemical composition of muscle and major organs. Meat quality. Pre- and post-slaughter handling practices and their effects on meat quality. Meat packaging.

SEMESTER: 2
COURSE CODE: FOST 6008
COURSE TITLE: PRESERVATION & PROCESSING FRUITS & VEGETABLES
NO. OF CREDITS: 3
PREREQUISITES:
SYLLABUS: Effect of post-harvest handling on the processing quality of fruits and vegetables. Unit operations of thermal processing, dehydration, refrigeration and freezing. Juices and beverages, their preparation and preservation. Jams, jellies and marmalades. Preserves, candied and crystallised products. Pickles and sauces. By-product utilisation.

SEMESTER:
COURSE CODE: FOST 6009
COURSE TITLE: FOOD ANALYSIS
NO. OF CREDITS: 3
PREREQUISITES:
SYLLABUS: Principles and application of the chemical, physical and instrumental methods used to determine the constituents of foods. Separation techniques using GC and HPLC, and spectroscopic techniques including UV/Vis and IR methods. Special consideration applicable to the analysis of certain foods. Legal and governmental regulations.

SEMESTER:
COURSE CODE: FOST 6010
COURSE TITLE: DAIRY CHEMISTRY & DAIRY PRODUCTS TECHNOLOGY
NO. OF CREDITS: 3
PREREQUISITES:
SYLLABUS: Basic composition, structure and properties of milk. Chemistry of changes occurring in the commercial processing of milk for utilisation as food. Manufacture of cheeses. Selection and preparation of cream for butter-making. Manufacture of fermented milk foods. Ice cream manufacture and processing of other dairy-based products.

SEMESTER:
COURSE CODE: FOST 6011
COURSE TITLE: BEVERAGE PROCESSING
NO. OF CREDITS: 3
PREREQUISITES:
SYLLABUS: Processing technology of the three major beverage groups - carbonated, non-alcoholic (soft drinks); carbonated mildly alcoholic (beer); non-alcoholic, non-carbonated, stimulating (coffee, tea). Raw material ingredients. Manufacturing processes. Standards of identity and standards for grades. Nutritive, public health and safety concerns.

SEMESTER:
COURSE CODE: FOST 6012
COURSE TITLE: INDUSTRIAL MANAGEMENT
NO. OF CREDITS: 3
PREREQUISITES:
SYLLABUS: Principles and models (qualitative and quantitative) that are critical to effective decision-making in Operations Management. Development and formulating operational strategies: capacity strategy, product strategy, process strategy and human resource strategy. Technical support activities: aggregate planning, quality assurance - quality management control, cost control and shop floor control.

SEMESTER:
COURSE CODE: FOST 6013
COURSE TITLE: CHEMISTRY OF FOOD COLOURS
NO. OF CREDITS: 3
PREREQUISITES:
SYLLABUS: Occurrence, structure, physical and chemical properties of natural and synthetic food colours. The interaction between colour substances and other food components during processing and storage. Analytical aspects of food colours.

SEMESTER:
COURSE CODE: FOST 6014
COURSE TITLE: CHEMISTRY & PROCESSING OF FATS AND OILS
NO. OF CREDITS: 3
PREREQUISITES:
SYLLABUS: Structure and composition of fats and oils and their chemical and physical properties. Deterioration of natural fats and oils. Theoretical study of fat sources; the processing of fats and oils and their application in foods. Fractionation, purification and analysis of fats and oils. Chemistry of autooxidation, antioxidants and emulsifiers. Health aspects of fats and oils.

SEMESTER:
COURSE CODE: FOST 6015
COURSE TITLE: PRINCIPLES OF NUTRITION
NO. OF CREDITS: 3
PREREQUISITES:
SYLLABUS: Nutrition value of foods and metabolism of essential nutrients. Basic and applied principles of nutrition to the formulation, fabrication, processing and marketing of food products. The application of principles of nutrition to the requirements of normal individuals throughout the life cycle.

SEMESTER:
COURSE CODE: FOST 6016
COURSE TITLE: PRESERVATION & PROCESSING OF SEAFOOD
NO. OF CREDITS: 3
PREREQUISITES:
SYLLABUS: Structure, physical and chemical composition of important species. Post-mortem changes and fish quality. Microbiology of fish. Handling and storage. Preservation and processing: chilling, freezing, salting and marinating, drying and smoking. Thermal processing. Fermented products. Fishery by-products.

SEMESTER:

COURSE CODE: FOST 6017

COURSE TITLE: SENSORY EVALUATION OF FOODS

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: The physiology, psychology and chemistry of flavour and flavour perception. Factual, visual and auditory components influencing the acceptability of foods. The principles and application of preference and discriminatory testing, and the interpretation of panel evaluation data.

SEMESTER: 1ST & 2ND Semesters

COURSE CODE: FOST 6018

COURSE TITLE: LITERATURE SURVEY

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: To undertake a literature survey of a particular topic in Food Science & Technology. Prepare a paper, and present findings at a seminar.

SEMESTER:

COURSE CODE: FOST 6019

COURSE TITLE: FOOD SCIENCE MSC RESEARCH PROJECT

NO. OF CREDITS: 6

PREREQUISITES:

SYLLABUS:

PROGRAMMES IN PETROLEUM ENGINEERING

MSc in Petroleum Engineering

MSc in Reservoir Engineering

OVERVIEW

The Subject

Petroleum engineering involves the application of earth and physical sciences to the evaluation and exploitation of natural hydrocarbon resources. The dominant problems of the petroleum engineer are those of flow and equilibrium in porous media, in vertical and horizontal well bores, in surface pipelines and in primary process equipment. The complexity of the hydrocarbon fluids, and the geological strata involved in flow in reservoirs and production systems raises problems requiring sophisticated numerical techniques for their solution. In the practical field, drilling and production engineering continually pose new engineering problems requiring engineered solutions.

Industrial Contact

We have strong links with both industry and government maintained by the growing awareness of the need for an interchange of advice and ideas. Industry also provides us with financial support for certain academic posts and scholarships. Visiting lecturers from the industry and government establishments make an important contribution to the more specialised teaching of the MSc programme.

Cooperation with Industry

- Many past students are now in responsible positions in industry.
- Lectures on some courses are given by personnel from industry.
- Regular seminars are given by engineers and managers from oil companies.
- Most companies regard the course as a good source of potential recruits.
- Industry support through scholarships and secondment.
- Majority of project topics are proposed and partly supervised by industry.
- Industry welcomes our students on visits.

Society of Petroleum Engineers (SPE)

Strong interaction with the Society of Petroleum Engineers, an international learned society looking after petroleum engineering. The aim of the SPE is to disseminate frontier knowledge from fundamental to field experience, including cost benefit. Over the years, the SPE has been most generous in its support to Petroleum Engineering at UWI, including scholarship support, running a student paper and welcoming students to their meetings and conferences.

MSC IN PETROLEUM ENGINEERING

Overview

The Petroleum Engineering MSc Programme consists of eight (8) taught courses, a Research Methods course and an Independent Project. It is a conversion programme from other engineering and science-based degree foundations into the specialities of petroleum engineering.

The Aims and Objectives

To provide the necessary background for employment in the oil and gas industry, or springboard for a research degree, as well as serving as a refresher for those already working in industry.

Regulations and Entry Requirements

1. The Regulations for the MSc (Eng) in Petroleum Engineering, Reservoir Engineering, (subject to approval) Petroleum Engineering & Management and Petroleum Management are the same as the General Regulations for the MSc (Eng) in the Faculty of Engineering, except that the candidates applying for registration should have at least:
 - a. a Second Class Honours degree in Engineering/ Natural Sciences (Physics & Chemistry majors)/Earth Sciences;
or
 - b. an equivalent qualification, in respect of either Engineering and/or Management.
2. A candidate applying for registration with a Pass degree may be considered for entry provided the candidate has acceptable industrial experience.

Structure of Programme

Offered both Part-time and Full-time

- a) Part-time students: - Normally required to complete the written examinations within two (2) years of registration - Project should be started at the commencement of the semester following the completion of the written examinations and completed within nine (9) months
- b) Full-time students: - Normally required to complete the written examinations within one (1) year of registration - Project should be started at the commencement of the semester following the completion of the written examinations and completed within six (6) months.

NB The normal load for a part-time student is half that of a full-time student.

Duration of Study

This is dependent on whether the student is part-time or full-time.

- a) Part-time students: Five (5) years.
- b) Full-time students: Three (3) years.

No. of Credits Required: 44

No. of Credits	32
Project (Research Methods - 3 credits; Project - 9 credits)	12

Other information

Credits for Diploma Courses towards the MSc Degree

Holders of the Postgraduate Diploma in Petroleum Engineering, Petroleum Engineering and Management or Petroleum Management will be granted credit for courses completed in the programme if they are subsequently admitted to the MSc degree, provided that not more than five (5) years have elapsed since the date on which such courses were passed.

Examination

As follows:

- a. Evaluation in all courses will normally be by coursework and final examination. Candidates will be required to pass both the coursework and examination.
- b. MSc Petroleum Project - evaluation will be on the report. Candidates may also be orally examined.

Students will, in addition, be required to present a Paper at a seminar.

Short Courses and Seminars

The programme in Petroleum Engineering and Management also includes short courses and seminars on topics of interest to supervisors, engineers and managers in the petroleum industry. These are on subjects of topical interest and are organised frequently in response to the identified needs and problems. For further details on these short courses or general advice on the programme, you are invited to contact the Head, Department of Chemical Engineering.

COURSE LISTING

An MSc (Eng) candidate in Petroleum Engineering will be required to pursue a course of study approved by the Board of the Faculty of Engineering. Such a course of study will normally be made up of eight (8) of the following courses a Research Methods course and an Independent Project.

Course Code	Course Title	Number of Credits
PENG 6000	Petroleum Geoscience	4
PENG 6001	Advanced Petroleum Geology & Geophysics	4
PENG 6002	Drilling Engineering & Completions	4
PENG 6003	Advanced Drilling Engineering & Well Completions	4
PENG 6004	Advanced Production Engineering & Technology	4
PENG 6005	Reservoir Evaluation	4
PENG 6006	Advanced Well Test Analysis	4
PENG 6007	Reservoir Engineering	4
PENG 6008	Advanced Reservoir Engineering	4
PENG 6010	Improved Oil Recovery	4
PENG 6012	Natural Gas Engineering	4
PENG 6014	Offshore Structures & Systems	4
PENG 6015	Production Engineering	4
PENG 6016	Petroleum Economics & Management	4
PENG 6017	Selected Topics	4

Each candidate will also be required to undertake PENG 6023 – Research Methods (subject to availability) or Faculty Equivalent COEM 6020 - Research Methods (Semester II); GINF 6024 – Research Methodology (Semester I) **or** MENG 6508 – Research Methods (Semester II) COEM 6020, (GINF 6024 and MENG 6508 subject to availability of space); followed by PENG 6024 – Research Project

Note that not all courses listed will be offered in any given year.

N.B. Students who have already registered for PENG 6019 should continue to register for PENG 6019. All other students should register for PENG 6023 or Faculty Equivalent and PENG 6024. There may be field work on a Saturday and/or on a Sunday.

MSC IN RESERVOIR ENGINEERING

Overview

Reservoir Engineering is a sub-set of Petroleum Engineering where understanding of the reservoir is studied in more detail. Reservoir Engineers seek to economically optimise the exploration of the reservoir.

Regulations and Entry Requirements

1. The regulations for the MSc (Eng) in Reservoir Engineering are the same as the General Regulations for the MSc (Eng) in the Faculty of Engineering, except that the candidates applying for registration should be in possession of at least:
 - a Second Class Honours degree from an approved university, in Engineering or Natural Sciences (Physics, Chemistry, or Mathematics majors) or Earth Sciences, and preferably at least one (1) year of relevant industry experience.
2. A candidate applying for registration with a Pass degree may be considered for entry provided the candidate has acceptable industrial experience.
3. A candidate for admission may be required to sit a qualifying examination. Candidates may be restricted by the Department to certain subject areas in the course of study. In particular, graduates must be numerate and have had some exposure to the fields of geology/geophysics, natural sciences and engineering. Candidates other than those that have had an exposure of petroleum engineering may be required to take qualifying examinations to become eligible for entry into the programme, unless such a graduate possesses adequate and practical experience in industry.
4. Examinations follow the same form as the MSc in Petroleum Engineering.

Structure of Programme

Part-time/Full-time

No. of credits Required: 44

No. of Credits Courses	32
Project (Research Methods - 3 credits; Project - 9 credits)	12

Information on Project

Each candidate will also be required to pass a Research Methods course and submit a Project Report PENG 6024 This project would be a choice of:

- (i) A traditional research project or
- (ii) A professional, industry-based project.

In both cases, the students will be examined by a written and, where possible, an oral presentation.

COURSE LISTING

An MSc (Eng) candidate in Reservoir Engineering will be required to pursue a course of study approved by the Board of the Faculty of Engineering. Such a course of study will normally be made up of eight (8) of the following courses, a Research Methods course and an Independent Project.

Course Code	Course Title	Number of Credits
PENG 6000*	Petroleum Geoscience	4
PENG 6001	Advanced Petroleum Geology & Geophysics	4
PENG 6005*	Reservoir Evaluation	4
PENG 6006	Advanced Well Test Analysis	4
PENG 6007*	Reservoir Engineering	4
PENG 6008	Advanced Reservoir Engineering	4
PENG 6010*	Improved Oil Recovery	4
PENG 6012*	Natural Gas Engineering	4
PENG 6017*	Selected Topics (Field Project)	4

* Currently offered in the Petroleum Engineering MSc.

Each candidate will also be required to undertake PENG 6023 - Research Methods (subject to availability) or Faculty Equivalent COEM 6020 - Research Methods (Semester II); GINF 6024 - Research Methodology (Semester I) or MENG 6508 - Research Methods (Semester II) (COEM 6020, GINF 6024 and MENG 6508 subject to availability of space); followed by PENG 6024 - Research Project

POSTGRADUATE DIPLOMAS

POSTGRADUATE DIPLOMA IN PETROLEUM ENGINEERING

Entry Requirements

To be admitted to the prescribed course of study, candidates must be:

- in possession of at least a Second Class Honours degree from an approved university, in Engineering or Natural Sciences (Physics, Chemistry, or Mathematics majors) or Earth Sciences, and at least one (1) year of relevant industry experience. A candidate applying for registration with a Pass degree may be considered for entry provided the candidate has acceptable petroleum industry experience.
- in possession of an equivalent qualification which will include a combination of academic training and petroleum industry experience and which is acceptable to the Board for Graduate Studies.

A candidate for admission to the Postgraduate Diploma may be required to sit a qualifying examination. Candidates may be restricted by the Department to certain subject areas in the course of study.

Examination

As follows:

- a. Evaluation in all courses will normally be by coursework and final examination. Candidates will be required to pass both the coursework and the examination.

Structure of Programmes

Offered both Part-time and Full-time

- a) Part-time students: - Normally required to complete the written examinations within two (2) years of registration
 - Project should be started at the commencement of the semester following the completion of the written examinations and completed within nine (9) months
- b) Full-time students: - Normally required to complete the written examinations within one (1) year of registration
 - Project should be started at the commencement of the semester following the completion of the written examinations and completed within six (6) months

Duration of Study

- a) Part-time students: Five (4) years.
- b) Full-time students: Three (3) years.

No. of Credits: 24

Course Load: The normal load for a part-time student is half that of a full-time student

COURSE LISTING

POSTGRADUATE DIPLOMA IN PETROLEUM ENGINEERING

Candidates will be required to pursue three (3) of the following courses, plus a Research Methods course (PENG 6023 – Research Methods (subject to availability) or Faculty Equivalent COEM 6020 - Research Methods (Semester II); GINF 6024 – Research Methodology (Semester I) or MENG 6508 – Research Methods (Semester II) COEM 6020, (GINF 6024 and MENG 6508 subject to availability of space); and undertake an Independent Project PENG 6024.

Alternatively, candidates may pursue six (6) of the following courses:

Course Code	Course Title	Number of Credits
PENG 6000	Petroleum Geoscience	4
PENG 6001	Advanced Petroleum Geology & Geophysics	4
PENG 6002	Drilling Engineering & Completions	4
PENG 6003	Advanced Drilling Engineering & Well Completions	4
PENG 6004	Advanced Production Engineering & Technology	4
PENG 6005	Reservoir Evaluation	4
PENG 6006	Advanced Well Test Analysis	4
PENG 6007	Reservoir Engineering	4
PENG 6008	Advanced Reservoir Engineering	4
PENG 6010	Improved Oil Recovery	4
PENG 6012	Natural Gas Engineering	4
PENG 6015	Production Engineering	4
PENG 6016	Petroleum Economics & Management	4
PENG 6017	Selected Topics	4

Note that not all courses listed will be offered in any given year.

POSTGRADUATE DIPLOMA IN PETROLEUM ENGINEERING & MANAGEMENT

Candidates will be required to pursue three (3) of the following courses, plus a Research Methods course (PENG 6023 - Research Methods (subject to availability) or Faculty Equivalent COEM 6020 - Research Methods (Semester II); GINF 6024 - Research Methodology (Semester I) or MENG 6508 - Research Methods (Semester II) (COEM 6020,GINF 6024 And MENG 6508 subject to availability of space); and undertake an Independent Project PENG 6024.

Course Code	Course Title	Number of Credits
PENG 6002	Drilling Engineering & Completions	4
PENG 6003	Advanced Drilling Engineering & Well Completions	4
PENG 6006	Advanced Well Test Analysis	4
PENG 6007	Reservoir Engineering	4
PENG 6008	Advanced Reservoir Engineering	4
PENG 6009	Strategic Petroleum Management & Organisations	4
PENG 6010	Improved Oil Recovery	4
PENG 6011	Petroleum Economics, Law & Contract Administration	4
PENG 6012	Natural Gas Engineering	4
PENG 6015	Production Engineering	4
PENG 6020	Economic & Quantitative Aids to Decision-Making	4

Alternatively, candidates may pursue six (6) of the above-mentioned courses:

POSTGRADUATE DIPLOMA IN PETROLEUM MANAGEMENT

Candidates will be required to pursue three (3) of the following courses, plus a Research Methods course (PENG 6023 - Research Methods (subject to availability) or Faculty Equivalent COEM 6020 - Research Methods (Semester II); GINF 6024 - Research Methodology (Semester I) or MENG 6508 - Research Methods (Semester II) (COEM 6020,GINF 6024 and MENG 6508 subject to availability of space); and undertake an Independent Project PENG 6024.

Course Code	Course Title
PENG 6009	Strategic Petroleum Management & Organisations
PENG 6011	Petroleum Economics Law & Contract Administration
PENG 6013	Financial Management & Accounting
PENG 6018	Petroleum Engineering Research Project
PENG 6020	Economic & Quantitative Aids to Decision-Making
PENG 6021	Production Planning & Control
PENG 6022	Maintenance & Safety Management

Alternatively, candidates may pursue six (6) of the above-mentioned courses:

MPhil PROGRAMMES

MPhil in Petroleum Engineering
MPhil in Petroleum Geoscience
MPhil in Geoscience

Regulations and Entry Requirements

The Regulations for the MPhil in Petroleum Engineering, Petroleum Geoscience or Geoscience are the same as the General Regulations for MPhil, except that candidates applying for registration should normally have either:

- a. a Bachelor's degree in Petroleum Engineering or
- b. an equivalent qualification or
- c. a Diploma in Petroleum Engineering with a Pass with Credit (at least 60%) of The University of the West Indies

Graduates in the fields of geology/geophysics, natural sciences, and engineering (other than petroleum engineering) may be required to do qualifying examinations to become eligible for entry into the programme unless such a graduate possesses adequate and practical experience in industry, in which case only Departmental examinations will be required.

PHD PROGRAMMES

PhD in Petroleum Engineering
PhD in Petroleum Geoscience
PhD in Geoscience

Regulations and Entry Requirements

1. The appropriate University and Faculty of Engineering Regulations for the degree of Doctor of Philosophy shall apply.
2. Candidates applying should normally have either:
 - a. a Master's degree in Petroleum Engineering of The University of the West Indies or an approved University or
 - b. an equivalent qualification

SYLLABUSES IN PETROLEUM ENGINEERING AND RESERVOIR ENGINEERING

SEMESTER:

COURSE CODE: PENG 6000

COURSE TITLE: PETROLEUM GEOSCIENCE

NO. OF CREDITS:

PREREQUISITES:

SYLLABUS: Introduction to Geology, Earth Structure, Plate Tectonics, Geological Time and History; Minerals and Rocks; Rock Forming Processes with Environments of Deposition; Sedimentary basins; Structural Geology and Hydrocarbon Traps; Origin, Migration and Accumulation of Petroleum; Composition of Hydrocarbons and Reservoir Characteristics. The petroleum reservoir; Geophysical exploration techniques. Mapping - Surface and Subsurface; Geological Laboratory. Field Trip. Petroleum Engineering vocabulary; Units. Pressures. Routine core analysis, laboratory procedures. Characteristics of reservoir rocks; pore space representation. Porosity; saturation; Volumetric representation of hydrocarbon in place. Permeability, Darcy and non-Darcy Flow; linear and radial flow; datum correction; Saturation effects; capillary pressure, relative permeability essentials.

SEMESTER:

COURSE CODE: PENG 6001

COURSE TITLE: ADVANCED PETROLEUM GEOLOGY & GEOPHYSICS

NO. OF CREDITS:

PREREQUISITES:

SYLLABUS: Interpretation of geological and geophysical data; Geological history of Trinidad & Tobago; Structural and stratigraphic setting of hydrocarbon occurrences; Hydrocarbon prospects; Evaluation of prospects; Seismic acquisition; Processing and interpretation of 2-D and 3-D data; Case studies.

SEMESTER:

COURSE CODE: PENG 6002

COURSE TITLE: DRILLING ENGINEERING & COMPLETIONS

NO. OF CREDITS:

PREREQUISITES:

SYLLABUS: Rotary drilling rigs. Rig components, Drilling bits and bottom-hole assemblies; Coring. Drilling fluid systems. Mud engineering; Subsurface control and safety; Blowout prevention and wellhead equipment; Bore hold stability; Pressure losses; Rig hydraulics; Deviated drilling; Directional drilling; Horizontal well drilling; Hole problems and solutions; Fishing and stuck pipe; Drill string and casing string design; Solids removal; Pore pressure prediction and fracture hydraulics; completion techniques; Casing strings and setting depths. Subsea completions; Computer modelling; AFE; Offshore drilling and equipment. Drilling Safety. Drilling practice in Trinidad. Well completion design. Casing, Tubing & Wellhead Equipment; Packers; Downhole Tubulars; Subsurface control and safety; Cementing; Perforating; Completion/Workover fluids; Sand control; wireline operations; Coiled Tubing; Stimulation; Horizontal wells; Workover Programmes; Case studies.

SEMESTER:

COURSE CODE: PENG 6003

COURSE TITLE: ADVANCED DRILLING ENGINEERING & WELL COMPLETION

NO. OF CREDITS:

PREREQUISITES:

SYLLABUS: Drilling fluids; Surface chemistry; Non-Newtonian flow and pressure losses in the circulating system; Surge and swab pressures; Solids removal; Pore pressure prediction and fracture hydraulics; Blowout prevention and wellhead equipment; Bore hold stability; Deviated drilling; Hole problems and solutions; Drill string and casing string design; Offshore drilling and equipment; Cementing, completion techniques; Completion/workover fluids; Subsea completions; Rig selection and evaluation; Bid evaluation; Sand control; Stimulation; Computer modelling; Case studies.

SEMESTER:

COURSE CODE: PENG 6004

COURSE TITLE: ADVANCED PRODUCTION ENGINEERING & TECHNOLOGY

NO. OF CREDITS:

PREREQUISITES:

SYLLABUS: Concept of nodes in the total production system; Inflow performance relationships; Single and multiphase flow; Nodal analysis; Natural and artificial lift methods and equipment; Production processes at surface; Control and instrumentation; Production logging; Pressure and rate measurement; Subsurface control and safety; Wellhead systems; Production economics.

SEMESTER:

COURSE CODE: PENG 6005

COURSE TITLE: RESERVOIR EVALUATION

NO. OF CREDITS:

PREREQUISITES:

SYLLABUS: Well logging: Logging methods and interpretation techniques; Conditions around the wellbore, effects on measurements of mud filtrate invasion, formation contents etc. The terminology of well logging, Sw, Sxo, Rt, Rxo etc. Formation and fluid properties; The physical principles involved in geophysical well logging: electrical logs; sonic log; radioactivity logs; dipmeter log. The Archie Equations in clean formations. Discussion of the uncertainties involved. Estimation of porosity in different lithologies. Cross-plots for porosity and lithology, uncertainties. Estimation of water saturation. Gas effects. Differentiation between gas and oil hydrocarbon saturation. Effects of shaliness and modified equations. Shale estimation. Computed logs; Local field examples. Well testing: Principles of Pressure Transient Test Analysis; the Diffusivity Equation; Analysis of Buildup and Drawdown Tests; Multi-rate testing; Type-curve Analysis; Determination of skin; wellbore storage, drainage radius and stabilisation time; Gas well-testing; Real gas potential application; Other well tests. Gas well-testing; computer logging packages. Local field examples.

SEMESTER:

COURSE CODE: PENG 6006

COURSE TITLE: ADVANCED WELL TEST ANALYSIS

NO. OF CREDITS:

PREREQUISITES:

SYLLABUS: Diffusivity equation; Constant rate and constant pressure; Solutions; Effects of total skin and wellbore storage; Type-curve analysis; Varying wellbore storage; Determination of average pressure; Radius of drainage and stabilisation time; Multiphase flow; Real gas potential application; Multi-rate, interference, pulse and vertical permeability testing; Layered systems; Fractured reservoirs; Faults; Channel sands; Use of pressure and its time derivative in type curve matching; Gas well-testing; Real gas potential application; gas flow tests with non-Darcy flow; extended well testing. Computerised methods of analysis. Local field examples.

SEMESTER:

COURSE CODE: PENG 6007

COURSE TITLE: RESERVOIR ENGINEERING

NO. OF CREDITS:

PREREQUISITES:

SYLLABUS: Hydrocarbon Composition; Properties of reservoir rocks and fluids; Phase behaviour; Vapour-liquid Equilibria; Oil and gas reservoirs; Drive mechanisms; Pore Volume Compressibility; Reservoir mechanics: PVT Analysis, General material balance; Natural water influx.

SEMESTER:

COURSE CODE: PENG 6008

COURSE TITLE: ADVANCED RESERVOIR ENGINEERING

NO. OF CREDITS:

PREREQUISITES:

SYLLABUS: Dry gas, gas-condensate and oil reservoirs; Material balance and applications; Tarner's method; Natural water influx; Immiscible flooding; Reservoir simulation - single and multi-phase; Compositional simulators; Computer simulation exercises.

SEMESTER:

COURSE CODE: PENG 6009

COURSE TITLE: STRATEGIC PETROLEUM MANAGEMENT & ORGANISATIONS

NO. OF CREDITS:

PREREQUISITES:

SYLLABUS: The nature and role of strategy in petroleum operations; Involvement of strategy in organisations; Structuring change; Leadership styles; Life cycles; Range of strategic planning and organisational behaviour; Learning and Development; Communicating strategy; Corporate cultures; Analysis of the corporate environment; Response to challenges.

SEMESTER:

COURSE CODE: PENG 6010

COURSE TITLE: IMPROVED OIL RECOVERY

NO. OF CREDITS:

PREREQUISITES:

SYLLABUS: Water influx; Waterflooding; Problems of waterflooding. Models - Buckley Leverett, Stiles. Miscible and Immiscible Fluid Displacements; Carbon dioxide flooding; Ternary Diagrams; Minimum Miscible Pressure; Thermal methods of oil recovery; Heavy oil problems relevant to Trinidad. Well completion types for thermal processes; Other IOR processes. Screening Criteria; Reservoir simulation - single and multi-phase; Computer exercises.

SEMESTER:

COURSE CODE: PENG 6011

COURSE TITLE: PETROLEUM ECONOMICS, LAW & CONTRACT ADMINISTRATION

NO. OF CREDITS:

PREREQUISITES:

SYLLABUS: World energy supply/demand; Oil pricing; Petroleum leasing/contracts; Petroleum taxation; Comparison of petroleum natural gas; Managing petroleum resources; Petroleum act and regulations; Petroleum taxes act; Income tax in aid of industry act; Contractual arrangements; Drilling contracts; Natural gas contracts; Service (rental) contracts; Services contracts; Oil sales/purchase contracts.

SEMESTER:

COURSE CODE: PENG 6012

COURSE TITLE: NATURAL GAS ENGINEERING

NO. OF CREDITS:

PREREQUISITES:

SYLLABUS: Properties of Natural Gas Systems; Gas Volumes; Reserve estimates; Pressure Transient Testing of Gas Wells; Deliverability Testing of Gas Wells; Gas Flow Measurement; Compression of Natural Gas; Gas Conditioning and Processing; Uses of natural gas; LNG; Field Development/Management; Gas Transmission/Pipeline Design Considerations; Offshore Operations; Gas Contracts.

SEMESTER:

COURSE CODE: PENG 6013

COURSE TITLE: FINANCIAL MANAGEMENT & ACCOUNTING

NO. OF CREDITS:

PREREQUISITES:

SYLLABUS: Basic principles of financial management; Financial reporting and the local regulatory framework; Financial ratio analysis; Corporate report analysis; International differences in petroleum finance; Budgeting and budgetary control; Short-term decision analysis; Long-term decision analysis; Introduction to strategic financial management; Balance sheets; Profit and loss accounts; Management of working capital; Preparation of management accounting statements; Investment appraisal techniques.

SEMESTER:

COURSE CODE: PENG 6014

COURSE TITLE: OFFSHORE STRUCTURES & SYSTEMS

NO. OF CREDITS:

PREREQUISITES:

SYLLABUS: Oil and gas production facilities; Dynamics of floating structures; Floating production systems; Offshore loading; Offshore storage facilities; Articulated columns; Submerged production systems.

SEMESTER:

COURSE CODE: PENG 6015

COURSE TITLE: PRODUCTION ENGINEERING

NO. OF CREDITS:

PREREQUISITES:

SYLLABUS: Productivity Index (PI) and the Inflow Performance Relationships (IPR) for oil and gas wells. Single and multiphase flow; tubing sizing; Nodal analysis; Natural and artificial lift methods and equipment; Typical production profiles (plateau and exponential decline). Control and instrumentation; Pressure and rate measurement; Production logging; Surface operations; Wellhead systems; Surface facilities - onshore, offshore. Design and operation of crude oil separation, Emulsion breaking; liquid recovery. Gas production. Sand control; Wax and asphaltine problems, Hydrate prevention; Stimulation ñ acidisation and fracturing. HSE in production. Local field examples.

SEMESTER:

COURSE CODE: PENG 6016

COURSE TITLE: PETROLEUM ECONOMICS & MANAGEMENT

NO. OF CREDITS:

PREREQUISITES:

SYLLABUS: World energy supply/demand; Oil pricing; Petroleum taxation systems and comparisons; Cash flow, profit and profitability; Uncertainty and risk; Incremental investments; Contractual arrangements; Economic issues in natural gas; Managing petroleum resources.

SEMESTER:

COURSE CODE: PENG 6017

COURSE TITLE: SELECTED TOPICS

NO. OF CREDITS:

PREREQUISITES:

SYLLABUS: To include Petroleum Economics and Taxes, Management and Safety; Field Design Project. Assessment: Coursework only.

SEMESTER:

COURSE CODE: PENG 6018

COURSE TITLE: HUMAN RESOURCE MANAGEMENT

NO. OF CREDITS:

PREREQUISITES:

SYLLABUS: Social environment of the petroleum industry; Managing change and creating effectiveness; Management structures; Diagnosis of change; Conflict management; Leadership; The strategy; Human resource planning; Organisations and culture; Communication; Labour markets; Trade unions and the collective bargaining process in petroleum industries; Work design and motivation; Management development; Evaluation and reward.

SEMESTER:

COURSE CODE: PENG 6020

COURSE TITLE: ECONOMIC & QUANTITATIVE AIDS TO DECISION-MAKING

NO. OF CREDITS:

PREREQUISITES:

SYLLABUS: Linear programming; Non-linear programming; Network planning techniques; Simulation in petroleum industry situations; Demand and supply of key commodities in the petroleum industry; Demand analysis; Energy market structures; Pricing practices; The role of the state in the market economy; Decision-making under uncertainty, time value of capital, correlation and regression analysis, analysis of time-series data, stochastic decision-making and Markov Analysis; Other decision-making models.

SEMESTER:

COURSE CODE: PENG 6021

COURSE TITLE: PETROLEUM PRODUCTION PLANNING & CONTROL

NO. OF CREDITS:

PREREQUISITES:

SYLLABUS: Decision theory; Forecasting techniques in petroleum production operations; Processing and capacity planning; Inventory management; Material requirement planning; Sequencing and line balancing; Scheduling operations; Resource allocation; Project management techniques.

SEMESTER:

COURSE CODE: PENG 6022

COURSE TITLE: MAINTENANCE & SAFETY MANAGEMENT

NO. OF CREDITS:

PREREQUISITES:

SYLLABUS: Maintenance activities; Types of maintenance; Trouble-shooting; Production equipment; Drilling equipment and maintenance; Scheduling planning activities for maintenance; Repair and programming design and evaluation; Health safety and welfare; Provision and role of the management in safety and awareness; Management of health; Occupational safety; Accidents and their causes; Financial implications of accidents; Protective devices; Legislation for safety and environmental issues.

COURSE CODE: PENG 6023

COURSE TITLE: RESEARCH METHODS

NO. OF CREDITS: 3

PREREQUISITES: NONE

SYLLABUS: Introduction to research methods. Research process from conceptualisation to analysis and conclusions. Types of research, defining a research topic, originality and thinking of research, identifying issues and objectives for research, developing research methodology, literature review, finding research material, data collection, referencing and citation, executing the research, hypothesis testing, data analysis, reporting the findings of the research, dealing with supervisors.

COURSE CODE: PENG 6024

COURSE TITLE: PROJECT

NO. OF CREDITS: 9

PREREQUISITES:

SYLLABUS: Each candidate will also be required to submit a Project Report of an individual analysis of a problem.

DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING

Research

Civil Engineering is intimately concerned with what is called the 'Built Environment'. In this regard, it is directed at the provision of facilities that can be used beneficially by the community. Clearly, such facilities condition the process of social and economic development and to a large extent, mirror them. The civil engineering industry is therefore of strategic national and regional importance in the Caribbean. An important aspect of research in the Department is the role of the construction sector in the local national economies.

Because civil engineering works are essentially 'resource hungry', that is to say, they consume large quantities of materials in their creation, there is a considerable potential for cost savings in the use of materials for construction. One way of achieving this is through more imaginative use of traditional materials. Another is to develop entirely new materials from indigenous sources. Materials research is therefore an area accorded high priority by the Department.

Other areas of priority take account of the special conditions under which civil engineering works are carried out in the Caribbean. This is true of the organisation and management of labour, the techniques of construction, operation and maintenance of facilities, no less than of the design of systems and the specification of materials. Additional focus is also placed on Hazard Resistant Construction and Coastal Engineering.

The research interests of the Department are thus related directly to the critical needs and interests of the wider community. Towards this end, it seeks to cultivate links with organisations and interest groups outside the University. Research funded by the National Institute of Higher Education Research, Science and Technology (NIHERST), TANTEAK, IDRC and the EU are typical examples. Funds are also obtained from international sources such as the British Council. The facilities provided are good and constantly being improved. There are eight laboratories: Structures, Concrete, Fluid Mechanics, Environmental Engineering, Soil Mechanics, Highway Materials, Geology and Transportation, to which has recently been added a new computing facility.

The main areas of research can be listed as follows:

- Civil Engineering Economics
- Civil Engineering Project Management
- Computer-aided Engineering & Design
- Disaster Mitigation & Management
- Environmental Engineering
- Materials Engineering
- The Analysis & Design of Foundations
- The Analysis & Design of Hydraulic Systems
- The Analysis & Design of Structures
- Transport Engineering
- Other areas of research related to the Construction programme are indicated in Section 3.5.4.

The Department offers programmes of study by research leading to the MPhil and PhD degrees in Civil Engineering in all its areas of speciality.

PROGRAMMES IN CONSTRUCTION MANAGEMENT & CONSTRUCTION ENGINEERING AND MANAGEMENT

Overview

The practice of civil engineering involves a series of decisions having to be made on choices from a diverse and complex set of alternatives. Such choices are often interrelated and are usually urgent. These decisions have to be made throughout the life of a project from the basis of the initial conception through the design phase, and material and procedure selection to the construction and commissioning of the completed structure. At any stage, the effectiveness of the whole process can be compromised by poor decision-making.

As a result, a heavy demand is placed upon both the managerial and technical skills of the engineers involved. There has been a continuing tendency for civil engineering projects to become both increasingly large and increasingly complex. This has naturally resulted in the technical and managerial functions not only becoming more difficult but also becoming more important. As a result, there is a continuing need to provide training programmes that upgrade the skills and capabilities of engineers and other construction professionals in modern engineering and managerial techniques. An important secondary objective of the MSc/Diploma programme is to provide this service.

By allowing a wider perspective of engineering technology and economy to be taken, it is anticipated that the quality of engineering management should thereby improve. Emphasis is placed upon the publication and presentation of the results of this research to the widest possible national and international audience. Clearly the spin-off benefits of this programme include enhancing the initiative, creativity and purposeful thinking that are generated in those who participate.

The Aims and Objectives

- a) To provide instruction in a range of engineering, economic and managerial subjects that should enable engineers and construction professionals to be better able to deal with the problems that can occur on a construction project.
- b) To improve the decision-making capabilities of engineers and other construction professionals in the region, with a view to improving the efficiency and effectiveness of the whole construction process.
- c) To equip engineers and construction professionals to apply modern knowledge effectively in the real, competitive world of industry, and hence to assist the nations of the regions in their bid for modernisation and development.
- d) To foster the advancement of knowledge through the promotion of research into the problems and opportunities that face the construction sector.

POSTGRADUATE DIPLOMAS IN: CONSTRUCTION ENGINEERING MANAGEMENT & CONSTRUCTION MANAGEMENT

Regulations and Entry Requirements

Before registration as a student of the University proceeding to the Postgraduate Diploma in Construction Engineering, Construction Management or Construction Engineering & Management, a candidate must have a minimum of one year's appropriate practical experience as well as the following:

- i. A first degree or equivalent qualification in Civil, Structural, Construction, Building or Architectural Engineering;
or
- ii. A first degree or equivalent qualification in Architecture or Quantity Surveying or Surveying & Land Information
or
- iii. An equivalent qualification acceptable to the Faculty of Engineering.

Any candidate for the Diploma may be required to sit an entrance examination and/or complete an introductory/qualifying course before being granted permission to read for the Diploma. In addition, candidates seeking admission under (ii) or (iii) may be restricted to certain subject areas in the Course of Study.

Structure of Programmes

Offered both part-time and full-time, the candidate must pass four courses – 3 compulsory plus one elective – the Practical Team Project and the Independent Investigative Project The Diploma requires a minimum of 26 credits.

Duration of Study

Full-time: Not less than one (1) academic year
Part-time: Not less than two (2) academic years

COURSE LISTING CONSTRUCTION MANAGEMENT

The courses offered are:

CORE COURSES

SEMESTER 1

Course Code	Course Title	Number of Credits
COEM 6006	Construction Accounting & Finance	E4
COEM 6009	Contracts Management & Construction Law	E4

SEMESTER 2

Course Code	Course Title	Number of Credits
COEM 6005	Construction Project Management	E4

+ One option from the list below or other approved by the Department

CORE COURSES

SEMESTER 1

Course Code	Course Title	Number of Credits
COEM 6003	Organization & Management of Construction	E4
COEM 6016	Natural Hazards Management	E4
COEM 6017	Construction in Hazard-Prone Areas	E4

SEMESTER 2

Course Code	Course Title	Number of Credits
COEM 6004	Construction Equipment	E4
COEM 6015	Maintenance & Facilities Management	E4

COURSE LISTING CONSTRUCTION ENGINEERING & MANAGEMENT

Structure of Programmes

Offered both part-time and full-time, the candidate must pass four courses – 3 compulsory plus one elective – the Practical Team Project and the Independent Investigative Project

Duration of Study

The same as for Construction Management

The courses offered are:

CORE COURSES

SEMESTER 1

Course Code	Course Title	Number of Credits
COEM 6006	Construction Accounting & Finance	E4
COEM 6009	Contracts Management & Construction Law	E4

SEMESTER 2

Course Code	Course Title	Number of Credits
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Any two courses from the list below or others approved by the Department:

CIE6 6000	Advanced Environmental Engineering Systems Design	E4
CIE6 6001	Advanced Structural Engineering	E4
CIE6 6002	Road Network Conservation	E4
COEM 6012	Geotechnics in Construction	E4

NOTE: All Diploma students must also complete the Practical Team Project (5 Credits) and an Individual Investigative Project (COEM 6002) carrying 6 credits.

Candidates for the Diploma may be awarded the Diploma without completing the Individual Investigative Project provided that they have completed all core courses plus the Practical Team Project and have earned a minimum of 26 credits.

Other information

- Candidates pursuing a Postgraduate Diploma will be required to follow and pass examinations in four (4) courses, and to complete the Practical Team Project (COEM 6025) carrying 5 Credits and an Individual Investigative Project (COEM 6002) carrying 6 credits.
- They will also be required to carry out coursework as prescribed.
- The examination will be conducted by means of written papers and coursework. Candidates may also be orally examined on any part of the examination.
- Part-time students will be required to complete the written examinations and submit the project within two (2) academic years.
- Successful completion of the examinations will lead to the award of a Diploma in Construction Management or Construction Engineering & Management. The designation will depend upon the course combinations.
- Candidates registered for an MSc (Eng) may be awarded a Postgraduate Diploma if they follow and pass examinations in courses carrying a minimum of 26 credits at the graduate level, as well as the prescribed coursework.

MSC (ENG) IN CONSTRUCTION MANAGEMENT (WITH A MAJOR IN BUILDING) & MSC (ENG) IN CONSTRUCTION MANAGEMENT (WITH A MAJOR IN OPERATIONS)

Regulations and Entry Requirements

Candidates applying for registration should normally have a minimum of one year's appropriate practical experience as well as either:

- A Bachelor's Degree in Civil, Structural, Construction, Building Engineering, Quantity Surveying, Land Surveying,
or
- An equivalent qualification.

COURSE LISTING - MSc IN CONSTRUCTION MANAGEMENT (WITH A MAJOR IN BUILDING)

An MSc candidate in **MSc in Construction Management (with a Major in Building)** will be required to follow and sit examinations in six (6) core courses as well as two (2) other electives, in addition to the two projects:

CORE COURSES

SEMESTER 1

Course Code	Course Title	Number of Credits
COEM 6003	Organisation & Management of Construction	E4
COEM 6006	Construction Accounting & Finance	E4
COEM 6009	Contracts Management & Construction Law	E4
COEM 6013	Materials Technology	E4

CORE COURSES

SEMESTER 2

Course Code	Course Title	Number of Credits
COEM 6005	Construction Project Management	E4
COEM 6020	Research Methods	E3

The above six (6) courses are compulsory core courses; the candidate will also be required to complete two (2) elective courses and a Practical Team Project (COEM6025) and an Independent Research Project (COEM 6018)

COURSE LISTING CONSTRUCTION MANAGEMENT (WITH A MAJOR IN OPERATIONS)

An MSc candidate in **MSc in Construction Management (with a Major in Operations)** will be required to follow and sit examinations in six (6) core courses as well as two (2) other electives, in addition to the two projects:

CORE COURSES

SEMESTER 1

Course Code	Course Title	Number of Credits
COEM 6003	Organisation & Management of Construction	E4
COEM 6006	Construction Accounting & Finance	E4
COEM 6009	Contracts Management & Construction Law	E4
COEM 6016	Natural Hazards Management	E4

CORE COURSES

SEMESTER 2

Course Code	Course Title	Number of Credits
COEM 6015	Maintenance & Facilities Management	E4
COEM 6020	Research Methods	E3

The above six (6) courses are compulsory core courses; the candidate will also be required to complete two (2) elective courses and a Practical Team Project (COEM6025) and an Independent Research Project (COEM 6018)

Other information

- Students in both programmes must submit a Practical Team Project (COEM6025) carrying 5 credits and an Independent Research Project (COEM 6018) that has a nine (9) credit value.
- A minimum of 44 credits are required for the MSc.
- Students will be expected normally to complete their Independent Research Projects within 3 months of finishing examinations.
- Full-time students will be required normally to complete altogether within one (1) calendar years.
- Part-time students will be required normally to complete altogether within two (2) calendar years.
- Candidates registered for an MSc (Eng) may be awarded a Postgraduate Diploma if they follow and pass examinations in courses carrying a minimum of 26 credits at the graduate level, as well as the prescribed coursework.

Short Courses and Seminars

- The Programme in Construction Engineering & Management may also include Short Courses and/or Seminars on topics of interest to the sector. These are on subjects of topical interest and are organised at various times in response to identified needs and problems.
- Details of Short Courses and Seminars are advertised widely and notified to appropriate individuals as and when details are finalised.
- For further details of the courses and the programme syllabus, or general advice on the programme, please contact the Head, Department of Civil & Environmental Engineering, or the Leader of the Programme.

SYLLABUSES IN CONSTRUCTION ENGINEERING & MANAGEMENT AND CONSTRUCTION MANAGEMENT

SEMESTER: 2+

COURSE CODE: COEM 6002

COURSE TITLE: THE INDEPENDENT RESEARCH PROJECT

NO. OF CREDITS: 6

PREREQUISITES: SUCCESSFUL COMPLETION OF ALL REQUIRED CORE AND OPTIONAL COURSES

SYLLABUS: The research project takes the form of an investigation into a topic of significance to the construction sector, and is intended to ensure the capacity of the student to apply skills acquired within the prescribed courses. It is executed under the direction of one or more supervisors approved by the Department, and is examined by the submission of a written report, which is required to conform to the general standards for MSc projects within the Faculty of Engineering. The project shall be formally assigned as soon as practicable after the results of the written examinations are available, and in any case not normally later than July 1 in any year. The project shall normally be completed within three (3) months of being assigned, i.e., by the end of September of the year in question. Any project not completed at the end of December of the year of assignment shall require formal approval of extension of time.

SEMESTER: 1

COURSE CODE: COEM 6003

COURSE TITLE: ORGANISATION & MANAGEMENT OF CONSTRUCTION

NO. OF CREDITS: 4

PREREQUISITES: NONE

SYLLABUS: The functions of managers; planning, organising, controlling and leading. The role of managers; interpersonal, informational and decision-making. The evolution of management thought, from the Industrial Revolution to now. Professional ethics and the engineer/manager. Problem-solving and decision-making. Initiative and creativity. Information Technology (IT) and management information systems (MIS), and the role of computers in information management. The management of quality; TQM and ISO 9000.

SEMESTER: 1

COURSE CODE: COEM 6005

COURSE TITLE: CONSTRUCTION PROJECT MANAGEMENT

NO. OF CREDITS: 4

PREREQUISITES: NONE

SYLLABUS: This course addresses the culture, principles and techniques of project and programme management. The following are covered: What is a project? What is project management? The project life cycles for different industries, project context: planning the project (project selection - tools and techniques), scope management defining the project. Project planning, work breakdown structures, Gantt Chart, PERT Chart, CPM, preparing the master plan, project budgeting, responsibility matrix, communication plan, project criterion for success, project control (project baseline, status reporting, control cycle, monitoring and control tools, resource grading, change control, resource levelling, variance reporting tools, project audit). Implementation, project finalisation and close-out. Project cost, risk and quality management. What is programme management, benefits of programme management, programme management organisation/programme planning, benefits management, stakeholder management, programme management processes, effective project and programme teams. The project support office, audit, applications of project management software, e-business programme management.

SEMESTER: 1

COURSE CODE: COEM 6006

COURSE TITLE: CONSTRUCTION ACCOUNTING & FINANCE

NO. OF CREDITS: 4

PREREQUISITES: NONE

SYLLABUS: Introduction to accounting: the nature and purpose of financing accounting, business entity, chart of accounts, recording accounting transactions, the accounting cycle, profit and loss statement, balance sheet, accounting ratios, accounting controls. Introduction to Management Accounting: cost classification, methods of costing, job costing and contract costing, integrated accounts. Introduction to Financial Management: project financing, budgeting, financial planning and cost control. Construction claims, performance of construction contracts.

SEMESTER: 1

COURSE CODE: COEM 6009

COURSE TITLE: CONTRACT MANAGEMENT & CONSTRUCTION LAW

NO. OF CREDITS: 4

PREREQUISITES: NONE

SYLLABUS: An introduction to the different legal systems. The impact of law on the delivery of engineering goods and services; Law and the construction sector. The making of law and the courts; litigation. The elements of contract law and relation with the construction sector. Types of contracts; Different procurement systems; Standard form building contracts (specifications codes of practice; Standards, statutes and local government regulations); The elements of the Law of Tort, disputes and conflict resolution methods; Professional associations, codes of ethics, professional liability; Construction claims; Different forms of business organisations; Business law and the company act; Health and safety legislation; Environmental law; Introduction to intellectual property; Confidentiality of information; Warranties and indemnity. Introduction to international law.

SEMESTER: 1

COURSE CODE: COEM 6013

COURSE TITLE: MATERIALS TECHNOLOGY

NO. OF CREDITS: 4

PREREQUISITES: NONE

SYLLABUS: Factors affecting the choice and use of materials in construction. The general properties and behaviour of the major types of construction materials. Factors affecting the production of the construction materials in major use in the Caribbean. Specifications, standards and testing of materials. Methods of improving the properties and performance of materials. Major-project patterns in the Caribbean (e.g., marine projects) and the resultant demands for materials performance. Materials procurement, handling, storage, and extraction control.

SEMESTER: 2

COURSE CODE: COEM 6015

COURSE TITLE: MAINTENANCE & FACILITIES MANAGEMENT

NO. OF CREDITS: 4

PREREQUISITES: NONE

SYLLABUS: Maintenance awareness. Planned maintenance, maintenance management systems. Maintenance of facilities. Maintenance policy - housing, offices, industries - private and public sector projects. Maintenance surveys, repairs, rehabilitation of structures. Corrosion in construction, building defects, deterioration, repair procedures. Performance audit, reliability, performance evaluation. Maintenance financing, budget. Planning considerations, upgrading, recycling, reuse. Maintenance manuals, checklists, information systems.

SEMESTER: 1

COURSE CODE: COEM 6016

COURSE TITLE: NATURAL HAZARDS MANAGEMENT

NO. OF CREDITS: 4

PREREQUISITES: NONE

SYLLABUS: The course deals with the genesis and nature of natural hazards, their physical and theoretical basis as well as their operation and propagation. It deals with their economic and social impact; vulnerability of structures; policy and legislation; planning response; engineering and physical response; the development of site-specific disaster plans; international, regional and local response agencies; evacuation and evacuation drills and simulations; search and rescue; recovery, emergency relief shelter management and risk analysis.

MPHIL, PHD IN CONSTRUCTION ENGINEERING & MANAGEMENT AND CONSTRUCTION MANAGEMENT

The Construction Engineering & Management Programme also offers programmes of study by research leading to the MPhil and PhD Degrees in Construction Engineering & Management and Construction Management.

Regulations and Entry Requirements

The regulations for the MPhil in Construction Engineering & Management or Construction Management would require:

- a. A good honours degree (Upper Second Class) in one of the construction-related professions, e.g., Civil Engineering, Building Engineering, Architecture, Quantity Surveying, Planning, Land Surveying, etc.
- b. At least one (1) year of relevant industrial experience.
- c. Before completion must have passed a course in Research Methodology

Regulations and Entry Requirements

For the Construction Management or Construction Engineering & Management Programme, the applicant must possess:

- a. A first degree with Honours (Upper Second Class) in Civil or Structural Engineering, Construction, Building or Architectural Engineering
or
- b. An equivalent acceptable qualification
and
- c. At least one (1) year of relevant industrial experience.

A candidate may be required to sit an entrance examination and/or complete introductory/qualifying courses before being allowed to read for the MPhil or PhD degree.

The Principal Areas of Research

The principal areas of research are as follows:

- Behaviour of Structural Elements/Systems under Loadings
- Building Aerodynamics
- Caribbean Construction Firms
- Construction Economics
- Construction Finance
- Construction Management & Administration
- Construction Materials
- Construction Public Policy
- Construction Technology
- Contract Procurement Systems
- Disaster Mitigation & Management
- Earthquake & Hurricane Resistance Design
- Energy Management and Thermal Comfort in Buildings
- Expert Systems
- Flood Management
- Infrastructure Planning
- Infrastructure Technology in Construction Management
- Macro & Micro Economic Issues in Construction
- Maintenance, Rehabilitation & Finance
- Management of Quality in Construction
- Productivity in Construction
- Resource Management
- Structural Design & Codes for Disaster Mitigation

PROGRAMMES IN COASTAL ENGINEERING & MANAGEMENT

Integrated coastal zone management in the wider Caribbean is recognised as the approach for ensuring the survival and sustainable development of the coastal resources of the region. The Coastal Zone Manager needs to have a stream of knowledge and skills that would support reliable decision-making on the sustenance of coastal resources and infrastructure and systematic tropical coastal zone management initiative.

The Graduate Programme in Coastal Zone Engineering in the Department of Civil & Environmental Engineering has two (2) degree offerings:

- (i) Postgraduate Diploma in Coastal Zone Processes, and
- (ii) MSc in Coastal Zone Engineering

Aims of the Programme

1. To provide advanced and specialised knowledge in the field of coastal engineering and management associated with the natural and man-made coastal zone infrastructure.
2. To equip the graduate with the knowledge of coastal processes and coastal engineering techniques required for the assessment of coastal defence systems and the design of coastal engineering schemes, with particular emphasis on Caribbean conditions.
3. To produce a graduate capable of developing coastal zone plans and management systems.
4. To produce a graduate capable of implementing and managing new research initiatives.

Course Delivery

The course is designed to be delivered as a distance learning course through the myelearning platform, to facilitate participation across all Caribbean Islands. To provide the students with some face to face contact, both with staff and fellow students, the course includes three one week intensive sessions for group activities, field trips and group design exercises.

Regulations and Entry Requirements

- (i) A first degree from an approved University in the Natural Sciences, Planning, Civil Engineering, Environmental Engineering, Surveying, Land Information, or
- (ii) An accredited BTech or HND/Associate Degree in Civil Engineering plus five (5) years related postgraduate experience.

POSTGRADUATE DIPLOMA IN COASTAL ENGINEERING AND MANAGEMENT

Structure of Programme

Offered both Part-time and Full-time

Duration of Study:

Minimum of two (2) semesters or a maximum of six (6) semesters

Number of credits required: 42

COURSE LISTING

SEMESTER I

Course Code	Course Title	Number of Credits
CZEM 6100	Coastal Processes & Hazards	E4
CZEM 6101	Coastal Geomorphology	E4
CZEM 6103	Principles of Coastal Defence, Management and Environmental assessment	E4
CZEM 6016	Natural Hazards Management	E4

SEMESTER II

Course Code	Course Title	Number of Credits
CZEM 6102	Coastal Zone Metrics	C4
CZEM6106	Design of Coastal Structures	C4
CZEM 6112	Coastal Zone Modelling	C4

MSC IN COASTAL ENGINEERING & MANAGEMENT

Structure of Programme

Offered Part-time and Full-time

Duration of Study:

Minimum of three (3) semesters or a maximum of six (6) semesters

Number of Credits Required: 42

COURSE LISTING

SEMESTER I

Course Code	Course Title	Number of Credits
CZEM 6100	Coastal Processes & Hazards	E4
CZEM 6101	Coastal Geomorphology	E4
CZEM 6103	Principles of Coastal Defence, Management and Environmental Assessment	E4
COEM 6106	Natural Hazards Management	E4

SEMESTER II

Course Code	Course Title	Number of Credits
CZEM 6102	Coastal Zone Metrics	C4
CZEM 6106	Design of Coastal Structures	C4
CZEM 6112	Coastal Zone Modelling	C4
COEM 6020	Research Methods	E4

SEMESTER III

Course Code	Course Title	Number of Credits
CZEM 6108	Research Project	C9

SEMESTER: 2

COURSE CODE: CZEM 6102
COURSE TITLE: COASTAL ZONE METRICS
NO. OF CREDITS: 4
PREREQUISITES: NONE

SYLLABUS: Descriptive statistics; nearshore and upland sampling, measurements and monitoring techniques for storms, beach profiling, tidal, wind and wave measurements, currents and sediments; aqueous sampling techniques; coastal resources, hazards, classification and configuration, coastal hazard vulnerability tools; database development; spatial techniques and web-based solutions.

SYLLABUSES IN COASTAL ENGINEERING AND MANAGEMENT

SEMESTER: 3

COURSE CODE: COEM 6020
COURSE TITLE: RESEARCH METHODS
NO. OF CREDITS: 3
PREREQUISITES: NONE

SYLLABUS: Principles of research, information sources, research design, research methodology, data collection, data analysis, presenting research proposals, writing research reports.

SEMESTER: 1

COURSE CODE: CZEM 6100
COURSE TITLE: COASTAL PROCESSES & HAZARDS
NO. OF CREDITS: 4
PREREQUISITES: NONE

SYLLABUS: Description and calculation procedures for tides; currents (Caribbean), storm surges; global wind systems, hurricanes, linear wave theory, wave transformation and attenuation processes, random waves, short and long term wave statistics, design wave specification, wave prediction from wind records, wave-induced longshore currents; coastal sediment transport, sediment budgets, assessing site functionality and vulnerability to coastal disasters.

SEMESTER: 1

COURSE CODE: CZEM 6101
COURSE TITLE: COASTAL GEOMORPHOLOGY
NO. OF CREDITS: 4
PREREQUISITES: NONE

SYLLABUS: Coastal classification and morphology, volcanic coasts, reefs, corals, estuaries and wetlands, continental shelf; coastal morphodynamics, coastal inlets, morphodynamics and shoreface processes; geotechnical investigations; slope and embankment stability; soil liquefaction, stabilisation, compaction, bearing capacity and settlement.

SEMESTER: 1

COURSE CODE: CZEM 6103
COURSE TITLE: PRINCIPLES OF COASTAL DEFENCE MANAGEMENT AND ENVIRONMENTAL ASSESSMENT
NO. OF CREDITS: 4
PREREQUISITES: NONE

SYLLABUS: The functional performance of coastal defence techniques including artificial headlands, offshore breakwaters, groynes, beach nourishment, sea walls and revetments, managed retreat. Identification of their environmental impacts and opportunities. Introduction to shoreline management plans and coastal zone plan development. Objectives of EIA, legal context, scope of impacts of coastal developments, watershed impacts; mitigation and remedial measures, control measures, consequences of infringement, monitoring and management.

SEMESTER: 2

COURSE CODE: CZEM 6106
COURSE TITLE: DESIGN OF COASTAL STRUCTURES
NO. OF CREDITS: 4
PREREQUISITES: NONE

SYLLABUS: Deterministic and probabilistic design methods for coastal applications. The structural performance of coastal structures: Design wave loading; design methods for jetties, breakwaters, sea walls, revetments and beach renourishment. Design for enhancement of capacity in response to climate change and sea level rise.

SEMESTER: 3
COURSE CODE: CZEM 6108
COURSE TITLE: RESEARCH PROJECT
NO. OF CREDITS: 9
PREREQUISITES: NONE
SYLLABUS: INDICATIVE SYLLABUS

- 1 The material covered will be a reflection of the student's own requirements. In general, all projects will demand: - problem identification and definition of objectives; - planning and execution within time and cost constraints; - information search and its interpretation; - evaluation resulting in the making of conclusions.
- 2 The project may be suggested by a member of staff, by the individual student or an industrial concern. Industry generated projects must be approved by academic staff as being suitable before being accepted.
- 3 Project allocation procedures provide each student to: - select a preferred area, based upon a taught programme or upon previous experience; - discuss projects with prospective supervisors; - agree on a particular project, supervisor and outline project terms of reference.
- 4 Each project will be supervised by a member of academic staff who will monitor progress, offer guidance and encourage the student to take the active lead role in researching and the development of the project. The need to plan the objective and outcomes against a time scale will be stressed.

SEMESTER: 2
COURSE CODE: CZEM 6112
COURSE TITLE: COASTAL ZONE MODELLING
NO. OF CREDITS: 4
PREREQUISITES: NONE

SYLLABUS: Introduction to modelling concepts, types and time scales including process-based numerical models and scaled physical models, behaviour-based numerical models, Geomorphological analysis and parametric equilibrium models. Concepts of computational fluid dynamics; Navier Stokes equations, numerical solution techniques, practical application of models. Wave model types and applicability. Coastal morphodynamic model types and applications. Circulation models. Physical models. Case studies; wave and current models and morphodynamic models.

PROGRAMMES IN CIVIL & ENVIRONMENTAL ENGINEERING

There are two (2) Degrees offered in this programme:-

- (i) **MSc in Civil Engineering**
- (ii) **MSc in Civil with Environmental Engineering**

The Aims and Objectives

- a) To extend existing engineering and science knowledge beyond the level covered at the BSc Honours Degree level and to move to a professional, Masters output.
- b) To widen existing engineering and science knowledge and to include areas not covered in the BSc Honours Degree level.
- c) To develop the skills required for team-working (and, for CEng, leadership), social and business awareness, through further studies, such as law, finance, management, risk assessment and environmental issues.
- d) To gain experience of team-working, ideally with cross-disciplinary elements, integrating topics covered in the BSc level and centred on real professional and business issues.

Regulations and Entry Requirements

There are two routes offered for admission to the programmes:

1. Route 1 provides for 4 continuous years of study leading to the award of the BSc Honours and the MSc Degrees. Applicants must have successfully completed the 3-year BSc Honours Degree programme in three (3) years, attaining a minimum of 55 % weighted average across the three (3) years (GPA of 2.5).
2. Route 2 provides for successful completion of the BSc Honours Degree and pursuit of the MSc Degree after two (2) years of Initial Professional Development in the workplace. This would give the student an opportunity to better understand the learning outcomes of BSc Honours Degree before proceeding to the MSc.

An MSc candidate in Civil Engineering must have a BSc Civil Engineering Honours Degree and those for the MSc Civil with Environmental Engineering Degree must have a BSc Civil with Environmental Engineering Honours Degree, or an equivalent qualification.

A candidate for any MSc degree must normally pass a course in Research Methodology.

Structure of Programmes

Offered part-time

It is an evening programme with lectures and tutorials being delivered face-to-face between 4:00 pm and 8:00 pm on weekdays. Two (2) courses, Coastal Processes & Hazards and Environmental Impact Assessment of Coastal Zones, will be delivered on-line.

Duration of Study

Minimum of three (3) semesters or a maximum of six (6) semesters.

No. of Credits required: 40 or 41

The credits required to complete the programme are dependent on the electives chosen. The semester 1 workload is 16 credits, semester 2 has 15 or 16 credits and semester 3 (May to July) has 9 credits.

MSC IN CIVIL ENGINEERING

COURSE LISTING

Candidates are required to select one (1) optional subject in semester 2.

SEMESTER 1

The core subjects are:

Course Code	Course Title	Number of Credits
CIEN 6001	Advanced Structural Engineering	E4
COEM 6006	Construction Accounting & Finance	E4
COEM 6009	Contracts Management & Construction Law	E4
COEM 6012	Geotechnics in Construction	E4

SEMESTER 2

The core subjects are:

Course Code	Course Title	Number of Credits
CIEN 6005	Civil Engineering Design Project	C9
COEM 6020	Research Methods	E3

The optional subjects are:

Course Code	Course Title	Number of Credits
CIEN 6002	Road Network Conservation	C3
CZEM 6106	Design of Coastal Structures	C4
COEM 6004	Construction Equipment	E4
COEM 6005	Construction Project Management	E4
COEM 6011	Construction Economics	E4
COEM 6013	Materials Technology	E4
COEM 6015	Maintenance and Facilities Management	E4
COEM 6016	Natural Hazards Management	E4
COEM 6017	Construction in Hazard Prone Areas	E4

In addition to the listed courses, the Department may approve any other course as an optional subject.

SEMESTER 3 (May-July)

Course Code	Course Title	Number of Credits
COEM 6018	Research Project	C9

MSC IN CIVIL WITH ENVIRONMENTAL ENGINEERING

COURSE LISTING

Candidates are required to select one (1) optional subject in Semester 2.

SEMESTER 1

The core subjects are:

Course Code	Course Title	Number of Credits
CIEN 6000	Advanced Environmental Engineering	E4
COEM 6006	Construction Accounting & Finance	E4
COEM 6009	Contracts Management & Construction Law	E4
COEM 6012	Geotechnics in Construction	E4

SEMESTER 2

The core subjects are:

Course Code	Course Title	Number of Credits
CIEM 6005	Civil Engineering Design Project	C9
COEM 6020	Research Methods	E3

The optional subjects are:

Course Code	Course Title	Number of Credits
CIEN 6002	Road Network Conservation	C3
CZEM 6106	Design of Coastal Structures	C4
COEM 6004	Construction Equipment	E4
COEM 6005	Construction Project Management	E4
COEM 6011	Construction Economics	E4
COEM 6013	Materials Technology	E4
COEM 6015	Maintenance and Facilities	E4
COEM 6016	Natural Hazards Management	E4
COEM 6017	Construction in Hazard Prone Areas	E4

In addition to the listed courses, the Department can approve any other course as an optional subject.

SEMESTER 3 (May-July)

Course Code	Course Title	Number of Credits
COEM 6018	Research Project	C9

SYLLABUSES IN CIVIL & ENVIRONMENTAL ENGINEERING

(TO BE READ IN CONJUNCTION WITH SYLLABUSES FROM OTHER DEPARTMENTS AND PROGRAMMES WHERE APPLICABLE.)

SEMESTER: 2

COURSE CODE: CIEN 6000

COURSE TITLE: ADVANCED ENVIRONMENTAL ENGINEERING SYSTEMS DESIGN

NO. OF CREDITS: 4

PREREQUISITES: NONE

SYLLABUS: Water supply and treatment systems; Wastewater collection and treatment; Solid waste management; urban drainage systems; Air and noise pollution prevention and mitigation in built environment.

SEMESTER: 2

COURSE CODE: CIEN 6001

COURSE TITLE: ADVANCED STRUCTURAL ENGINEERING

NO. OF CREDITS: 4

PREREQUISITES: NONE

SYLLABUS: Flexibility and stiffness methods; numerical methods in Structural Engineering, non-linear analysis; computer aided analysis and design.

SEMESTER: 2

COURSE CODE: CIEN 6002

COURSE TITLE: ROAD NETWORK CONSERVATION

NO. OF CREDITS: 4

PREREQUISITES: NONE

SYLLABUS: Road networks, classes, function and configuration; Pavement Maintenance Management Systems; Roadway characteristics, vehicle fleet costs and performance; Maintenance and rehabilitation strategies and policies; Pavement design and performance prediction models; Road pricing, sustainable maintenance budgeting and financing, optimisation and programme development.
(Coursework)

SEMESTER: 2

COURSE CODE: CIEN 6005

COURSE TITLE: PROJECT: CIVIL ENGINEERING DESIGN IV

NO. OF CREDITS: 9

PREREQUISITES: COMPLETION OF ALL REQUIRED CORE AND OPTIONAL COURSES

SYLLABUS: This course is a capstone project designed to generate a learning atmosphere that is close as possible to the experience of working on the design of a real engineering project. The project work is carried out yearlong, engenders a sense of leadership in the student, and draws on the first three years of learning in the programme. The emphasis is on self-learning, creativity, design, understanding, project team-working and communication skills, as well as engineering judgement and problem solving. The projects are interdisciplinary, with the involvement of students from other departments, experienced practicing professional engineers in addition to the UWI supervisors and tutors, as well as other Engineering Departments in the Faculty. Students may also pursue internship/industry projects that are approved by the Department. This course applies to the Civil Engineering programme.

MSC IN ENVIRONMENTAL ENGINEERING

INTRODUCTION

Environmental Engineering in the Caribbean is concerned primarily with the provision of an adequate supply of safe and potable water, the prevention of pollution of land, water and air, the collection, treatment and disposal of solid and hazardous wastes, urban and land drainage, forest and soil conservation, management and mitigation of natural and industrial disasters, safety, management of resources in the coastal zone, the protection of public health and the economics of sustainable development. The programme provides both a theoretical and practical approach to environmental problems with the goal of improving the effectiveness of environmental management. Its objectives are:

- to alert participants to major environmental concerns: global, regional and local.
- to promote, among participants, a holistic and proactive approach to the solution of environmental problems.
- to familiarise participants with instruments and techniques used for the prediction and measurement of environmental quality.
- to train participants in the planning and design of engineering works related to the preservation and improvement of the environment.

THE AIMS AND OBJECTIVES

The overall objective of the programme is to provide advanced education and training for graduates in Engineering, Science, and related areas to meet current and future needs of environmental engineering in the region.

The purpose of this study is to provide engineers with an in-depth understanding of the technical, economic and managerial factors and their integration in the specification, design and operation of environmental engineering systems. This is expected to appeal to all engineers, but experience elsewhere has shown that those with first degrees in the physical sciences have also been attracted to, and have successfully completed, similar programmes of study.

ENTRY REQUIREMENTS

The requirements for admission to the programme are as follows:

Applicants must have a Bachelor's Degree in Engineering or an equivalent qualification. Candidates with a Bachelor's Degree in the physical sciences will be considered if they have at least one (1) year relevant experience. Qualifying examinations may also be prescribed for such candidates.

STRUCTURE OF THE PROGRAMME

Offered both part-time and full-time

DURATION OF STUDY:

Part-time students: Normally expected to complete the examination requirements within four (4) semesters and to complete the project in accordance with the relevant University Regulations
Full-time students: Normally expected to complete the examination requirements within two (2) semesters and to complete the project in accordance with the relevant University Regulations.

NO. OF CREDITS: 45

Project (consisting of either a laboratory or field study or detailed design)	9
Compulsory group of courses	12
Optional group of courses	24 (minimum)
Total	45

The compulsory group of courses is designed to introduce students to major global, regional and local environmental concerns and to provide them with the basic background knowledge for a proper understanding of the specialist topics that follow.

Courses should be selected in consultation with the programme co-ordinator according to the student's background and interest.

Upon the recommendation of the programme co-ordinator, up to two (2) courses (8 credits) can be credited for studies undertaken at other institutions of higher education.

Course Load: Each course will carry four (4) credits, which includes 39 lecture hours per semester and a minimum of 30 hours of Labs, tutorial coursework and mini-projects additional to this.

INFORMATION ON THE PROJECT

Projects will relate to real environmental problems and will test a candidate's ability to work independently. A project may be a major laboratory or field investigation, detailed design or research or any combination of these. Its scope will reflect the fact that it counts for close to twenty percent (20%) of the total number of credits. The MSc Project will be evaluated based on the final report.

COURSE LISTING FOR THE MSc PROGRAMME

Course Code	Course Title	Number of Credits
ENGR 6000	Introduction to Environmental Engineering & Management	4
ENGR 6001	Environmental Data: Quality Standards, Sampling & Analysis	4
ENGR 6002	Environmental & Health Effects of Pollution	4
ENGR 6003	Environmental Engineering Research Project	9
Total		21

SPECIALISED OPTIONAL COURSES

(Six courses are to be selected from the following)

Course Code	Course Title	Number of Credits
ENGR 6004	Solid and Hazardous Waste Management	4
ENGR 6005	Pollution Prevention & Industrial Waste Abatement	4
ENGR 6006	Water and Wastewater Engineering (ENGR 6013) (ENGR 6014) (FE67C, FE67D)	4
ENGR 6007	Air Pollution Control (ENGR 6014) (FE67D)	4
ENGR 6008	Environmental Impact Assessment in Environmental Engineering	4
ENGR 6009	Engineering in Disaster Management & Mitigation	4
ENGR 6010	Economics for Environmental Engineering	4
ENGR 6011	GIS, Land Use & Resource Management in Environmental Engineering	4
ENGR 6012	Hydrology & Drainage Systems (inactive)	4
ENGR 6013	Chemistry & Microbiology for Environmental Engineering	4
ENGR 6014	Transport of Pollutants	4
ENGR 6015	Environmental Separation Processes (inactive)	4

OTHER INFORMATION

Evaluation

Evaluation in all courses will normally be by approved combination of coursework and final written examination. However, in some instances evaluation will be entirely by coursework. Candidates will be required to pass both the coursework and written examination where applicable. Students who fail more than two courses in any one semester may be required to withdraw. Students will not normally be permitted more than two attempts at any course examination. Part-time students will normally be allowed a pro-rated number of attempts before withdrawal.

With the exception of those courses listed below, the coursework component of all courses (which may contain individual miniprojects), will count for forty percent (40%) of the final mark. The exceptions are:

Course Coursework Component Of Final Mark	(%)
• Environmental Data: Quality Standards, Sampling & Analysis	60
• Environmental Impact Assessment in Environmental Engineering	40
• GIS - Land Use and Resource Management in Environmental Engineering	100

The MSc Project will be evaluated based on the final report. The MSc will be awarded with distinction to candidates who achieve an overall average of 70% in the courses, as well as 70% in the Project.

Students failing to complete all course requirements for the MSc programme within the specified period but have obtained 24 or more credits will be granted a Post Graduate Diploma in Environmental Engineering.

DURATION OF STUDY

The M.Sc. programme in Environmental Engineering is offered on both a full-time and a part-time basis. Full-time students will normally be expected to complete the examination requirements within two (2) semesters and to complete the project within a period of one semester (including the summer semester) after the completion of all their courses. Students will however be allowed to register and start their projects at the beginning of the second semester.

Part-time students will normally be expected to complete the examination requirements within four (4) semesters and to complete the project within a period of two semesters (including the summer semester) after the completion of all their courses. Students will however be allowed to register and start their projects at the beginning of the third semester.

Students who have completed the course requirements for the MSc programme but have failed to complete their projects within the specified period will be granted a Post Graduate Diploma in Environmental Engineering. There will be normally no extension for the project.

FACILITATION OF SHORT COURSES AND DISTANCE TEACHING

Although the curriculum has been designed primarily for MSc degree in Environmental Engineering, much of the course material can stand on its own and is therefore suitable for offering under the Continuing Education Programme of the Engineering Institute, as short intensive courses delivered either directly or through distance teaching. Such courses would be of great benefit to part-time students, practising engineers and other practitioners wishing to update their knowledge and skills, i.e. taking the courses without a prior registration for a degree. For these reasons, the curriculum is highly modularised, consisting of four-credit courses, most of which comprise stand-alone modules.

PROGRAMME DELIVERY AND ACADEMIC SUPERVISION

Since the programme is inter-disciplinary, the Office of the Dean will be responsible for its academic supervision. The Engineering Institute of the Faculty will administer the non-academic affairs of the programme. It will draw mainly on staff in the Departments of Chemical and Civil & Environmental Engineering, but staff in the Departments of Mechanical & Manufacturing Engineering and Surveying & Land Information and of Departments in the Faculties of Science & Agriculture, Social Sciences, Medicine and Law will also contribute to teaching. Teaching will be complemented by the services of visiting specialists from consulting firms, public authorities, international agencies and industry. The programme will be delivered through lectures, laboratory classes, field trips, coursework assignments, design classes, miniprojects, tutorials, seminars and the Project.

ENTRY REQUIREMENTS

The requirements for admission to the programme are as follows:

- Applicants must have a Bachelor's Degree in Engineering or an equivalent qualification.
- Candidates with a Bachelor's Degree in the physical sciences will be considered if they have at least one (1) year relevant experience. Qualifying examinations may also be prescribed for such candidates.

RESOURCES

Library

The UWI Library has an excellent stock of books, journals and reports relevant to the many discipline areas, which comprise the MSc programme. This collection is continuously augmented by annual additions.

Laboratories And Equipment

The laboratories that will be used for teaching are extensive and well equipped. All the basic equipment for carrying out routine analyses of water, wastewater and solid wastes are available in the Environmental Engineering Laboratory of the Department of Civil Engineering. This facility also includes sophisticated instruments such as an Atomic Absorption Spectrophotometer and a UV/ Visible Spectro photometer for heavy metal and nitrogen analysis respectively. These facilities are complemented by the generously equipped laboratories of the University.

Computer Facilities

Considerable expansion of the computer facilities of the Faculty has taken place. Students will have full access to the expanded system resulting from the recent interconnection of the computers of the five departments in a Faculty network, and the INTERNET. Students will be trained in the use of the INTERNET and in tapping the vast information resources available therein. A large collection of specialised environmental software has also been acquired.

DETAILS OF COURSEWORK

- A. Coursework counting for forty percent (40%) of the final mark for the Course. The coursework will be in two parts as follows:
1. Written in-course tests, each of one-hour duration, during the semester in which the course is delivered. In each test, candidates will be required to answer two questions from a total of four questions based on the preceding course instructions. It may also be conducted in the form of multiple-choice tests and short quizzes.
 2. Coursework assignments, which may include: Laboratory work, field investigations, engineering design, analysis, essays or short projects.

- B. Coursework counting for sixty percent (60%) of the final mark for the Course.
1. Two (2) written in-course tests, each of one hour duration or multiple choice quizzes, during the semester in which the course is delivered. In each test, candidates will be required to answer two questions from four questions based on the preceding course instructions. These tests will count for 20 percent (20%) of the total mark for the course.
 2. Field assignments, which may include: Laboratory work, field investigations, engineering design, analysis, essays or short projects. The number of assignments will not be less than four and not greater than six. The assignments will count for 40 percent of the final mark.
- C. Coursework counting for one hundred percent (100%) of the Final Mark for the Course. Each course will have either:
1. One (1) or two (2) detailed projects.
 2. Four (4) to six (6) case study assignments.
- These will be written in the form of short projects.

SYLLABUSES

COMPULSORY COURSES

SEMESTER:

COURSE CODE: ENGR 6000

COURSE TITLE: INTRODUCTION TO ENVIRONMENTAL ENGINEERING & MANAGEMENT

NO. OF CREDITS: 4

PREREQUISITES:

SYLLABUS: The nature of the environment; environmental concerns: global, regional, local; the environmental movement; population and poverty; environmental management; evolution of environmental management, energy consumption; environmental pathways; sustainable development; environment assessment methods; life cycle assessment; environmental impact statements; economic assessments; environmental auditing; impact matrices; environmental ethics; environmental design, environmental management systems, integration with health, safety and quality management systems; environmental standards and legislation in the Caribbean; economic instruments for pollution control; regulations for pollution control.

SEMESTER:

COURSE CODE: ENGR 6001

COURSE TITLE: ENVIRONMENTAL DATA – QUALITY STANDARDS, SAMPLING & ANALYSIS

NO. OF CREDITS: 4

PREREQUISITES:

SYLLABUS: Quality standards for the atmosphere, hydrosphere and lithosphere and for the built environment; sampling techniques; analysis and interpretation of results in connection with standard methods for the physical, chemical and biological examination of water, waste water, air quality and soil; statistical methods in environmental data analysis.

SEMESTER:

COURSE CODE: ENGR 6002

COURSE TITLE: ENVIRONMENTAL & HEALTH EFFECTS OF POLLUTION

NO. OF CREDITS: 4

PREREQUISITES:

SYLLABUS: Health effects of inorganic and organic contaminants; sanitation and health; pathogenic organisms; waterborne diseases; airborne diseases; diseases spread by vermin; toxic effects of inorganic and organic contaminants on flora and fauna; eutrophication; pollution and self purification of streams; living indices of pollution.

SPECIALIST OPTIONAL COURSES

SEMESTER:

COURSE CODE: ENGR 6004

COURSE TITLE: SOLID & HAZARDOUS WASTE MANAGEMENT

NO. OF CREDITS: 4

PREREQUISITES:

SYLLABUS: Definition of Municipal Solid Waste Management (MSW) and hazardous wastes systems; system objectives; waste classification; municipal and hazardous waste quantities, composition and characteristics; collection systems; waste disposal at sanitary landfills; design of sanitary landfills, hazardous waste treatment and disposal; hazardous waste handling and transport; secure landfills; hazardous waste management organisations, resource recovery; re-use, recycling and waste minimisation; energy recovery through incineration; composting; agricultural waste treatment process and plant design; disposal of treated agricultural wastes.

SEMESTER:

COURSE CODE: ENGR 6005

COURSE TITLE: POLLUTION PREVENTION, CLEANER PRODUCTION & INDUSTRIAL WASTE ABATEMENT

NO. OF CREDITS: 4

PREREQUISITES:

SYLLABUS: Preventative Environmental strategies versus end-of-pipe treatment, environmentally friendly product design, low-waste production technologies, efficient use of energy and raw materials, optimisation of existing technologies, operational safety, integrated approach to waste minimisation. In plant Survey. Waste minimisation through volume and strength reduction, process modification, separation and segregation, recycle and reuse technology. Characterisation of liquid, solid and gaseous wastes from important industries of the country or region. Treatment of wastes from different industries – case studies. Combined treatment plant for small-scale industries.

SEMESTER:

COURSE CODE: ENGR 6006

COURSE TITLE: WATER & WASTEWATER ENGINEERING

NO. OF CREDITS: 4

PREREQUISITES:

SYLLABUS: Water quality and beneficial uses. Water quality criteria and drinking water guidelines and standards. Water quality indices. Physicochemical processes for water and wastewater treatment: sedimentation; flotation; chemical coagulation and flocculation; filtration; ion exchange; adsorption; precipitation; disinfection; aeration; membrane processes; water demand and distribution. Wastewater quantities, wastewater collection system, and characteristics of municipal wastewater. Preliminary, primary, secondary and tertiary treatment of wastewater. Reactor kinetics, reactor types and their analyses. Aerobic and anaerobic process design. Activated sludge and its modification; trickling filter; rotating biological contractors; suspended and attached growth anaerobic systems. Stabilisation ponds aerated lagoons etc. Sludge treatment and disposal. Treated effluent disposal in inland waters and marine environment. On-site waste treatment.

SEMESTER:

COURSE CODE: ENGR 6007

COURSE TITLE: AIR POLLUTION CONTROL

NO. OF CREDITS: 4

PREREQUISITES:

SYLLABUS: Sources of air pollution; natural and industrial sources; emissions from utilities, transportation; domestic emissions and their influence on indoor air quality; estimates of emission; concept of source reduction; process change; fuel change; material substitution. Control devices for: particulates and mist, gaseous pollutants, choice of device and design of trains; control for re-use and recovery; industry-specific control strategies.

SEMESTER:

COURSE CODE: ENGR 6008

COURSE TITLE: ENVIRONMENTAL IMPACT ASSESSMENT IN ENVIRONMENTAL ENGINEERING

NO. OF CREDITS: 4

PREREQUISITES:

SYLLABUS: Elements of the EIA process; design of an EIA; Leopold matrices; EIA in development projects; international EIAs; case studies; Environmental Impact Statements (EIS): definition, documentation, typical headings, major sections; checklist.

SEMESTER:

COURSE CODE: ENGR 6009

COURSE TITLE: ENGINEERING IN DISASTER MANAGEMENT & MITIGATION

NO. OF CREDITS: 4

PREREQUISITES:

SYLLABUS: Environmental and socio-economic impacts of natural disasters: wind, floods, earthquakes, landslides, tsunamis, volcanoes; preparedness mitigation, prediction emergency response; engineering in management and mitigation. Industrial accidents; oil spills; environmental and socio-economic impacts; hazard and risk assessment; systematic identification and quantification of hazards; flammability assessment and fire prevention; safety of plant in start-up, operation; shut-down, maintenance and modification; fire and explosion; toxicity and toxic release; Factory Acts; Health and Safety at Work Act.

SEMESTER:

COURSE CODE: ENGR 6010

COURSE TITLE: ECONOMICS FOR ENVIRONMENTAL ENGINEERING

NO. OF CREDITS: 4

PREREQUISITES:

SYLLABUS: Economics of environmental management; internalisation of externalities; concept of public ownership of natural resources; resource evaluation; economics of sustainable development in small island states; economics of pollution, project economics; cost-benefit analysis including environmental components; shadow pricing; risk analysis; the role of the international lending agencies.

SEMESTER:

COURSE CODE: ENGR 6011

COURSE TITLE: GIS, LAND USE & RESOURCE MANAGEMENT IN ENVIRONMENTAL ENGINEERING

NO. OF CREDITS: 4

PREREQUISITES:

SYLLABUS: Principles of integrated land-use planning; planning practice; managing forests and fragile eco-systems; managing renewable resources; sustainable human settlement, principles of land surveying; aerial surveys and photographic interpretation; data acquisition and analysis for geographic and land information systems.

SEMESTER:

COURSE CODE: ENGR 6012

COURSE TITLE: HYDROLOGY & DRAINAGE SYSTEMS

NO. OF CREDITS: 4

PREREQUISITES:

SYLLABUS: Catchment morphology; natural run-off processes in the humid tropics; linear theory and the unit hydrograph; non-linear rainfall run-off models; lumped and distributed flow routing; catchment responses to changing land uses; the role of natural forests in catchment water balance relationships; design of land drainage and flood control systems; modelling of run-off in urban catchments; effects of urban development on catchment responses; lumped and continuous simulation models; numerical solution of the Saint Venant equations; design of storm-water drainage systems; erosivity and erodibility; modelling soil loss; erosion control; design of control structures; the role of forests in limiting erosions; protecting soil quantity and modeling flooding; effects of deforestation; agro-forest systems, forestry management.

SEMESTER:

COURSE CODE: ENGR 6013

COURSE TITLE: CHEMISTRY & MICROBIOLOGY FOR ENVIRONMENTAL ENGINEERING

NO. OF CREDITS: 4

PREREQUISITES:

SYLLABUS: Particle dispersion, solutions and solubility; acid-base reactions; Redox reaction; the carbonate system; acidity and alkalinity, laws relating to gases and gaseous mixtures; gas-liquid transfer; mass and charge balances; Nernst's equation; corrosion; chemical precipitation; chemical coagulation; precipitation of iron and manganese; phosphate precipitation. Special reference to water and waste treatment processes, chemical equilibria and kinetics relevant to the water cycle allowing definition of water quality parameters. Micro-organisms and their characteristics; bacterial growth and death; viruses, algae, fungi and protozoa in wastewater treatment processes and environmental pollution; microbiology of soil, solid wastes, water, wastewater, the atmosphere and indoor air; laboratory techniques for the culture and identification of micro-organisms. The role of different species in the various treatment processes. An outline of the bacterial metabolism which occurs during aerobic biological sewage treatment and anaerobic sewage sludge digestion.

SEMESTER:

COURSE CODE: ENGR 6014

COURSE TITLE: TRANSPORT OF POLLUTANTS

NO. OF CREDITS: 4

PREREQUISITES:

SYLLABUS: Modelling of pollutant transport in watercourses and coastal water; the Navier-Stokes Equations; Diffusion Equations; numerical solutions using finite elements methods; modeling of pollutant transport in groundwater flow; Darcy Equation; Stream and potential functions; flow notes; flow modeling techniques; numerical solution techniques; finite difference and finite element methods; the advection-dispersion equation; use of computer models. Air pollution meteorology, ventilation, stagnation, wind, atmospheric stability, mixing height; modeling air pollution: point, area and line sources; reactive pollutants; heavier than air gases.

SEMESTER:

COURSE CODE: ENGR 6015

COURSE TITLE: ENVIRONMENTAL SEPARATION PROCESSES

NO. OF CREDITS: 4

PREREQUISITES:

SYLLABUS: Screening of water, wastewater and liquids; settling and flotation; aerobic and biological processes; coagulation and flocculation; filtration; ion exchange; adsorption; disinfection separation by membranes, sludge stabilisation, thickening and conditioning, solidification. Settling of particulates by gravity, inertia, electrostatic and wet collectors, gas and vapour absorption processes; adsorption processes.

DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING RESEARCH

GENERAL ACTIVITIES

The Department offers programmes of study by research leading to MAsc, MPhil and PhD degrees in Electrical & Computer Engineering in five (5) major subject areas - Communication Systems, Computer Systems, Control Systems, Electronic Systems and Energy Systems. The Department is also at the forefront of research in the technology of the steel pan. Further details can be accessed via <http://www.eng.uwi.tt/depts/elec/>.

COMMUNICATION SYSTEMS

Research in the Communication Systems includes mobile technologies for development; cognitive, semantic and related technologies for productivity enhancement, and network and application performance studies.

Research in new and emerging communications technologies focuses heavily on the performance analysis of wired and wireless high-speed, multiservice networks. The group is actively engaged in, for example, the evaluation of IP networks in wired and wireless environments, mobility management for wireless networks, mobile IP and the performance of TCP in wireless as well as mobile environments. This work is conducted both on simulated platforms as well as on a multiservice carrier-grade hardware platform hosted in the Nortel Networks Communications Laboratory in the Department.

The Communication Systems Group has a keen interest in technical areas relating to telecommunications regulation and policy. These include: spectrum management, network interconnection and network modelling and simulation.

The group has enjoyed the gracious support of industry for a number of years. Support has been forthcoming in a variety of ways from TTNIC, Nortel Networks, Lucent Wireless Networks Group, Digidata, TSTT, The Ministry of Energy and Energy Industries, Microsoft Caribbean, NGC, OAS, ICL, IBM and TTARS.

ENERGY SYSTEMS

Research in Power Systems is related to real operating and planning problems encountered in the industry. Emphasis is placed on special problems related to peculiarities of small, isolated systems as obtains in all the Caribbean countries. The Energy Systems Group conducts research in electricity generation, with renewable and conventional sources, and its transmission and distribution. Current research activities include consideration of the effects of large loads, such as arc furnaces, on the system operation and the life span of equipment; simulation of various electromechanical and electromagnetic transient phenomena; introduction of wind energy systems to a grid; linear and non-linear optimisation problems as applied to power systems and design and simulation of power electronic drives. The Group additionally conducts research in the application of power electronics to electrical drive systems.

Research is being conducted in the electronic control of machines and drives where induction motors are being controlled using rotor field-oriented control and digital signal processing methods. Electro-magnetic interference and radio frequency interference problems are being studied as well as power factor correction in the presence of harmonics.

COMPUTER SYSTEMS ENGINEERING

The CSE Group conducts research in areas of computer architecture & organisation, advanced computer architecture, microprocessor / microcontroller based hardware & software design, design of application specific parallel architectures, embedded systems, supercomputer technologies, image processing, artificial intelligence and robotics.

CONTROL SYSTEMS

Automation, control and instrumentation theory is crucial to measurement and product quality control. Control plays a vital role in regulating machines and processes to close tolerances. The Control Systems Group conducts research in industrial control and instrumentation systems analysis, design and implementation. This includes the application of electronic, computer and communications technologies to the programming, design and application of advanced control strategies on Real Time Embedded Controllers, Programmable Logic Controllers and Distributed Computer Control Systems.

ELECTRONIC SYSTEMS

Research in this area involves the design and testing of new analogue circuit configurations using operational amplifiers and linear integrated circuits. Other areas under investigation include the design and application of a new form of transconductance amplifier, the use of current feedback techniques in small and large signal design and the evaluation of current conveyors and their comparison with operational amplifiers in the design of voltage amplifiers, filters, multiphase oscillators and gyrators.

The Electronics group is actively involved in the design of digital logic systems using the current technologies. In this regard, the Department boasts of state-of-the-art FPGA and CPLD technologies for rapid prototyping of logic solutions.

POSTGRADUATE PROGRAMMES IN ELECTRICAL AND COMPUTER ENGINEERING

The Department offers two (2) Masters level programmes:

1. Master of Applied Science (MAsc) in Electrical Computer Engineering.
2. Postgraduate Diploma in Electrical and Computer Engineering.

The MAsc and Diploma in Electrical and Computer Engineering are offered with Majors in five (5) subject areas, i.e., Communication Systems, Computer Systems, Control Systems, Electronic Systems and Energy Systems.

REGULATIONS FOR MASC AND DIPLOMA PROGRAMMES ENTRY REQUIREMENTS

Minimum requirements for entry into the MAsc and Diploma Programmes are:

1. BSc (Hons) in Electrical and/or Computer Engineering
2. BSc (Hons) in Mechanical Engineering
3. BSc (Hons) in Applied Physics majoring in Electronics
4. Other such qualifications deemed equivalent to any of the above (1,2,3) by the Faculty.

For entry into MAsc Energy Systems option, only candidates with qualifications under categories 1 or 2 or equivalent are eligible for entry.

Candidates with a BSc Third Class (Hons) Degree in Electrical Engineering may be considered eligible for entry, subject to an evaluation of the BSc degree and relevant post-degree industrial experience.

All students who seek entry under categories 2, 3 and 4 may be required to pursue qualifying courses and undertake examinations in these courses. The qualifying courses will be determined by the Head of the Department and will normally not exceed twelve (12) credits.

CREDIT REQUIREMENTS

Postgraduate Diploma in Electrical and Computer Engineering

The Diploma will be awarded to students who pass 18 credits of courses approved by the Department. Students will be required to select a major subject area from the five already listed and must register for five courses (15 credits) listed as core for that major. The remaining credits may be obtained from any of the other postgraduate courses offered by the Department or from other Departments within the Faculty and approved by the Department Head.

MASTER OF APPLIED SCIENCE IN ELECTRICAL AND COMPUTER ENGINEERING

The MAsc in Electrical and Computer Engineering will be awarded to students who obtain a minimum of 36 credits as follows:

Taught courses	24 credits
Supervised Research Course	4 credits
MAsc Project	8 credits

Fifteen (15) credits of the taught course component must comprise courses that define the core of one of the subject majors. Core courses for each of the majors offered are listed below.

The other nine (9) credits may be taken from any other approved programme in the University. In the first instance, these should be taken from Postgraduate programmes offered by the Faculty of Engineering as well as Final year Undergraduate and Postgraduate courses offered by the Department of Mathematics and Computer Sciences. Requests for inclusion of courses from other departments and units in the University will be considered on a case-by-case basis.

In all cases, course registration must be approved by the Head of Department.

Duration of Study

Both the Diploma and MAsc programmes are offered in full-time and part-time modes. Part-time students are normally expected to fulfill the degree requirements in six (6) semesters. Full-time students are normally expected to fulfill the degree requirements in three (3) semesters

MASC PROJECT

The MAsc Project must be conducted in the area of the selected major.

- (a) Students who have completed the taught course requirements and are approved to proceed to the project phase MUST register for the following courses:
ECNG 6021 MAsc Research I – 4 credits,
followed by
ECNG 6022 MAsc Research II – 0 credits,
followed by
ECNG 6023 MAsc Project – 8 credits

Students can register for these courses in any semester. ECNG 6022 registration is only required if the student requires more than one semester to complete the research project [refer to (c) below].

- (b) **Project Selection**
 As early as the semester prior to anticipated registration in ECNG 6021, proposals for MASc projects must be submitted to the Department on the prescribed form duly signed by the project supervisor(s). Students should consult the MASc Project Guide or the Department website for further details.
- (c) Students are to submit their completed project for examination no later than the semester following registration in ECNG 6022 i.e., the third semester of the project phase. Immediately upon submission, the student will register for ECNG 6023 MASc Project.

Students making substantial progress in their work, and who can therefore complete the project at least three weeks prior to the end of the second semester of the project phase, should not register for ECNG 6022 but should, instead, register directly for ECNG 6023.

- (d) **Examination of Project Components**
 First and second examiners for each student project will be appointed by the Department Head immediately following the submission and approval of the project proposal.

ECNG 6021, 6022 will be examined by way of an interim report submitted by the student and examined by the first and second examiners.

ECNG 6023 will be evaluated by way of a demonstration, dissertation presentation and oral examination lead by a panel comprising the first and second examiners as well as a moderator. These presentations will be held in the week prior to the start of examinations in any given semester. Students should consult the MASc Project Guide or the Department website for further details.

Students who fail ECNG 6021, 6022 on the first attempt will be deemed to have failed the programme and asked to withdraw. As recognition of the work completed in the MASc Programme, these students will be offered a Postgraduate Diploma Degree. Students who fail ECNG 6023 will be allowed one final opportunity to pass the course.

COURSE LISTING FOR THE MASC AND DIPLOMA PROGRAMMES

Prerequisite Courses

Each major has a list of prerequisite BSc level courses. Prerequisites may be waived based on qualification and experience. Otherwise, candidates will be required to complete the relevant prerequisites as qualifying or departmental courses, as determined by the Department Head. Students may opt to register for electives other than those listed for the selected major.

MAJOR IN COMMUNICATION SYSTEMS

CORE COURSES

Course Code	Course Title
ECNG 6700	Stochastic Processes
ECNG 6701	Data Communication Networks
ECNG 6703	Principles of Communication
ECNG 6704	Performance Engineering of Computer Communication Systems
ECNG 6708	Transmission Systems

ELECTIVES:

ECNG 6506	Optimisation Techniques
ECNG 6706	Antennas & Radiation
ECNG 6707	Multimedia Communication Systems

PREREQUISITE COURSES:

ECNG 3001	Communication Systems II
ECNG 3002	Data Communication Systems
ECNG 3003	Telecommunication Networks

MAJOR IN COMPUTER SYSTEMS

Course Code	Course Title
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PREREQUISITE COURSES

ECNG3006	Microprocessor Systems Design & Applications
ECNG3023	Introduction to Software Engineering

CORE COURSES

ECNG 6600	Real Time Systems
ECNG 6707	Multimedia Communication Systems
ECNG 6605	Distributed Computer Control
ECNG 6613	Database Systems Principles and Design

ELECTIVES:

ECNG 6617	Artificial Intelligence and Fuzzy Systems
ECNG 6611	Software Engineering II
ECNG 6612	Operating Systems
ECNG 6614	Multiprocessor Systems
ECNG 6616	Computer Graphics
ECNG 6618	System Safety for Software
ECNG 6619	Visual Media Processing I
ECNG 6620	Visual Media Processing II

PREREQUISITE COURSES:

ECNG 3006	Microprocessor Systems Design & Applications
ECNG 3023	Introduction to Software Engineering

MAJOR IN CONTROL SYSTEMS

CORE COURSES:

Course Code	Course Title
ECNG 6600	Real Time Systems
ECNG 6603	Modern Control Strategies
ECNG 6604	Linear Control Systems
ECNG 6605	Distributed Computer Control
ECNG 6700	Stochastic Processes

PREREQUISITE COURSES:

ECNG 2009	Control Systems
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MAJOR IN ELECTRONIC SYSTEMS

COURSE CODE COURSE TITLE

ECNG 6600	Real Time Systems
ECNG 6601	Digital Electronic Systems
ECNG 6602	Digital Electronic Design
ECNG 6609	Analogue Electronic Systems
ECNG 6707	Multimedia Communication Systems

ELECTIVES:

ECNG 6608	Digital Integrated Circuits
ECNG 6610	Digital System Hardware Organisation & Design

PREREQUISITE COURSES:

ECNG 3024	Network Synthesis
ECNG 3016	Digital Electronics III

MAJOR IN ENERGY SYSTEMS

CORE COURSES:

COURSE CODE COURSE TITLE

ECNG 6500	Computer Aided Power Systems Analysis
ECNG 6503	Advanced Power System Protection
ECNG 6504	Electrical Drives & Industrial Power Systems
ECNG 6505	Surge Phenomena & Insulation Coordination
ECNG 6509	Switchgear & Transformer Technology

ELECTIVES:

ECNG 6501	Power System Dynamics
ECNG 6502	Power System Operations & Planning
ECNG 6506	Optimisation Techniques
ECNG 6507	Energy Economics & Planning
ECNG 6508	Power System Instrumentation
ECNG 6510	Power Systems Monitoring & Control

PREREQUISITE COURSES:

ECNG 3008	Power Electronic Circuits
ECNG 3010	Electrical Machines & Drive Systems
ECNG 3012	Power Systems Analysis

SYLLABUSES

SEMESTER: 1 & 2

COURSE CODE: ECNG 6021

COURSE TITLE: MASC RESEARCH I

NO. OF CREDITS: 4

SYLLABUS:This course represents the first phase of the MASc. Project. Students are expected to identify their project area and proceed to fully engage their research. A 4-credit weighting has been applied to underscore the effort expected in the timely and effective management of the research project. Grading and assessment will be based on the submission of a report.

SEMESTER: 1 & 2

COURSE CODE: ECNG 6022

COURSE TITLE: MASC RESEARCH II

NO. OF CREDITS: 0

SYLLABUS:This course is offered on a PASS/FAIL basis only. During the semester of registration in ECNG 6022 MASc. Research II, it is expected that students would complete their MASc research activity but not yet completed their final report. Assessment will be based on the submission of a report.

SEMESTER: 1 & 2

COURSE CODE: ECNG 6023

COURSE TITLE: MASC PROJECT

NO. OF CREDITS: 8

SYLLABUS:Students registered for the ECNG 6023 MASc. Project are expected to complete their final report for submission no later than three (3) weeks prior to the start of the relevant end-of-semester examinations. ECNG 6023 MASc. Project will be assessed by way of dissertation presentation and oral examination led by a panel comprising the first examiner and second examiners as well as a moderator. These presentations will be held in the week prior to the start of examinations in any given semester. Candidates are to arrange for the demonstration of working models/software packages developed to the first and second examiners within one week of submission of the Final Report.

SEMESTER: 1

COURSE CODE: ECNG 6500

COURSE TITLE: COMPUTER-AIDED POWER

SYSTEM ANALYSIS

NO. OF CREDITS: 3

SYLLABUS: Review of power system components and their representation; Network equations and solutions; Load-flow and solution techniques; Power flow controls; Fault studies; Solution of large networks; Application of diakoptics.

SEMESTER: 1

COURSE CODE: ECNG 6501

COURSE TITLE: POWER SYSTEM DYNAMICS

NO. OF CREDITS: 3

SYLLABUS: Generalised machine theory - Synchronous machine: parameters, steady state and transient state models - steady state; Dynamic and transient stability of Power Systems - large induction motor loads; Effects on system dynamics ñ Multi-machine Systems - stabilisation of power systems.

SEMESTER: 1

COURSE CODE: ECNG 6502

COURSE TITLE: POWER SYSTEM OPERATION & PLANNING

NO. OF CREDITS: 3

SYLLABUS: Economic and Security methods in Power Systems - Control of interconnected systems - Reliability analysis of Power Systems - System Planning and Expansion.

SEMESTER: 2

COURSE CODE: ECNG 6503

COURSE TITLE: ADVANCED POWER SYSTEM PROTECTION

NO. OF CREDITS: 3

SYLLABUS: Relay elements; Principles; Relay response; Voltage and Current transducers; Microprocessor-based relays; Comparator characteristics; Over-current protection; Fault protection with centralised digital computer; Real-time fault-impedance calculations; Sampling techniques; Co-ordination of protective systems; Assessment and cost of protection.

SEMESTER: 2

COURSE CODE: ECNG 6504

COURSE TITLE: ELECTRICAL DRIVES & INDUSTRIAL POWER SYSTEMS

NO. OF CREDITS: 3

SYLLABUS: Power Semiconductor Controlled Drives: DC Motor, Induction Motor and Synchronous rotor Drive Systems; Industrial and Commercial Power Systems: Planning, Design and Modernisation, Protection and Power Factor improvement.

SEMESTER: 1

COURSE CODE: ECNG 6505

COURSE TITLE: SURGE PHENOMENA & INSULATION COORDINATION

NO. OF CREDITS: 3

SYLLABUS: Classification and origins of surges; Lightning and switching transients; Sustained transients; Ferro-resonance phenomena; Digital computer simulation techniques; Protection against over-voltages; Insulation Coordination.

SEMESTER: 1

COURSE CODE: ECNG 6506

COURSE TITLE: OPTIMISATION TECHNIQUES

NO. OF CREDITS: 3

SYLLABUS: Linear Programming: Simplex and revised Simplex methods, Duality, Sensitivity analysis - Dynamic Programming and Integer Programming methods - Network Planning techniques; PERT/CPM; Dynamic Optimisation methods - Applications to Engineering Systems.

SEMESTER: 2

COURSE CODE: ECNG 6507

COURSE TITLE: ENERGY ECONOMICS & PLANNING

NO. OF CREDITS: 3

SYLLABUS: The Energy System - Technical, Economic and Planning Issues; Power System Economics; Cost of Service Tariff structure; System Expansion Studies.

SEMESTER: 2

COURSE CODE: ECNG 6508

COURSE TITLE: POWER SYSTEM INSTRUMENTATION

NO. OF CREDITS: 3

SYLLABUS: Signal processing and conditioning; Transducers; Metering technology (volts, amperes, watts, vars, frequency, etc.); Application of P techniques in instrumentation; Thermal measurements (flow pressure, temperature, etc.); Techniques, networking of instruments; Application of computers to measurement and display; Transient data recorders; Maintenance of power system instruments.

SEMESTER: 2

COURSE CODE: ECNG 6509

COURSE TITLE: SWITCHGEAR & TRANSFORMER TECHNOLOGY

NO. OF CREDITS: 3

SYLLABUS: Physics of high pressure arcs; Circuit interruption techniques; Air circuit breakers; Oil circuit breakers; SF6 circuit breakers; Vacuum circuit breakers; Specification/standards applied to circuit breakers; Modern trends in circuit breaking; Maintenance and testing of circuit breakers; Transformer core and winding arrangements; Transient behaviours of transformers; Onload tap changing gear; Load cycles and transformer ratings.

SEMESTER: 2

COURSE CODE: ECNG 6510

COURSE TITLE: POWER SYSTEMS MONITORING & CONTROL

NO. OF CREDITS: 3

SYLLABUS: SCADA systems, networking applied to power systems; On-line load flow and security analysis; State estimation techniques; Automatic load frequency control; Modern trends in power system monitoring and control.

SEMESTER: 1

COURSE CODE: ECNG 6600

COURSE TITLE: REAL TIME SYSTEMS

NO. OF CREDITS: 3

SYLLABUS: Software and system concepts, real-time definitions; events (asynchronous, synchronous), determinism, time-loading, address modes, memories and input-outputs. Required attributes in a real-time programming language information hiding and its use in designing reliable, understandable and maintainable real-time systems. Elements of the software life cycle, specification and design techniques. Real-time kernels. Inter-task communication and synchronisation. Memory management, system performance analysis and optimisation. An overview of real-time database systems. An introduction to the design of distributed real-time systems. Multiprocessor systems.

SEMESTER: 1

COURSE CODE: ECNG 6601

COURSE TITLE: DIGITAL ELECTRONIC SYSTEMS

NO. OF CREDITS: 3

SYLLABUS: Fundamental concepts of digital design. Advanced aspects of digital design: sharpening combinational design skills, races and hazards, timing and clock issues, metastability, synchronisation, pipelining. FPGAs vs ASICs. Specification and synchronous design: hardware programming models (finite state machines, algorithmic state machines, communicating sequential processes, khan network processes, etc), advanced topics in VHDL, formal specification of digital systems, synchronous architectures. Introduction to asynchronous logic. Formal hardware verification. Reconfigurable hardware systems (reconfigurable computing). Interface design considerations of IP cores.

SEMESTER: 2

COURSE CODE: ECNG 6602

COURSE TITLE: DIGITAL ELECTRONIC DESIGN

NO. OF CREDITS: 3

SYLLABUS: Digital electronic design using regionally accessible technology: Field Programmable Gate Arrays and Programmable Array Logic devices. Logic design tools. Design considerations and applications of IP cores in signal/image processing and digital communications. Use of formal specification, formal hardware verification and reconfigurable computing. Students will develop the target skills and capabilities through a mix of the following activities: supervised lab sessions, classroom discussions, audio-visual presentations, unsupervised lab activities, research, project reports and presentations.

SEMESTER: 2

COURSE CODE: ECNG 6603

COURSE TITLE: MODERN CONTROL STRATEGIES

NO. OF CREDITS: 3

SYLLABUS: Selected topics in: State Space methods; state feedback, Optimal Control, Linear Quadratic Regulation (LQR) and Linear Quadratic Gaussian (LQG) methods, State Estimation, Optimal State Estimators and Kalman filters, Stochastic Control, Model Reference Adaptive Control (MRAC), Self Tuning Regulators, Intelligent Control Systems, Neuro-Fuzzy Control.

SEMESTER: 1

COURSE CODE: ECNG 6604

COURSE TITLE: LINEAR CONTROL SYSTEMS

NO. OF CREDITS: 3

SYLLABUS: Mathematical representation of dynamic systems. Matrix theory review: eigenvalues and eigenvectors, generalised eigenvectors, Jordan Form, Functions of a square matrix. Concept of state-space description of dynamic systems. Controllability and observability. Feedback control and state estimation. Canonical decomposition of State-space systems. System stability. Introduction to non-linear systems and State-space representation. Stability analysis. Introduction to optimal control.

SEMESTER: 2

COURSE CODE: ECNG 6605

COURSE TITLE: DISTRIBUTED COMPUTER CONTROL

NO. OF CREDITS: 3

SYLLABUS: Overview and Goals of a Distributed System: historical development, promises of distributed systems, extensibility, ease of maintenance, ease of programming. What can be distributed? Performance requirements (specification). Hardware Design Issues: dedicated function, traffic sharing, dynamic and hybrid architecture. Software Design Issues: task allocation, client server approach, distributed operating systems, distributed database systems, hardware and software fault tolerance, comparison of different structures. Software reliability concepts, designing for maintainability. Real time specification, issues, state and event issues. Industrial Networking: MAP/TOP Standardisation, Field Bus, Trends in DCCS. Examples of commercially available DCCS.

SEMESTER: 1

COURSE CODE: ECNG 6606

COURSE TITLE: OPTICAL COMPONENTS

NO. OF CREDITS: 3

SYLLABUS: This course identifies key components used in optical systems: fiber, sources, detectors, amplifiers, modulators, etc. It presents the theoretical foundation for the physical phenomena utilised in the operation of the optical devices and then investigates the performance limitations imposed by these physical processes. Ideal and real characteristics of the optical devices are related to performance specifications represented in commercial data sheets. Case studies treat cost analysis for system design.

SEMESTER: 2

COURSE CODE: ECNG 6607

COURSE TITLE: OPTICAL APPLICATIONS

NO. OF CREDITS: 3

SYLLABUS: This course treats the design and performance analysis of systems derived from a range of optical applications. Optical applications are drawn from Communications and Instrumentation. After this course, the student will have an appreciation for the description of light in terms of its degrees of freedom (amplitude, phase, frequency, polarisation and propagation direction) and the physical processes used to manipulate these parameters for communications, sensing and beam-positioning. The student should be able to evaluate the performance of a range of systems and offer reasonable component selection criteria for the design of such systems. Cost analysis is treated.

SEMESTER: 1

COURSE CODE: ECNG 6608

COURSE TITLE: DIGITAL INTEGRATED CIRCUITS

NO. OF CREDITS: 3

SYLLABUS: Introduction to IC fabrication techniques; Comparative study of logic families; Structure of memory elements; Design of VLSI design using stick diagram techniques; MOS, VLSI design.

SEMESTER: 1

COURSE CODE: ECNG 6609

COURSE TITLE: ANALOGUE ELECTRONIC SYSTEMS

NO. OF CREDITS: 3

SYLLABUS: Analysis and design of discrete building blocks - current sources, voltage sources/references; Amplifier characteristics and implementations including the Differential amplifier and with analysis of op-amp circuits; Special function circuits - integrated and discrete; High power audio amplifier techniques; Switch mode power supply design; High frequency amplifier design.

SEMESTER: 2

COURSE CODE: ECNG 6610

COURSE TITLE: DIGITAL SYSTEM HARDWARE ORGANISATION & DESIGN

NO. OF CREDITS: 3

SYLLABUS: Architecture of representative processors; Hardware programming language; Machine organisation; Hardware realisation; Micro-programming; Intersystem communication; Interrupt and memory mapped I/O; Communication and error control; Large memory systems; High-speed computer arithmetic realisations.

SEMESTER: 1

COURSE CODE: ECNG 6611

COURSE TITLE: SOFTWARE ENGINEERING II

NO. OF CREDITS: 3

SYLLABUS: Review of design methodologies; Modularity and decomposition; Parallel programming; Programme design; Design quality; Programme implementation and testing; System testing; Performance testing and documentation; Maintenance; Phased development; Changing schedule and requirements; Productivity; Updating documentation.

SEMESTER: 1

COURSE CODE: ECNG 6612

COURSE TITLE: OPERATING SYSTEMS

NO. OF CREDITS: 3

SYLLABUS: Communicating Sequential Process (CSP): Symbolic description of processors, traces, communication channels, pipes, etc. with analysis of properties such as synchronisation, parallelism, deadlock and livelock, data flow, etc. Centralised vs. Distributed Systems: comparisons of the behaviour of centralised operating systems vs. distributed operating system, Synchronisation, Deadlock and livelock Analysis using CS. Layered Protocol and Client Server Model: ISO OSI model, layers, interfaces and protocols. Remote Procedure calls and Distributed File Systems: message transport over network, RPC GEN tools. ěCí Programming for operating system development. UNIX as an industrialised standard platform.

SEMESTER: 1

COURSE CODE: ECNG 6613

COURSE TITLE: DATABASE SYSTEMS PRINCIPLES & DESIGN

NO. OF CREDITS: 3

SYLLABUS: Database fundamentals; Relational techniques; Data representation; Packing and protection; Access security protection; Selection in a database; DBMS techniques and database architectures; Real time databases; File structures; Optimised access and linking structures; Functional interference; Product overview.

SEMESTER: 2

COURSE CODE: ECNG 6614

COURSE TITLE: MULTIPROCESSOR SYSTEMS

NO. OF CREDITS: 3

SYLLABUS: Introduction to parallel processing techniques; Parallel processing languages and algorithms; Introduction to synchronous multiprocessing.

SEMESTER: 1

COURSE CODE: ECNG 6616

COURSE TITLE: COMPUTER GRAPHICS

NO. OF CREDITS: 3

SYLLABUS: Graphics Hardware: Implementation of Graphics Software; Interaction techniques; User Computer Interface; Geometric Transformations; Modeling; Display Architecture and Algorithms; Hidden Edges, Surfaces, Shading, Intensity, Colour.

SEMESTER: 2

COURSE CODE: ECNG 6617

COURSE TITLE: ARTIFICIAL INTELLIGENCE SYSTEMS

NO. OF CREDITS: 3

SYLLABUS: Fuzzy computing; basic definitions and terminology, fuzzy set operations, membership functions, fuzzy relations, fuzzy if-then-else rules, fuzzy reasoning; adaptive networks; architecture, back propagation learning methods, associative memory learning methods, supervised and unsupervised learning neural networks, neuro-fuzzy modeling, system identification; least squares methods; derivative-based and derivative free optimisation methods, genetic algorithms; neuro-fuzzy computing applications.

SEMESTER:

COURSE CODE: ECNG 6618

COURSE TITLE: SYSTEM SAFETY FOR SOFTWARE

NUMBER OF CREDITS: 3

SYLLABUS: This optional post-graduate/final-year course targets students who wish to address software-related system safety issues in their capstone project. Students will research software-related engineering disasters, and gain an appreciation of the role human-machine-interaction plays in the safe operation of complex systems. Students will complete an end-to-end system design, using accepted methods and models, and understand how these methods facilitate safe designs. At the end of this course the student will be able to analyse, specify, verify, and validate safe operation of, software within a system.

Pre-requisite: ECNG2007 or equivalent.

SEMESTER:

COURSE CODE: ECNG6619

COURSE TITLE: VISUAL MEDIA PROCESSING I

NUMBER OF CREDITS: 3

SYLLABUS: This optional post-graduate/final-year course targets students who wish to understand the scope and limitations of digital visual media. It introduces common standards, and explains the tradeoffs inherent in utilising these standards in different application domains, such as cinema post-production, machine vision, and visual consumer electronics. At the conclusion of the course, students will be able to identify, analyse, recommend, and justify use of image processing tools in applications. Topics include: image filtering, image content analysis, image compression, and motion estimation in image sequences.

SEMESTER:

COURSE CODE: ECNG6620

COURSE TITLE: VISUAL MEDIA PROCESSING II

NUMBER OF CREDITS: 3

SYLLABUS: This optional post-graduate/final-year course targets students who wish to investigate and/or manipulate digital visual media in their capstone project. Students will explore the tradeoffs inherent in utilising industrial standards in image and video communication (e.g. JPEG, MPEG-2, MPEG4) in different application domains, such as cinema post-production, machine vision, and visual consumer electronics. At the end of this course the student will be able to use, design and exploit image processing tools for creation/ manipulation of visual media. Pre-requisite: ECNG6619 Visual Media Processing I

SEMESTER: 1

COURSE CODE: ECNG 6700

COURSE TITLE: STOCHASTIC PROCESSES

NO. OF CREDITS: 3

SYLLABUS: Models in which there is uncertainty or randomness play a very important role in the analysis and design of engineering systems. These models are used in a variety of applications where the signals as well as the system parameters may change randomly and where the signals may also be corrupted with noise. This course looks at providing the tools required to be able to model mathematically such processes and ask questions such as:

- What are the spectral properties of a process?
- How does noise affect system performance?
- What is a receiver's ability to recover transmitted data correctly?
- What is the optimum processing algorithm that a receiver should use?
- What is the best model of a process?

SEMESTER: 1

COURSE CODE: ECNG 6701

COURSE TITLE: DATA COMMUNICATION NETWORKS

NO. OF CREDITS: 3

SYLLABUS: In this course we will design networks to support multi-service traffic. To guide the design process, requirements specifications will be developed, taking account of user-defined service metrics such as mobility, security, and availability objectives. Through ECNG 6701, students will also be exposed to contemporary networking protocols and technologies, which will be used to synthesize logical network designs. For these designs, issues such as logical addressing, routing, security, and network management will be considered. ECNG 6701 also exposes students to the use of computer-aided techniques employing protocol analysers and simulation tools for design validation. This course forms the basis for further analysis and optimisation of communications networks and protocols.

SEMESTER: 2

COURSE CODE: ECNG 6702

COURSE TITLE: PRINCIPLES OF SWITCHING

NO. OF CREDITS: 3

SYLLABUS: Switched networks for telephony; Teletraffic analysis; Digital circuit switching; Integrated digital networks; Packet switching; Signaling and control in digital telephone networks; New developments in digital telephone networks.

SEMESTER: 1

COURSE CODE: ECNG 6703

COURSE TITLE: PRINCIPLES OF COMMUNICATION

NO. OF CREDITS: 3

SYLLABUS: In this course, we shall examine those digital communication techniques employed at the physical layer for the reliable and efficient transfer of information across a communication channel in the presence of additive, white Gaussian Noise (AWGN). We will step through those functional elements that comprise a digital communications link, particularly, source encoding, channel encoding, and modulation, and determine how optimal performance can be achieved. In all this, we assume a discrete source. To help reinforce the understanding of the behaviour and the performance of these digital communication techniques we will engage in simulation exercises using MATLAB.

SEMESTER: 2

COURSE CODE: ECNG 6704

COURSE TITLE: PERFORMANCE ENGINEERING OF COMPUTER COMMUNICATION SYSTEMS

NO. OF CREDITS: 3

SYLLABUS: In this course, the performance of multi-service communication networks will be investigated using analytic and simulation-based methods. The requirements of various classes of applications will be mapped to performance metrics such as throughput, delay, jitter, and packet loss rate. Passive and active techniques for quantifying these metrics will be explored. From an empirical standpoint, input analysis performed on the real-world traffic will be used to drive simulation models which in turn will be used to predict the performance for a wider range of scenarios. However, prediction will also be performed using analytic means by assuming input distributions and using tools such as discrete-time and continuous-time Markov chains, queuing models, and models for networks of queues. Performance predictions and knowledge of quality-of-service (QoS) architectures will be used to inform strategies for the improvement of network performance.

SEMESTER: 1

COURSE CODE: ECNG 6705

COURSE TITLE: APPLIED PROBABILITY

NO. OF CREDITS: 3

SYLLABUS: Modeling, quantification and analysis of uncertainty; Formulation and solution in sample space; Random variables, transform techniques, simple random processes and their probability distributions; Markov processes; Limit theorems; Elements of statistical interference, and decision-making under uncertainty; Interpretations; applications and lecture demonstrations.

SEMESTER: 1

COURSE CODE: ECNG 6706

COURSE TITLE: ANTENNAS & RADIATION

NO. OF CREDITS: 3

SYLLABUS: In this course, we shall investigate analysis and design techniques for basic antenna systems employed in wireless communication systems. We will step through those functional elements that comprise the wireless communications link, with focus upon the transceiver front-end, waveguides, the propagation channel and the antenna itself. Traditional analytical techniques will be complimented with computer-aided tools for both the analysis and design of antenna systems. These will aid in reinforcing the understanding the concepts presented and provide a basis for investigating performance of these systems. The theoretical approach will be enhanced with coverage of practical issues such as performance measurement, EMC, and RF safety. Contemporary technologies involving antennas will be investigated through examination of the role of antenna systems and processing techniques in emerging standards and technologies.

SEMESTER: 2

COURSE CODE: ECNG 6707

COURSE TITLE: MULTIMEDIA COMMUNICATION SYSTEMS

NO. OF CREDITS: 3

SYLLABUS: Image processing: Filtering, sampling and compression of images (JPEG); High definition video (MPEG and HDTV); Speech processing; Speech and hearing; Coding for telephony; Speech synthesis, Speech over networks; Integrated Services Digital Networks: Narrowband and broadband ISDN, ATM; Frame relay and SMDS; Multimedia transmission over networks: TCP/IP, MPEG transport stream.

SEMESTER: 2

COURSE CODE: ECNG 6708

COURSE TITLE: TRANSMISSION SYSTEMS

NO. OF CREDITS: 3

SYLLABUS: In this course, the design of transmission systems employed in communication networks for the delivery of data, voice and video traffic will be performed. To drive this design process, requirements specifications for the physical layer, which include coverage, capacity, and error-performance objectives will be developed, taking into account a logical network design and pertinent geographical information. In both the wired and wireless domains, contemporary transmission and access technologies, as well as their governing standards, will be considered. Suitable simulation tools will be used to validate the design.

DEPARTMENT OF MECHANICAL & MANUFACTURING ENGINEERING

RESEARCH

The Department offers the facilities to carry out research leading to the MPhil and PhD Degrees in a wide range of important areas: Mechanical, Industrial and Agricultural Engineering (Biosystems), Production Engineering & Management.

Research students register for the MPhil degree in the first instance and then, subject to the Faculty and University's Regulations, may upgrade to the PhD degree. Students who already have a Master's degree obtained through a substantial research project, may register directly for the PhD. A research student works in his chosen field of research under the guidance of a supervisor who has substantial expertise and experience in the field.

Persons interested in pursuing research leading to the MPhil or PhD degrees in Agricultural, Industrial, Mechanical or Production Engineering & Management are invited to contact the Head of Department to discuss their research interests and for further information on research opportunities within the Department. The Department may be able to provide some financial support for specific research projects.

A sample of recent Research Theses and Projects are listed as follows:

- i. Neural Network Model for a Cement Kiln.
- ii. An Exergy Analysis of a Hydrocarbon Processing Unit.
- iii. Solids of Revolution: Pose from Symmetry.
- iv. Heat Transfer Mechanism in Biological Fibrous Materials.
- v. An Investigation into Wave Energy Potential of the Caribbean and Application of Symmetrical Heaving Body Recovery Systems.
- vi. Deep Drawing with a Novel Technique for Blank Holding.
- vii. Thermal Conductivity Measurement of Local Building Materials.
- viii. Post-harvest Handling and Processing Systems for Peanuts, Nutmegs, etc.
- ix. Refrigerated and Controlled Atmosphere Storage for Breadfruit, Mangoes, Carambola, etc.
- x. Osmotic and Air-drying Behaviour of Fruit and Fish.
- xi. A Reliability-centred Maintenance Programme.
- xii. Induction Melting of Iron Carbide.
- xiii. Strategic Remodelling of the Quality Systems of the Laboratories at the Caribbean Epidemiology Centre (CEC).

MASTERS AND DOCTORAL PROGRAMMES IN AGRICULTURAL ENGINEERING (BIOSYSTEMS ENGINEERING)

The Aims and Objectives

The main objective of these programmes is to offer sound, attractive Graduate degrees through both teaching and research in the three main areas of Agricultural Engineering viz:

- i. Engineering Design
- ii. Crop Processing, Food Engineering & Post-harvest Technology
- iii. Soil & Water Engineering

These guidelines apply to Masters and Doctoral Degree candidates and the number and nature of courses taken will be determined by both the background of the candidate and the Degree of interest.

All of the current rules, regulations and examination requirements for Postgraduate Degrees by Research in the University will apply, i.e., regulations for the MPhil and the PhD degrees.

The Degree in Engineering Design

The Research Degree in Engineering Design is aimed at training students to carry out research and development in the area of Tool and Equipment Design for agriculture and related industry. This will cover field equipment from hand tools and special accessories for local crops and products, to handling and pre-processing equipment for the food industry. Farm machinery design and development for small farm usage and for tropical crops will be encouraged.

The Degree in Crop Processing & Post-harvest Technology

The Research Degree in Crop Processing & Post-harvest Technology is aimed at the training of graduate students in post-harvest technology, crop processing and agribusiness development. The emphasis will be on primary crop processing and post-harvest technology of perishables (high moisture content, biological products, e.g., cereal grains, vegetables, fish and meat) and durable (lower moisture content, e.g., cereal grains, oilseeds). Product and process development will be encouraged all within a framework of agribusiness development for the Caribbean. Developing improved systems to process and store tropical crops/foods and by-products can lead to increased agribusiness activities in the Caribbean. These include packing-houses for fruits, vegetables, root crops and cut flowers both for domestic and export markets and food processing industries which utilise tropical fruits, vegetables, fish meat, etc.

The Degree in Soil & Water Engineering

The Research Degree in Soil & Water Engineering is aimed at the training of graduate students in Irrigation and Drainage Engineering, Soil Erosion and Conservation Engineering, Theory and Practices of Soil Cultivation and General Water Resources Planning and Development related to agriculture. Emphasis will be placed on modern methods of irrigation design and planning as well as on techniques of modifying the soil mechanical properties in order to improve soil workability by farm machinery and to minimise soil erosion. The research work in Soil & Water Engineering will also assess the effectiveness of new and existing techniques to reduce the related problems of soil erosion and degradation, poor drainage status and soil compaction under the impact of mechanical forces.

Degree Structure for MPhil and PhD

These being Research Degrees, students will be expected to produce a satisfactory Thesis (MPhil or PhD) as stipulated in the University's regulations.

Additionally, students depending upon their academic background, will be required to take three (MPhil) or four (PhD) Departmental courses. These courses will be used to direct the student's approach towards the research topic in particular, strengthening their knowledge base in their area of interest and to research methodology in general.

Finally, the student will be asked to give a mandatory research Seminar within three (MPhil) or four (PhD) Semesters of first registration.

The Degree structure therefore comprises the following: -

- i. An MPhil or PhD Thesis
- ii. Departmental Courses (three for MPhil, four for PhD)
- iii. A Research Seminar

COURSE LISTING

For all three Degrees, both at the MPhil and PhD levels, the structure is therefore as follows: -

Course Code	Course Title
AENG 6000	Research Methodology (Agriculture Economics)
AENG 6001	Processing & Storage of Perishable Crops
AENG 6002	Processing & Storage of Durable Crops
AENG 6003	Physical Properties of Agricultural Products
AENG 6004	Special Topics in Design
AENG 6005	Reading Course in Agricultural Engineering
AENG 6006	Hydrology & Water Resources
AENG 6007	Irrigation & Drainage Engineering
AENG 6008	Soil Mechanics & Cultivation
AENG 6009	Soil & Water Conservation Engineering
AGBU 3000	Farm Business Management
AGBU 3006	Agricultural Project Appraisal & Implementation
MENG 6501	Statistical Methods in Engineering

Other suitable courses from the Faculties of Engineering and Science & Agriculture may also be taken, subject to Departmental approval.

Course Code	Course Title
AENG 6010	Research Seminar
AENG 7000	MPhil Thesis
AENG 8000	PhD Thesis

Duration of Study

It is envisaged that a Master's programme of research and study can be completed by full-time postgraduate students in two to three (2-3) calendar years. This will be encouraged. The time limits for completion of postgraduate degrees (MPhil and PhD) however, are those as normally specified by the University.

Regulations and Entry Requirements

The normal University Regulations will apply for entry into the MPhil programme specifically an Honours Degree in any of the following disciplines viz.:

- Engineering
- Natural Sciences
- Earth Sciences
- Food Science
- Agriculture
- Agricultural Economics

as well as any other suitable degree. The suitability of the applicant's undergraduate training as generally specified above will be matched to the specific degree of interest. Students with Pass Degrees will be accepted only under special circumstances principally related to postgraduate experience.

SYLLABUSES

SEMESTER:

COURSE CODE: AENG 6000

COURSE TITLE: RESEARCH METHODOLOGY

NO. OF CREDITS:

PREREQUISITES:

Syllabus: Critical discussion of the application of scientific methodology to research in agricultural economics. The role of inductive and deductive logic in scientific research in the Caribbean.

SEMESTER:

COURSE CODE: AENG 6001

COURSE TITLE: PROCESSING & STORAGE OF PERISHABLE CROPS

NO. OF CREDITS:

PREREQUISITES:

Syllabus: Harvesting and handling of perishable crops; Post-harvest physiology; Crop pre-treatment for storage and processing; Water activity; Intermediate moisture foods; Principles of refrigeration and application to chilling and freezing; Thermal properties; Packing-house requirements; Packaging; Perishable process/Preservation principles.

SEMESTER:

COURSE CODE: AENG 6002

COURSE TITLE: PROCESSING & STORAGE OF DURABLE CROPS

NO. OF CREDITS:

PREREQUISITES:

Syllabus: Crop physical properties and characteristics; Harvest methods; Transient heat and mass transfer; Psychrometrics; Handling; Cleaning; Drying and storage systems; Dehydration; Pest control; Primary processing operations; Milling; Separation and Extraction; Processing of selected tropical crops.

SEMESTER:

COURSE CODE: AENG 6003

COURSE TITLE: PHYSICAL PROPERTIES OF AGRICULTURAL PRODUCTS

NO. OF CREDITS:

Syllabus: Geometry and shape factors. Some flotation and aerodynamic properties. Elastic and viscoelastic behaviour including variation with moisture and temperature. Measurement of toughness, friction, impact strength, and other properties that may be used as quality indicators.

SEMESTER:

COURSE CODE: AENG 6004

COURSE TITLE: SPECIAL TOPICS IN DESIGN

NO. OF CREDITS:

Syllabus: This is a project course graded by coursework only. Students will be required to analyse problems and existing equipment and to carry out design or modification work.

SEMESTER:

COURSE CODE: AENG 6006

COURSE TITLE: HYDROLOGY & WATER RESOURCES

NO. OF CREDITS:

PREREQUISITES:

Syllabus: Surface water hydrology and movement; Meteorology, Runoff measurement; Hydrograph analysis; Water balance studies; Groundwater resources; Pumping test; Bore hole design; Computer applications.

SEMESTER:

COURSE CODE: AENG 6007

COURSE TITLE: IRRIGATION & DRAINAGE ENGINEERING

NO. OF CREDITS:

PREREQUISITES:

Syllabus: Surface, sprinkler and trickle irrigation, land grading; On-farm and scheme water requirements; Scheduling of irrigation; Design of canals and hydraulic structures; Drainage design theories; Drain spacing and depth requirement for irrigated areas; Drainage system monitoring; Computer applications.

SEMESTER:

COURSE CODE: AENG 6008

COURSE TITLE: SOIL MECHANICS & CULTIVATION

NO. OF CREDITS:

PREREQUISITES:

Syllabus: Soil shear strength; Coulomb equation; Mohr-Coulomb failure criteria; Active and passive Rankine states; Bearing capacity; The general soil mechanics equation; Techniques for predicting forces on soil engaging tools; Soil cultivation requirements and techniques for effective crop production.

SEMESTER:

COURSE CODE: AENG 6009

COURSE TITLE: SOIL & WATER CONSERVATION ENGINEERING

NO. OF CREDITS:

Syllabus: Soil erosion study as a basis for designing soil conservation schemes; Water and wind erosion; Erosivity; Erodibility; Soil loss prediction; Design of terraces; Waterways; Shelter belts; Gully control structures; Conservation tillage; Water resources conservation and development. Computer applications.

MASTERS AND DOCTORAL PROGRAMMES IN MECHANICAL, MANUFACTURING, MANAGEMENT & INDUSTRIAL ENGINEERING

Background

A research degree programme that leads to the award of a Master of Philosophy (MPhil) or a Doctor of Philosophy (PhD) in Mechanical Engineering, Manufacturing Engineering Management or Industrial Engineering is being offered by the Department.

At the undergraduate level in Mechanical & Manufacturing Engineering, students are founded on the areas of Engineering Mechanics and Design, Thermal Engineering and Energy Systems, and Manufacturing Design, Processes and Systems. Students acquire the ability to deal with interrelated activities and operations involving product design, materials selection, production planning, quality assurance and management, and development of methods for integrating facilities and systems by which products may be manufactured economically.

At the undergraduate level in Industrial Engineering, students are grounded in Information Systems and Technology, Manufacturing Systems and Technology, Human Factors Engineering, and Management Science Operations Research. The current emphasis of IE is on the design, improvement and installation of integrated systems of people, material, equipment, information and energy. Graduates are employed in the service and manufacturing industries to harness and manage resources for sustainable development in the Caribbean region.

The Aims and Objectives

The objectives of the MPhil/PhD programmes in Mechanical/Manufacturing/Industrial Engineering by research are:

- a. To provide training at the postgraduate level in specialised Mechanical / Manufacturing/Industrial Engineering subject areas through teaching and to solve engineering problems through research.
- b. To assist in the transfer of new, emerging and advanced technologies to the businesses of the Region through the mechanism of research projects.
- c. To develop and augment the region's pool of expertise in Mechanical/Manufacturing/Industrial Engineering.
- d. To assist in the development of the Region through an outreach programme.

Entry Requirements

- a. BSc Honours Degree in Industrial, Mechanical, Manufacturing or Electrical Engineering or equivalent. Only in exceptional circumstances will candidates with pass degrees be considered.
- b. Normally, at least one (1) year of industrial experience is desirable.

DEGREE STRUCTURE FOR MPhil AND PHD

The Degree structure comprises the following:

- i. An MPhil or PhD Thesis
- ii. Departmental Courses (three for MPhil, four for PhD)
- iii. A Research Seminar (one for MPhil and two for PhD)

Research Thesis

These being Research Degrees, students will be expected to produce a satisfactory Thesis (MPhil or PhD) as stipulated in the University's regulations.

Duration of Study

Part-time students: Normally expected to complete the examination requirements within four (4) semesters for MPhil and six (6) semesters for PhD, and complete the MPhil programme in accordance with the relevant University Regulations.

Full-time students: Normally expected to complete the course examination requirements within two (2) semesters for MPhil and three (3) semesters for PhD, and complete the programme in accordance with the relevant University Regulations.

Departmental Courses

Depending upon their academic background, students will be required to take three (MPhil) or four (PhD) Departmental courses. These courses will be used to direct the students' approach towards the research topic in particular, strengthening their knowledge base in their area of interest and to research methodology in general.

A. COMPULSORY COURSE

MENG 6508 Research Methods

B. ELECTIVE COURSES IN INDUSTRIAL ENGINEERING

Course Code	Course Title
IENG 6000	Total Quality Management
IENG 6001	Expert Systems (COMP 2800 OR IENG 3004)*
IENG 6002	Distributed Information Systems & Databases (IENG 3013)*
IENG 6003	Computer Integrated Manufacturing Systems
IENG 6004	Occupational Biomechanics
IENG 6005	Industrial Ergonomics
IENG 6006	Occupational Safety & Health
IENG 6007	Industrial Automation
IENG 6009	Robotic Technology & Applications
IENG 6010	Operations Research in Manufacturing I (IENG 3007)*
IENG 6011	Operations Research in Manufacturing II (IENG 3007)*
IENG 6012	Operations Research in Services (IENG 3007)*
IENG 6013	Directed Readings
MATH 3530	Mathematics III (MATH 2240)*
MENG 6506	Project Management

C. MECHANICAL/MANUFACTURING ENGINEERING COURSES:

Course Code	Course Title
MENG 6200	Production Technology (MENG 2008)*
MENG 6201	Machine Tool Technology
MENG 6202	Applied Materials Technology
MENG 6203	Robotic Technology & Applications
MENG 6300	Applied Ergonomics
MENG 6301	Computer Applications in Manufacturing
MENG 6302	Design of Plant & Services
MENG 6303	Computer Control Systems
MENG 6400	Production Planning & Control
MENG 6401	Advanced Production Management
MENG 6402	Human Resource Management I
MENG 6403	Human Management II
MENG 6404	Maintenance Engineering & Management
MENG 6405	Total Quality Management
MENG 6500	Industrial Marketing
MENG 6501	Statistical Methods in Engineering
MENG 6502	Financial Management
MENG 6503	Applied Operations Research
MENG 6504	Technology & Product Development
MENG 6505	Health, Safety & The Environment
MENG 6506	Project Management for Mechanical Engineers
MENG 6508	Research Methods
MENG 6600	Final Project

The above courses build upon the foundations laid at the undergraduate level and are thus vertically integrated with the undergraduate programme.

D. RESEARCH SEMINAR - IENG 6015

This is compulsory and must be completed within three (3) (MPhil) or four (4) (PhD) Semesters of first registration.

SYLLABUSES

SEMESTER:

COURSE CODE: IENG 6000

COURSE TITLE: TOTAL QUALITY MANAGEMENT

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Principles of Quality Systems, Quality Assurance, and Total Quality Management. Company-wide planning for quality. Quality improvement tools. Basic philosophies of Deming, Juran, Crosby, Taguchi, Imai, etc., training for quality. Cost of quality systems. Quality Standards and ISO 9000 - Implementation, Certification, Auditing. Design of experiment; Taguchi approaches to robust design.

SEMESTER:

COURSE CODE: IENG 6001

COURSE TITLE: EXPERT SYSTEMS

NO. OF CREDITS: 3

PREREQUISITES: COMP 2800 OR IENG 3004

SYLLABUS: Expert systems, applications, and domains. Languages, shells, and tools. Procedural paradigms/ non-procedural paradigms. Knowledge engineering process (knowledge, acquisition, knowledge representation, inference methods, etc.). Prototyping, hardware and software support. Reasoning under uncertainty. Approximate reasoning/fuzzy sets/logic. Neural networks.

SEMESTER:

COURSE CODE: IENG 6002

COURSE TITLE: DISTRIBUTED INFORMATION SYSTEMS & DATABASES

NO. OF CREDITS: 3

PREREQUISITES: IENG 3013

SYLLABUS: Information systems in business/industry. Systems planning, requirements analysis. Systems analysis and design methods including structured methodologies. Data communications and distributed processing. Distributed database system, Management support systems.

SEMESTER:

COURSE CODE: IENG 6003

COURSE TITLE: COMPUTER INTEGRATED MANUFACTURING SYSTEM

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Overview of CIM. CIM user-computer interface. Interactive display techniques for CIM. Modelling in manufacturing design. Concurrent engineering techniques in design. Distributed processing and networks. Automated assembly. Quality control in CIM. Planning for CIM. Implementation and management of CIM systems.

SEMESTER:

COURSE CODE: IENG 6004

COURSE TITLE: OCCUPATIONAL BIOMECHANICS

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Introduction to anatomy and neurophysiology. Work physiology. Anthropometry in Occupational Biomechanics. Basic statics and dynamics and its application to the human body. Modelling in Biomechanics. Mechanical work-capacity evaluation. Measurement systems and bio-instrumentation. Electromyography. Applications to Industry.

SEMESTER:

COURSE CODE: IENG 6005

COURSE TITLE: INDUSTRIAL ERGONOMICS

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Introduction to the attributes of the human as a functioning system. The human sensory processes as human information input channels. Anthropometry and physical workspace and arrangement. Displays, controls and workplace design. Manual material handling and human strength. The working environment - atmospheric conditions; light, color, illumination; noise and vibration. Circadian rhythms, chronobiology and shift work in the workplace. Human-computer interaction.

SEMESTER:

COURSE CODE: IENG 6006

COURSE TITLE: OCCUPATIONAL SAFETY & HEALTH

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Introduction to occupational safety and health. Occupational health. Occupational safety. Ergonomics applied to occupational safety and health. Insurance. Management of occupational safety and health. Information sources and databases. Training programmes in occupational safety and health. Economics. Analytical tools. Legal aspects of occupational safety and health.

SEMESTER:

COURSE CODE: IENG 6007

COURSE TITLE: INDUSTRIAL AUTOMATION

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Introduction to control systems. Discrete models for machines and processes. Analog and discrete controllers. The B-transform. Transfer functions and block diagrams. Solution of difference equations. Stability analysis. Discrete function generation. Response of computer control systems. Final value theorem. Discrete controller design. Sampling. Feedforward and cascaded control systems. Binary logic. Architecture of computer systems. Assembly programming. Interfacing techniques. Boolean algebra. Ladder diagrams. Sequential logic design.

SEMESTER:

COURSE CODE: IENG 6009

COURSE TITLE: ROBOTIC TECHNOLOGY & APPLICATIONS

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Basic structure of robotics; classification and structure of robotic systems. Drives and control systems. Co-ordinate transformation and kinematic analysis. Trajectory planning and control. Programming. Intelligent robotic systems. Robotic applications and installations.

SEMESTER:

COURSE CODE: IENG 6010

COURSE TITLE: OPERATIONS RESEARCH IN MANUFACTURING I

NO. OF CREDITS: 3

PREREQUISITES: IENG 3013

SYLLABUS: Application of Operations Research methodology to Strategy, Planning, Scheduling, Sequencing, and distribution decisions in manufacturing organisations.

SEMESTER:

COURSE CODE: IENG 6011

COURSE TITLE: OPERATIONS RESEARCH IN MANUFACTURING II

NO. OF CREDITS: 3

PREREQUISITES: IENG 3007

SYLLABUS: Application of operations research methodology to distribution, Independent inventory, layout and handling, and Maintenance decisions in manufacturing organisations.

SEMESTER:

COURSE CODE: IENG 6012

COURSE TITLE: OPERATIONS RESEARCH IN SERVICES

NO. OF CREDITS: 3

PREREQUISITES: IENG 3007

SYLLABUS: Application of operations research methodology to strategy, facilities, logistics, and scheduling decisions in service organisations.

SEMESTER:

COURSE CODE: IENG 6013

COURSE TITLE: DIRECTED READINGS

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: A critical review of the current literature in a special topic of importance to Industrial Engineering.

SEMESTER:

COURSE CODE: MATH 3530)

COURSE TITLE: MATHEMATICS III

NO. OF CREDITS: 3

PREREQUISITES: MATH 2240

SYLLABUS: Linear algebra. Systems of equation, vector spaces, determinants, eigen values, similarity, positive definite matrices, singular value decomposition. Optimisation and mathematical programming. Calculus of variations.

SEMESTER:

COURSE CODE: MENG 6200

COURSE TITLE: PRODUCTION TECHNOLOGY

NO. OF CREDITS: 3

PREREQUISITES: MENG 2008

SYLLABUS: This course follows on from the fundamental principles of the manufacturing process and design in the undergraduate programme and emphasises the broader aspects of the production systems as opposed to the processes themselves. Topics will include welding design considerations and specifications, foundry systems, metal-forming equipment, polymer technology, machining system, automation and Computer Integrated Manufacturing.

SEMESTER:

COURSE CODE: MENG 6201

COURSE TITLE: MACHINE TOOL TECHNOLOGY

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Functional study of different types of machine tool elements such as spindles drives, bedways, bearings, tool holders, and work holding devices; effect of vibrations and methods of controlling vibrations; lubrication and cooling; acceptance test for machine tools; machine tools for newer machining techniques; large machine tool systems, numerical control of machine tools.

SEMESTER:

COURSE CODE: MENG 6202

COURSE TITLE: APPLIED MATERIALS TECHNOLOGY

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: This course follows on from the fundamental principles in the undergraduate programme and goes further into the more applied aspects of materials performance. The emphasis would be on preventive and investigative methods and would include such topics as inspection techniques, failure mechanisms and analysis.

SEMESTER:

COURSE CODE: MENG 6203

COURSE TITLE: ROBOTIC TECHNOLOGY & APPLICATIONS

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Basic structure of robots; Classification and structure of robotic systems; Drives and control systems; Co-ordinate transformation and kinematic analysis; Trajectory planning and control; Programming; Intelligent robotic systems; Robotic applications and installation. Programmable Logic Controls.

SEMESTER:

COURSE CODE: MENG 6300

COURSE TITLE: APPLIED ERGONOMICS

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Effect of heat on workers, acclimatisation; noise in industry, hearing loss, noise control; Colours in working environments; Light sources, illumination standards, brightness and contrast, visual fatigue; Levers, dials and controls; Human vibration control; Man-machine systems; Work design, hand-tool design, work-station design; Wider application of ergonomics.

SEMESTER:
COURSE CODE: MENG 6301
COURSE TITLE: COMPUTER APPLICATIONS IN MANUFACTURING
NO. OF CREDITS: 3
PREREQUISITES:

SYLLABUS: This course provides an overview of how computers are used to improve competitiveness in manufacturing enterprises. It takes a holistic viewpoint, tying together more detailed considerations of elements of the manufacturing business that are presented in other courses. Understanding how computers and especially modelling and simulation have transformed product and process development is a key theme. Another is how computer applications are used in management of production operations and support functions.

SEMESTER:
COURSE CODE: MENG 6301
COURSE TITLE: COMPUTER APPLICATIONS IN MANUFACTURING
NO. OF CREDITS: 3
PREREQUISITES:

SYLLABUS: Introduction to artificial intelligence, artificial neural networks, expert systems, fuzzy and neuro-fuzzy systems and their applications in the manufacturing and process industries.*

SEMESTER:
COURSE CODE: MENG 6302
COURSE TITLE: DESIGN OF PLANT & SERVICES
NO. OF CREDITS: 3
PREREQUISITES:

SYLLABUS: Product, process and schedule design, line balancing; Activity relationships and space requirements; Personnel requirements; Material handling including robotic and automatic-guided vehicles; Plant layout; Computer-aided plant layout; Receiving and shipping; Storage and warehousing; Office planning; Facility services - electricity, water, air-conditioning communications.

SEMESTER:
COURSE CODE: MENG 6303
COURSE TITLE: COMPUTER CONTROL SYSTEMS
NO. OF CREDITS: 3
PREREQUISITES:

SYLLABUS: Concepts of computer control; Process modelling, solution of difference equations; Stability analysis; System inputs and generating functions; System response; Discrete controller design, stability and realisability; sample period selection, feed forward control and cascade control; control computers; computer interfacing and sensors for computer control.

SEMESTER:
COURSE CODE: MENG 6400
COURSE TITLE: PRODUCTION PLANNING & CONTROL
NO. OF CREDITS: 3
PREREQUISITES:

SYLLABUS: Computer-controlled production and inventory systems; Computer-aided process planning techniques; Database configuration and techniques for forecasting and implementation of aggregate plans; Groups Technology for planning and control; Manufacturing Automation Protocol at the Shop Floor; Computer-controlled scheduling and sequencing techniques; Computerised costing systems.

SEMESTER:
COURSE CODE: MENG 6401
COURSE TITLE: ADVANCED PRODUCTION MANAGEMENT
NO. OF CREDITS: 3
PREREQUISITES: IENG 3006 FOR THE PROJECT MANAGEMENT COURSE ONLY

SYLLABUS: Designing, managing and improving operations in competitive environments; Supply chain management/logistics in operations; Management of the global business/operations environment; Managing technology and innovation for competitive advantage.

SEMESTER:
COURSE CODE: MENG 6402
COURSE TITLE: HUMAN RESOURCE MANAGEMENT I
NO. OF CREDITS: 3
PREREQUISITES:

SYLLABUS: Formal and informal organisation; The bureaucratic model; The organisational environment; Modern organisation theory; The individual in the organisation; SKAO; Theories of motivation and leadership industrial relations; IRA, RSBA; Communication in organisations; Performance appraisal systems.

SEMESTER:
COURSE CODE: MENG 6403
COURSE TITLE: HUMAN RESOURCE MANAGEMENT II
NO. OF CREDITS: 3
PREREQUISITES:

SYLLABUS: External staffing; Internal staffing; Base wage and salary systems; Training and development; Job evaluation systems; HRM planning; OD and change; Occupational health and safety; Future issues.

SEMESTER:
COURSE CODE: MENG 6404
COURSE TITLE: MAINTENANCE ENGINEERING & MANAGEMENT
NO. OF CREDITS: 3
PREREQUISITES:

SYLLABUS: Objectives and policies of maintenance; Reliability, availability, and maintainability; Failure statistics and analysis. Terotechnology and life cycle costing; Preventive maintenance: Condition-based and scheduled maintenance; Corrective maintenance and overhauls; Plant turnarounds; Work-planning and control; Performance and productivity analysis; Quantitative technique; Computer in maintenance.

SEMESTER:

COURSE CODE: MENG 6405

COURSE TITLE: TOTAL QUALITY MANAGEMENT

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Philosophy and principles of total quality management; Customer satisfaction; Quality systems; Quality tools; Continuous improvement; Employee involvement and empowerment; Supplier partnerships; Benchmarking; Quality function deployment; Statistical process control; Taguchi's quality engineering; Experimental design.

SEMESTER:

COURSE CODE: MENG 6500

COURSE TITLE: INDUSTRIAL MARKETING

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Nature and scope of marketing; Characteristics of industrial marketing; Organisational buyer behaviour; Industrial marketing research; Industrial marketing planning; Product planning, industrial innovation and new product strategies; Choice of channels and physical distribution; Price determination; Industrial advertising and sales promotion; Personal selling; Marketing audit, cost analysis and controls.

SEMESTER:

COURSE CODE: MENG 6501

COURSE TITLE: STATISTICAL METHODS IN ENGINEERING

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Probability distributions; Estimation and hypothesis testing; Correlation and regression analysis of variance; Experimental design; Multivariate statistics.

SEMESTER:

COURSE CODE: MENG 6502

COURSE TITLE: FINANCIAL MANAGEMENT

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Analysis of financial statements; Financial forecasting and planning; Risk, return and valuation; Capital budgeting; Financial structure and leverage; Cost of capital; Financing mix decisions; Current asset management: Cash, marketable securities, accounts receivables, inventory and short-term financing; Long-term financing; Common stock, debt, preferred stock, term loans, and leasing; Dividend policy.

SEMESTER:

COURSE CODE: MENG 6503

COURSE TITLE: APPLIED OPERATIONS RESEARCH

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Modelling and optimisation of large scale systems; Linear and non-linear models, stochastic models, multi-criteria models; Use of computer software packages; Decision support systems.

SEMESTER:

COURSE CODE: MENG 6504

COURSE TITLE: TECHNOLOGY & PRODUCT DEVELOPMENT

NO. OF CREDITS: 3

PREREQUISITES: MENG 3013

SYLLABUS: Relationship between technology transfers, technological change and economic development. Technology diffusion and innovation industry; Technology selection and capacity planning; Design axioms and corollaries; Features in design and manufacturing; Management of product development; Strategic approval; Integration of expert systems; Databases and CAD; Neural networks in design of products.

SEMESTER:

COURSE CODE: MENG 6505

COURSE TITLE: HEALTH, SAFETY & THE ENVIRONMENT

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Hazards associated with manual work, machinery, mechanical systems, construction and other common industrial scenarios; Safety technology and engineering controls; Electricity and fire; Principles of industrial hygiene; Occupational health hazards; Personal Protective Equipment; Ergonomics; Welfare issues - the working environment; Risk assessment and hazard analysis; Job safety analysis; Safe systems of work, including permit to work systems; Inspection techniques; Accidents: causation, investigation, reporting and costs; Communication; Motivation and training; Psychological factors in safe behaviour; Safety and health legislation (in Trinidad and Tobago, and key legislation in the UK and USA).

SEMESTER:

COURSE CODE: MENG 6506

COURSE TITLE: PROJECT MANAGEMENT

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Project identification in context of investment programme at national and sectorial level; Pre-investment studies; Detailed project preparation, development and evaluational project organisation; Project analysis and evaluation (technical, economics, financial, social and environmental). Project implementation (procurement/contracts programming and control); ex-post evaluation.

SEMESTER:

COURSE CODE: MENG 6508

COURSE TITLE: RESEARCH METHODS

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Introduction to research methods. Research process from conceptualisation to analysis and conclusions. The use of constructs. Operationalisation of constructs. Measurement. instruments - design, testing and administration. Data collection. Data coding and encoding. Data entry and verification. Hypothesis testing. Data analysis. Model building. Drawing conclusions from data analysis. Report writing and presentation of results. References and searches.

MSC PROGRAMMES IN PRODUCTION ENGINEERING & MANAGEMENT, PRODUCTION MANAGEMENT, & ENGINEERING MANAGEMENT

MSc in Production Engineering & Management

MSc in Production Management

MSc in Engineering Management

All taught MSc programmes in the Department of Mechanical and Manufacturing Engineering are accredited to CEng (Chartered Engineer) level by the Institution of the Mechanical Engineers (UK). Therefore these programmes satisfy fully the engineering education requirements for Chartered Engineer at (CEng) level 2.

The Aims and Objectives

- a) To provide advanced education and training for graduates in Engineering, Science and related areas to meet current and future needs of manufacturing and allied industries.

Three areas of specialisation are identified to enable students to pursue a course of study closely related to the needs of their organisations and their personal career advancement:

i. **MSc in Production Engineering & Management**

- a) To provide graduates in Mechanical and Industrial Engineering with an in-depth understanding of the technical, economic and managerial factors and their integration in the specification, design and operation of manufacturing systems.

Output: A competent Production Engineer capable of combining technical and managerial functions.

ii. **MSc in Production Management**

- a) To provide graduates in Engineering and Science with a thorough understanding of the analysis, planning and control of production systems.

Output: A competent Production Manager capable of profitable operations of manufacturing enterprises.

iii. **MSc in Engineering Management**

- a) To enable graduates in Engineering and Science to strengthen and enhance their managerial capabilities.

Output: A competent Engineering Manager capable of effective management of engineering functions and services.

Regulations

1. The General Regulations of the University and Faculty of Engineering Regulations for MSc Degrees shall apply.
2. Candidates are required to pass both coursework and written examinations in each course offered.
3. In respect of each candidate who fails the examination in any course, the Examiners shall recommend to the Board for Graduate Studies whether a second attempt at the examination should be permitted.
4. A full-time candidate who fails not more than two (2) courses in a semester may be allowed a second attempt at the examinations in those courses.
5. A part-time candidate who fails not more than one (1) course in a semester may be allowed a second attempt at the examination in that course.
6. Candidates will not normally be permitted to repeat the examination of any one (1) course on more than one subsequent occasion.

Entry Requirements

The requirements for admission to the Programme are as follows:

- i. **MSc in Production Engineering & Management:**
A BSc Degree in Mechanical, Industrial or Production Engineering or an equivalent.

MSc in Production Management:

BSc Degree in Engineering or Science or an equivalent. Candidates with other qualifications will be considered if they have at least ten (10) years industrial experience in the area of Production Management. Qualifying examinations may also be prescribed for such candidates.

MSc in Engineering Management:

BSc in Engineering or Science or an equivalent. Candidates with other qualifications will be considered if they have at least ten (10) years industrial experience in the area of Engineering Management. Qualifying examinations may also be prescribed for such candidates.

- ii. Normally, at least one (1) year of industrial experience is desirable.

STRUCTURE OF PROGRAMME

Duration of Study

Part-time students: Normally expected to complete the examination requirements within four (4) semesters and complete the Project in accordance with the relevant University Regulations.

Full-time students: Normally expected to complete the examination requirements within two (2) semesters and complete the Project in accordance with the relevant University Regulations.

The Programme consists of a set of courses grouped under four (4) major Subject Groups and a Final Project. Each course is taught over one (1) semester and carries three (3) credits and the Final Project carries nine (9) credits. MENG 6508 Research Methods is a compulsory course for all MSc programmes in the Department.

COURSE LISTING

A. Production Technology and Materials

Course Code	Course Title
MENG 6200	Production Technology MENG 2008*
MENG 6201	Machine Tool Technology
MENG 6202	Applied Materials Technology MENG 3015
MENG 6203	Robotic Technology & Applications

B. Production Systems Design

Course Code	Course Title
MENG 6300	Applied Ergonomics
MENG 6301	Computer Applications in Manufacturing
MENG 6302	Design of Plant & Services
MENG 6303	Computer Control Systems

C. Production Management & Control

Course Code	Course Title
MENG 6400	Production Planning & Control
MENG 6401	Advanced Production Management MENG 3006
MENG 6402	Human Resource Management I
MENG 6403	Human Resource Management II
MENG 6404	Maintenance Engineering & Management
MENG 6405	Total Quality Management

D. Engineering Management & Optimisation

Course Code	Course Title
MENG 6500	Industrial Marketing
MENG 6501	Statistical Methods in Engineering
MENG 6502	Financial Management
MENG 6503	Applied Operations Research
MENG 6504	Technology & Product Development (MENG 3013)
MENG 6505	Health, Safety & The Environment
MENG 6506	Project Management
MENG 6600	Final Project
MENG 6508	Research Methods

In addition, undergraduate options, not more than the equivalent of nine (9) credits, may be taken from the following list in each of the subject groups:-

Group A

Course Code	Course Title
MENG 2008	Manufacturing Technology
MENG 3014	Computer-aided Design & Manufacture
MENG 3015	Materials Technology

Group B

Course Code	Course Title
IENG 2000	Work Study & Ergonomics
IENG 3004	Control Systems Technology
IENG 3006	Automation

Group C

Course Code	Course Title
MENG 3006	Production Management

Group D

Course Code	Course Title
IENG 2002	Operations Research I
IENG 3007	Operations Research II
IENG 3008	Simulation

OTHER INFORMATION

Requirements for Award of MSc

Candidates are required to obtain a total of 36 credits, as given below, in coursework and complete an industry-oriented project, MENG 6600, equivalent to nine (9) credits.

- i. **MSc in Production Engineering & Management:**
18 credits from Subject Groups A and B and 18 credits from Subject Groups C and D.
- ii. **MSc in Production Management:**
24 credits from Subject Groups B and C and 12 credits from Subject Group D.
- iii. **MSc in Engineering Management:**
12 credits from Subject Groups A and B, and 24 credits from Subject Groups C and D.

Research Methods (MENG6508) if chosen should replace one of the optional courses. Selection of courses is subject to the approval of the Department.

Who Should Enrol?

The Programmes would be most useful to Engineers and Managers holding responsibilities for Planning, Design and Development, Production/Operations, Plant Maintenance, and Projects in Manufacturing and Service Industries.

Graduates in Engineering or Science wishing to pursue careers in Production/Operations Management may also apply.

MSC IN ENGINEERING ASSET MANAGEMENT

THE AIMS AND OBJECTIVES

1. The purpose of the programme is to provide industry with competent engineers capable of the acquisition, operation/maintenance, and disposition of the physical assets of the organisations.

On completion of the Programme, participants will be able to:

- Competently discuss the strategic role of physical assets in creating and sustaining a competitive edge
- Formulate maintenance objectives to support corporate objectives and strategies
- Develop maintenance plans and programs to achieve maintenance objectives
- Prepare and implement annual budgetary control systems
- Select and implement effective maintenance technologies
- Design organisational structures, processes, and procedures for managing physical assets
- Develop work systems to achieve effective use of human resources for managing physical assets
- Plan and schedule maintenance work to optimise resources
- Develop measurement and reporting systems for assessment of performance of assets and operations
- Formulate and execute long and medium term plans for improvement in asset performance
- Apply analytical and optimisation models to support decision making
- Plan and control major plant overhauls and turnarounds
- Select and use Computerised Maintenance Management Systems effectively and
- Improve asset reliability and maintainability on a continuous basis

REGULATIONS

1. The General Regulations of the University and Faculty of Engineering Regulations for MSc Degrees shall apply.
2. Candidates are required to pass both coursework and written examinations in each course offered.
3. In respect of each candidate who fails the examination in any course, the Examiners shall recommend to the Board for Graduate Studies whether a second attempt at the examination should be permitted.
4. A full-time candidate who fails not more than two (2) courses in a semester may be allowed a second attempt at the examinations in those courses.
5. A part-time candidate who fails not more than one (1) course in a semester may be allowed a second attempt at the examination in that course.
6. Candidates will not normally be permitted to repeat the examination of any one (1) course on more than one subsequent occasion.

Entry Requirements

The requirements for admission to the Programme are as follows:-

- a. BSc in Engineering or Science or an equivalent. Candidates with other qualifications will be considered if they have at least ten (10) years industrial experience in the area of Engineering Asset Management. Qualifying examinations may also be prescribed for such candidates.
- b. Normally, at least one (1) year of industrial experience is desirable. This may be waived in cases of high class of first degree from a recognised institution (i.e. first or upper second class honours).

Structure of Programme OFFERED PART-TIME AND FULL-TIME.

Duration of Study

Part-time students: Normally expected to complete the examination requirements within four (4) semesters and complete the Project in accordance with the relevant University Regulations.

Full-time students: Normally expected to complete the examination requirements within two (2) semesters and complete the Project in accordance with the relevant University Regulations.

The Programme consists of twelve (12) courses and a Final Project. Each course is taught over one (1) semester and carries three (3) credits and the Final Project carries nine (9) credits. MENG 6508 Research Methods is a compulsory course for all MSc programmes in the department.

COURSE LISTING

The structure and the courses for each type will consist of the following courses:

A. FULL-TIME PROGRAMME STRUCTURE: CORE COURSES

Semester 1

Course Code	Course Title
MENG 6700	Strategic Asset Management
MENG 6701	Asset Maintenance Technologies
MENG 6705	Maintainability Engineering & Management

Semester 2

Course Code	Course Title
MENG 6702	Work Planning and Scheduling
MENG 6703	Condition Monitoring and Diagnostics
MENG 6704	Maintenance Analysis and Optimisation
MENG 6706	Asset Reliability Management
MENG 6508	Research Methods

OPTIONAL COURSES

Semester 1

Course Code	Course Title
MENG 6505	Health, Safety and the Environment
MENG 6708	Reliability Centered Maintenance
MENG 6506	Project Management

Semester 2

Course Code	Course Title
MENG 6707	Asset Performance Management
MENG 6405	Total Quality Management

Course Code	Course Title
MENG 6600	Final Project (On successful completion of 12 courses)

B. PART-TIME PROGRAMME STRUCTURE:

CORE COURSES

Year 1

Semester 1

Course Code	Course Title
MENG 6700	Strategic Asset Management
MENG 6701	Asset Maintenance Technologies
MENG 6402	Human Resource Management I

Semester 2

Course Code	Course Title
MENG 6702	Work Planning and Scheduling
MENG 6703	Condition Monitoring and Diagnostics
MENG 6706	Asset Reliability Management

Year 2

Semester 1

Course Code	Course Title
MENG 6705	Maintainability Engineering and Management

Semester 2

Course Code	Course Title
MENG 6704	Maintenance Analysis and Optimisation
MENG 6508	Research Methods

OPTIONAL COURSES

Year 2

Semester 1

Course Code	Course Title
MENG 6505	Health, Safety and the Environment
MENG 6506	Project Management
MENG 6708	Reliability Centered Maintenance

Year 2

Semester 2

Course Code	Course Title
MENG 6707	Asset Performance Management
MENG 6405	Total Quality Management

Course Code	Course Title
MENG 6600	Final Project (On successful completion of 12 courses)

OTHER INFORMATION

Requirements for Award of MSc

Candidates are required to obtain a total of 36 credits, as given in the part-time and full-time programme structure and courses above, in coursework and complete an industry-oriented project, MENG 6600, equivalent to nine (9) credits.

Who Should Enrol?

The Programmes would be most useful to Engineers and Managers holding responsibilities for Asset Management, Plant and Project maintenance, Reliability and Operational Efficiency and Projects in Engineering, Manufacturing and Service Industries.

Graduates in Engineering or Science wishing to pursue careers in Engineering Asset Management may also apply.

MSC IN MANUFACTURING ENGINEERING (MFGE)

The Aims and Objectives

- i) To provide students with greater depth of technical knowledge in manufacturing and greater breadth and options in related areas;
- ii) To develop an understanding of manufacturing systems, modelling and simulation.
- iii) To provide a deeper understanding of the knowledge required for designing products, tools and manufacturing systems in a concurrent engineering perspective;
- iv) To synthesise and apply the knowledge and techniques in the taught courses in project work; and
- v) To develop an understanding of the multi-disciplinary nature of manufacturing through group design projects that provide experience in team-based business and design projects.

Regulations and Entry Requirements

- A) The General Regulations of the University, the Faculty of Engineering and the Department of Mechanical and Manufacturing Engineering for MSc Degrees shall apply.
- B) The requirements for admission to the programme are as follows:
 - 1) UWI graduates with:
 - i) BSc (Eng) in Mechanical Engineering
 - ii) BSc (Eng) in Industrial Engineering, and
 - iii) BSc (Eng) Mechanical Engineering with a Minor in Biosystems
 - 2) Graduates with a BSc Degree in Mechanical, Industrial, Manufacturing or Production Engineering or equivalent from recognised universities or institutes of higher education.
 - 3) Only in exceptional circumstances will candidates with Pass Degrees be considered.

Structure of Programme

Offered part-time and full-time

Duration of Study

Part-time students: Minimum of two (2) years
Full-time students: One-year (3 semesters)

No. of Credits Required: 45

	No. of Credits
Seven (7) Compulsory Courses	21
Five (5) Optional Courses	15
Final Project	9

Other information

The programme consists of a set of seven (7) compulsory courses and five (5) optional courses and a final project. All courses are of three (3) credits unless otherwise specified.

The programme stresses university-industry linkages. Student projects will normally be provided and sponsored by companies in which a joint advisory committee of Faculty members and corporate personnel will provide guidance.

COURSE LISTING

COMPULSORY COURSES:

Course Code	Course Title
MENG 6207	Computer Integrated Manufacturing
MENG 6208	Product Tool & Manufacturing Analysis
MENG 6505	Health, Safety & The Environment
MENG 6507	Entrepreneurship & Innovation
MENG 6508	Research Methods
MENG 6603	Group Project
ENGR 6701	Management & Leadership
MENG 6600	Final Project

One (1) course to be chosen from the following:

Course Code	Course Title
MENG 6402	Human Resource Management I
MENG 6506	Project Management

Two (2) courses to be chosen from the following:

Course Code	Course Title
MENG 6204	Advanced Machining Methods & Analysis
MENG 6205	Advanced Forming Methods & Analysis
MENG 6206	Plastics Processing
MENG 6504	Technology & Product Development
MENG 6304	Advanced Manufacturing Systems

One (1) course to be chosen from the following:

Course Code	Course Title
MENG 6200	Production Technology
MENG 6202	Applied Materials Technology
MENG 6203	Robotic Technology & Applications
MENG 6401	Advanced Production Management
MENG 6405	Total Quality Management

One course from the following:

Production Engineering and Management Programme courses
OR Production Management Programme Courses
OR Engineering Management Programme Courses

SYLLABUSES

SEMESTER:

COURSE CODE: ENGR 6701

COURSE TITLE: MANAGEMENT & LEADERSHIP

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Leadership and Team-Building; Decision Making, Communication and Presentation; Motivation and People Management; Time and Project Management; Business Processes; New Venture Development; Supply Chain Management; other related areas.

SEMESTER:

COURSE CODE: MENG 6200

COURSE TITLE: PRODUCTION TECHNOLOGY

NO. OF CREDITS: 3

PREREQUISITES: MENG 2008

SYLLABUS: This course follows on from the fundamental principles of the manufacturing process and design in the undergraduate programme and emphasises the broader aspects of the production systems as opposed to the processes themselves. Topics will include welding design considerations and specifications, foundry systems, metal-forming equipment, polymer technology, machining system, automation and Computer Integrated Manufacturing.

SEMESTER:

COURSE CODE: MENG 6202

COURSE TITLE: APPLIED MATERIALS TECHNOLOGY

NO. OF CREDITS: 3

PREREQUISITES: MENG 3015

SYLLABUS: This course follows from the fundamental principles of materials technology and goes further into the more applied aspects of materials performance. The emphasis would be on preventive and investigative methods and would include such topics as inspection and analytical techniques, failure mechanisms and analysis.

SEMESTER:

COURSE CODE: MENG 6203

COURSE TITLE: ROBOTIC TECHNOLOGY & APPLICATIONS

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Basic structure of robots; Classification and structure of robotic systems; Drives and control systems; Co-ordinate transformation and kinematics analysis; Trajectory planning and control; Programming; Intelligent robotic systems; Robotic applications and installation; Programmable Logic Controls.

SEMESTER:

COURSE CODE: MENG 6204

COURSE TITLE: ADVANCED MACHINING METHODS & ANALYSIS;

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Overview of methods and systems for material removal; Machining methods employing tools of defined geometry; Mechanics of orthogonal and oblique cutting; Nature of contact between chip and tool; Thermal aspects; Tool wear and Tool life; Machinability; Cutting fluids; Analysis of turning, drilling and milling processes; Abrasive machining processes; Developments in non-traditional machining methods; Economics of machining.

SEMESTER:

COURSE CODE: MENG 6205

COURSE TITLE: ADVANCED FORMING METHODS & ANALYSIS

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Stress and strain analysis; Yield conditions; Stress-strain relations in elastic and plastic deformations; Workhardening; Formulation of elastic and plastic problems; Methods of solution: Slab method; Slip-line fields and extremum principles; Applications of theory of plasticity to metal-working operations viz: wire drawing, extrusion, rolling, forging, deep drawing, spinning, etc; Friction in metal-forming; Recent developments in technology and theory of metal-forming.

SEMESTER:

COURSE CODE: MENG 6206

COURSE TITLE: PLASTICS PROCESSING

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Properties and applications of common and engineering plastics; Manufacturing methods for products of thermosetting and thermoplastic polymers; Design for production and development of tooling for Extrusion, Injection moulding; Thermoforming; Calendring; Rotational moulding; Compression moulding; Transfer moulding; Blow moulding; Film blowing; Analysis of polymer melt-flow; Processing of reinforced plastics.

SEMESTER:

COURSE CODE: MENG 6207

COURSE TITLE: COMPUTER INTERGRATED MANUFACTURING

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Introduction to CIM; Role of the computer in manufacturing; Hardware and software components of computer automation; Advanced computer architectures used in manufacturing; Computer Aided Design (CAD); Computer Aided Manufacturing (CAM); Linking CAD with CAM; Control of manufacturing equipment; Computer controlled parts handling and assembly; Simulation of manufacturing processes; Quality in CIM perspective; Programmable factory.

SEMESTER:

COURSE CODE: MENG 6208

COURSE TITLE: PRODUCT TOOL & MANUFACTURING ENGINEERING

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Product domain/process domain; Product design/product quality; Process flow chart; Sheet metal forming design considerations; Metal cast parts design; Plastic component design; Wood products design; Design for assembly; Finishes; Detailed tool, dye and mould design; Equipment selection; Manufacturing support systems.

SEMESTER:

COURSE CODE: MENG 6304

COURSE TITLE: ADVANCED MANUFACTURING SYSTEMS

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Flexible manufacturing concepts: Planning and Control of FMS; Cellular manufacturing; Case studies in flexible manufacturing; Global strategy issues: Structuring international capacity; strategic management of advanced integrated manufacturing technologies; Methods and tools for agile manufacturing; Manufacturing strategy for globally competitive market evaluation, selection and adoption of AMS: Decision support system for evaluating and selecting projects incorporating strategic business objectives; Planning and justification of advanced manufacturing technologies; Implementation issues; Practices for implementing concurrent engineering; Simulation for cellular layouts; Internet for manufacturing managers and researchers.

SEMESTER:

COURSE CODE: MENG 6305

COURSE TITLE: FINITE ELEMENT ANALYSIS IN MANUFACTURING

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Introduction to Finite Element Analysis (FEA). Material properties. Truss and beam elements. Two-dimensional brick elements. Combining elements. Static linear analysis, modal analysis and buckling. Verification of accuracy of results. Introduction to non-linear analysis. Application to manufacturing problems.

SEMESTER:

COURSE CODE: MENG 6401

COURSE TITLE: ADVANCED PRODUCTION MANAGEMENT

NO. OF CREDITS: 3

PREREQUISITES: MENG 3006

SYLLABUS: Designing, managing and improving operations in competitive environments by focusing on key elements: Quality, productivity and technology; Supply chain management/logistics in operations; Management of the global business/operations environment; Integrated flow of funds, data and materials; Industrial ecology process and product audits, EIA and ISO 14000; Management and the legal environment.

SEMESTER:

COURSE CODE: MENG 6402

COURSE TITLE: HUMAN RESOURCE MANAGEMENT I

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Formal and informal organisations; The bureaucratic model; The organisational environment; Modern organisation theory; The individual in the organisation; SKAO; Theories of motivation and leadership; Industrial relations; IRA, RSBA; Communication in organisations; Performance appraisal systems.

SEMESTER:

COURSE CODE: MENG 6405

COURSE TITLE: TOTAL QUALITY MANAGEMENT

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Philosophies and principles of total quality management; Customer satisfaction; Quality systems; Quality tools; Continuous improvement; Employee involvement and empowerment; Supplier partnerships; Benchmarking; Quality function deployment; Statistical process control; Taguchii's quality engineering; Experimental design.

SEMESTER:

COURSE CODE: MENG 6504

COURSE TITLE: TECHNOLOGY & PRODUCT DEVELOPMENT

NO. OF CREDITS: 3

PREREQUISITES: MENG 3013

SYLLABUS: Relationship between technology transfers, technological change and economic development. Technology diffusion and innovation industry; Technology selection and capacity planning; Design axioms and corollaries; Features in design and manufacturing; Management of product development; Strategic approval; Integration of expert systems; Databases and CAD; Neural networks in design of products.

SEMESTER:

COURSE CODE: MENG 6505

COURSE TITLE: HEALTH, SAFETY & THE ENVIRONMENT

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Hazards associated with manual work, machinery, mechanical systems, construction and other common industrial scenarios; Safety technology and engineering controls; Electricity and fire; Principles of industrial hygiene; Occupational health hazards; Personal Protective Equipment; Ergonomics; Welfare issues - the working environment; Risk assessment and hazard analysis; Job safety analysis; Safe systems of work, including permit to work systems; Inspection techniques; Accidents: causation, investigation, reporting and costs; Communication; Motivation and training; Psychological factors in safe behaviour; Safety and health legislation (in Trinidad and Tobago, and key legislation in the UK and USA).

SEMESTER:

COURSE CODE: MENG 6506

COURSE TITLE: PROJECT MANAGEMENT

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Project identification in the context of investment programmes at national and sectoral levels; Pre-investment studies; Project management, development and evaluation; Project organisation; Project analysis and evaluation (market, technical, economic, financial, social and environmental); Project implementation (procurement/contracts programming and control); Export evaluation.

SEMESTER:

COURSE CODE: MENG 6507

COURSE TITLE: ENTREPRENEURSHIP & INNOVATION

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Entrepreneurship (Theory and Practice); Entrepreneurship in small businesses; Entrepreneurial ventures; Creative design and innovation; Patterns of creativity and innovation (Ideas to Product to Market); Design, marketing and the consumers; Diffusion and transfer of technology and innovation; Strategic planning (Business Planning and New Ventures).

SEMESTER:

COURSE CODE: MENG 6508

COURSE TITLE: RESEARCH METHODS

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Introduction to research methods. Research process from conceptualization to analysis and conclusions. The use of constructs. Operationalisation of constructs. Measurement. Instruments – design, testing and administration. Data collection. Data coding and encoding. Data entry and verification. Hypothesis testing. Data analysis. Model building. Drawing conclusions from data analysis. Report writing and presentation of results. References and searches.

COURSE CODE: MENG 6603

COURSE TITLE: GROUP PROJECT

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Investigation of an industrial problem with the guidance of academic and industry-based supervisors. This could be a feasibility study, or the design of a product, together with the design or selection of relevant equipment and tooling, the appropriate manufacturing process(es), plant layout, materials handling, inspection procedures, and production, inventory and material requirements planning or system design/review for productivity and quality improvement or other similar assignment approved by the course leader/coordinator of the programme.

CORE COURSES

YEAR: 1

SEMESTER: 1

COURSE CODE: MENG 6700

COURSE TITLE: STRATEGIC ASSET MANAGEMENT

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Historical development of maintenance practices. Strategic characteristics of physical assets. Business Plans. Operations Strategy and Plans. Maintenance Objectives and Goals. Maintenance Strategies and Tactics. Maintenance Organisation and Staffing. Outsourcing Maintenance. Quality and Maintenance. Asset Strategy and Acquisitions. Life Cycle Costing. Measurement of Performance. Data Collection and Reporting Systems

YEAR: 1

SEMESTER: 1

COURSE CODE: MENG 6701

COURSE TITLE: ASSET MAINTENANCE TECHNOLOGIES

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Preventive and Corrective Maintenance. Condition based Maintenance. Predictive Maintenance. Cost, benefits and implementation guidelines. RCM: Concepts and processes; Introduction and implementation issues. TPM: Concepts and processes. Introduction and implementation issues. CMMS: Features and benefits; Systems specification, sourcing and implementation issues.

YEAR: 1

SEMESTER: 2

COURSE CODE: MENG 6702

COURSE TITLE: WORK PLANNING AND SCHEDULING

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Maintenance Plans and Programs. Job Planning. Work Order Systems. Work Measurement. Maintenance Resource Planning. Quality Assurance. Work Scheduling, Monitoring and Control. Backlog Control. Budget Preparation and Control. Inventory Control Systems. Inventory usage analysis and control. Shutdowns and Overhauls: Planning; Estimating and Budgeting; Scheduling, Feedback and Control

YEAR: 1

SEMESTER: 2

COURSE CODE: MENG 6703

COURSE TITLE: CONDITION MONITORING AND DIAGNOSTICS

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Predictive Maintenance: Condition Monitoring Techniques. Selection, Justification, and Applications. Vibration Basics. Vibration Analysis Techniques Lubricating Oil Analysis. Wear Debris Analysis. Thermography Process Parameters. Ultrasonics. Visual Inspection Selection and Implementation of System Optimisation and Control of Programme.

YEAR: 1

SEMESTER: 2

COURSE CODE: MENG 6704

COURSE TITLE: MAINTENANCE ANALYSIS AND OPTIMISATION

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Component Replacement Decisions: Individual Replacement Policies; Group Replacement Policies Inspection Decisions to Maximise Profits Inspection Decisions to Maximise Availability . Equipment Replacement for Minimisation of Cost. Equipment Replacement for Maximisation of Discounted Benefits Optimum Number of Machines to Meet Service Demand Optimum Crew Size to Meet Service Demand

YEAR: 2

SEMESTER: 1

COURSE CODE: MENG 6705

COURSE TITLE: MAINTAINABILITY ENGINEERING AND MANAGEMENT

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Maintainability Functions and Measures. Maintainability Tools. Availability. Maintainability Design Characteristics. Maintainability Design for Human Factors and Safety. Maintainability Prediction and Demonstration.

YEAR: 2

SEMESTER: 2

COURSE CODE: MENG 6706

COURSE TITLE: ASSET RELIABILITY MANAGEMENT

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Reliability of components and systems. Reliability Modeling and Prediction Failure Mode Effects and Criticality Analysis. Fault Tree Analysis. Design for Reliability Reliability Data Collection and Analysis. Reliability Testing and Demonstration. Root Cause Failure Analysis. Reliability Improvement

OPTIONAL COURSES

YEAR: 2

SEMESTER: 2

COURSE CODE: MENG 6707

COURSE TITLE: ASSET PERFORMANCE MANAGEMENT

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Maintenance Scorecard: Strategy Level Functional Level Implementation. Benchmarking Fundamentals. Benchmarking Best Practices. Maintenance Improvement Plans. Corrective Action and Continuous Improvement

YEAR: 1

SEMESTER: 1

COURSE CODE: MENG 6708

COURSE TITLE: RELIABILITY CENTERED MAINTENANCE

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Developments in RCM. RCM Process: Equipment Functions, Standards, and Failures. Maintenance Tasks. Maintenance Plans and Schedules. Implementation Plans.. Review and Control.

DEPARTMENT OF SURVEYING & LAND INFORMATION

RESEARCH

The Department has eight academic staff members involved with three taught postgraduate programmes in addition to MPhil and PhD research degrees. The taught programmes are MSc Geoinformatics, M.Sc. Urban and Regional Planning and Graduate Diploma in Land Administration.

The Department's research expertise is established in the ability to understand, capture and visualise the spatio-temporal phenomena and processes to provide reliable management options for decision-makers to achieve sustainable development.

These objectives are achieved by using surveying, mapping, monitoring, modelling and spatial analysis tools and techniques. Cutting edge technology is being utilised in the research such as global positioning systems, satellite remote sensing and GIS. The other side of the approach is in the field of physical planning and development associated with policy planning, strategic and development planning, coastal zone planning and development control.

Priority areas and new themes of research have been identified and are being pursued. The research focus extends to areas covering geomatics, geodesy, land administration, spatial analysis, geoinformatics, spatial and settlements planning, the environment and ecosystems. The following are some topics of immediate concern:

- Multidisciplinary approach to mapping, monitoring, and modelling and land use/cover dynamics for the sustainable management of the environment and natural resources.
- Development of computational and algorithmic aspects of image processing for the extraction of spatial information from aerial and satellite Imagery and Lidar
- Coastal zone management, developing plans for coastal zones, coastal erosion and modelling coastal changes for sustainable development.
- Comparative analysis of planning statutes and administrative structures in the Caribbean.
- Design for sustainable development of urban and other settlement areas, environmental planning and policy planning.
- Urban structure and urban form in the Caribbean.
- Community and participatory planning.
- Non-structural measures for hazard mitigation.
- Formulation and definition of national datums.
- Geohazards; flooding and landslides, developing plans for areas exposed to natural and man-made hazards.
- Global climate change, climate change and food security, sea level change.
- Land tenure rights and practices including family land in specific jurisdictions.
- Quality assurance of spatial data and other land-related information, development of standards for spatial data exchanges.
- Relevant theory and methodology for Caribbean Planning and Resource Management.

Resources for research include automated field and GPS data recording and computation systems, photogrammetric and satellite images processing and analysis tools, GIS and mapping hardware and software, in addition to state-of-the-art computing and digital services facilities.

MPHIL/PHD DEGREES IN SURVEYING & LAND INFORMATION

It is possible to read for the MPhil and PhD in Surveying & Land Information in one of the surveying specialisations, Planning & Development and Geoinformatics.

Regulations

MPhil in Surveying & Land Information

The Regulations for the MPhil in Surveying & Land Information are the same as the General Regulations for the MPhil, except that candidates applying for registration should normally have either:

- a. A Bachelor's degree with Second Class Honours in Surveying & Land Information;
or
- b. An equivalent qualification suited to the fields of Urban & Regional Planning or Geoinformatics.

PHD IN SURVEYING & LAND INFORMATION

The Regulations for the PhD in Surveying and Land Information are the same as the University and Faculty of Engineering regulations for the Degree of Doctor of Philosophy except that candidates applying should normally have either:

- a. An MPhil Degree in Surveying and Land Information of The University of the West Indies
or
- b. A Master's Degree by Research in Urban & Regional Planning or Geoinformatics of an approved University.

PGDIP/MSC IN URBAN & REGIONAL PLANNING

Introduction

The MSC Urban and Regional Planning Programme is driven by the need to produce a cadre of planning professionals with a tailored education and training in Caribbean planning issues, which are distinct from other regions of the world by virtue of population dynamics, economic evolution, social problems and unique physical environment. The programme focuses on the evolution of theoretical perspectives on planning, especially with a developing country planning epistemology, it aims to equip the graduate with the knowledge associated with policy planning, strategic and development planning, physical planning and design, as well as development control in areas of development relevant to the Caribbean region.

The Aims and Objectives

Aims

- a. To provide general and specialised knowledge in the field of physical planning with respect to theory, methodology, analysis and applications.
- b. To equip the graduate with the knowledge for a profession in the field of urban and regional planning, associated with policy planning, strategic and development planning, physical planning and urban design, coastal zone planning, environmental planning, as well as development control.
- c. To produce a graduate capable of developing appropriate plans for communities and settlements, open areas, coastal zones, protected areas, areas exposed to natural and man-made hazards, and other areas where development occurs, or areas which are subjected to protection, conservation, or any other special treatment.
- d. To produce a graduate capable of managing the implementation and monitoring of policies and plans.

Objectives

- i. The core courses are intended to fulfil the following objectives:
 - To provide students with full understanding of planning as a discipline, the philosophical basis of planning, and the major theoretical and analytic developments in the field.
 - To cover the methods and procedures for making plans for physical development, be it for the public or private sector, at the national, regional, local or site level.
 - To equip students with a reflective and insightful understanding of the social and environmental conditions of human settlements and spatial development and change.
 - To equip students with an understanding and knowledge of implementing policies, strategic and development plans, physical and urban design plans, as well as development control measures.
 - To understand and evaluate the impact of development.
- ii. The electives provide the basis for students to acquire a measure of skills mix, as well as the background for further work, research and development.

Learning Outcomes

As a result of the course content and instruction graduates should be able to:

- Demonstrate the ability to respond effectively to unfamiliar problems in unfamiliar contexts.
- Formulate and propose incisive and innovative policies, strategies and courses of action as responses to a variety of planning problems, transforming existing systems and not simply function within an ineffective one.
- Synthesise and Integrate data from various sources and to identify the contexts in which the various data types are appropriate.
- Describe the genesis and function of planning in society.
- Apply the history and theory of planning in relation to social and economic structures, including, but not limited to, such characteristics as income, race, ethnicity, and gender.

- Understand the ethics of professional practice and behaviour, including the relationship to clients and the public, and the role of citizens in a democratic society.
- Interpret case laws relevant to the field of urban and regional planning and application of these laws to realistic hypothetical situations.
- Conceptualise problems from complex, real world situations so that the problems are meaningful to clients and are research worthy.
- Apply statistical and other analytic techniques, as well as computer methods, to define planning problems, generate alternatives, and evaluate their consequences. Use census data to inform policy formulation.
- Effectively and fluently communicate a wide variety of planning information, ideas, principles, arguments and proposals through well-prepared written, graphic, oral and electronic means, and demonstrate effectively and fluently written, numeric, oral, IT and information literacy skills.
- Work effectively as members and leaders of planning teams, and to apply an understanding of interpersonal and group dynamics to assure effective group action.
- Interpret case laws relevant to the field of urban and regional planning and application of these laws to realistic hypothetical situations.
- Exhibit an excellent level of understanding of the complexities of planning issues and problems especially the complexities of planning within the Caribbean context, with regards to space, ecology, resources and susceptibility to natural disasters.
- Demonstrate originality and flair in the treatment and exposition of the subject matter, making excellent connections between the different areas of the curriculum
- Work very well individually and in groups, demonstrating high levels of initiative, autonomy and leadership
- Exhibit a sensibility in formulating interventions that reflect an understanding of place-specific socioeconomic, political, and cultural circumstances.

The programme offers a wide range of courses that allows the student to pursue individual specialisations, progress to employment within the field and to embark on advanced study within planning, including MPhil/PhD research.

Entry Requirements

Applicants for the M.Sc. Urban and Regional Planning should have:

- (1) at least a Second Class Bachelor's Degree in a related area from a recognised institution, or
- (2) a combination of maturity, training and professional experience acceptable to the Faculty. A typical applicant would have a previous degree gained in Urban and/or Regional Planning, Surveying, Natural Sciences, Engineering, Geography, Architecture, Sociology, Economics, Political Science, Management and Law.

Qualifying Student

An applicant not considered suitable for direct admission may be admitted as a qualifying student, up to one year. The structure of study will be designed to suit the needs of the individual student.

Transfer of Credits

Up to six (6) credit hours of coursework taken prior to enrolment in the Master's programme, whether at this university or another, may be counted towards the Master's degree, if the Head of Department formally approves acceptance of these courses. Prior to the approval, the advice from the Programme Coordinator should be sought.

Structure of Programme

Offered part-time and full-time

- a) Part-time students: - Normally required to complete the coursework and written examinations within six (6) semesters of registration - Project should be started at the commencement of the semester following the completion of the written examinations and completed within nine (9) months
- b) Full-time students: - Normally required to complete the coursework and written examinations within three (3) semesters of registration - Project should be started at the commencement of the semester following the completion of the written examinations and completed within six (6) months

NB The normal load for a part-time student is half that of a full-time student.

Duration of Study

Part-time students: Must normally complete the programme within ten (10) semesters.

Full-time students: Must normally complete the programme within eight (8) semesters.

No. of Credits Required: 39

	No. of Credits
Core courses	18
Elective courses	9
Research Project	12

Other information

Examination

- (a) Evaluation may take one of the following modes: (1) coursework only, normally applied for studio work, (2) combination of coursework and final examination, and (3) final examination. In the case of combination, candidates will be required to pass both the coursework and examination.
- (b) In MSc Research Project evaluation will be on the report. Candidates may also be orally examined. They will in addition be required to present at least one acceptable seminar.
- (c) A full-time candidate who fails not more than two courses, or a part-time candidate who fails not more than one course in a semester may be allowed to repeat such courses if the Board of Higher Degrees so decides.
- (d) A full-time candidate who fails more than two courses, or a part-time candidate who fails more than one course in a semester, will normally be required to withdraw from the programme.

Award of Degree

- 1. The MSc in Urban & Regional Planning will be awarded on successful completion of all courses and the Research Project/Professional Report.
- 2. The MSc may be awarded with distinction if the candidate attains an overall mark of 'A' grade and a similar mark in the project.

COURSE LISTING

CORE COURSES

Course Code	Course Title	Number of Credits
PLAN 6000	Philosophy & Principles of Planning	3
PLAN 6001	Planning Practice Law and Ethics in the Caribbean	3
PLAN 6002	Graphic and Design Studio	3
PLAN 6003	Design for Development	3
PLAN 6004	Planning Analysis and Evaluation	3
PLAN 6024	Research Methods	3
PLAN 6030	Research Project (MSc Urban and Regional Planning Only)	12

Elective Courses:

Course Code	Course Title	Number of Credits
PLAN 6005	Urban Design	3
PLAN 6006	Sustainable Housing and Settlements Planning	3
PLAN 6007	Community and Participatory Planning	3
PLAN 6008	Tourism Planning	3
PLAN 6009	Transportation Planning	3
PLAN 6011	Planning in the Coastal Zone	3
PLAN 6012	Professional Planning Internship	3
PLAN 6014	SIDS Resource Management	3
TOUR 6040	Sustainable Tourism Management	3
TOUR 6002	Tourism Destination Management	3
TOUR 6003	Tourism Policy and Strategy	3
GINF 6100	Principle of Geoinformatics	3

SEMESTER: 1

COURSE CODE: PLAN 6000

COURSE TITLE: PHILOSOPHY & PRINCIPLES OF PLANING

NO. OF CREDITS: 3

PREREQUISITES: NONE

SYLLABUS: The material covered in this course is related to the context and environment of the Caribbean and illustrated by case studies from the region and other similar societies as far as available. The content covered by this course includes: Garden cities, Anglo-American and European tradition, Third World urbanisation and planning, Planning in the Caribbean SIDS, Sustainable development and sustainable planning, National urban strategies, growth centre and secondary cities, Self- Help; architecture of the poor, Globalisation and impacts on planning, Impacts of CIT.

SEMESTER: 1

COURSE CODE: PLAN 6001

COURSE TITLE: PLANNING PRACTICE LAW & ETHICS IN THE CARIBBEAN

NO. OF CREDITS: 3

PREREQUISITES: NONE

SYLLABUS: This course examines planning law and the effectiveness of institutions involved in physical planning and development and to determine the need for institutional reform given the goals and objectives of planning. The evolution of Caribbean legislation; Public and private property rights and policy instruments; Constitutional powers and responsibility of the government for the provision of land and environmental resources, utilities, transport, social services and public health; Planning-related legislation such as the Public Health Ordinance, Municipal Corporations Act, the Housing Act, Slum Clearance and Housing Act; Public decision making in the Caribbean-the roles of government, political parties, interest groups, entrepreneurs and individuals; decision making and the judicial review of public decision and appellate tribunals.

SEMESTER: 1

COURSE CODE: PLAN 6004

COURSE TITLE: PLANNING ANALYSIS & EVALUATION

NO. OF CREDITS: 3

PREREQUISITES: NONE

SYLLABUS: This course deals with tools and techniques of Data Collection and Analysis; encompassing Survey techniques; Site analysis and processing of development applications; Settlement Planning; Sampling; Probability analysis; Project analysis; Planning evaluation tools; Goal achievement matrices; Multiple criteria evaluation; Planning balance sheets; Time value of money; Internal Rate of Return; NPV; Demographic Projections.

SEMESTER: 1

COURSE CODE: PLAN 6002

COURSE TITLE: GRAPHIC & DESIGN STUDIO

NO. OF CREDITS: 3

PREREQUISITES: NONE

SYLLABUS: This course offers a practical, problem solving approach that involves students in varied planning projects, and introduces students to various graphic methods used to aid in design. It is intended to give students an introduction to graphics and spatial data analysis and presentation, including the use of digital techniques. It will be done in a studio context and will include a range of graphic and design problems and techniques, such as AutoCAD, cartography, and other graphic software used in planning.

SEMESTER: 2

COURSE CODE: PLAN 6003

COURSE TITLE: DESIGN FOR DEVELOPMENT

NO. OF CREDITS: 3

PREREQUISITES: NONE

SYLLABUS: This course is designed around a studio project which aims at highlighting the physical aspects of urban development and its relationship to the economic, social and environmental features of human settlements development. The content of this course includes the following topics: Existing urban centres and towns, Re-development and renewal, Development of coherent communities into the real neighbourhoods and diverse districts, Public spaces. Conservation of natural environments and the preservation of the built legacy, Urban places framed by architecture and landscape design rooted in local history, climate, ecology and building practice, Infrastructure and amenity design and standards, including local traffic distribution, transportation and related land-use controls, Re-establishment of the relationship between the art of building and the making of community, through citizen-based participatory planning and design.

SEMESTER: 2

COURSE CODE: PLAN 6014

COURSE TITLE: SMALL ISLAND DEVELOPING STATES (SIDS)

RESOURCE MANAGEMENT

NO. OF CREDITS: 3

PREREQUISITES: NONE

SYLLABUS: This course is aimed at giving the student an appreciation of the critical issues in land use and natural resources management, and to foster a solution-oriented approach to the management of these vital resources. The content of this course includes: The concept of ecosystems, Debates on development and the environment, Challenges of rural environments, The Brown Agenda, Land Use and integrated water resources management, Natural Hazards, Policy framework, Institutional strengthening, The human face of land use planning and natural resource management, The green agenda and protected areas, Coastal development.

SEMESTER: 1

COURSE CODE: PLAN 6011

COURSE TITLE: PLANNING IN THE COASTAL ZONE

NO. OF CREDITS: 3

PREREQUISITES: NONE

SYLLABUS: The course is designed to enhance the student's understanding of the challenges in planning for coastal areas in the Caribbean given the concentration of development on lands along the coast. It will cover the importance of the coast, coastal issues, governing the coast and coastal zone management approaches, drawing on case studies from the Caribbean Region. The content of this course includes the following: Stress from development and conflict, Development constraints: pollution, natural hazards, global climate change etc, Development potential in the coastal zone, The integrated planning framework, Legislative and administrative framework, Institutional environment and stakeholders, Land use optimisation, Planning process/planning methodology, Industry norms and standards.

SEMESTER: INACTIVE

COURSE CODE: PLAN 6007

COURSE TITLE: COMMUNITY & PARTICIPATORY PLANNING

NO. OF CREDITS: 3

PREREQUISITES: NONE

SYLLABUS: This course deals with the history, role and functions of both community and participatory planning, including the growing role of the public and stakeholder interests in the planning process. The evolution of planning in the Anglo-American and international experience, the specific process and tools of public consultation and participation in the development of and regulatory functions, the problems associated with community planning and participation in the planning process, Tools and techniques used in community planning exercises which include: Community mapping, Needs assessment, Strategic planning and lobbying, Community Visioning.

SEMESTER: 1

COURSE CODE: PLAN 6009

COURSE TITLE: TRANSPORTATION PLANNING

NO. OF CREDITS: 3

PREREQUISITES: NONE

SYLLABUS: This course gives an introduction to transportation planning, and its relationship to land-use planning, it will acquaint students with the profession of transportation planning and the types and activities that transport planners are required to conduct. Urban transportation planning and its relationship to land-use planning, including procedures for traffic impact analysis of urban development sites, analysis framework for long-range planning, data collection procedures, basic demand forecasting, assessment of alternative transport plans and impact on the environment and land development at the regional scale.

SEMESTER: 1

COURSE CODE: PLAN 6006

COURSE TITLE: SUSTAINABLE HOUSING & SETTLEMENTS PLANNING

NO. OF CREDITS: 3

PREREQUISITES: NONE

SYLLABUS: This course aims at demonstrating the ways in which human settlements planning is undertaken, whether this is for small towns, villages, neighbourhoods or extensive urban areas, with the focus being on sustainability of these developments. Housing Demand Analysis; Housing Finance; Housing Infrastructure; Construction; residential environment and community development, with the associated issues of fostering employment opportunities, responding to social and educational needs, commercial and recreational facilities demand transportation, infrastructure and environmental concerns.

SEMESTER: INACTIVE

COURSE CODE: PLAN 6005

COURSE TITLE: URBAN DESIGN

NO. OF CREDITS: 3

PREREQUISITES: NONE

SYLLABUS: Cultural basis for design, new approaches: smart cities, sustainable cities, new urbanism. The competing goals and objectives in urban design, Users versus providers of the built environment, urban structure, public space, safety and security in urban design. Elements and components: neighbourhood, block, street, individual building. Guidelines and standards.

SEMESTER: 2

COURSE CODE: PLAN 6008

COURSE TITLE: TOURISM PLANNING

NO. OF CREDITS: 3

PREREQUISITES: NONE

SYLLABUS: This course gives an introduction to the land-use, infrastructure, coastal and environmental impacts and needs of the tourism industry, this will be done at the macro, national, and regional planning levels as well as the more detailed project site and community levels.

SEMESTER: 2

COURSE CODE: PLAN 6024

COURSE TITLE: RESEARCH METHODS

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Preparation and methods of research. Problem definition: research objectives, quantitative and qualitative methods, data collection and analysis, field surveys, preparation of questionnaires, literature reviews, testing hypotheses, case studies, historical and policy analysis, report preparation.

SEMESTER: NOT APPLICABLE

COURSE CODE: PLAN 6030

COURSE TITLE: MSC RESEARCH PROJECT

NO. OF CREDITS: 12

PREREQUISITES:

SYLLABUS: The research project is expected to be the result of a comprehensive investigation and independent analysis of a topic that is germane to the area of interest to the student. The goal of the research should be to study a specific area or phenomenon and to provide a contribution of new knowledge to the field of study or produce a new interpretation of existing information.

POSTGRADUATE DIPLOMA IN LAND ADMINISTRATION

This programme is being developed to address the reform of the policies, procedures, statutes and institutions involved in Land Administration and Management throughout the Caribbean. This programme is a response to the need to maintain and strengthen the human resources employed in land administration and land management in key institutions of the state, and private quasi-state sectors.

The Aims and Objectives

- a. Provide specialised training in Land Administration Management to key public, quasi-state and private sector professionals.
- b. To enhance the existing process of reform in Land Administration in the public sector.
- c. To enhance the Department's capability in offering training in the broader area of Land Studies and Land Management in keeping with the Department's strategic plan.

Entry Requirements

The main condition for entry would be a relevant first degree and relevant industrial experience or maturity and professional experience acceptable to the Faculty. Present entry requirements for either MSc Planning and Development or MSc Geoinformatics would also be acceptable. The target groups are:

- (a) Public officials nominated by sponsoring institution.
- (b) Professionals: Surveyors, engineers, planners, geographers, agriculturalists, natural and social scientists interested in the area of Land Administration and Management.
- (c) Individuals interested in upgrading their skills on a course-by-course basis.

Structure of Programme

The programme will be delivered in six (6) short intensive instructional periods each approximately one week of whole day lectures, tutorial demonstrations and lab/field exercises. There will be a full-time, three-week period when students will work on their special projects towards the end of the cycle.

Duration of Study

Twelve (12) months.

Course Listing

Students are required to complete the following courses:

Course Code	Course Title	Number of Credits
LAND 5000	Introduction to Land Administration	E3
LAND 5001	Land Use & Natural Resource Management	E3
LAND 5002	Land Economy & Property Management	E3
LAND 5003	Land Law	E3
LAND 5004	Land Information Management	E3
LAND 5005	Research Methods	E3
LAND 5006	Special Project	C6
LAND 5007	Cadastral Systems	E3
PLAN 6014	Small Island Developing States (SIDS) Resource Management	E3

Assessment and Award of Diploma

With the exception of SURV 5006 Special Project which shall be assessed as a 100% coursework, all other courses shall be assessed as follows:

- Final examination: 60%
- Assessed assignments: 40%.

Diplomas shall be awarded upon completion of all courses and the final project.

SYLLABUSES

SEMESTER:

COURSE CODE: LAND 5000

COURSE TITLE: INTRODUCTION TO LAND ADMINISTRATION

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: This course introduces the concepts of land administration including the legislative provisions and policy concepts relating to land, its transfer and control. Land settlement in the Caribbean is covered including evolution of policy frameworks. State lands and their management, land policy formulation, information needs are also introduced with land administration and land management concepts in general.

SEMESTER:

COURSE CODE: LAND 5001

COURSE TITLE: LAND USE & NATURAL

RESOURCE MANAGEMENT

NO. OF CREDITS: 3

PREREQUISITES:

Syllabus: Relationships between people, technology and the environment. Environmental analysis for site planning and coastal environment and the evaluation of the effects of development projects and policies on the environment with particular reference to the Caribbean context. Overview of environmental legislation in the Caribbean. Effectiveness of environmental management.

SEMESTER:

COURSE CODE: LAND 5002

COURSE TITLE: LAND ECONOMY & PROPERTY MANAGEMENT

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: This course gives an overview of the land economy of the Caribbean. It introduces the nature of real property, land rent theory, locational theory, the role of the State in the land economy, land and property taxation, the real estate industry and the finance sector, land and property speculation, and the relationship between formal and informal economy. Also covered are property and real estate management, and project and programme financing and management. The project cycle is also investigated including management formulation and appraisal, project evaluation, public good vs. economic good, time value of money, internal rate of return, net present value and discounting and shadow pricing.

SEMESTER:

COURSE CODE: LAND 5003

COURSE TITLE: LAND LAW

NO. OF CREDITS: 3

PREREQUISITES: NONE

SYLLABUS: This course introduces Caribbean legal systems including introduction to case laws. Discussed are sources of land law including equity and statutes. Covered are doctrines of estates, reception of English law in the Caribbean and its evolution, the meaning of 'law', estates and interests including freehold, leasehold, absolute, co-ownership, joint tenancies, tenancies in common, profits-a-prendre. Also covered are easements, restrictive covenants, adverse possession, prescription, contracts for sale of land, the doctrine of part performance, pre-contract enquiries and inspection. An investigation of title of unregistered land, forms of deed and other documents, registration of deeds and other document, and registration of title including the Torrens system.

SEMESTER:

COURSE CODE: LAND 5004

COURSE TITLE: LAND INFORMATION MANAGEMENT

NO. OF CREDITS: 3

PREREQUISITES: NONE

SYLLABUS: This course examines the concept of systems, information systems, geographic systems, and land information systems. It discusses data in LIS, their acquisition, input, pre-processing, verification, structures, management, manipulation, analysis, output and quality. Hardware and software considerations are investigated including project specification and national systems, their design and development

SEMESTER:

COURSE CODE: LAND 5005

COURSE TITLE: RESEARCH METHODS

NO. OF CREDITS: 3

PREREQUISITES:

SYLLABUS: Preparation and methods of research. Problems definition: research objectives, quantitative and qualitative methods, data collection and analysis, field surveys, preparation of questionnaires, literature reviews, testing hypotheses, case studies, historical and policy analysis, report preparation.

SEMESTER:

COURSE CODE: LAND 5006

COURSE TITLE: SPECIAL PROJECT

NO. OF CREDITS: 6

PREREQUISITES:

SYLLABUS: Students will be expected to do a Special Project of approximately 10,000 - 15,000 words. The topic will be chosen in collaboration with the agencies sending students to make it relevant to their work situation.

COURSE CODE: LAND 5007

COURSE TITLE: CADASTRAL SYSTEMS

NO. OF CREDITS: 3

PREREQUISITES: NONE

SYLLABUS: This course examines the importance of cadastral systems to land administration. The cadastral system as a foundational element of the land information system is discussed. The evolution of cadastral systems to their current role in the socio-economic development of a country is covered along with aspects of establishment, maintenance reform and re-engineering of systems.

SEMESTER:

COURSE CODE: PLAN 6014

COURSE TITLE: SMALL ISLAND DEVELOPING STATES (SIDS)

RESOURCE MANAGEMENT

NO. OF CREDITS: 3

PREREQUISITES: NONE

SYLLABUS: This course is aimed at giving the student an appreciation of the critical issues in land use and natural resources management, and to foster a solution-oriented approach to the management of these vital resources. The content of this course includes: The concept of ecosystems, Debates on development and the environment, Challenges of rural environments, The Brown Agenda, Land Use and integrated water resources management, Natural Hazards, Policy framework, Institutional

PGDIP/MSC IN GEOINFORMATICS

Introduction

The goal of the MSc in Geoinformatics programme is to provide high-quality professional graduate instructions in Geoinformatics that lead to productive careers and life long learning. Geoinformatics is a nascent multidisciplinary field in which graduates must be prepared to apply knowledge in new contexts, work cooperatively and communicate effectively.

The Aims and Objectives

Aims

The goal of the MSc/PGDip Geoinformatics programmes is to provide high-quality professional graduate instructions in Geoinformatics that leads to productive careers and long life learning. Geoinformatics is a nascent multidisciplinary field in which graduates must be prepared to apply knowledge in new contexts, work cooperatively and communicate effectively.

Objectives

The graduate with a PGDip in Geoinformatics will be able to:

- Explain the principles, theories, tools and techniques of Geoinformatics.
- Apply specialised knowledge of Geoinformatics to a wide range of disciplines.
- Use the skills required to work individually or as a member of a team.
- Apply creative and critical thinking in solving applications in multidisciplinary areas using Geoinformatics.
- Formulate and effectively communicate professional opinions on topical issues.

In addition to the above, the graduate with an MSc in Geoinformatics will be able to:

- Develop research capabilities to contribute to the further academic and professional development of Geoinformatics.

Entry Requirements

Applicants for the MSc or the PGDip in Geoinformatics programmes should have one of the following:

- (a) A Second Class Honours BSc degree in Surveying and Land Information or a degree in a related area from a recognised institution.
- (b) A Second Class Honours BSc degree in Engineering, Natural Science, Agriculture or Geography, which includes Mathematics and Computer Science at levels equivalent to the respective courses in (a).
- (c) An equivalent qualification acceptable to the Faculty of Engineering.
- (d) A PGDip in Geoinformatics (for MSc Geoinformatics only)

A graduate student in these programmes is also expected to have a strong mathematical/analytical background and ability to use specialised software applications within this context.

Duration of Study and Award of Degree

The programme is geared towards full-time study. It is expected that full-time students will complete the PGDip in 9 months and the MSc programme in 12 months. Part-time is expected to take two (2) calendar years for the PGDip programme and two and a half (21/2) calendar years for the MSc programme. Upon completion of all course requirements, a candidate will be awarded a PGDip in Geoinformatics. With the additional completion of the research thesis, a candidate will be awarded the Masters degree in Geoinformatics.

Structure of Programme

Offered both part-time and full-time

Award of Degree

Upon completion of all course and project/report requirements, a candidate will be awarded a Master's degree.

Course of Study

Students registered for the Postgraduate Diploma in Geoinformatics are expected to complete 26 credits of core courses and six (6) credits of elective courses, while students registered for the MSc in Geoinformatics are expected to complete 36 credits of core courses and six (6) credits of elective courses.

COURSE LISTING

CORE COURSES

The core courses for the PGDip/MSc Geoinformatics programmes are as follows:

Course Code	Course Title	Number of Credits
GINF 6100	Principles of Geoinformatics	3
GINF 6015	Extraction and Management of Information from Geo-images	4
GINF 6020	Spatial Databases	4
GINF 6021	GIS and Society	4
GINF 6022	Spatial Analysis and Modeling	4
GINF 6023	Enterprise GIS Design and Development	4
GINF 6024	Research Methodology	3
GINF 6006	Research Project (MSc Geoinformatics only)	12

ELECTIVE COURSES

There are several courses available in the Department of Surveying and Land Information and other departments that may be selected to cover the elective courses that students are allowed to take. Elective courses may be taken in consultation with the Programme Coordinator or the Head of Department.

GINF 6009	Applications of GIS in Natural Resource Management	4
GINF 6010	Applications of GIS in Urban Development	4
GINF 6007	Issues and Application of Remote Sensing	4
GINF 6030	Independent Study in Geoinformatics	3
GINF 6025	Professional Internship (new)	3
PLAN 6011	Planning in the Coastal Zone	3
PLAN 6014	SIDS Resource Management	3
PLAN 6006	Sustainable Housing and Settlements Planning	3
PLAN 6007	Community and Participatory Planning	3
PLAN 6008	Tourism Planning	3
PLAN 6009	Transportation Planning	3
COMP 6100	Computer Communications Network	3
COMP 6150	Distributed Computing	3
ECNG 6613	Database Systems, Principles & Design	3

Programme of Study

A typical schedule of courses for the PGDip and MSc Geoinformatics would look like the following;

Semester I

Course Code	Course Title	Number of Credits
GINF 6100	Principles of Geoinformatics	3
GINF 6020	Spatial Databases	4
GINF 6015	Extraction and Management of Information from Geo-images	4
GINF 6024	Research Methodology	3
	One Elective	3

Semester II

Course Code	Course Title	Number of Credits
GINF 6022	Spatial Analysis and Modeling	4
GINF 6023	Enterprise GIS Design and Development	4
GINF 6021	GIS and Society	4
	One Elective	3

Semester II

Course Code	Course Title	Number of Credits
GINF 6006	Research Project (MSc Geoinformatics only)	12

SYLLABUSES

SEMESTER:

COURSE CODE: GINF 6007

COURSE TITLE: ISSUES & APPLICATIONS IN REMOTE SENSING

NO. OF CREDITS: 4

PREREQUISITES:

Syllabus: The course is intended to familiarise students with the range of management and scientific problems that may be addressed with remote sensing. Scale issues in remote sensing, Multi-spectral image processing methods, image interpretation, analysing spatial patterns, issues in data integration, accuracy assessment, remote sensing and GIS. Remote sensing and change detection, remote sensing in the Caribbean. Remote sensing and hazard assessment and mitigation, remote sensing and biodiversity, remote sensing and coastal zone management, global remote sensing. New directions in remote sensing.

SEMESTER: 2

COURSE CODE: GINF 6010

COURSE TITLE: APPLICATIONS OF GEOINFORMATICS IN URBAN DEVELOPMENT

NO. OF CREDITS: 4

PREREQUISITES:GINF 6003

Syllabus: Introduction to GIS concepts; GIS application areas in urban development; database design and development; building applications in urban planning and development: site selection models, locating landfill sites, estimating the carrying capacity of land resources; urban crime analysis; modelling equity in the distribution of social facilities.

SEMESTER:

COURSE CODE: GINF 5010

COURSE TITLE: PRINCIPLES OF GEOINFORMATICS

NUMBER OF CREDITS: 3

PREREQUISITES: NONE, COMPUTER SKILLS WOULD BE AN ASSET

Syllabus: Introduction to GIS: definitions of GIS, The Geography, Information and Systems in the GIS, Current Issues and Views of GIS, Spatial data issues- Acquisition and Input, introduction to GNSS measurements and processing, Data Management, Data Processing. GIS Data Structures, Raster GIS Capabilities, Vector GIS capabilities, GIS and Network Analysis, GIS functionality and applications, Manipulating and extracting information, Spatial data quality issues, Hardware and Software Systems, Introduction to designing and implementing GIS.

SEMESTER:

COURSE CODE: GINF 6015

COURSE TITLE: EXTRACTION AND MANAGEMENT OF INFORMATION FROM GEO-IMAGES

NUMBER OF CREDITS:

PREREQUISITES: NONE

Syllabus: Electromagnetic radiation: properties and behaviour; Interaction of EM with Earth's atmosphere and surface features. Aerial photographs: geometry of aerial photograph: scale, relief and tilt displacement; Principles of photo interpretation. Space borne sensors and systems (optical, thermal, radar). Principles of digital image processing: digital images; Image correction and enhancement; Thematic information extraction. Applications in the environment and natural resource management. Practical Work: photo interpretation, digital image processing, multi-spectral classification

SEMESTER:

COURSE CODE: GINF 6020

COURSE TITLE: SPATIAL DATABASES

NUMBER OF CREDITS:

PREREQUISITES: NONE

Syllabus: A review of basic concepts of databases; Spatial database design; The Extended Entity-Relationship Model; Object- Oriented Database for GIS; Distributed and Networked Spatial Databases; Web-based GIS database design and management.

SEMESTER:

COURSE CODE: GINF 6021

COURSE TITLE: GIS AND SOCIETY

NUMBER OF CREDITS:

PREREQUISITES: NONE

Syllabus: This course examines the interrelationships between GIS and the structures of modern society. Through case studies of related to private and public organisations as well as the general public, the broader social implications of GIS will be examined. How GIS systems and spatial data are embedded in particular economic, political, social and legal structures create social barriers affecting the wider use of GIS, such barriers will be debated throughout the course. The way in which GIS is employed in society has the ability to influence values, perceptions and knowledge, the representation of knowledge in GIS will be discussed with particular reference to how information held by marginalised groups of society is represented. Other areas of importance include the impact of internet mapping, ethics and privacy and the use and misuse of GIS.

SEMESTER:

COURSE CODE: GINF 6022

COURSE TITLE: SPATIAL ANALYSIS AND MODELLING

NUMBER OF CREDITS:

PREREQUISITES: GINF 6100 OR EQUIVALENT

Syllabus: Introduction to spatial analysis; spatial phenomena types and relationships. Spatial analysis and GIS; raster and vector capabilities, network analysis, spatial phenomena and relationships; analysis for discrete entries, spatial data modelling; cartographic modelling, vector and raster overlay. Statistical analysis of attributes: univariate and bivariate descriptions. Spatial interpolation; polynomials, splines, TIN, Geostatistics; spatial correlation, modelling of a spatial process, geostatistical interpolation, semivariogram, kriging, Digital Elevation Models, surface analysis techniques. Spatial Analysis Applications.

SEMESTER:

COURSE CODE: GINF 6023

COURSE TITLE: ENTERPRISE GIS DESIGN AND DEVELOPMENT

NUMBER OF CREDITS: 4

PREREQUISITES: GINF 6100 OR EQUIVALENT

Syllabus: Enterprise GIS design concepts and issues; user requirements analysis including the design of URA questionnaires; conceptual and logical design strategies; executing and evaluating pilot studies, benchmarking methodologies, planning for data collection and automation; GIS system integration, application development, Graphic User Interface development and customisation.

SEMESTER:

COURSE CODE: GINF 6024

COURSE TITLE: RESEARCH METHODOLOGY

NUMBER OF CREDITS: 3

PREREQUISITES:

Syllabus: Research and its characteristics, types of research, defining a research topic, originality and thinking of research, identifying issues and objectives for research, developing research methodology, literature review, finding research material, referencing and citation, executing the research, reporting the findings of the research, dealing with supervisors.

SEMESTER:

COURSE CODE: GINF 6025

COURSE TITLE: PROFESSIONAL INTERNSHIP

NUMBER OF CREDITS: 3

PREREQUISITES: ON COMPLETION OF A MINIMUM OF 2 CORE COURSES

Syllabus: The content of this course will vary with the agency to which the student is assigned.

SEMESTER:

COURSE CODE: GINF 6006

COURSE TITLE: RESEARCH PROJECT

NUMBER OF CREDITS: 12

PREREQUISITES: NONE

Syllabus: A Research Project is required to be completed for the MSc Geoinformatics. The research project report is expected to be the result of a comprehensive investigation and independent in-depth analysis of a topic that is germane to the concentration that is being pursued by the student. The goal of the research should be to study a specific area or phenomenon and to provide an incremental contribution of new knowledge to the field of study or produce a new interpretation of existing information.

OFFICE OF THE DEAN MSC IN PROJECT MANAGEMENT

This is a Campus programme involving the Faculty of Engineering, Faculty of Social Sciences (Department of Management Studies) and the Institute of Business, and it is administered in the Faculty by the Department of Civil & Environmental Engineering through a Programme Coordinator. It is academically managed by a Campus-based team led by the Dean of the Faculty. This MSc is a two-year evening programme. The Degree will be awarded with Pass or Distinction, following the normal University requirements for taught Masters Programmes.

The Aims and Objectives

To train and produce Graduates who will be able to:

- Solve real-world management problems associated with the project cycle and to exercise sound management judgment through practical application of Project Management concepts and skills;
- Apply management principles to business situations;
- Develop and communicate project financial and performance objectives;
- Accurately develop Master Plans for projects and programmes, including tasks, budget and resource requirements;
- Effectively monitor, control and report project costs, the scheduled and quality /performance levels needed to meet agreed milestones and required levels of earned value; and
- Provide effective leadership and promote a true environment that will help motivate team members and resolve conflicts.

Entry Requirements

A first degree from an approved University in Project Management, Information Technology, Planning, Agriculture, Accounting, Engineering, Management Sciences, Economics, Architecture, Quantity Surveying, Land Surveying, Construction Management. Applicants must possess sufficient related work experience that would assist the candidate in becoming eligible for registration in related professional associations and institutions. Candidates with a good first degree in other areas will be entertained on a case-by-case basis.

Structure of Programme

Offered Part-time only

The programme will be an evening programme with lectures and tutorials being delivered between 4.00 pm and 8.00 pm on weekdays, and will involve an interactive approach to learning embracing real life problems and experiences. Group discussions and pursuit of topics and assignments will be an essential feature of the delivery format.

Duration of Study:

A minimum of four (4) semesters or a maximum of six (6) semesters.

No. of Credits Required: 45

No. of Credits

Eight (8) core courses to be done over the first two semesters	24
Project (over the third and fourth semesters)	9
Four (4) electives over the third and fourth semesters	12
Total	45

Course Listing

Course Code	Course Title	Number of Credits
PRMG 6001	Project Leadership & Organisational Behaviour	3
PRMG 6003	Project & Programme Management	3
PRMG 6004	Project Accounting & Finance	3
PRMG 6002	Project Management Information Systems	3
PRMG 6006	Strategic Project Planning	3
PRMG 6007	Procurement Management, Logistics & Contracting	3
PRMG 6010	Risk Management for Project Managers	3
PRMG 6015	Contract Management & Contract Law for Project Managers	3

Candidates will be required to deliver seminar presentations for three (3) of the eight (8) core courses.

Electives

The following is a list of the Elective Courses from which the candidate is required to complete four (4) by the end of the fourth semester. Other courses may be selected from graduate programmes but must be approved by the Programme Coordinator.

Course Code	Course Title	Number of Credits
COEM 6001	Infrastructure Planning & Construction	3
COEM 6007	HR Management & Industrial Relations in Construction	3
COEM 6008	Strategic Land Use Planning & Development	3
COEM 6015	Maintenance Facilities & Management	3
COEM 6016	Natural Hazards Management	3
IENG 6006	Occupational Safety & Health	3
MENG 6405	Total Quality Management	3
MENG 6505	Health, Safety & The Environment	3
PRMG 6005	Marketing Management & Business Communication	3
PRMG 6008	Project Estimating & Cost Management	3
PRMG 6009	Managing Information Technology Projects (PRMG 6002)	3
PRMG 6011	Advanced Project Management Practice	3
PRMG 6012	Value Engineering & Management	3
PRMG 6013	International Project Management	3
GINF 5002	Geographic Information Systems 1	3
PRMG 6014	Project Management Research Project	9

Designated courses are already delivered within the Campus Units involved.

PROJECT MANAGEMENT RESEARCH PROJECT

This project-based course carries nine (9) credits, and provides the student with the opportunity to integrate knowledge and skills learned throughout the programme, and should normally be taken as the last course in the delivery of the programme. Conceptual work on the Project will begin at the end of the first semester, and the project should be completed by the end of the fourth semester. Students develop, design and present a project; plan and justify the project; work to satisfy performance, schedule and budget requirements; adjust for unplanned occurrences; and provide status reports.

As an alternative, the student may opt to pursue an internship project, within the mainstream of their area of specialisation, that is approved by the Academic Unit involved.

SYLLABUSES FOR CORE COURSES

SEMESTER:

COURSE CODE: COEM 6009

COURSE TITLE: CONTRACT MANAGEMENT & CONSTRUCTION LAW

NO. OF CREDITS: 3

PREREQUISITES:

Syllabus: An introduction to the different legal systems. The impact of law on the delivery of engineering goods and services; law and the construction sector. The making of law and the courts; litigation. The elements of contract law and relation with the construction sector. Types of contracts; different procurement systems; standard form building contracts (specifications codes of practice; standards, statutes and local government regulations); The elements of the Law of Tort, disputes and conflict resolution methods; professional associations, codes of ethics, professional liability; construction claims; different forms of business organisations; business law and the company act; health and safety legislation; environmental law; introduction to intellectual property; confidentiality of information; warranties and indemnity. Introduction to international law.

SEMESTER:

COURSE CODE: PRMG 6001

COURSE TITLE: PROJECT LEADERSHIP & ORGANISATIONAL BEHAVIOUR

NO. OF CREDITS: 3

PREREQUISITES:

Syllabus: This course examines interpersonal and intrapersonal dynamics as they affect the achievement of corporate goals. Topics include: leadership, theories of organisational behaviour including motivation, group dynamics, organisational communication processes, leadership skills for project managers (profile of effective project managers), project leadership, developing a project vision, leadership and team building, team dynamics and cultural diversity, Project organisational design and structure, managing stress, negotiation, understanding conflict in the project environment, managing change in a complex domestic and international environment, leadership, power, influence and politics in project management.

SEMESTER:

COURSE CODE: PRMG 6002

COURSE TITLE: PROJECT MANAGEMENT INFORMATION SYSTEMS (PMIS)

NO. OF CREDITS: 3

PREREQUISITES:

Syllabus: This course addresses project management principles and methods from the standpoint of the project and programme manager who must organise, plan, implement and control non-routine activities to achieve schedule, budget and performance objectives. Topics include: project life cycles, definition of PMIS, the planning system and the control systems, networking systems, performance management systems, cost and resource management systems, capacity planning systems. Evaluating systems, project management procedures, system selection and implementation, project management software, earned value techniques and project audits are studied.

SEMESTER:

COURSE CODE: PRMG 6003

COURSE TITLE: PROJECT & PROGRAMME MANAGEMENT

NO. OF CREDITS: 3

PREREQUISITES:

Syllabus: This course addresses the culture, principles and techniques of project and programme management. The following are covered: What is a project? What is project management? The project life cycles for different industries, project context: Planning the project (project selection - tools and techniques), scope management defining the project. Project planning, work breakdown structures, Gantt chart, PERT chart, CPM, preparing the master plan, project budgeting, responsibility matrix, communication plan, project criterion for success, project control [project baseline, status reporting, control cycle, monitoring and control tools, resource grading, change control, resource levelling, variance reporting tools, project audit], implementation, Project Finalisation and close-out. Project cost, risk and quality management. What is programme management, benefits of programme management, programme management organisation/programme planning, benefits management, stakeholder management, programme management processes, effective project and programme teams, the project support office, audit, applications of project management software, e-business programme management.

SEMESTER:

COURSE CODE: PRMG 6004

COURSE TITLE: PROJECT ACCOUNTING & FINANCE

NO. OF CREDITS: 3

PREREQUISITES:

Syllabus: The objective of this course is to apply principles, concepts, tools and techniques of accounting and finance to the different phases of project conception, imitation and planning, scheduling and control and implementation, termination and post-evaluation; financial statements and analysis; accounting principles and policies, valuing projects - engineering economic analysis, financial methods (NPV, IRR, profitability index), multi-criteria methods of evaluation, real options analysis, social cost-benefit analysis and development impacts, cost capacity relationships/life cycle costing, earned value approach, the costing of products and services (product-costing, job-costing), projects budgets in planning, cost control and performance evaluation.

SEMESTER:

COURSE CODE: PRMG 6005

COURSE TITLE: MARKETING MANAGEMENT & BUSINESS COMMUNICATION

NO. OF CREDITS: 3

PREREQUISITES:

Syllabus: This course presents a structured approach to understanding the marketing function. Each student chooses a product or service and develops a written marketing plan to learn how to determine and integrate the elements of marketing strategy. Topics include: marketing segregation, targeting and positioning, market research, product decisions, pricing, channels of distribution, sales management, advertising, marketing budgets. Business communication emphasises communication competencies that can help ensure business success. Topics covered include how to conduct research, analyse information and prepare business reports, deliver effective information and persuasive oral presentations, work successfully with an assigned group and communicate effectively in a global workplace.

SEMESTER:

COURSE CODE: PRMG 6006

COURSE TITLE: STRATEGIC PROJECT PLANNING

NO. OF CREDITS: 3

PREREQUISITES:

Syllabus: This course examines practical, real world tools and techniques for many projects, in order to help students develop distinctive skills in managing strategic projects across functions: students will also learn how to develop twenty critical plans for managing projects to maximise returns from investment in capital projects. Topics include: the growth in project management, success, maturity and excellence definitions, strategic planning for project and programme management, project execution, The project charter, the project planning basis, plans for production and control, project implementation profile. The integrated logical framework and stakeholder management.

SEMESTER:

COURSE CODE: PRMG 6007

COURSE TITLE: PROCUREMENT MANAGEMENT, LOGISTICS & CONTRACTING

NO. OF CREDITS: 3

PREREQUISITES:

Syllabus: Principles and concepts essential to effecting large procurement programmes. Planning, sourcing and contractual design for diverse acquisitions. This course examines processes through which works, goods and services are acquired in the project management. Topics include: What is procurement management, contract and procurement strategies [IDB, WB, EEC, CDB, private sector and public sector]; legal issues, contracting pricing alternatives; writing terms; reference, technical, managerial and commercial requirements, request for proposals (RFP) development, source selection, invitation to bid, bid evaluation (process criteria report), risk assessment, contract negotiation and administration, contract close out and case studies.

SEMESTER 1

COURSE CODE: PRMG 6015

COURSE TITLE: CONTRACT MANAGEMENT & CONTRACT LAW FOR PROJECT MANAGERS

NO. OF CREDITS: 3

SYLLABUS: An introduction of the different legal systems, the hierarchy of local courts, creation of laws and the role of the Parliament and Statute. Contract and the conduct of business. Types of Contracts (Oral v. Written). Employment contract, contracts of service and contracts for services (Consultation, etc). Elements of the law of Contract and application to business. Sale of Goods Contracts, Insurance Contracts, Warranties, Guarantees. Different types of Contracts, Admeasurement Contracts, Cost plus Imbursement Contracts, Lump Sum Contracts, Labour only contracts, their Application and Management. Standard Form Contracts and their parts. Standards, Specification and Codes of Practice. The different procurement systems; Design and Build (D&B) Turnkey contracts, Design, Finance and Contracts.

SYLLABUSES FOR ELECTIVES

SEMESTER: 3

COURSE CODE: PRMG 6008

COURSE TITLE: PROJECT ESTIMATING & COST MANAGEMENT

NO. OF CREDITS: 3

PREREQUISITES:

Syllabus: This course addresses the need for project managers to understand and apply advance tools and techniques to the development and management of project financial plans. Topics include project cost and benefit estimation, project financial analysis, project simulation, budgeting, cost/schedule integration, the cost breakdown structure, the cost commitment profile, techniques for monitoring and controlling project cost, methods of payment and their uses, types of estimate, estimates at different stages of the project life cycle, estimating methods such as: parametric, comparative, bottom-up estimating, computerised tools, analytical, accuracy of estimates, earned value management systems.

SEMESTER: 3

COURSE CODE: PRMG 6009

COURSE TITLE: MANAGING INFORMATION TECHNOLOGY PROJECTS

NO. OF CREDITS: 3

PREREQUISITES: PRMG 6002

Syllabus: This course addresses all areas of IT project management, hardware, software, systems integration, and human resources. It extends traditional project management concepts into the IT arena. Topics covered: IT project phases, strategies for IT projects, Project initiation and requirements definition, establishing IT project teams, project planning estimation, project execution and control, project close-out, managing hardware and telecommunications projects, managing software projects, managing systems, integration projects.

SEMESTER: 3

COURSE CODE: PRMG 6010

COURSE TITLE: RISK MANAGEMENT FOR PROJECT MANAGERS

NO. OF CREDITS: 3

PREREQUISITES:

Syllabus: This course will emphasise risks and risk management processes in projects and firms that are involved in project management. It will discuss and explore the concept of risk management both from the strategic and tactical levels. Topics: Why project risk management? The risk management cycle, the nature of risk management, risk and decision-makers, integration, general approach and definitions, risk identification, risk assessment goals and methodology, computer applications, risk response and documentation, management of contingency allowances, managing the risks of the project environment dealing with risks in contracts and project risk analysis and management (tools and techniques) e.g. assumption analysis, check lists, prompt lists, brainstorming, Delphi technique, probability impact tables, interviews, risk register, decision trees, influence diagrams, Monte Carlo simulation, sensitivity analysis, PERT and control techniques). The practical use of statistics in collecting, organising, analysing, interpreting and presenting data both descriptive and inferential techniques are covered. The perspective will be aimed at medium and upper level project managers in various organisations.

SEMESTER: 3

COURSE CODE: PRMG 6011

COURSE TITLE: ADVANCED PROJECT MANAGEMENT PRACTICE

NO. OF CREDITS: 3

PREREQUISITES:

Syllabus: Advanced PM practice and professional exam preparation examines current topics in the project management field and provides a comprehensive review of the project management body of knowledge PMBOK (USA) and BOK (Europe). Topics include: global project management, leadership, virtual teams and project information systems.

SEMESTER:

COURSE CODE: PRMG 6012

COURSE TITLE: VALUE ENGINEERING & MANAGEMENT

NO. OF CREDITS: 3

PREREQUISITES:

Syllabus: This course provides students with central concepts and practical tools and techniques in Value Engineering (VE), Value Management (VM) and Value Analysis (VA). Topics include: the value concept, value engineering methodology [information phase, speculative phase, analytical phase, proposal phase and final report phase]. Several techniques for project selection e.g., breakdown analyses, cost modelling techniques, delphi techniques, energy modelling, lifecycle cost model. Life cycle costing methodology. Value management plan, keys to successful VE implementation and programme management strategy for a VE/VA programme.

SEMESTER: 3

COURSE CODE: PRMG 6013

COURSE TITLE: INTERNATIONAL PROJECT MANAGEMENT

NO. OF CREDITS: 3

PREREQUISITES:

Syllabus: Geography, culture and society, transnational commerce and finance; international principles and regulations for procurement of finance, goods and services, tendering procedures; project preparation, planning, financing and execution; international contract law and operations in the conduct of transnational projects, preparing contracts, negotiating contracts, dispute resolution; transnational joint ventures and the management of resources for project execution and closure.

FOR FURTHER INFORMATION, CONTACT

The Project Management Office

Tel: 1 (868) 662-2002; ext: 3838

REGULATIONS FOR POSTGRADUATE DIPLOMAS

GENERAL REGULATIONS

The Postgraduate Diploma shall be awarded on the basis of an examination by written papers and/or approved combinations of written papers and coursework which may include a Project. The duration of the programme shall be not less than one (1) calendar year for full-time study and not less than two (2) calendar years for part-time study. The appropriate University Regulations for the Postgraduate Diploma shall apply.

Normally entry is available to those who have a Lower Second Class Honours degree or its equivalent in the specified subject area or in a related area with a record of experience in the subject area.

Applicants holding non-engineering Bachelor's degrees may be required to pass a qualifying examination.

All applications must be approved by the Board for Graduate Studies and Research and a candidate may be required to satisfy such prerequisites as are deemed necessary before proceeding to the Postgraduate Diploma programme.

No candidate will be allowed to proceed to a Project before successfully completing the written papers of the examination unless the Board of Examiners decides otherwise.

Candidates with full-time registration who start their Projects after completing their written papers of the examination may be allowed to change their registration to part-time provided they are in full-time employment and that they make the necessary request to the Registry.

There shall be at least one External Examiner and his role and duties shall be identical to those for the BSc (Eng) Examination.

Boards of Examiners shall be established by the Board of the Faculty of Engineering. The Faculty Board shall establish from time to time, guidelines for the Board of Examiners.

The Board of Examiners shall make recommendations to the Chairman of the Campus Committee on Graduate Studies and Research on passes and failures in the examination. Permission to repeat all or part of the examination shall be at the discretion of the Board for Graduate Studies and Research.

The results of the examination shall be published in a Pass Lists in which names of the successful candidates shall be arranged alphabetically as follows:

- i. Distinction
- ii. Pass

The Board for Graduate Studies and Research may recommend to the Senate the withdrawal of any candidate whose performance it considers to be unsatisfactory.

REGULATIONS FOR MASTERS DEGREES

GENERAL REGULATIONS

The Masters (Eng) Degree shall be awarded on the basis of an examination by written papers and/or approved combinations of written papers and course work which may include a Project. The duration of the programme shall be not less than one (1) calendar year for full-time study and not less than two (2) calendar years for part-time study. The appropriate University Regulations for the Master's Degree shall apply.

Normally entry is available to those who have a Lower Second Class Honours degree or its equivalent in the specified subject area or in a related area with a record of experience in the subject area.

Applicants holding non-engineering Bachelor's Degrees may also be considered provided they hold passes, not lower than Second Class Honours level, in appropriate or equivalent Engineering subjects. Such candidates may also be required to pass qualifying examinations.

All applications must be approved by the Board for Graduate Studies and Research and any candidate may be required to satisfy such prerequisites as are deemed necessary before proceeding to the Masters Degree programme.

No candidate will be allowed to proceed to a Project before successfully completing the written papers of the examination unless the Board of Examiners decides otherwise.

Candidates with full-time registrations who start their project after completing their written papers of the examination may be allowed to change their registration to part-time provided they are in full-time employment and that they make the necessary request to the Registry.

There shall be at least one External Examiner and his role and duties shall be identical to those for the BSc (Eng) Examination.

A Board of Examiners shall be established by the Board of the Faculty of Engineering. The Faculty Board shall establish from time to time, guidelines for the Board of Examiners.

The Board of Examiners shall make recommendations to the Chairman of the Campus Committee of Board for Graduate Studies and Research on passes and failures in the examination shall be at the discretion of the Board for Graduate Studies and Research.

The results of the examination shall be published in a Pass List in which names of the successful candidates shall be arranged alphabetically as follows:

- i. Distinction
- ii. Pass

The Board for Graduate Studies and Research may recommend to the Senate the withdrawal of any candidate whose performance it considers to be unsatisfactory.

REGULATIONS FOR MSC PROGRAMMES

- Masters in Civil Engineering (MSc)
- Masters in Civil with Environmental Engineering (MSc)
- Masters in Manufacturing Engineering (MSc)

GENERAL REGULATIONS

These programmes are specially designed for candidates seeking to fulfill the academic requirements for advancement to practise as a registered professional engineer and are of twelve (12) months duration, full-time.

ADMISSION

Candidates for admission to these programmes should have a Bachelor's degree, normally at the level of at least Second Class Honours in the relevant discipline.

Qualified candidates opting to pursue these Masters programmes immediately following completion of the BSc programmes in Engineering, will not be required to submit an application for entry, but be allowed to progress seamlessly into these programmes.

A student who has completed the Level 2 programme at the Bachelor's level with a weighted average of a minimum of 50% may be granted provisional direct entry into these Masters programmes.

COURSE OF STUDY

The course of study for these Masters programmes include in addition to the courses of instruction, examination by written papers, supervised design/research work which may be industry-based and oral and written presentations.

Full-time Masters students must complete and submit project requirements at the time stipulated by the Departments. All project work must have been completed within one (1) calendar year of the start of the programme.

Candidates failing the examination in any course or the project may be allowed a second attempt at the examination on the recommendation of the Board of Examiners.

Candidates are not normally allowed oral examinations in more than two (2) full courses per semester.

A proportion of the marks which make up the final result of a particular course examined by a written Paper may be derived from the candidate's performance in course work assignments, in course tests, etc. All such assignments must be completed and submitted to the examiners before the date of the written examination.

Candidates must pass both the written examination and the course work component with at least a 50% mark to be credited with a Pass.

Candidates whose work is at any time reported by their Supervisors to be unsatisfactory or who do not satisfy the Examiners on Courses or Project Work that form part of the programme will be required to withdraw and will be removed from the Register of Postgraduate students.

Such students shall not normally be readmitted for at least two (2) years thereafter. Students readmitted to these programmes shall be eligible for credits for those courses passed creditably during their previous registration, provided that not more than five (5) years have elapsed since the applicants withdrew from the University and that the course content has not changed significantly in the interval.

DISTINCTIONS - MSC

A Distinction may be awarded for a Masters degree provided that the candidate obtains 70% or more in EACH component of the course of study, i.e., (i) written Papers and (ii) Research/ Design Project.

REGULATIONS FOR RESEARCH DEGREES

GENERAL REGULATIONS

A candidate for the MPhil degree is required to read courses totaling a minimum of six (6) credits. A candidate for the PhD degree is required to read courses totaling a minimum of nine (9) credits. Candidates are required to pass both the coursework and the written examinations before submitting the thesis.

Where graduate students write undergraduate examinations for graduate credit, or where they are writing qualifying or departmental examinations, they must pass both components of the course (i.e. coursework and written examination) in accordance with the University's marking scheme before proceeding to graduate work.

Master of Philosophy

The MPhil Degree shall be awarded on the basis of an examination by thesis and the appropriate University Regulations for the Master's Degree shall apply.

Candidates applying for registration should normally be holders of a Bachelor's Degree in Engineering or other appropriate field of at least the standard of at least an Upper Second Class Honours Degree of The University of the West Indies. Holders of lower class Degrees or a General Bachelor's Degree must normally pass qualifying examinations.

Doctor of Philosophy

The appropriate University and Faculty of Engineering Regulations for the Degree of Doctor of Philosophy shall apply.

Attendance at the oral examination for the PhD Degree in the Faculty of Engineering shall be open to the academic and professional community. A minimum of seven days notice shall be given before the examination.

REGULATIONS FOR MPHIL QUALIFYING EXAMINATIONS

GENERAL REGULATIONS

Any person wishing to proceed to MPhil in the Faculty of Engineering must take a qualifying examination unless:

- a) He/she possesses at least an Upper Second Class Honours Degree or equivalent in the area in which he/she is working or in a related area;
or
- b) He/she has been appointed to the post of Assistant Lecturer or higher in the Faculty;
or
- c) The Board for Graduate Studies and Research exempts him/her on the recommendation of the Faculty Sub-committee of the Board for Graduate Studies and Research.

The qualifying examination shall consist of at least two (2) papers lasting three (3) hours each.

Normally, one of the papers shall be taken from the BSc (Eng) Degree Examination or be of equivalent standard and one will be specific paper in the specialist area of interest.

There shall be a Moderator appointed by the Dean on the recommendation of the Head of Department from among persons not working in the Department(s) involved in the research.

The Head of the Department will assign the responsibility for the preparation of the question papers and the marking of the scripts.

The Moderator mentioned in the Regulations above shall be required to examine the question papers before the examination and to examine the scripts after they have been marked. He may, if he wishes, require an oral examination. In order for the candidate to pass, the Examiners must certify to the Board for Graduate Studies and Research that the candidate has reached at least a standard equivalent to Second Class Honours in the papers examined and the Moderator must give his approval of the examination.

REGULATIONS FOR PART-TIME POSTGRADUATE STUDENTS

GENERAL REGULATIONS

A part-time postgraduate student is anyone who, while reading for the Masters or PhD Degrees or any other Postgraduate Degree or Diploma, spends an average of nine or more hours a week in any paid employment. A part-time student will not, except in very special circumstances, be permitted to register for PhD in Engineering without having previously achieved the Masters in Engineering of this University.

Applicants for registration for part-time study towards a postgraduate degree will be required to meet all the academic requirements for admission into full-time postgraduate studies.

Those applicants who are required to pass qualifying examinations will sit such examinations under existing Faculty Regulations.

On acceptance for postgraduate studies a part-time student shall be assigned to one or more supervisors to whom the student shall report in person or in writing not less than once every term.

All part-time postgraduate students may be required to attend such postgraduate seminars as may be arranged by the department in the Faculty of Engineering during the academic year.

Not less than two (2) calendar years (unless the Faculty relaxes this requirement if it can be shown that the candidate's employment is such that his normal work is the same as the research work for his degree) after passing the qualifying examination a part-time student for the MPhil will present a dissertation and may also be orally examined on the general field of study or on the dissertation.

A part-time student for the PhD will submit a thesis and be orally examined in the general field of study and on the thesis not less than three (3) calendar years (unless the Faculty relaxes this requirement if it can be shown that the candidate's employment is such that his normal work is the same as the research work for his degree) after registration for the degree.

The award to a part-time student of the postgraduate degree, be it Masters or PhD Degree, will be subject to the conditions of award to full-time postgraduate students.

For part-time students, an MPhil thesis must be submitted normally not later than six (6) years after the date of registration. Similarly, a PhD thesis must be submitted not later than eight (8) years after the date of registration.

REGULATIONS FOR CERTIFICATE COURSES

GENERAL REGULATIONS

Construction Engineering and/or Management

Before registration as a student of the University proceeding to a Certificate in Construction Engineering and/or Management, a candidate must:

- a. Satisfy the matriculation requirements of the University, and
- b. Have, in the opinion of the Faculty, practical experience, or other qualifications or general standard of education of special relevance to the course of study.

Any candidate for the Certificate may be required by the Faculty to sit an entrance examination and/or successfully complete an introductory course before being granted permission to read the Certificate.

Candidates for the Certificate will be required to follow the prescribed course of study for a period of not less than one (1) academic year (full-time) or two (2) academic years (part-time).

They will also be required to carry out coursework as prescribed.

The examination will be conducted by means of written papers and course work. Candidates may be orally examined on any part of the examinations.

Part-time students will be required to take examinations in two (2) courses in the first year and the third course in the second year.

The Board of the Faculty of Engineering may recommend to the Senate the withdrawal of any candidate whose performance it considers unsatisfactory.

Successful completion of the examination will lead to the award of a Certificate in Construction Engineering or Construction Management or Construction Engineering & Management. The designation will depend on the course combinations.

The results of the examinations shall be published in a Pass List in which the names of the successful candidates shall be arranged alphabetically.

The reports of the examiners and the Pass List shall be laid before the Senate for approval.

A Certificate in Construction Engineering or Construction Management or Construction Engineering & Management under the seal of the University shall be sent thereafter to each successful candidate.

GUIDELINES FOR POSTGRADUATE PROGRAMMES: MSC/ DIPLOMA

GUIDELINE FOR POSTGRADUATE PROGRAMMES: MSC

The following are the approved guidelines for the conduct of Graduate Programme in the Faculty of Engineering.

Registration

A full-time candidate will not normally be permitted to register for more than 18 credits per semester, and a part-time candidate for not more than 9 credits.

A full-time student should complete all the course requirements (including project) within two (2) years, a part-time student within four (4) years.

Total Number of Credits in Masters Programme

The total number of credits should normally be set at 45 in accordance with the recommendations of the Board for Graduate Studies.

Value of a Course Credit

A course credit is defined as one (1) contact hour per week OR one (1) 2 hour lab per week OR one (1) hour supervised research per week.

Performance of Students:

Qualifying candidates may normally be allowed one (1) attempt at the original examination for any one course.

Masters/Diploma candidates may normally not have more than two (2) attempts at an examination for any one course.

To maintain registration, candidates should normally pass a minimum of 50% of the course load in each semester.

University Regulations state that candidates may not have more than two (2) attempts at an examination.

Oral Examination

A student failing a course examination with a mark of 45% or more shall be provided the opportunity to be orally examined up to a maximum of two (2) courses. In cases of students failing the written examination component of a course on the first attempt, being allowed an oral examination, and performing satisfactorily in the oral examination, the examiners shall recommend a passing mark of no more than 50% for the written component, which shall then be combined with the coursework mark to obtain the final overall mark for the course. In cases of students failing the written examination component of a course on the second attempt, being allowed an oral examination, and performing satisfactorily in the oral examination, the examiners shall recommend a passing mark of no more than 50% as the final overall mark for the course.

In special circumstances as determined by the department, an oral examination may be given. These circumstances may include the following:

- (i) A high failure rate in the course (>25%)
- (ii) Following a failure in an examination for which a student has provided acceptable written advice of extreme personal or professional difficulties prior to the scheduled examination date.

Note: Resit examinations have been phased out from the Academic Year 2002/2003.

Marking System

Examination of Project Report

Examiners must observe the University guidelines for report marking. Marks awarded for each section should be indicated in the report together with brief comments. Where this is not done, the report will be sent back to the examiner for re-examination.

Procedure for Examination Reports

The Faculty will continue to submit all project reports to External Examiners in cases where the projects constitute more than 25% of the programme credit ratings. Project Reports are to be submitted simultaneously to all examiners. For a student to pass, all three examiners should normally concur. Where there is no-agreement among examiners, the Board of Examiners will decide on the appropriate action to be taken. For programmes with less than 25% project credit rating, the use of an external examiner could be avoided.

Withdrawal

A candidate required to withdraw will not be considered for re-admission within two (2) years of their withdrawal, but within five (5) years after withdrawal. The candidate will retain credits for courses already successfully completed. Candidates who voluntarily withdraw may be allowed to re-enter at the next available opportunity. In this case, all credits previously accumulated will be retained by the candidate (normally for up to five (5) years thereafter, at the discretion of the department).

No extensions will be granted to students beyond three (3) years full-time and six (6) years of part-time.

