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Dr. Margaret Rouse-Jones
BA, MA, PhD, Dip Library & Information Studies

MISSION STATEMENT

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.

THE DEAN'S WELCOME ADDRESS

On behalf of the Faculty, let me extend to all new and returning Undergraduate students, a warm welcome to the Faculty for the new Academic Year 2004/2005.

To the new BSc students in particular, I understand the excitement at this time as you embark, many for the first time, into the various disciplines of Engineering, and also to Surveying & Land Information and the Geosciences. I sincerely hope that the excitement of today is kept up throughout your course of study and that despite the challenges ahead, your yearning for a solid education in Engineering or Surveying & Land Information or in the Geosciences continues to grow.

The Faculty of Engineering at The University of the West Indies has developed a proud tradition for delivering a quality Undergraduate programme of international repute. Our BSc (Hons) Undergraduate Engineering programmes have all been internationally accredited or are being reaccredited by the Professional Engineering Bodies of the United Kingdom - The Institution of Mechanical Engineers (IMechE), The Institution of Electrical Engineers (IEE), the Institution of Chemical Engineers (IChemE) and the Joint Board of Moderators (JBM). This accreditation leads to a pathway for any of our graduate Engineers wanting to become Chartered Engineers (CEng) - a globally, distinctive brand of professional Engineers. Our Surveying & Land Information Programme is accredited by the Royal Institution of Chartered Surveyors (RICS) of the United Kingdom. Our new Petroleum Geoscience programme was internationally accredited by the Geological Society of London and our graduates can eventually seek to register as Chartered Geologists (CGeol). Additionally, our graduates are well accepted regionally and have been leading the Engineering profession in the Caribbean for nearly 40 years.

My vision is for you to have an education in the Faculty which can allow you to practise your profession globally. As your Dean, I am therefore committed to enhancing our standards to meet national, regional and global benchmarks. The Faculty is currently engaged in a process of revisiting our Undergraduate programmes with a view to adding greater depth, breadth and industry readiness. The International Accreditation review processes have been pressing us in these directions. There are new, rising international standards expected of an Engineering, university education. The Faculty is preparing to meet these standards and you will be advised accordingly.

The Faculty, working with the Trinidad & Tobago Institute of Technology (TTIT) of the NESC, launched the Bachelor of Applied Technology (BTech) programmes in Mechanical and Electrical Engineering two years ago. These programmes will provide an additional opportunity for students from Trinidad & Tobago, as well as the wider Caribbean for technology training certified by The University of the West Indies. I also welcome those TTIT students who have enrolled in our BTech programmes.

A UWI education must prepare you to become a self-starter in the world of work, to be critical and creative thinkers and problem-solvers, to have a yearning for continuous learning and to develop embracing values of honesty, integrity, trust, etc. Through our combined efforts, we can build better Caribbean societies. In today's world, one cannot be complacent about quality. Your efforts, and particularly the time and devotion dedicated to your studies and assignments are paramount in our efforts to develop your engineering potential. Use this opportunity to also build new friendships, particularly with other West Indian students, as such relationships will be of lifelong value in an era of complexity and competition, where regional and global partnerships are important for progress. At the end of your Undergraduate studies, I would like you to think that the years spent at the St. Augustine Campus were your best years. I certainly did.

I look forward to seeing you over the next few years. The Heads of Departments, the Deputy Deans, the Dean and your Tutors and Lecturers are going to be important persons in supporting your studies in the Faculty. Get to know them!

I wish you all the very best and every success.

Clement K. Sankat, FIAgrE, CEng.
Professor and Dean, Faculty of Engineering

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OFFICE OF THE DEAN

Dean

Professor Clement K. Sankat

Deputy Deans

Undergraduate Student Affairs
Dr. Stephan Gift

Research & Postgraduate
Student Affairs
Professor Winston Mellowes

Physical Facilities & Administrative,
Technical and Service Staff
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Mrs. Margaret Richards

Secretary to Deputy Deans
Mrs. Cindy Lakhan-Hardyal

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 50,000 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 Academic year 2003/2004, 5604 graduates in fields of Chemical (818), Civil (1,193), Electrical and Computer (1,511), Mechanical (1,393), Industrial (325), Agricultural (79), Biosystems (8), Petroleum (48) and Surveying & Land Information (218). In 2001/2002, the Faculty introduced its BSc (Hons) programme in Petroleum Geoscience, graduating 13 students in 2003/2004.

The Faculty of Engineering continues to dedicate its considerable resources towards the pursuit of excellence in teaching, research and community service.

GENERAL INFORMATION

Programmes of Study

The Faculty offers programmes of study leading to the degrees of BSc, MSc, MPhil and PhD in Agricultural and Biosystems, Chemical & Process, Civil, Electrical & Computer, Industrial, Mechanical, Petroleum Engineering, Petroleum Geoscience, and Surveying & Land Information. The admission requirements of the undergraduate programmes of study are detailed in the Regulations for Undergraduate Programmes.

The BSc programmes are divided into Levels 1, 2 and 3 and are conducted over three (3) academic years of two (2) semesters each. These programmes are accredited by the respective British Professional Engineering Institutions.

A Cooperative Programme (COOP) was introduced in 1994. In the COOP, students who have completed Levels 1 and 2 of their respective BSc degree programmes, may spend a full year in industry undergoing supervised practical engineering training. After completion of this training, they return to Level 3 of their programme.

Specialised Branches of Engineering

(Undergraduate Programmes)

There are many specialised branches of Engineering, four of which may be regarded as the most important and universally known. These four branches which are well established in the Faculty are as follows:

- Chemical Engineering
- Civil Engineering
- Electrical & Computer Engineering
- Mechanical Engineering

Other disciplines which were subsequently offered in the Faculty starting at the Undergraduate level are as follows:

- Biosystems (Agricultural) Engineering
- Industrial Engineering
- Petroleum Geoscience
  and
- Surveying & Land Information

Specialised Branches of Engineering

(Graduate Programmes)

In addition to those specialities offered at the Undergraduate level, certain taught programmes (MSc) are also catered for at the Graduate level. These are as follows:

- Construction Engineering & Management
- Construction Management
- Communication Systems
- Digital Systems
- Energy Systems
- Environmental Engineering
- Engineering Management
- Food Technology
- Geoinformatics
- Land Administration
- Petroleum Engineering
- Petroleum Engineering & Management
- Petroleum Management
- Planning & Development
- Production Engineering & Management
- Production Management
- Project Management

Further details of these programmes can be obtained from the Faculty of Engineering Graduate Studies Booklet.

Prizes

Prizes are awarded for excellent performance at Levels 1, 2 and 3 as well as in other specified areas.

Chemical Engineering

Petrotrin Prize ($1,000)
To the best student in Level 1 Chemical & Process Engineering.

Schlumberger Prize (US$1,000)
To the best all-round student currently in Level 2 Petroleum Geoscience.

Petrotrin Prize ($1,000)
To the best student in Level 2 Chemical & Process Engineering.

Petrotrin Prize ($1,000)
To the best student in Level 3 Chemical & Process Engineering.

Petrotrin Prize ($1,000)
To the student producing the best Chemical & Process Engineering Design Project.

NP Prize ($1,000)
To the student producing the best Chemical & Process Engineering Research Project.

National Agro-Chemicals Ltd. Prize ($1,000)
To the student obtaining the highest mark in the Principles of Food Processing course in the Faculty of Engineering.

EOG Resources Prize ($2,500)
To the best student in Level 3 who did the Natural Gas Engineering and/or Petroleum Engineering option.

GSTT Prize ($1,000)
To the student with the best academic performance and continuing in Level 2 Petroleum Geoscience.

GSTT Prize ($1,000)
To the student with the best academic performance and continuing in Level 3 Petroleum Geoscience.

Schlumberger Prize (US$500)
To the best all-round student currently in Level 3 Petroleum Geoscience.

Civil & Environmental Engineering

Bill Massiah/Percy Phillips Memorial Prize ($500)
To the best student in Level 1 Civil Engineering.

Bill Massiah/Percy Phillips Memorial Prize ($500)
To the best student in Theory of Structures including Design Coursework at Level 2 Civil Engineering.

Bill Massiah/Percy Phillips Memorial Prize ($1,100)
To the best student who is a National of Trinidad & Tobago in Level 2 and not on scholarship.

Bill Massiah/Percy Phillips Memorial Prize ($500)
To the best student in Level 3 Structural Analysis and Design Courses including coursework.

Yorke Structures Prize ($1,000)
To the best student in Level 2 Civil Engineering.

David Key Prize ($2,000)
To the best student in Level 3 Civil Engineering.

Association of Professional Engineers of Trinidad & Tobago Prize ($600)
To the student producing the best Civil Engineering Design Project.

B.G. Singh Prize ($500)
To the Level 3 Civil Engineering student obtaining the highest mark in Coursework including Design, over the three-year period.

Airports Authority of Trinidad & Tobago Prize ($500)
To the student obtaining the highest Level 3 mark in Transportation Engineering.

H.O. Phelps Prize ($1,000)
To the student obtaining the highest aggregate mark for the two courses in Environmental Engineering.

Desmond Imbert Prize ($1,000)
To the student obtaining the highest mark in the Level 3 course in Civil Engineering Management.

Samuel Naranjit Memorial Prize ($3,000)
To the student obtaining the highest aggregate mark in the Water Resources group of courses.

Lauriston Lewis Memorial Prize ($2,500)
To the best Level 3 Project in the area of Geotechnics.

Thomas Chanona Prize ($1,000)
To the Level 2 student who has the most improved overall performance over his/her First Year.

Thomas Chanona Prize ($1,000)
To the Level 3 student who has the most improved overall performance over his/her Second Year..

Electrical & Computer Engineering

Charles R. Massy Book Prize (worth $500)
To the best student in Level 1 Electrical & Computer Engineering.

Charles R. Massy Book Prize (worth $500)
To the best student in Level 2 Electrical & Computer Engineering.

Charles R. Massy Book Prize (worth $500)
To the best student in Level 3 Electrical & Computer Engineering.

Association of Professional Engineers of Trinidad & Tobago Prize ($600)
To the student producing the best Electrical & Computer Engineering Laboratory Project.

Illuminat Trinidad & Tobago Ltd. Prize ($500)
To the best Level 3 student in Electronics and Communications including Coursework.

Raytheon Canada Prize ($1,000)
To the best Level 3 student doing the Computer Option in Electrical & Computer Engineering.

Trinidad & Tobago Electricity Commission Prize ($1,000)
To the student producing the highest mark in Industrial and Commercial Electrical Systems.

Trinidad & Tobago Electricity Commission Prize ($1,000)
To the student producing the best Level 3 Special Project in Energy Systems.

Telecommunications Services of Trinidad & Tobago Ltd. (TSTT) Prize ($1,500)
To the student with the most innovative Level 3 Special Project.

Mechanical & Manufacturing Engineering

Alvin Daniell Prize ($500)
To the best student in Level 1 Mechanical Engineering.

Schlumberger
Prize (US$500)
To the best student in Level 2 Mechanical Engineering.

Damus Ltd.
Prize ($1,000)
To the best student in Level 3 Mechanical Engineering.

Association of Professional Engineers of Trinidad & Tobago Prize ($600)
To the student producing the best Mechanical Engineering Special Project.

Damus Ltd. Prize ($1,000)
To the best student in Level 3 Industrial Engineering.

Faculty Prize ($500)
To the best student who has completed Level 3 in Biosystems Engineering Minor.

Powergen Prize ($1,000)
To the student obtaining the highest mark in the course Power Plant Engineering Course.

Powergen Prize ($1,000)
To the student obtaining the highest mark in the course Energy Engineering.

Alvin Daniell Prize ($500)
To the best student in Level 1 Industrial Engineering.

Faculty Prize ($500)
To the best student in Level 2 Industrial Engineering.

Powergen Prize ($1,000)
To the student obtaining the highest mark in the Energy Engineering Course.

Surveying & Land Information

Faculty Prize ($500)
To the best student in Level 1 Surveying & Land Information.

Faculty Prize ($500)
To the best student in Level 2 Surveying & Land Information.

Faculty Prize ($500)
To the best student in Level 3 Surveying & Land Information.

Institute of Surveyors of Trinidad & Tobago Prize ($500)
To the Level 1 student producing the best Project in Surveying & Land Information.

Institute of Surveyors of Trinidad & Tobago Prize ($500)
To the Level 2 student producing the best Project in Surveying & Land Information.

Institute of Surveyors of Trinidad & Tobago Prize ($500)
To the Level 3 student producing the best Special Project in Surveying & Land Information.

Bill Barnes Memorial Prize (£120)
To the Level 3 student showing significant ability in professional studies and also in some form of sporting activity.

Special Prizes

Telecommunications Services of Trinidad & Tobago Ltd. (TSTT) Prize ($1,000)
To the most outstanding Level 1 student.

Yorke Structures Prize ($1,000)
To the most outstanding Level 2 student.

Charles R. Massy Prize ($1,000)
To the most outstanding Level 3 student.

EOG Resources (Trinidad) Ltd. Prize ($2,500)
To the most outstanding Level 2 student

Ministry of Energy Prize ($5,100)
To the most outstanding Level 3 student.

British Gas Trinidad & Tobago Ltd. Prize ($5,000)
To the graduating student with the best weighted average.

Engineering Students' Society (ESS) Prize ($500)
To the student who must have made a significant contribution to the ESS.

Hamid Farabi Prize ($1,000)
To the Level 2 student going into Level 3 who has done significant community-oriented social work (excluding sports).

PCS Nitrogen Trinidad Ltd. Prize ($5,000)
To the best student in Level 2 who is a National of Trinidad & Tobago.

NP Prize ($2,500)
To the student producing the best Level 3 Special Project in the area of Environmental Engineering.

UNDERGRADUATE REGULATIONS

THE DEGREE OF BACHELOR OF SCIENCE (ENGINEERING)

BACHELOR OF SCIENCE (PETROLEUM GEOSCIENCE)

BACHELOR OF SCIENCE (SURVEYING & LAND INFORMATION)

1. (a) The Degree of Bachelor of Science (Engineering) (BSc (Eng)) is obtainable in the branches:
   (i) Chemical & Process Engineering
   (ii) Civil Engineering
   (iii) Civil Engineering with Environmental Engineering
   (iv) Electrical & Computer Engineering
   (v) Industrial Engineering
   (vi) Mechanical Engineering
   (vii) Mechanical Engineering with a Minor in Biosystems Engineering

   Degrees may be awarded in each discipline with First Class Honours, Second Class Honours (Upper or Lower Division), Third Class Honours or Pass.

   (b) The Degree of Bachelor of Science is obtainable in Petroleum Geoscience. Degrees may be awarded with First Class Honours, Second Class Honours (Upper or Lower Division), Third Class Honours or Pass.

   (c) The Degree of Bachelor of Science is obtainable in Surveying & Land Information. Degrees may be awarded with First Class Honours, Second Class Honours (Upper or Lower Division), Third Class Honours or Pass.

QUALIFICATIONS FOR ADMISSION

2. Before a student can be registered for a Degree programme in the Faculty of Engineering, he/she must:
   (a) Have satisfied the University Matriculation Requirements for entry to a Degree programme (see Matriculation Requirements), and

   (b) Either:
   (i) have included among his/her qualifications, passes at the required levels in accordance with the Course Requirements in Regulation 3
   Or:
   (ii) have obtained passes in Natural Sciences at this University in the subjects:*

   ** Pure and Applied Mathematics, Physics (and Chemistry for those applying for Chemical & Process Engineering) at the Preliminary examinations, or in Mathematics and Physics (and Chemistry for those applying for Chemical & Process Engineering) at the Introductory examinations.*

3. Students who wish to pursue programmes of study in the following branches are normally required to have for:

   (a) Civil, Electrical & Computer, Industrial and Mechanical Engineering:
   * *GCE 'Advanced' Level passes in Pure Mathematics or Mathematics (Pure and Applied) and*
   * *'Advanced' Level in Physics and*
   * *'Ordinary' Level in Chemistry.*

   (b) Chemical & Process Engineering:
   * *GCE 'Advanced' Level passes in Pure Mathematics or Mathematics (Pure and Applied);*
   * *'Advanced' Level in Physics and in Chemistry.*

   (c) Petroleum Geoscience:
   * *GCE 'Advanced' Level passes in Mathematics (Grades A or B);*
   * *'Advanced' Level in Physics or Chemistry and*
   * *One other science subject.*

   (d) Surveying & Land Information:
   * *GCE 'Advanced' Level passes in Pure Mathematics or Mathematics (Pure and Applied); 'Advanced' Level in either Physics, Chemistry, Physical Science, Technical Drawing, Engineering Science, Geography, Economics or other relevant subject; and 'Ordinary' Level in Physics, where 'Advanced' Level in Physics is not attained.*

   (e) The Faculty will consider for admission:
   Applicants wishing to read Civil, Industrial and Mechanical Engineering who do not have an 'Advanced' Level pass in Physics but who have 'Ordinary' Level Physics from an 'Advanced' Level Examination and at least a Grade 'B' average in 'Advanced' Level passes in Mathematics (Pure and Applied) or Pure Mathematics and in one other relevant subject such as Chemistry, Physical Science, Technical Drawing or Engineering Science. Applicants wishing to read Chemical & Process Engineering who do not have an 'Advanced' Level pass in Physics but who have 'Ordinary' level Physics from an 'Advanced' Level Examination and at least a Grade 'B' average in 'Advanced' Level passes in Mathematics (Pure and Applied), or Pure Mathematics, and in Chemistry.

   (f) The Faculty will also consider for admission:
   Applicants with equivalent qualifications to 3(a), (b), (c) and (d) from Community Colleges and Technical Schools.

PROGRAMMES OF STUDY

4. A student for the Degree of BSc (Eng), BSc (Surveying & Land Information) or BSc (Petroleum Geoscience) must:

   (a) Pursue the curriculum and obtain, within a maximum of 14 semesters, the credits as prescribed in the Schedule except as otherwise provided in Regulations 5 and 23.

   (b) Normally pass prerequisites for courses before being allowed to register for those courses.

   (c) In any semester, pursue courses worth not less than nine (9) credits except where prerequisites, the timetable and/or the number of courses required for completion of the Degree programme dictate otherwise.

   (d) Register in accordance with the number of courses and credits set out in the schedule and must first include all outstanding lower level courses.

   (e) Not take more than the normal number of credits as defined in the Schedule for a particular semester unless a single course is being trailed and a minimum average mark of 50% or a GPA of at least 2.0 has been achieved in the Year or Level preceding that semester.

   (f) Complete the programme as prescribed in the Schedule in not less than three (3) academic years except as otherwise provided in Regulation 5.

   (g) Students requiring up to seven (7) credits to graduate may request permission to write examinations without attending classes provided the examinations are in courses, which are being repeated by the students.

EXEMPTIONS

5. A student who has satisfactorily completed courses outside of the Faculty may be granted up to a maximum of 36 credits towards the fulfilment of Level 1 and Level 2 requirements provided that not less than four (4) semesters of study for the degree in the Faculty are pursued.

6. The course of study and examinations qualifying for such exemption will be subject to the approval of the Board for Undergraduate Studies on the recommendation of the Faculty Board.

SCHEME OF EXAMINATION

7. (a) The examinations shall be conducted by written papers, coursework and or project(s).

   (b) A candidate may also be orally examined.

8.* A student who fails to obtain a minimum of ten (10) credits in any academic year shall be required to withdraw from the Faculty** except for:

   (a) Students attempting Level 1 for the first time when the required minimum shall be eight (8) credits, and

   (b) Students requiring nine (9) or less credits to graduate.

9. A student failing course examinations with a mark of 30% or more shall be granted the opportunity to be orally examined in those courses, up to a maximum of nine (9) credits per semester. The total mark obtainable in a course by this means shall not exceed 40%.

**For students with year of entry 2003/2004 and beyond, Regulation 8 is replaced by GPA Regulation 8*

*** University requirements are that:*

1. *"Students required to withdraw from the University for failing to complete their degree programme (Part I or Part II etc.) within the stipulated period or for poor performance as provided for in the Faculty Regulations, may be re-admitted to the Faculty after at least one (1) year has elapsed since their withdrawal."*
2. *"Students from one Faculty who had been required to withdraw from the University for failing to complete their degree programme within the stipulated period may be admitted to another Faculty after a period of one year has elapsed since their withdrawal."*

10. A candidate who fails to be present at a written examination and does not submit an acceptable medical certificate for his/her absence, as prescribed in the University Examination Regulations, shall be treated as having failed that examination. If the candidate submits an acceptable medical certificate, he/she will be permitted to write the examination at a later date, without penalty.

11. (a) Except where Regulation 8 applies, a student failing a course is allowed to repeat the course and examination subject normally to a limit of only one (1) repeat of any Level 1 course.

    (b) Where a student fails the course examination(s) in no more than two (2) Level 1 courses after two attempts, he/she will be permitted after consultation with the Head of Department to register for a reduced course load which must include the failed courses.

    (c) Where a student fails the course examination(s) in more than two (2) Level 1 courses, after two attempts, he/she will be required to withdraw.

COURSEWORK

12. Coursework shall comprise laboratory, drawing and field exercises, literature surveys, problem exercises, in-house tests, or such other assignments as Faculty Board may approve. There are two types of coursework (see Regulation 14):

    (a) Coursework which is graded and must be passed but is not taken into account in determining the mark attained in a course.

    (b) Coursework which is graded and taken into account in determining the mark attained in the course.

13. A student who is absent from written coursework tests for certified medical reasons, as prescribed in the University Regulations, shall be graded on the tests he/she has taken as if such tests constitute the full test requirement provided that the tests not taken constitute no more than 20% of the total mark for all the tests. If the tests not taken constitute more than 20% of the total mark for all the tests, the candidate shall have to take make-up tests at a later date.

14. (a) Students who fail the examination in any course, but pass the coursework which does not count towards the final mark in that course, need not resubmit that coursework for examination.

(b) Students are required to submit coursework by the prescribed date. Coursework will only be accepted after the deadline with the specific written authority of the Head of Department in extenuating circumstances and in any event, not later than the day before the start of the relevant end of semester examinations of the semester in which the particular course is being offered.

(c) In a course with coursework which, although graded, is not taken into account in determining the mark attained in the course, a candidate will not be accredited with a pass in the course, unless he/she achieves a passing grade in the coursework.

(d) Students who fail a course because of a failure in coursework which does not count toward the final mark shall be required to repeat and pass the coursework before being credited with a pass in the relevant course.

SCHEDULE OF COURSES

15. The programme is ordered by Level in the nine (9) disciplines:

(i) Chemical & Process Engineering
(ii) Civil Engineering
(iii) Civil Engineering with Environmental Engineering
(iv) Electrical & Computer Engineering
(v) Industrial Engineering
(vi) Mechanical Engineering
(vii) Mechanical Engineering with a Minor in Biosystems Engineering
(viii) Petroleum Geoscience
(ix) Surveying & Land Information

For each Level, the Schedule is separated by semester. For each course, the following information is given:

Course code:
Note that a digit as the last character indicates a year-long course that continues over two (2) semesters.

Course name:
(i) Prerequisites, if any, follow the course name in round brackets ( ).
(ii) Co-requisites, if any, follow the course name in square brackets [ ].

NOTICE OF EXAMINATIONS

16. Examinations involving written papers will take place each year on dates posted on official notice boards within the minimum time prescribed by the University Regulations.

AEGROTAT DEGREES

17. A student who has obtained at least three-quarters of the credits required for a Bachelor's Degree but has been unable through illness to complete the programme may apply under the University Regulations for the award of an Aegrotat Degree.

18. An Aegrotat Degree will not be awarded unless the Board of Examiners considers that, in the courses which he/she has completed, the student has reached a standard which, if also reached in the remainder of the programme, would have qualified him/her for the award of a Degree.

19. An Aegrotat Degree will be awarded without class.

20. Holders of an Aegrotat Degree are not permitted to re-enter for the same Degree programme but may proceed to a second or higher degree on complying with the Regulations for such Degrees.

CLASSIFICATION OF DEGREE

21. The award of the degree BSc (Eng), BSc (Surveying & Land Information) and BSc (Petroleum Geoscience) shall be published in a separate Pass List for each branch of the Degree in which the names of the successful students shall be arranged alphabetically as follows:
(a) First Class Honours
(b) Second Class Honours:
(i) Upper Division
(ii) Lower Division
(c) Third Class Honours
(d) Pass

22. (a)* The class of the Degree shall be determined on the results of first attempts at all prescribed course examinations.

A weighted average shall be computed using as weighting factors:

For each Level 1 course:
1 x No. of Credits

For each Level 2 course:
3 x No. of Credits

For each Level 3 course:
6 x No. of Credits
(excluding 6 credit Level 3 projects)

Note: Level 3 compulsory 6 credit special, design, or research projects shall account for 20% of the total weighted average.

Courses for which credit and exemption have been given on the basis of qualifications obtained outside the Faculty/University shall not be taken into account in this calculation, except where the prescribed Schedule of courses allows for a student to take a course outside of the Faculty of Engineering for credit.

(b)* First Class Honours, Second Class Honours (Upper Division), Second Class Honours (Lower Division) or Third Class Honours shall be awarded on the basis of final weighted average mark of 70.0%, 60.0%, 50.0% or 40.0% respectively.

(c) Where a student completes the Degree in more than eight (8) semesters, he/she shall not normally be eligible for Honours. Students who have been granted permission to write examinations without attending classes in up to two (2) courses, or who require up to seven (7) credits in one (1) semester to graduate shall have this period counted as one-half (1/2) of a semester.

(d) For the BSc Programmes in Industrial Engineering, Mechanical Engineering and Mechanical Engineering with a Minor in Biosystems Engineering, the following shall apply:

A candidate, who fails any Level 3 course, including the Industrial Engineering Project or Mechanical Engineering Project, at the first attempt, shall not be eligible for the award of Honours.

(e) A student who does not satisfy the requirements for the award of Honours, but who otherwise meets the requirements for the award of a degree in accordance with the Faculty's regulations, shall be awarded a Pass Degree.

23. (a) Where a student takes all the course examinations as prescribed in the Schedule but fails a single course examination equivalent to a maximum of four (4) credits, with a minimum mark of 30%, the Degree shall be awarded in accordance with Regulation 22(b).

(b) Where a student takes all the course examinations as prescribed in the Schedule but fails two course examinations equivalent to a maximum of seven (7) credits, with a minimum mark of 30% in each of those two (2) examinations, the Degree shall be awarded but with a classification one level lower than it would otherwise be awarded in accordance with Regulation 22(b). If the student chooses not to accept the lower classification, he/she shall be required to pass at least one of the two course examinations before the Degree can be awarded. In the case of a candidate who would be awarded a Pass Degree in the first instance, the classification shall not be affected.

(c) The choice of the particular course examination(s) for which failure may be allowed in accordance with (a) and (b) above shall be determined by the Department concerned.

** For students with year of entry 2003-2004 to the Faculty, GPA Regulations 2, 3 and 4 will apply.*

GRADE POINT AVERAGE REGULATIONS

1. (i) For purposes of these regulations, the following meanings shall apply, except where the context otherwise requires:

Credit Hours Earned

"Credit Hours Earned" means the credits for each course that counted toward the degree requirement and for which a passing grade is obtained.

Quality Hours

"Quality Hours" mean the credits for each course that is included in the GPA calculations. Quality hours shall be assigned even when a grade of F is obtained in a course. Courses that are not used in the determination of the GPA shall be assigned zero quality hours.

Quality Points:

"Quality Points" means the numerical value assigned to the relevant letter grade earned.

(ii) For the purpose of these Regulations:

(a) Level 1, 2 and 3 Courses

Level 1, 2 and 3 Courses are courses so designated by the Board for Undergraduate Studies.

(b) Grade Points

Grade points are determined by multiplying the quality hours by the quality points for a course.

(c) Grade Point Average (GPA)

Grade Point Average is the average obtained by dividing the total grade points earned by the total quality of hours for which the student has registered for any total quality of hours for which the student has registered for any stated period of time, excluding courses taken on a pass/fail basis, audited courses, courses taken for preliminary credit and courses for which the designation I or IP is awarded under Regulations 6 (iv).

(d) Weighted Grade Point Average

Weighted Grade Point Average is the average determined by applying appropriate weights for Level 1, 2 and 3 courses to the grade points and the quality hours used in determining grade point average as set out at Regulations 1 (ii) (c) above.

(e) Credit Hours

The credit values for courses, as well as for projects, laboratory sessions, foreign language classes or other contact hours, shall be determined by the Faculty Board and approved by the Board for Undergraduate Studies.

(iii) Pass/Fail Course Provision

Credit hours earned in courses taken on a Pass-Fail basis shall not be included in calculating grade point averages.

2. (i) The class of degree shall be awarded on the basis of the Weighted GPA as set out in these Regulations.

Weighted Grade Point Average

(ii) Weighted Grade Point Average is the average determined by applying the appropriate weights of 10%, 30% and 60% for Levels 1, 2 and 3 courses (except the Final Year Project) respectively to the grade points and the quality hours used in determining grade point average as set out at 1.

(iii) Except for the purpose of determining the class of degree, the term GPA in these Regulations shall mean the GPA as defined at Regulation 1(ii)(c) above.

3. (i) First Degrees awarded by the University for the Bachelor of Science (Engineering) shall be classified as follows:

First Class Honours
(Weighted GPA 3.6 and above)

Upper Second Class Honours
(Weighted GPA 3.00 - 3.59)

Lower Second Class Honours
(Weighted GPA 2.99 - 2.59)

Third Class Honours
(Weighted GPA 1.50 - 1.99)

Pass
(Weighted GPA 1.00 - 1.49)

4. (i) The letter grades for completed courses used in the calculation of GPA shall be the following:

A - four quality points
B - three quality points
C - two quality points
D - one quality point
E - no quality points

(ii) Plus and minus modifiers may be used with letter grades A through D.

(iii) In the determination of GPA, the range of marks, the defined grades with the corresponding quality points shall be:

A+ (80 - 100)	=	4.3
A (70 - 79)	=	4.0
A- (67 - 69)	=	3.7
B+ (63 - 66)	=	3.3
B (60 - 62)	=	3.0
B- (57 - 59)	=	2.7
C+ (53 - 56)	=	2.3
C (50 - 52)	=	2.0
C- (47 - 49)	=	1.7
D+ (43 - 46)	=	1.3
D (40 - 42)	=	1.0
F<40	=	0.0

(iv) The following designations may be assigned, but shall not be used in the calculation of Grade Point Average (GPA).

PC: Preliminary Credits - used for matriculation or academic disciplinary purposes only.

EC: Exemption with credit.

E: Exemption.

V: Audited - when the course has been taken in accordance with Regulation 14.

NV: When a student has been permitted to audit a course but has not done so satisfactorily.

P: Pass - a pass obtained in a course taken on a Pass/Fail basis.

NP: Not Passed - when a student has failed a course taken on a Pass/Fail basis.

FM: Failed Medical - when a student is absent from an examination for medical reasons or where failure in an examination is attributed to medical reasons as supported by a certificate from an authorised medical practitioner.

AB: Absent - when a student is absent from an examination for acceptable reasons other than medical reasons.

I. Incomplete - indicates that the student has made progress in a course but at the end of the semester has not finished the work required to receive a letter grade. An 'I' designation is not counted in credit hours earned, or quality hours until a letter grade is reported. If neither a letter grade nor notification of an extension of time is received by the Registry from the Office of the Dean, the 'I' designation is replaced by an 'F' letter grade at the end of the first six (6) weeks into the next semester in which the student is registered. An extension of time may be granted but shall not normally extend beyond the end of the semester in which the extension is granted. Any remaining 'I' symbol at the end of the period of extension will be deemed an 'F'.

NR: Not Reported - when a lecturer fails to submit grades by the published deadline, through no fault of the student.

IP: In Progress - when a dissertation, thesis, project, student teaching, practicum, internship, proficiency requirement, or other course intended to last more than one semester, is not completed during the semester in which the student is registered. The 'IP' designation must be replaced with an appropriate grade on completion of the course.

5. The scheme to be used for conversion of numerical marks to letter grades shall be as prescribed in Regulation 4 (iii) above.

6. (i) Where credit for a course taken at another institution is requested, it is the student's responsibility to provide all the information needed by the University to enable it to assess the course.

(ii) Credit hours earned from another institution at the time of admission to The University of the West Indies will not be used in the computation of a grade point average.

7. The following shall apply to credits earned by a UWI undergraduate from another approved institution:

(i) A UWI student who wishes to take academic courses elsewhere and apply those credits toward the UWI degree must obtain approval in advance from the relevant Academic Board on the recommendation of the Board of the Faculty in which he/she is registered.

(ii) A student must have obtained a minimum UWI GPA of 2.00 to be approved to take courses as an exchange/transfer student.

(iii) Only the grades earned at another institution and not the marks so earned, shall be used in the computation of the student's GPA.

8. (i) Except where otherwise prescribed in Faculty Regulations, a student whose GPA for a given semester is less than or equal to 0.75 shall be deemed to be performing unsatisfactorily and shall be placed on probation. A student on probation whose GPA for the succeeding semester is less than 0.75 will be required to withdraw.

(ii) Auditing means recorded attendance at the lectures, tutorials and laboratory sessions for a given course without the requirement of sitting the final exam.

(iii) Satisfactory attendance certified by the Head of Department shall be awarded the designation V. In absence of such certification, the designation 'NV' shall be recorded.

(iv) No academic credit may be granted for auditing a course.

9. (i) A student who voluntarily withdraws from the University and who applies for re-admission within five (5) years may elect to:

(a) Have a new GPA record that will be used for determining academic standing and eligibility for graduation started when the student has been approved for re-admission; or

(b) Apply for exemption and credit for courses previously passed subject to the time limit for the maintenance of credit stipulated in the relevant Faculty Regulations.

(ii) Where exemption and credit are granted in accordance with 10(i), the grades obtained at previous attempts at such courses shall be used in the determination of the student's GPA.

10. A student who was required to withdraw for reasons of failure to progress as prescribed in Faculty Regulations may be re-admitted on the following conditions.

(i) A minimum of one (1) year must have passed since the date of withdrawal.

(ii) All grades previously obtained shall continue to apply for the purpose of determining the student's GPA;

(iii) Work done at an institution other than UWI during the period between the student being required to withdraw and being granted re-admission may be eligible for credit under Regulation 6.

DEPARTMENT OF CHEMICAL ENGINEERING

The Department of Chemical Engineering has traditionally offered a BSc in Chemical & Process Engineering. From the 2001/2002 academic year, the Department has introduced a BSc in Petroleum Geoscience in response to the stated needs of the oil and gas industry.

BSc in Chemical & Process Engineering

One of the key sectors in the economies of the English-speaking Caribbean is that of the process industries. Thus, the petroleum and natural gas industries effectively control the economy in Trinidad & Tobago, and the minerals industry (bauxite, cement, etc.) is of prime importance in Jamaica, with sugar and food having an impact in all territories.

In addition to these industries however, there is a wide range of operations in the medium and small-scale process categories such as soaps and detergents, paints, pharmaceuticals, oils and fats, etc. The discipline of Chemical Engineering is concerned with the design, construction and operation of all the processes involved in these industries. Serious considerations are given in all of these industries to safety and environmental protection. The course of study requires basic knowledge of Physics, Chemistry and Mathematics at Advanced level status and comprises a balanced curriculum of basic chemical engineering analysis but with a significant component of practical and project work in engineering applications, computer studies and industrial plant projects.

In the final year programme, students are required to carry out the design of a plant;; this being the culmination of the programme of studies. The programme is ideal as a background for postgraduate studies in many areas including petroleum engineering.

Graduates of the Chemical & Process Engineering Programme will find employment in all aspects of the process industries including design, process engineering, project engineering, operations management, technical services and marketing.

BSc in Petroleum Geoscience

A new programme has been introduced into the Faculty of Engineering - a BSc in Petroleum Geoscience with majors in Petroleum Geology and Petroleum Geophysics. It is a three-year programme that allows students the option of specialising in either Petroleum Geology or Petroleum Geophysics and has been a fast-track initiative within the Faculty of Engineering, Department of Chemical Engineering. The programme was

asked for by the petroleum industry of Trinidad, particularly the GSTT (Geological Society of Trinidad & Tobago) and has the support from all the major upstream hydrocarbon companies and government.

Petroleum Geoscience is concerned with understanding the structure of the earth to depths of five miles to identify potential areas of hydrocarbon deposits, and to identify the hydrocarbon bearing zones, fault patterns and water ingress, and thence to model them in sufficient detail so as to be able to design development programmes for economic exploitation. After a reservoir comes into production, the Petroleum Geoscientists monitor production to ensure that forecasts are accurate and identify potential geological problems and opportunities. Petroleum Geoscientists are the professionals who assess acreage, identify exploration prospects, suggest possible drilling sites for hydrocarbon exploration, appraise new discoveries, plan and implement field development, monitor the wells during production, and generally assist field management by teaming with petrophysicists, drillers, engineers and commercial units.

The professional careers of petroleum geoscientists and engineers can be very varied. Undergraduate education and training therefore needs to be broad. This is reflected in the proposed curriculum in all years, although specialisation is pronounced in the later years. A three-year course delivers the essentials of the topic but a fourth year MSc Petroleum Geoscience provides advanced training for students wishing to become professional petroleum geologists/geophysicists or, perhaps later, enter academia. The first two years of the Petroleum Geoscience course progressively build a broad, sound knowledge in relevant courses in geology, mathematics, essential physical sciences and IT. The courses are integrated through a comprehensive and carefully designed fieldwork programme. At the end of the second year, students have a firm basis for selecting an option and can decide whether to follow the Petroleum Geology or Petroleum Geophysics option.

The Petroleum Geoscience Degree Programme majors in quantitative petroleum geology and geophysics courses but also includes significant basic training in petrophysics and reservoir engineering. It is expected to attract bright science students, fascinated with the earth and wishing to have a productive industrial career in their areas of interest. The quantitative nature of the course demands a good entrance grade in Mathematics. Entrance requirements are, therefore, Advanced Level Grades A or B in Mathematics, in addition to Physics or Chemistry, and one other Science subject.

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Schedule of Courses

BSc in Chemical & Process Engineering

Accredited by the Institute of Chemical Engineers (IChemE) of the UK to the BEng level, en route to CEng.

LEVEL 1

Semester 1		**17 Credits**
CHNG 1000	Introduction to Chemical & Process Engineering (CH10A)	E3
CHNG 1001	Applied Chemistry I (CH11A)	E2
ENGR 1001	Information Technology for Engineers (FE11A)	C3
MATH 1180	Engineering Mathematics I (M17A)	E3
MENG 1000	Engineering Graphics (ME10A)	C3
MENG 1005	Workshop Technology (ME14B)	C3

Semester 2		**18 Credits**
CHNG 1002	Applied Chemistry II (CH11B)	E2
CHNG 1003	Science of Materials (CH13A)	E3
CHNG 1004	Chemical Process Principles I (CH14B)	E3
CHNG 1006	Transport Phenomena I (CH16B)	E3
CHNG 1007	Chemical Engineering Laboratory I (CH17B)	C1
ECNG 1007	Electrical Engineering Technology (EE18B)	E3
MENG 1001	Engineering Thermodynamics I (ME11B)	E3

LEVEL 2

Semester 1:		**16 Credits**
CHNG 2000	Transport Phenomena II (CH20A) (CHNG 1006) (CH16B)	E3
CHNG 2001	Process Design & Economics I (CH22A)	E3
CHNG 2002	Chemical Process Principles II (CH23A)	E3
CHNG 2004	Separation Processes I (CH25A)	E3
CHNG 2009	Chemical Engineering Laboratory II (CH29A)	C1
MATH 2230	Engineering Mathematics II (M17A) (M26A)	E3

Semester 2:		**17 Credits**
CHNG 2003	Computer-aided Engineering (CH24B)	C3
CHNG 2005	Plant & Safety Engineering (CH25B)	E3
CHNG 2006	Process Dynamics & Control (M17A) (CH26B)	E3
CHNG 2007	Particle Technology (CH27B)	E3
CHNG 2008	Chemical Engineering Practice (CH28B)	C2
CHNG 2010	Chemical Engineering Laboratory III (CH29B)	C1
MATH 2240	Statistics (M26B)	E2

LEVEL 3

Semester 1		**15 Credits**
CHNG 3001	Transport Phenomena III (CH31A) (CHNG 2000) (CH20A)	E3
CHNG 3004	Chemical Reaction Engineering I (CH33A)	E3
CHNG 3006	Process Design & Economics II (CH34A) (CHNG 2001) (CH22A)	E3
CHNG 3007	Separation Processes II (CH35A) (CHNG 2004) (CH25A)	E3
MENG 3000	Engineering Management I (ME30A)	E3

Semester 2		**15 Credits**
CHNG 3012	Chemical Engineering Design Project (CH35B)	C6
CHNG 3013	Chemical Engineering Research Project (CH36B)	C3

Together with TWO (2) Optional courses, subject to the approval of the Head of Department, to be chosen from:

CHNG 3000	Natural Gas Technology (CH30B)	E3
CHNG 3002	Biochemical Engineering (CH31B)	E3
CHNG 3003	Process Dynamics & Control II (CH33B)	E3
CHNG 3005	Chemical Reaction Engineering II (CH33B)	E3
CHNG 3008	Petroleum Reservoir Engineering (CH37C)	E3
CHNG 3009	Petroleum Production Engineering (CH37D)	E3
CHNG 3010	Petroleum Processing Technology (CH38B)	E3
CHNG 3011	Technology of the Sugar Industry (CH39B)	E3
CVNG 3008	Environmental Engineering II (CE34B)	E3
FOST 3001	Principles of Food Processing (FS31B)	E3
MENG 3001	Engineering Management (ME30B)	C3

BSc in Petroleum Geoscience

Accredited by the Geological Society of London en route to CGeol.

LEVEL 1

Semester 1		**17 Credits**
CHNG 1001	Applied Chemistry I (CH11A)	E2
ENGR 1001	Information Technology for Engineers (FE11A)	C3
MATH 1180	Engineering Mathematics I (M17A)	E3
PGSC 1000	Introduction to Geology & Geological History (PX10A)	E3
PGSC 1001	Introduction to Earth Sciences, Processes & Caribbean Geology (PX13A)	E3
PGSC 1003	Engineering Graphics & Geodetics for Petroleum Geoscience (PX15A)	C3

Semester 2		**16 Credits**
CVNG 1001	Mechanics of Fluids I (CH11B)	E3
CHNG1002	Applied Chemistry II (CH11B)	E2
MATH 2240	Statistics (M26B)	E2
PGSC 1002	Paleontology & Biostratigraphy (PX13B)	E3
PGSC 1004	Field & Mapping Principles (PX15B)	C3
PGSC 1005	Geophysics Fundamentals (PX16B)	E3

Internship: 8 weeks with industry (optional)

LEVEL 2

Semester 1		**17 Credits**
MATH 2230	Mathematics (M26A)	E3
PGSC 2000	Structural Geology (PX21A)	E3
PGSC 2001	Sedimentology (PX21B)	E3
PGSC 2003	Mineralogy (PX23A)	E3
PGSC 2005	Fundamental Petroleum Geology & Petroleum Geophysics (PX24A)	E3
PGSC 2010	Communication Skills (PX28A)	C2

Semester 2		**17 Credits**
PGSC 2002	Petrophysics (PX22B)	E3
PGSC 2004	Geochemistry of Petroleum (PX23B)	C2
PGSC 2006	Stratigraphy (PX24A)	E3
PGSC 2007	Igneous & Metamorphic Petrology (PX25A)	E3
PGSC 2008	HSE for Upstream Petroleum Industry (PX25B)	E3
PGSC 2009	Field & Geologic Mapping (PX27B)	C3

Internship: Working for 12 weeks with industry

Petroleum Geology Option

LEVEL 3

Year-long Course:

PGSC 3000	Oil & Gas Field Project	C6

Semester 1		**16 Credits**
MENG 3000	Engineering Management (ME30A)	E3
PGSC 3001	Petroleum Geology of the Southeast Caribbean (PX30A)	E2
PGSC 3002	Petroleum Exploration - Geological Methods (PX31A)	E3
PGSC 3003	Formation Evaluation (PX33A)	E2
PGSC 3004	Essential Petroleum Engineering (PX34A)	E3

Semester 2		**16 Credits**
PGSC 3005	Computational Petroleum Geology & Geophysics (PX30B)	C3
PGSC 3006	Reservoir Development Geology & Reservoir Modelling (PX32B)	E3
PGSC 3007	Basin/Structure Analysis (PX33B)	E3
PGSC 3008	Prospect Assessment, Evaluation & Petroleum Economics (PX35B)	E3
PGSC 3009	Geoscience Seminar (PX37B)	C1

Petroleum Geophysics Option

LEVEL 3

Year-long Course:

PGSC 3000	Oil & Gas Field Project (PX330)	C6

Semester 1 **16 Credits**

MENG 3000	Engineering Management I (ME30A)	E3
PGSC 3001	Petroleum Geology of the Southeast Caribbean (PX30A)	C2
PGSC 3003	Formation Evaluation (PX33A)	E2
PGSC 3004	Essential Petroleum Engineering (PX34A)	E3
PGSC 3010	Wave Propagation & Wave Theory (PX32A)	E3

Semester 2 **16 Credits**

PGSC 3005	Computational Petroleum Geology & Geophysics Methods (PX30B)	C3
PGSC 3008	Prospect Assessment, Evaluation & Petroleum Economics (PX35B)	E3
PGSC 3009	Geoscience Seminar (PX37B)	C1
PGSC 3011	Petroleum Exploration - Geophysical Methods (PX34B)	E3
PGSC 3012	Seismic Data Acquisition, Processing & Interpretation (PX36B)	E3

Course Codes

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CHNG	Chemical	Page 28
ECNG	Electrical	Page 54
ENGR	Faculty	Page 85
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**Non-departmental*

***Note**: The letter "E" or "C" preceding the credit allocation indicates Examination by written papers or by coursework, respectively.*

Syllabus

BSc in Chemical & Process Engineering

LEVEL 1

CHNG 1000 (CH10A)
Introduction to Chemical & Process Engineering
3 Credits

The structure of the process industries in the Caribbean. Role of the Chemical Engineer. Social and environmental impact of the process industries. Process equipment. Process flowsheets. Instrumentation and control. Introduction to mass and heat balances. Introduction to process economics. Separation processes - simple applications of stage and continuous contacting. Safety and loss prevention. Technical report writing and oral presentation.

CHNG 1001 (CH11A)
Applied Chemistry I
2 Credits

Fundamental properties and behaviour of matter. Spectroscopy: UV, IR, AA and NMR. Applied physical chemistry: solid surface chemistry, surface and colloidal chemistry, solubility, ionic mobilities, physico-chemical methods of analysis. Applied organic chemistry: reaction mechanisms and reaction types.

CHNG 1002 (CH11B)
Applied Chemistry II
2 Credits

Applied organic chemistry: building blocks for organic chemicals - natural gas, methanol, ammonia, ethylene. Characteristics of important organic and inorganic unit processes. Applied Biochemistry: carbohydrates, proteins, enzymes, lipids. Metabolic pathways - chemistry and thermodynamics. Introduction to microbiology, biochemical processes.

CHNG 1003 (CH13A)
Science of Materials
3 Credits

Introduction to materials science. Crystal structures. Thermal equilibrium diagrams. Iron and steels I. Non-ferrous alloys I. Joining processes. Corrosion. Properties of materials. Shaping of materials. Iron and steels II. Non-ferrous alloys II. Design and selection of materials. Polymers. Ceramics. Composite materials.

CHNG 1004 (CH14B)
Chemical Process Principles I
3 Credits

Applications of material and energy balances to special processes: single phase systems, multiphase systems, combustion, recycle processes. Transient balances. Introduction to flowsheet development. Property estimation techniques. Chemical kinetics. Introduction to reactor design.

CHNG 1005 (CH15A)
Science of Materials A
1 Credit

Introduction to materials science. Crystal structures. Thermal equilibrium diagrams. Iron and steels I. Non-ferrous alloys I. Joining processes. Corrosion.

CHNG 1006 (CH16B)
Transport Phenomena I
3 Credits

Properties of fluids, statics, pressure distribution, forces on plane and curved surfaces. Kinematics: ideal and real fluids, streamlines, flow in pipes, flow measurements, introduction to dimensional analysis. Steady and unsteady state heat conduction. Convection-film and overall heat transfer coefficient. Application of dimensional analysis to heat transfer. Combined mode heat transfer. Temperature measurement. Introduction to mass transfer by molecular and convective diffusion. Introduction to heat exchangers. Analogy between heat and momentum transfer. Molecular and convective diffusion.

CHNG 1007 (CH17B)
Chemical Engineering Laboratory I
(Coursework)

LEVEL 2

CHNG 2000 (CH20A)
Transport Phenomena II
3 Credits

Basic transport mechanisms in fluid flow, heat and mass transfer. Conservation of momentum: application of linear momentum balance, Navier Stokes equation, generalised Bernoulli equation (rotational and irrotational flow), angular momentum balance. Introduction to boundary layer theory. Flow in ducts. Compressible flow. Pumps, compressors, turbines (specification of equipment) Introduction to radiant heat transfer, heat transfer equipment, multitube heat exchangers, evaporators, fluidised beds. Simultaneous heat and mass transfer, water cooling. Interphase mass transfer n 2 film theory.

CHNG 2001 (CH22A)
Process Design & Economics I
3 Credits

Process synthesis. Development of a project. Selection and economic evaluation of the process. Design methodology and general design considerations, site selection, plant layout. Services. Provision, metering and distribution of steam, electricity, cooling water, inert gases. Capital equipment and utilities cost estimate. Project capital requirements - sources of finance, debt and equity elements, interest, cost of capital. Elements of cash flow: sales, operating cost, depreciation, taxes, scrap value etc. Assessment of economic feasibility. Payback time value of money. Discounted cash flow methods - net present value and DCF Rate of Return. Sensitivity analysis. Use of codes and standards. Pressure vessels: theoretical basis for design, design procedures from standards; selection of equipment and materials of construction.

CHNG 2002 (CH23A)
Chemical Process Principles II
3 Credits

Thermodynamic properties of mixtures: chemical equilibria, physical equilibria. Thermodynamic analysis of processes: availability. Physico-mechanical processes: refrigeration, power generation, cogeneration.

CHNG 2003 (CH24B)
Computer-aided Engineering
3 Credits

Introduction to Computer-aided drafting. Numerical methods: Solution of systems of linear and non-linear algebraic equations. Solution of differential equations. Flowsheeting: introduction to methods of steady state simulation. Introduction to available packages. Material and energy balances. Economic analysis: Use of computer packages for plant evaluation. Safety and risk analysis: reliability, risk and safety analysis methods e.g., fault tree, event tree. Failure modes and effect analysis, hazard and operability studies. Introduction to the use of physical property packages.

CHNG 2004 (CH25A)
Separation Processes I
3 Credits

Identification, use and characteristics of separation processes. Phase contacting in stage and continuous processes. Analysis of selected processes for the separation of binary mixtures - distillation, absorption, liquid/liquid and solid/liquid extraction. Stage efficiency determination.

CHNG 2005 (CH25B)
Plant & Safety Engineering
3 Credits

Management of safety. Legal background. Factory Acts, Health and Safety at Work Act. Legislation on emissions, toxic substances, fires, explosions. Systematic identification and quantification of hazards, hazard and operability studies (HAZOPS). Waste disposal and pollution control. Disposal of solid wastes. Gaseous and liquid emissions, dispersion. Flammability assessment and fire prevention, pressure relief and venting. Safety of plant in start-up, operation, shut-down, maintenance and modification. Safety personnel, and personnel protection systems and procedures. Product safety. Reliability and maintainability of equipment. Plant performance and produce quality standards, downtime, maintenance frequency. Explosion, toxicity and toxic release. Electrical area classification. Measurement and control of noise and heat.

CHNG 2006 (CH26B)
Process Dynamics & Control I
3 Credits

Mass and energy conservation for time varying systems. Lumped and distributed parameter models of simple systems. Linear analysis, Laplace transforms, transfer functions. Open loop responses to simple inputs. Bode plots. Computer simulation. Measurement of temperature, flow, level, pressure, composition, etc. Elements of control systems. Controller algorithms. Concept of feedback. Closed loop responses. Analysis of degrees of freedom. Selection of variables for measurement and control. Performance specifications, dominant mode approximations. Stability criteria. Bode design. Root locus.

CHNG 2007 (CH27B)
Particle Technology
3 Credits

Properties of particles. Interactions between particles and fluids: individual particles, beds of particles. Fluidisation. Processing of particulate materials; storage and transport, size reduction and enlargement, mixing and blending, separation of particles from liquids and gases, separation by size and species.

CHNG 2008 (CH28B)
Chemical Engineering Practice
2 Credits

Study of specific process industry. Industrial plant evaluation.

CHNG 2009 (CH29A)
Chemical Engineering Laboratory II
0 Credits
(Coursework)

CHNG 2010 (CH29B)
Chemical Engineering Laboratory III
0 Credits
(Coursework)

LEVEL 3

CHNG 3000 (CH30B)
Natural Gas Technology
3 Credits

Origins, composition and general properties. Production, separation and recovery of natural gas and condensate. Purification of natural gas. Transmission and distribution. Use of natural gas as a feedstock for the petrochemical industry. Liquefied and condensate natural gas technology.

CHNG 3001 (CH31A)
Transport Phenomena III
3 Credits

Integral momentum balance. Classification of fluids, steady and unsteady Newtonian and Non-Newtonian flows. (Low Reynolds number flows. Inviscid incompressible flow). Boundary layer theory. Turbulence in stirred vessels. Multiphase flows. Flows with surface tension effects. Numerical methods in fluid dynamics. Radiant heat transfer. Heat transfer in special systems. Free and forced convection heat transfer. Interphase mass transfer theories. Diffusion in solids. Simultaneous heat and mass transfer in systems other than air & water.

CHNG 3002 (CH31B)
Biochemical Engineering
3 Credits

Basic microbiology. Introduction to biochemistry. Enzyme technology. Kinetics of substrate utilisation. Product yield and biomass production in cell cultures. Reactor configuration. Transport phenomena in microbial systems. Design and analysis of biological reactors. Recovery of fermentation products.

CHNG 3003 (CH32B)
Process Dynamics & Control II
3 Credits

Analysis and design of advanced control systems. Feedback control of systems with large dead-time or inverse response; control systems with multiple loops; feedforward 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; Digital computer control loops, continuous to discrete-time systems; z-transforms; Discrete-time response of dynamic systems; Design of digital feedback controllers; Process identification and adaptive control.

CHNG 3004 (CH33A)
Chemical Reaction Engineering I
3 Credits

Review of kinetic rate expression and thermodynamic principles; complex kinetics homogeneous and heterogeneous catalysis. Theories of reaction rates. Classification and characterisation of reactor configurations. Conservation equations for batch, residence time distribution. Heat and mass transfer in reacting systems. Interpretation of kinetic data in laboratory, pilot and full-scaled plant operations. Commercial reactor systems. Optimisation control and stability, operating characteristics and safety; mechanical design considerations.

CHNG 3005 (CH33B)
Chemical Reaction Engineering II
3 Credits

Heterogeneous catalysis: Kinetics of solid catalysed gaseous reactions. Catalyst types, characterisation, manufacture. Industrial applications. Fermentation (Enzyme and microbial) kinetics and reactors. Polymerisation kinetics and reactors. Gas/solid non-catalytic reactions, kinetics and applications. Gas/liquid reactions and industrial applications. Reactor modelling. Survey/analysis of existing reactors.

CHNG 3006 (CH34A)
Process Design & Economics II
3 Credits

Process synthesis: development of conceptual design and best flow sheet; synthesis of separation systems; heat integration and heat exchanger networks. Batch processes: design and scheduling, planning and operation. Process optimisation including the use of linear programming, dynamic programming, search techniques, etc. Process design and economic analysis in the presence of uncertainty.

CHNG 3007 (CH35A)
Separation Processes II
3 Credits

Basic considerations in the separation of multi-component mixtures: equilibria. Analysis of multi-component distillation and absorption. Azeotropic and extractive distillation. Analysis of further selected processes for the separation of binary mixtures - drying, crystallisation, ion exchange, membrane processes. Energy requirements for separation processes. Selection of separation processes.

CHNG 3008 (CH37C)
Petroleum Reservoir Engineering
3 Credits

Classification of rocks. Origin, migration and trapping of hydrocarbons. Brief description of the reflection technique used in oil/gas exploration; usefulness of a seismic section. Properties of reservoir rocks and fluids, FVP's, compressibility, capillary pressure, porosity, viscosity and permeability. Types of well logs and their functions. Reservoir mechanics - definitions using a P-T diagram of black oil, volatile oil, dry gas, wet gas and condensate gas reservoirs, the material balance and its applications; immiscible flooding. Introduction to reservoir characterisation using drawdown and buildup techniques.

CHNG 3009 (CH37D)
Petroleum Production Engineering
3 Credits

Modern design and operating practices for completing, producing and stimulating wells and for handling produced fluids at the surface - Inflow performance, multiphase flow in pipes and the flowing well. Artificial lift methods - gas lift, sucker rod pumping, hydraulic pumping, electrical submergible pumping. Recent advances in artificial lift methods. Analysis, design and application for production and processing equipment, including separation problems, emulsions, corrosion, treating; storage and transmission systems. Casing and tubing design, principles of cementing, well completion materials, well perforating, equipment and operative standards, acidising, fracturing, problem well analysis and remedial treatment design.

CHNG 3010 (CH38B)
Petroleum Processing Technology
3 Credits

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.

CHNG 3011 (CH39B)
Technology of the Sugar Industry
3 Credits

The sugar cane 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.

CHNG 3012 (CH35B)
Chemical Engineering Design Project
6 Credits
(Coursework)

CHNG 3013 (CH36B)
Chemical Engineering Research Project
3 Credits
(Coursework)

BSc in Petroleum Geoscience

LEVEL 1

PGSC 1000 (PX10A)
Introduction to Geology & Geological History
3 Credits

Introduction to central concepts of geology, history of geological thought. Origin and structure of the earth, geochronology, fossils and geologic time. Rock-forming minerals. The rock cycle. Igneous and metamorphic geology. Sedimentary geology/Stratigraphy. Geologic maps. Field geology trip to view outcrops of rock types of Northern Range, Laventille and Guaracara limestones, and reservoir sandstones.

PGSC 1001 (PX13A)
Introduction to Earth Sciences, Process & Caribbean Geology
3 Credits

Palaeontology and evolution. Plate tectonics. Volcanism/earthquakes. Structural geology. Geologic hazards. Surficial processes, erosion and deposition. Rivers, deltas and coastal processes, ocean floor. Earth resources/ground water. Sedimentary structures and textures. Wind action and desert landscapes. Caribbean geology overview. Overview of the geology of Trinidad.

PGSC 1002 (PX13B)
Palaeontology & Biostratigraphy
3 Credits

Environmental variable and evolutionary theory. Biostratigraphy of ammonites and bivalves, ecology and history of reef communities, the Cretaceous/tertiary boundary. Introduction to paleoecology. Micropaleontology; details of the more important microfossil groups; plat spores, pollen grains, dinoflagellates, benthis and planktonic foraminifera, calcareous nannofossils, and ostracods; historical development; technology development; Applied Biostratigraphy; global biozonations, sequence stratigraphic applications and the role of biostratigraphy in hydrocarbon exploration.

PGSC 1003 (PX15A)
Engineering Graphics & Geodetics for Petroleum Geoscience
3 Credits

Instruments and their use - orthographic drawing and sketching; point lines and planes in space; auxiliary views: point, edge and normal views; isometric and perspective drawings, sectional views. Geodetic control; specification, classification. Control survey methods, triangulation, azimuths; projections, boundary and topographic surveys, ellipsoid references, international, Clarke(1858), WGS84, units, datum shifts. GIS. (Coursework)

PGSC 1004 (PX15B)
Field & Mapping Principles
3 Credits

Dip and strike, folds and fault nomenclature and symbols. Purpose and fundamentals of subsurface mapping. Preparation and uses of structure contour, isopach, paleogeographic and facies maps, cross sections and fence diagrams. Reservoir sandstone types, payzones, structural traps, sealing shales, source rocks and oil seeps. Field trips and lab exercises. (Coursework)

PGSC 1005 (PX16B)
Geophysics Fundamentals
3 Credits

Physics of the earth. Vibration and waves, reflection and refraction, earthquake and earth structure, magnetism of the earth, variation with time of earth'ís magnetic field, magnetic prospecting, earth'ís gravity, principles of gravity prospecting, Geoelectrics.

LEVEL 2

PGSC 2000 (PX21A)
Structural Geology
3 Credits

Description, classification, and origin of earth structures. Ways in which the continental crust can deform; link scales of structure from the field, outcrops, hand specimen, thin section by integrating analytical techniques with practical examples. Theoretical and meso to microscale analysis of structures developed through a linked series of lectures and practicals; practical 2D strain analysis; 3D strain concepts; incremental strain, kinematics and polyphase deformations; fold construction and classes; fault evolution and section balancing; fault rock microstructures; fault and fold mechanics, current concepts in plate tectonics, cross-section construction techniques, structural interpretation of seismic data, structural styles in different tectonic settings (thrust and fold belts, rifts, strike-slip, gravity tectonics, inversion), structural geology of reservoir units.

PGSC 2001 (PX21B)
Sedimentology
3 Credits

Origin of sediments and sedimentary rocks; climate, weathering, and weathering products; transport, deposition, and depositional environments for sediments; field and laboratory studies in description and interpretation of genesis of sedimentary rocks; principles of stratigraphy and basin analysis; plate tectonics and the formation of sedimentary basins stratigraphic nomenclature; geologic time and correlation; sequence stratigraphy and basin architecture. Physical processes of sedimentation: basics of flow and sediment transport; bedforms generated in unidirectional, oscillatory and multidirectional flows; soft sediment deformation and erosional sedimentary structures; depositional environments and facies analysis; Depositional environments and facies models for clastic sedimentary systems including, braided and meandering rivers, deltas, coasts and continental shelves, deep marine basins, alluvial fans and lakes. Composition and classification of carbonate rocks.

PGSC 2002 (PX22B)
Petrophysics
3 Credits

Rock properties; porosity and permeability laboratory measurements of rock properties and their application to reservoir studies. Scope of petroleum petrophysics; vocabulary; rock properties; porosity; permeability; seismic velocity; compressibility; elasticity; fracturing; resistivity; core analysis. Density; S.P; well logs and their interpretation.

PGSC 2003 (PX23A)
Mineralogy
3 Credits

Introduction to minerals, mineral study techniques. Rock classification; physical properties of minerals and rocks; Mineralogy; crystallography, crystal chemistry, mineral chemistry, optical crystallography, physical properties, and geologic occurrence of rock-forming and economic minerals. Weathering. Review of structure of silicate materials, mineral chemistry and solid solutions of major rock-forming minerals, introduction to thermodynamics, real crystals, defects, grain boundaries and diffusion.

PGSC 2004 (PX23B)
Geochemistry of Petroleum
2 Credits

Basic concepts and terminology of petroleum geochemistry; processes related to preservation of organic matter in sedimentary environments; composition and characterisation of kerogen, bitumen, and petroleum; conversion of kerogen to hydrocarbon; principles and interpretation of geochemical data; basic concepts of maturity modelling; integrating measured geochemical data with conceptual geologic models. Aspects of pure and applied inorganic and organic geochemistry; isotope geology.
(Coursework)

PGSC 2005 (PX24A)
Fundamental Petroleum Geology & Petroleum Geophysics
3 Credits

Nature, generation, migration and entrapment of petroleum. Nature of source, reservoir and cap rocks and the relationships between them. Introduction to the habitat of petroleum in the Caribbean and South American region, particularly the main controls of oil and gas distribution in the Orinoco basin. The scope of geophysics in petroleum exploration. Overview of the acquisition, processing and interpretation of seismic reflection data. Strengths and limitations of seismic data; sources of errors and uncertainties; influence of subjectivity in seismic data processing.

PGSC 2006 (PX24B)
Stratigraphy
3 Credits

Mechanisms of basin formation and structure of basins; tectonic controls on sedimentation; origins and sedimentary and/or geomorphic impact of sea-level changes; sequence stratigraphic principles and concepts. Processes and products of near-surface and burial diagenesis in clastic and carbonate sediments. Principles of sequence stratigraphy, seismic expression of depositional systems; stratigraphic architecture; sequence boundaries and flooding surfaces. Nature and significance of high-resolution depositional sequences and their stacking patterns based on core, outcrop and wireline log data. Sequence stratigraphic interpretation and mapping of seismic data. Applied biostratigraphy; palynomorphs, spores and pollen, dinoflagellates, benthic and planktonic foraminifera, calcareous nannofossils, global biozonations, sequence stratigraphic applications and the role of biostratigraphy in hydrocarbon exploration.

PGSC 2007 (PX25A)
Igneous & Metamorphic Petrology
3 Credits

Introduction to the origin and evolution of igneous, sedimentary, and metamorphic rocks; classification and petrographic analysis of major rock types; relationships to tectonic settings. Identification in field, hand specimen and under the microscope.

Igneous Petrology: Melting processes in the earth. Phase diagrams for binary and ternary systems, eutectics. Processes in magma chambers and their crystallisation history. Physical properties of magmas. Magmatism in extensional settings and in collision zones.

Metamorphic Petrology: Metamorphic rocks as equilibrium systems; petrogenetic grids, phase diagrams and projections. Progressive metamorphism of major rock types, metamorphic facies. Metamorphic processes and the role of fluids; deformation accompanying metamorphism. Geodynamic settings of metamorphism.

Sedimentary Petrology: weathering, petrologic provinces, introduction to sedimentary facies.

PGSC 2008 (PX25B)
HSE for the Upstream Petroleum Industry
3 Credits

EIA for seismic, drilling and production locations; drilling hazards that affect safety and environment, blow outs, disposal of drilling fluids and drill cuttings; effluent gases and waters in production operations. Use and disposal of CO2 and H2S. Disposal of BS&W. Management of chemicals; oil spills on land and marine; legal framework for HSE in Trinidad, emissions trading, Kyoto protocol. Safety policies and procedures. Hazops.

PGSC 2009 (PX27B)
Field & Geologic Mapping
3 Credits

Field trips to observe, analyse and interpret the geology and geophysics of selected localities in Trinidad & Tobago and adjacent regions; complements classroom experience. Methods of geologic mapping with topographic maps and aerial photographs. Field studies include measuring sections, interpretation of stratigraphy, structure, environments of deposition of various sedimentary rocks. Construction of geologic cross sections; geological expression of structural styles and terrain histories; application of subsurface well and seismic data in the preparation of structural contours and facies maps. Use of remote sensing images to plan exploration strategies; Strengths and limitations of different remote sensing tools; assessment of relief, drainage, solid and drift lithologies, tectonic and sedimentary features from the appropriate images; comparison of data from images with geological map information; synthesis of data in the form of sketch maps and cross-sections; analysis of complex problem maps using structure contours; construct accurate cross-sections in areas of complex structure and stratigraphy.
(Coursework)

PGSC 2010 (PX28A)
Communication Skills
2 Credits

Review of personal and transferable skills and use of this information to compile careers documents, including CVs; word processing and use of spreadsheets. Improve oral presentation skills with practice and training in giving a talk; oral presentation of a selected topic relevant to petroleum geoscience. Library searches; collecting information. Enhance certain transferable skills such as team working and writing skills; improve written communication and scientific skills by undertaking literature reviews of scientific controversies and new developments.
(Coursework)

LEVEL 3

PGSC 3000 (PX330)
Oil & Gas Field Project
6 Credits

This course is an extended practical exercise where well, outcrop, seismic and other geophysical data are interpreted in order to evaluate the exploration potential of an area, or an individual study to solve a particular geological/geophysical problem in a field. The students may work in groups. If in a team, the team will take a field from initial discovery stage (seismic plus one well) through appraisal into planning development, reservoir zonation, selection of pay zones and a calculation of in-situ reserves.
(Coursework)

PGSC 3001 (PX30A)
Petroleum Geology of the South-east Caribbean
2 Credits

Geological evolution of the Caribbean; Geology of the South-east Caribbean from Suriname to Barbados with emphasis on hydrocarbon basins in the region.

PGSC 3002 (PX31A)
Petroleum Exploration - Geological Methods
3 Credits (Geology option)

Use of modern geological techniques of structure, basin evolution, sequence stratigraphy, facies analysis, geochemistry and mapping techniques to predict trap configuration, integrity and timing; reservoir quality; source and hydrocarbon volume generation, timing and migration; and seal integrity. Case histories will be included.

PGSC 3003 (PX33A)
Formation Evaluation
2 Credits

Reservoir Petrophysics. Data acquisition, the geophysical logs and logging tools that measure the electrical, radioactive, acoustic and dielectric properties of the rocks penetrated in boreholes. Qualitative interpretation. Techniques of quantitative log interpretation. Assessment of commercial viability - porosity, water and hydrocarbon saturation, shale volume fraction. Integrated petrophysical interpretation. Field assessment - fence diagrams. Structural and sedimentological interpretation. Integrated facies analysis. Reservoir zonation. Case studies including shaly formations. Applications of dipmeter data, borehole imaging, recent advances. NMR logs. LWD. Horizontal well-logging. Computer methods.

PGSC 3004 (PX34A)
Essential Petroleum Engineering
3 Credits

Overview of petroleum industry; petroleum operations and the total production system. The reservoir, the wellbore, vertical flow, well head, gathering, primary facilities and delivery system. Petroleum engineering vocabulary and units. Reservoir fluids: gases, oils and water. Petroleum reservoir types; hydrocarbon fluid recovery methods and recovery factors. Reserves determination. Principles of primary, secondary and tertiary reservoir performance and recovery. Reservoir mechanics, improved oil recovery. Well-testing. Reservoir modelling and simulation. Reservoir performance monitoring. Gas reservoirs: gas in place and depletion, water influx problems. Gas production performanjce; gas-processing. Drilling principles and environmental effects. Benefits of horizontal well-drilling. Completions. Production and surface facilities. Production operations.

PGSC 3005 (PX30B)
Computational Petroleum Geology & Geophysics
3 Credits

Introduction to a variety of computational tools for solving common quantitative problems in geology and geophysics; statistical description and modelling of data sets; overview and comparison of various techniques applied to modelling of geophysical processes, including mapping and graphics; use of UNIX and modern commercial software (Landmark and Geoquest). (Coursework)

PGSC 3006 (PX32B)
Reservoir Development & Modelling (Reservoir Development Geology & Reservoir Modelling)
3 Credits

Fundamentals of development geology, including the geological controls on hydrocarbon distribution, recovery and fluid flow. Evaluation of the nature and distribution of reservoir quality patterns in clastic and carbonate deposits. Reservoir geological modelling, reservoir mapping and reservoir simulation. Subsurface facies analysis, sedimentological characteristics of clastic and carbonate depositional systems in relation to the distribution of reservoir, source and seal facies. Diagenesis; effects on reservoir properties, compaction, cementation and dissolution in siliciclastic and carbonates. Subsurface diagnosis of sedimentary environments from cores, ditch cuttings and wireline logs. Prediction of the distribution, geometry and orientation of reservoir bodies, engineering analysis of reservoirs; measuring and monitoring reservoir pressures and reservoir formation evaluation, predicting reservoir history; determining well locations for infill drilling; principles of primary, secondary, and tertiary reservoir performance and recovery; reservoir modelling.

PGSC 3007 (PX33B)
Basin/Structure Analysis
3 Credits (Geology option)

Use of physical and geophysical data to define mechanisms responsible for basin formation, interval structure and stratigraphy of different basin types, and hydrocarbon occurrence in basins. Reservoirs, seals and pressures; petrography and petrophysics of reservoir rocks, including the nature, origin and distribution of porosity and permeability. Description, identification and interpretation of reservoir rocks from cores and ditch cuttings. Recognition and distribution of cap rocks and subsurface seals. Diagenesis and fluid flow. Nature and origin of subsurface fluids and pressures. Effects of plate tectonics on reservoir formation; sedimentation, metamorphism, igneous activity, and deformation patterns at rift zones, subduction zones, and transform margins. Plate motion and interactions through time; structural geology, paleontology, petrology and stratigraphy of plate margins such as compressional mountain belts, passive margins, mid-oceanic ridges and transform boundaries. Applied structural geology for subsurface evaluation, including the development of folds, faults and halokinetic structures in orogenic and non-orogenic regions. Fracture formation and distribution.

PGSC 3008 (PX35B)
Prospect Assessment, Evaluation & Petroleum Economics
3 Credits

Introduction to the geography and international politics of oil and gas, exploration/production licensing, taxation and development planning. Hydrocarbon history of Trinidad & Tobago. Differences in oil economy and gas economy. Prospect evaluation, risk analysis and volumetric reserves estimates. Reserve estimation, production profiles, parameterisation of risk factors, net present value, rate of return, profit to investment ratios, tax and royalties. Geostatistics; introduction to the software and techniques of geostatistics and their applications to quantifying risk and uncertainty in petroleum geoscience.

PGSC 3009 (PX37B)
Geoscience Seminar
1 Credit

Each student is assigned a topic on an aspect of petroleum geoscience of a selected geographic region or discussion of a subject of current importance and presents it in a seminar. (Coursework)

PGSC 3010 (PX32A)
Wave Propagation & Wave Theory
3 Credits

Theoretical basis for the various seismic wave modes in the earth. Physical and mathematical foundations for seismic ray theory; linear system analysis in time and frequency domains, methods and problems in deriving velocity information from reflection and refraction seismic data to S/N improvement and velocity spectra. Wave propagation in a multilayered medium. Seismic attenuation, dispersion and scattering. Seismic anisotropy. Reflection amplitude (variations with offset). Seismic attribute analysis. Fourier theory, sampling theory, convolution, filtering, the X-transform, correlation, Wiener filtering, spectral analysis, two-dimensional filtering. Potential field theory. Sampling (wavefield sampling), F-K analysis (application to dip filtering and migration); deconvolution (deterministic and predicative); velocity estimation and tomography (travel time inversion); imaging in time and depth (migration); Zoeppritzís equation, AVO and AVAZ.

PGSC 3011 (PX34B)
Petroleum Exploration - Geophysical Methods
3 Credits

Use of modern geophysical techniques including gravity, magnetics and 2D, 3D and 4D seismic in petroleum exploration and development. Case histories will be included.

PGSC 3012 (PX36B)
Seismic Data Acquisition, Processing & Interpretation
3 Credits

Seismic sources and source arrays. Receivers (geophones and hydrophones) and receiver arrays. Cables and streamers. Recording instruments. Positioning (offshore and onshore) 2D, 3D, 3C and 4D field and marine seismic acquisition. Complete processing sequence for the petroleum industry needs including deconvolution filtering, DMO, ray tracing and full wave equation migration. Data binning, effects of feathering, migration aperture. Introduction to the problems of reflection time, velocity impedance, amplitude and phase to geologic parameters of lithology. Acquisition and processing of three-dimensional seismic data with emphasis on the applications of modern software packages. Seismic stratigraphy and structural interpretation of seismic data. Introduction to computerised interpretation used in modern exploration and reservoir studies. Acoustic wave propagation in boreholes and the acquisition and analysis of full waveform acoustic logs and crosswell and VSP data.

DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING

Civil Engineering is the discipline that covers the conversion of resources through the application of the laws of science and engineering to facilities, products and systems that sustain and improve the quality of life. Civil Engineering concerns itself with the provision of roads, bridges, buildings, airports, seaports, dams, water supply, beaches, marinas, ports and harbours, recreational facilities and environmental plant and systems, all as integrated components of civil infrastructure and facilities that support towns, cities, countries and regions.

The Department offers training in the five essential engineering sub-disciplines, Geotechnical Engineering, Structural Engineering, Transportation Engineering, Water Resources and Coastal Engineering, and Environmental Engineering. Civil Engineering Management is also included to cover the effective management of the conversion of resources to social, commercial and recreational infrastructure, and the event and impact of hurricanes, earthquakes and other natural hazards today form an essential module of the discipline.

Civil Engineering is also concerned with the sustainability of infrastructure and society, and emphasis on Environmental Engineering is now considered vital to the discipline. Accordingly, the Department now offers two streams of engineering education, one in the traditional Civil Engineering, and the other in Civil with Environmental Engineering.

The Civil Engineering Degree Programme provides core competency in the essential engineering sub-disciplines and Project Management, and offers a wide choice of specialisation within any of the five sub-disciplines in the final year of the programme.

The Civil with Environmental Engineering Degree Programme also provides core competency in the five sub-disciplines and Civil Engineering Management and offers streamlined specialisation in Environmental Engineering in the final year of the programme.

The Department's programmes are accredited to the joint requirements of the Institution of Civil Engineers (UK), the oldest professional engineering organisation in the world, and the Institution of Structural Engineers (UK).

Head of Department
Mr. Francis R. Charles

Administrative Assistant
Mrs. Andrea Perreira

Secretary
Mrs. Angela Crichlow

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Schedule of Courses

Being accredited by the Joint Board of Moderators (JBM) of the UK to the BEng level, en route to CEng status.

BSc in Civil Engineering

LEVEL 1

Semester 1		**17 Credits**
CVNG 1000	Mechanics of Solids (CE10A)	E3
CVNG 1004	The Civil Engineer in Society (CE14B)	E2
ENGR 1000	Introduction to Engineering (FE10A)	E3
ENGR 1001	Information Technology for Engineers (FE11A)	C3
MATH 1180	Engineering Mathematics I (M17A)	E3
MENG 1000	Engineering Graphics (ME10A)	C3

Semester 2		**16 Credits**
CHNG 1005	Science of Materials A (CH15A)	E1
CVNG 1001	Mechanics of Fluids I (CE11B)	E3
CVNG 1002	Civil Engineering Design I (CE12C)	C2
CVNG 1003	Construction Techniques (CE13B)	C2
CVNG 1005	Science of Materials B (CE15B)	E2
ECNG 1007	Electrical Engineering Technology (EE18B)	E3
MENG 1001	Engineering Thermodynamics I (ME11B)	E3

LEVEL 2

Year-long Courses		**8 Credits**
CVNG 2002	Soil Mechanics (CVNG 1000) (CE22B)	E4
CVNG 2006	Structural Design 1 (CVNG1000) (CE225) (CE10A)	C4

Semester 1		**13 Credits**
CVNG 2000	Geology (CVNG 1000) (CE10A) (CE20A)	E4
CVNG 2001	Structural Mechanics (CVNG 1000) (CE21A) (CE10A)	E3
MATH 2230	Engineering Mathematics II (M17A) (M26A)	E3
SURV 2004	Surveying for Civil Engineers (SV24C)	E3

Semester 2		**9 Credits**
CVNG 2003	Civil Engineering Design II (CE26C) (CVNG 1002) (CE12C)	C2
CVNG 2004	Civil Engineering Law (CE27B)	E2
CVNG 2005	Mechanics of Fluids II (CVNG 1001) (CE28B) (CE11B)	E3
MATH 2240	Statistics (M26B)	E2
SURV 2005	Surveying Project for Agricultural & Civil Engineers (SV24D)	C0

LEVEL 3

Year-long Courses:		**9 Credits**
CVNG 3014	Civil Engineering Design Project (CE335) (CVNG 2001) (CVNG 2002) (CVNG 2003) (CVNG 2006) (CE21A) (CE22B) (CE26C) (CE225)	C6
CVNG 3015	Special Investigative Project (CE360)	C3

Semester 1		**15 Credits**
CVNG 3002	Structural Analysis (CVNG 2001) (CVNG 2006) (CE21A) (CE31C) (CE225)	E3
CVNG 3005	Foundation Engineering (CE32A) (CVNG 2002) (CE22B)	E3
CVNG 3007	Environmental Engineering I (CE34A)	E3
CVNG 3009	Highway Engineering (CE37A)	E3
CVNG 3012	Water Resources (CVNG 2005) (CE28B) (CE38B)	E3

Semester 2 **8 Credits**

CVNG 3000	Civil Engineering Management (CE30C)	E3
CVNG 3003	Structural Design II (CVNG 3002) (CE31C) (CE31D)	C2

Plus ONE (1) of the following course options, subject to the approval of the Head of Department:

CVNG 3001	Structural Engineering (CE31B) (CVNG 2001) (CVNG 2006) (CVNG 3002) (CE21A) (CE225) (CE31C)	E3
CVNG 3004	Structural Dynamics (CVNG 3002) (CE31E) (CE31C)	E3
CVNG 3006	Environmental Geotechnics (CE32B) (CVNG 3005) (CE32A)	E3
CVNG 3008	Environmental Engineering II (CE34B) (CVNG 2005) (CE28B)	E3
CVNG 3010	Transportation Engineering (CE37B) (CVNG 3009) (CE37A)	E3
CVNG 3011	Pavement Design & Management (CE37C) (CVNG 3009) (CE37A)	E3
CVNG 3013	Coastal Engineering (CE39C) (CVNG 2005) (CE28B)	E3
ENGR 3001	Natural Hazards & Disaster Management In the Caribbean (FE31B)	E3

BSc in Civil with Environmental Engineering

LEVEL 1

Semester 1 **17 Credits**

CVNG 1000	Mechanics of Solids (CE10A)	E3
CVNG 1004	The Civil Engineer in Society (CE14B)	E2
ENGR 1000	Introduction to Engineering (FE10A)	E3
ENGR 1001	Information Technology for Engineers (FE11A)	C3
MATH 1180	Engineering Mathematics I (M17A)	E3
MENG 1000	Engineering Graphics (ME10A)	C3

Semester 2 **16 Credits**

CHNG 1005	Science of Materials A (CH15A)	E1
CVNG 1001	Mechanics of Fluids I (CE11B)	E3
CVNG 1002	Civil Engineering Design I (CE12C)	C2
CVNG 1003	Construction Techniques (CE13B)	C2
CVNG 1005	Science of Materials B (CE15B)	E2
ECNG 1007	Electrical Engineering Technology (EE18B)	E3
MENG 1001	Engineering Thermodynamics I (ME11B)	E3

LEVEL 2

Year-long Courses: **8 Credits**

CVNG 2002	Soil Mechanics (CVNG 1000) (CE22B) (CE10A)	E4
CVNG 2006	Structural Design I (CVNG 1000) (CE225) (CE10A)	C4

Semester 1 **13 Credits**

CVNG 2000	Geology (CVNG 1000) (CE10A) (CE20A)	E4
CVNG 2001	Structural Mechanics (CVNG 1000) (CE21A) (CE10A)	E3
MATH 2230	Engineering Mathematics II (M17A) (M26A)	E3
SURV 2004	Surveying for Civil Engineers (SV24C)	E3

Semester 2 **9 Credits**

CVNG 2003	Civil Engineering Design II (CVNG 1002) (CE12C) (CE26C)	C2
CVNG 2004	Civil Engineering Law (CVNG 1004) (CE27B) (CE14B)	E2
CVNG 2005	Mechanics of Fluids II (CVNG 1001) (CE28B) (CE11B)	E3
MATH 2240	Statistics (M26B)	E2
SURV 2005	Surveying Project for Agricultural & Civil Engineers (SV24D)	C0

LEVEL 3

Year-long Courses: **9 Credits**

CVNG 3014	Civil Engineering Design Project (Environmental) (CVNG 2001) (CVNG 2002) (CVNG 2003) (CVNG 2006) (CE21A) (CE22B) (CE26C) (CE225)	C6
CVNG 3015	Special Investigative Project (Environmental) (CE360)	C3

Semester 1		**15 Credits**
CVNG 3002	Structural Analysis (CE31C) (CVNG 2001) (CVNG 2006) (CE21A) (CE225)	E3
CVNG 3005	Foundation Engineering (CVNG 2002) (CE32A) (CE22B)	E3
CVNG 3007	Environmental Engineering I (CE34A)	E3
CVNG 3009	Highway Engineering (CE37A)	E3
CVNG 3012	Water Resources (CVNG 2005) (CE38B) (CE28B)	E3

Semester 2		**8 Credits**
CVNG 3000	Civil Engineering Management (CE30C)	E3
CVNG 3016	Design of Environmental Systems (CE31F) (CVNG 3002) (CVNG 3007)	C2

Plus ONE (1) of the following course options, subject to the approval of the Head of Department.

CVNG 3006	Environmental Geotechnics (CE32B) (CVNG 3005) (CE32A)	E3
CVNG 3008	Environmental Engineering II (CE34B) (CVNG 2005) (CVNG 3007) (CE28B) (CE34A)	E3
CVNG 3013	Coastal Engineering (CVNG 2005) (CE39C) (CE28B)	E3
ENGR 3001	Natural Hazards Management (FE31B)	E3

Note: The letter "E" or "C" preceding the credit allocation indicates Examination by written papers or by Coursework, respectively.

1. Course loadings in any semester shall not exceed the credits as stated above, unless approved by the University.

2. A minimum of 96 credits is required for graduation.

Syllabus

LEVEL 1

CVNG 1000 (CE10A)
Mechanics of Solids
3 Credits

Simple static forces, stress, strain. Hardness, impact, temperature effects. Two-dimensional stress and strain, torsion, combined stresses. Statically determinate beams and plane frames. Bending theory and moment, shearing, force, slope, deflexion, moment-area.

CVNG 1001 (CE11B)
Mechanics of Fluids I
3 Credits

Physical properties of fluids - statics: pressure distribution, forces on plane and curved surfaces, floating stability. Kinematics: ideal and real fluid, streamlines, path lines, streak lines; graphical plotting of streamlines. Dynamics: continuity, momentum and energy equations for one-dimensional flow. Laminar and turbulent flow, flow in pipes, flow measurements. Introduction to dimensional analysis. Dynamic similarity. Boundary layers. Pipe friction. Darcy equation. Rotodynamic machines: selection; performance, cavitation.

CVNG 1002 (CE12C)
Civil Engineering Design I
2 Credits

Concept of design and its contribution to the quality of life; Civil Engineering Design, the role of geomatics, the environment, and scientific laws in design; Introduction to the design of buildings and Civil Engineering Infrastructure, site appraisal; Risk and vulnerability in design; Health and safety in Civil Engineering Design, environmental impact assessment; Civil Engineering drawing, CAD techniques, introduction to GIS techniques.

FOR COURSE CODES, SEE PAGE 27

CVNG 1003 (CE13B)
Construction Techniques
2 Credits

Introduction to Construction; Construction in the context of National Physical Planning, land development: construction techniques of sewer, drainage, road and wastewater collection and disposal systems. Building systems, construction delivery systems and construction contracts, the principles of construction management, construction capacity, legislation, regulations, and funding; Materials handling, construction health and safety.

CVNG 1004 (CE14B)
The Civil Engineer in Society
2 Credits

Historical development of Civil Engineering; contribution to the quality of life; branches and sub-disciplines in Civil Engineering; The investigative process and technological progression; the role of the environment, conservation and restoration in the provision of buildings and infrastructure; Risk, vulnerability and mitigation in the provision of social, commercial and lifeline facilities; Ethical issues in Civil & Environmental Engineering, their nature and character; International standards of professional behaviour and codes of ethics.

CVNG 1005 (CE15B)
Science of Materials
2 Credits

Fundamental structure, properties and behaviour of other major materials used in Civil Engineering; concrete, asphalt, timber, soil, rock, paints, polymers, adhesives, composite materials; Durability and deterioration; Hazardous materials, classification and handling.ion; Hazardous materials, classification and handling.

LEVEL 2

CVNG 2000 (CE20A)
Geology
4 Credits

Fundamental geology for Civil Engineers: The Rock Cycle Structure and geological history of the Earth, surface geological processes, structural geology, geologic maps and their interpretation. Engineering geology - topics and concepts: Principles of rock mechanics, engineering properties of rocks, the stability of slopes and cuttings, industrial rocks and minerals, hydrogeology, geotechnical investigation, engineering seismology, dams and reservoirs. Field trips, tutorial sessions.

CVNG 2001 (CE21A)
Structural Mechanics
3 Credits

Introductory concepts, equilibrium and compatibility, statical determinacy; compatibility of deformations, flexibility method applied to simple flexural systems; analysis of beams (flexure, shear, thin-walled sections); compression members, strain energy and related theorems. Analysis of beams (asymmetrical bending); simple plastic theory (hinges, mechanism, equilibrium diagram method, redistribution of bending moments, moment capacity, fundamental theorems of plastic collapse), approximate methods of analysis; influence lines for statically determinate systems.

CVNG 2002 (CE22B)
Soil Mechanics
4 Credits

Characteristics of soils - soil formation, soil structure, grain size analysis, plasticity, classification, phase relations. Soil compaction and stabilisation. Permeability and seepage - permeability, flownets, seepage through earth dams. Consolidation - oedometer test, one-dimensional theory, settlement calculations, correction for construction time. Stress distribution - elastic theory, influence charts. Shear strength - Mohr-Coulomb failure criteria, strength tests, shear strength of sands and clays, pore pressure coefficients, stress-strain relationships. Lateral earth pressures - Rankine's theory, Coulomb's theory, Culmann's graphical method, gravity and cantilever walls, reinforced earth walls. Stability of slopes - types of slope failures, Taylor's stability numbers, method of slices: Bishop's simplified method, short-term and long-term stability.

CVNG 2003 (CE26C)
Civil Engineering Design II
2 Credits
Innovation in design, the investigative process: designing for health and safety, risk and vulnerability; role of analysis, synthesis and optimisation in design; project planning, networks and graphs; embankments, dams, drainage design, geometric design of roads, environmental impact assessment.

CVNG 2004 (CE27B)
Civil Engineering Law
2 Credits
The impact of Law on the delivery of Civil Engineering services and works; the building process, regulating agencies, national physical development planning, approvals, standard form of construction contracts; Health and safety laws and regulations; liability, claims, conflict resolution, conciliation, arbitration and litigation; the value of engineering ethics, professional worthiness, consequences of ethical and unethical behaviour; professional practice, partnerships, companies and cooperatives; industrial relations, labour legislation and trade unions.

CVNG 2005 (CE28B)
Mechanics of Fluids II
3 Credits
Rotational and irrotational flow; potential flow. Euler and Navier-Stokes equations. Bernoulli theorem, Reynolds stresses, lift and drag, curved flow, vortices. Open channel flow, energy and momentum principles, critical depths, hydraulic jump, backwater curves, surges, resistance to flow, waves, model analysis, sediment transport.

CVNG 2006 (CE225)
Structural Design I
4 Credits
Conceptual design of structures; structural design of steel, reinforced concrete, timber and masonry structures, use of construction materials in design.

LEVEL 3

CVNG 3000 (CE30C)
Civil Engineering Management
3 Credits
Introduction to management theory; human resource management, leadership, corporate strategy, communication, conduct of meetings; Management information systems (MIS); resolution of engineering ethics, Civil Engineering case studies, resources and reasoning methods; Civil Engineering project management, networks and graphs, quality management; Facilities management, maintenance management, managing health and safety; Introduction to management accounting and financial management.

CVNG 3001 (CE31B)
Structural Engineering
3 Credits
Structural dynamics and stability, wind and seismic forces. Advanced structural analysis. Non-uniform sections, beams on elastic supports, torsion. Plastic collapse and yield line methods. Theory of plates and shells, containers, silos, water-retaining structures and other special structures. Composite construction, pre-cast concrete, model analysis. Structural form and conceptual design, computer-aided design.

CVNG 3002 (CE31C)
Structural Analysis
3 Credits
Symmetry and anti-symmetry, indeterminacy, slope deflection, moment distribution, structural dynamics, stability, prestressed concrete, plates, combined bending and axial loads, arches, influence lines, suspension cables.

CVNG 3003 (CE31D)
Structural Design II
2 Credits
Computer modelling, hurricane resistant design, earthquake resistant design, liquid retaining structures, shear walls, prestressed concrete.

CVNG 3004 (CE31E)
Structural Dynamics
3 Credits
Introduction to structural dynamics, discretisation concepts. Single Degree of Freedom Systems (SDOF), Multi-Degree of Freedom Systems (MDOF), review of applications in earthquake and wind engineering.

CVNG 3005 (CE32A)
Foundation Engineering
3 Credits
Site investigations, bearing capacity and settlement, design of spread footings and rafts, pile foundations, sheet pile walls.

CVNG 3006 (CE32B)
Environmental Geotechnics
3 Credits
Geotechnical aspects of environmental control - e~~E~~xpansive soils, identification and classification, design of buildings and pavements. Landslides, geotech investigations, stability analysis, stabilisation techniques. Earthquakes, liquefaction of sands, effect on retaining structures and earthdams. Land-use planning.

CVNG 3007 (CE34A)
Environmental Engineering I
3 Credits
Environmental needs and priorities, pollution, the role of environmental engineering, water quality standards, unit operations in water treatment, sources of wastewater, wastewater quality and effluent standards, unit operations in wastewater treatment, on site treatment and disposal, stream purification processes, sources of solid wastes, treatment of solid and faecal wastes, control of leachates, recycling, environmental impact assessment, soil conservation systems and mitigation of forest destruction.

CVNG 3008 (CE34B)
Environmental Engineering II
3 Credits
Water supply systems, wastewater collection and disposal systems, hydraulics of treatment plants, pumping stations, urban storm water drainage systems, industrial wastewater and pollutants, treatment systems for industrial and agricultural waste water, solid waste collection systems disaster mitigation, environmental engineering in the built environment.

CVNG 3009 (CE37A)
Highway Engineering
3 Credits
Highway traffic characteristics, capacity of roadways and intersections, design of intersections, traffic management, parking studies; environmental impact, road safety; route location, economic analysis, introduction to transportation planning; pavement materials, pavement and drainage design; quality control and pavement maintenance management systems.

CVNG 3010 (CE37B)
Transportation Engineering
3 Credits
Transport policy, economics and mathematics; design operation and management of air, land and sea transportation systems; Transportation planning, Intelligent Transportation Systems (ITS), architecture design and management; Road safety management systems; managing the environmental impact of transportation.

CVNG 3011 (CE37C)
Pavement Design & Management
3 Credits
Roads and highways pavement design, airport runway design, seaports and special pavements, pavement management systems, road rehabilitation and maintenance.

CVNG 3012 (CE38B)
Water Resources
3 Credits

The water resource system, meteorology, hydrologic cycle, hydro-meteorologic measurements and instrumentation, hydrologic statistics, rainfall and run-off, unit hydrographs, low flows, impoundment reservoirs, reservoir safety, groundwater flow, flow to wells, seawater intrusion, and contaminant transport.

CVNG 3013 (CE39C)
Coastal Engineering
3 Credits

Introduction to coastal zone management; The marine environment, coastal processes; Wave generation and propagation; Coastal sediment transport, sediment budget; Port and marine structures. Design of coastal defense works; Port-planning and management. Coastal pollution control, EIA and waste disposal in the coastal zone.

CVNG 3014 (CE335)
Civil Engineering Design Project
6 Credits

The purpose of this course is to develop the student's ability in Civil Engineering Design, as well as the ability to work in a team. The emphasis is on self-learning, creativity, design, understanding, project team-working and communication skills, as well as engineering judgement and problem solving. The project gives professional orientation to work in the final year by simulating as closely as is possible the investigation and design works which are required for substantial Civil Engineering works and projects in the provision of buildings, lifeline facilities and Civil Engineering infrastructure. The integration of health and safety, and risk and vulnerability in the design process gives the student a complete outlook on the design process.

CVNG 3015 (CE360)
Special Investigative Project
3 Credits

This course is a project-based one, designed to generate an investigative learning atmosphere. The project work is carried out year-long, engenders a sense of enquiry, research and verification in the student, and draws on the first two years of learning in the programme. The emphasis is on self-learning, creativity, understanding, communication skills, as well as on engineering analysis and problem solving. The projects are supervised by tutors from the Department of Civil & Environmental Engineering. Special permission may be sought to pursue a relevant engineering-based project in other Departments in the Faculty of Engineering.

CVNG 3016 (CE31F)
Design of Environmental Systems
2 Credits

Environmental and hydraulic design of water treatment systems; design of domestic wastewater collection and treatment systems; functional design of advanced wastewater treatment systems: design of industrial water and wastewater treatment systems; structural design of water and wastewater treatment systems and vessels; structural design of conduits, and supports; earthquake, hurricane and hazard-resistant design procedures and typical details for hydraulic structures, conduits and supports.

DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING

Electrical & Computer Engineering is primarily concerned with the application of electrical, electronic and electromechanical technology to diverse aspects of human endeavour in business and industry, for entertainment and health services. These activities may include generation, distribution and utilisation of electrical energy; design, production and installation of electrical and electronic equipment; development of systems for communication; use of systems for monitoring and automatic control of engineering equipment; and development of systems for storing, communicating and processing all types of information.

Electrical technology has found widespread use in fields such as measurement, control, automatic computation and bioengineering. Moreover, the exploitation of abstract systems-oriented concepts, which have evolved largely from the rigorous analysis of problems in Electrical Engineering, has engendered fields of exploration and endeavour which are essentially independent of the basic physical principles of electron flow. These new fields include areas such as Information Technology and Software Engineering that are concerned with the development of systems for managing data flow. Unprecedented advances in all aspects of information technology have contributed significantly to the predominance of Electrical Engineering as the fastest growing discipline in the field of engineering.

The successful practice of Electrical & Computer Engineering very often requires the application of the advanced mathematics and physics. A good engineer must therefore master the relevant concepts so as to be able to competently analyse and resolve the various issues which arise in the field.

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Teaching Assistant

Schedule of Courses

Accredited by the Institute of Electrical Engineers (IEE) of the UK to the BEng level, en route to CEng status.

BSc in Electrical & Computer Engineering

LEVEL 1

Semester 1		**15 Credits**
ECNG 1003	Electronics (EE13D)	E3
ECNG 1009	Introduction to Programming (EE10C)	C3
ECNG 1010	Communication Skills for Engineers (EE10G)	E2
ECNG 1012	Engineering Science & Technology (EE12E)	E4
ECNG 1180	Engineering Mathematics I (M17A)	E3

Semester 2		**15 Credits**
ECNG 1000	Electrical Circuits (EE10A)	E3
ECNG 1004	Introduction to Electrical Energy Systems (EE14B) (ECNG 1000)	E3
ECNG 1006	Laboratory & Project Design I (EE17D)	C3
ECNG 1013	Introduction to Thermodynamics (EE12F)	E2
ECNG 1014	Digital Electronics (EE19D)	E4

LEVEL 2

Semester 1		**15 Credits**
ECNG 2000	Electromechanical Energy Conversion Systems (ECNG 1004) (EE20A)	E3
ECNG 2004	Laboratory & Project Design II (ECNG 1006) (EE24C)	C3
ECNG 2011	Signals & Systems (EE20C)	E3
ECNG 2012	Electronics & Instrumentation (EE26D)	E3
MATH 2210	Engineering Mathematics II (M26A)	E3

Semester 2		**15 Credits**
ECNG 2001	Communications I (EE22A)	E3
ECNG 2005	Laboratory & Project Design III (EE24D)	C3
ECNG 2006	Introduction to Microprocessors (EE25M) (ECNG 2004)	E3
ECNG 2007	Computer Systems & Software Design (EE26A)	E3
ECNG 2009	Control Systems (ECNG 1005) (EE27B)	E3

Level 3
Year-long Course

ECNG 3020	Special Project (EE302)	C6

Semester 1
Compulsory

ECNG 3015	Industrial & Commercial Electrical Systems (EE36C)	E3
ECNG 3021	Introduction to Engineering Management & Accounting Systems (EE30A)	E4

Semester 2

ECNG 3022	Electromagnetic Field Theory (EE30C)	E3

All other courses are chosen from the regular list of options to a total minimum of 33 credits, i.e., a programme total of 93 credits, subject to the approval of the Head of Department to be chosen from:

COMP 3100	Operating Systems (CS31A)	E4
COMP 3700	Compiling Techniques (CS36E)	E4
COMP 3750	Numerical Computing I (CS37A)	E4
ECNG 3001	Communication Systems II (EE31B)(ECNG 2001) (EE22A)	E3
ECNG 3002	Data Communication Systems (EE31D)	E3
ECNG 3003	Telecommunication Networks (EE31T)	E3
ECNG 3004	Control Systems Applications (EE32D)(ECNG 2009) (EE27B)	E3
ECNG 3005	Modern Control Theory (EE32D) (ECNG 2009) (EE27B)	E3
ECNG 3006	Microprocessor Systems Design & Applications (ECNG 2006) (EE33A) (EE25M)	E3
ECNG 3007	Network Synthesis (EE33B)	E2
ECNG 3008	Power Electronics Circuits (EE33D) (ECNG 2000) (EE20A)	E3
ECNG 3009	Instrumentation Systems (EE35E)	E3
ECNG 3010	Electrical Machines & Drive Systems (ECNG 2000) (EE20A) (EE35M)	E3
ECNG 3011	Power Systems Protection (EE35P)	E3
ECNG 3012	Power Systems Analysis (EE35S) (ECNG 3015) (EE36C)	E3
ECNG 3013	Electrical Transmission & Distribution Systems (EE35T)	E3
ECNG 3014	Discrete Signal Processing (EE36A)	E2
ECNG 3016	Digital Electronics III (EE37C) (ECNG 2003) (EE23B)	E3
ECNG 3017	Computer Applications in Energy Systems (EE38B)	C3
ECNG 3018	Advanced Software Engineering (EE38D)	E2
ECNG 3019	Digital Control System Design (EE39B) (ECNG 2009) (EE27B)	E2
ECNG 3023	Introduction to Software Engineering (EE38C)	C3
ENGR 3000	The Technology of the Steelpan (FE30B) (M26A)	E3
IENG 3009	Database Systems Design (IE34A)	E4
MATH 3530	Mathematics III (M26A) (M37A)	E3
MENG 3001	Engineering Management II (ME30B)	E2
MENG 3006	Production Management Distribution Systems (ME31C)	E3

Provided that the total number of credits over the two semesters amounts to not less than 33 and that course loadings as recommended by the University are not exceeded. A minimum of 93 credits is required for graduation.

Students doing Level 3 courses must first register for courses listed above as compulsory. They must then select one of the following streams of specialty by registering for those courses which are listed in the Department's 2001/2002 Student Guide, as mandatory for that stream:

- Communication Systems
- Computer Systems
- Control Systems
- Electronic Systems
- Energy Systems

Students are asked to note that:

i. The above lists all courses which the Department is authorised to teach at the Undergraduate level. Year 3 students should consult the Student Guide for the list of optional courses which the Department will actually offer and their respective semesters of offering.

ii. Selection of a particular stream of specialisation does not exclude the possibility of registering for courses in other areas. Students are advised to consult the Department's current Student Guide for the list of mandatory courses.

iii. Registration for Level 3 courses will not be approved until credits for all required Level 1 courses have been attained. The Student Guide as well as other more detailed information may be obtained from the Department's website at:- http://www.eng.uwi.tt/depts/elec

Note: The letter "E" or "C" preceding the credit allocation indicates Examination by written papers or by Coursework, respectively. All "CS" courses are completely administered by the Department of Mathematics & Computer Science.

FOR COURSE CODES, SEE PAGE 27

Syllabus

LEVEL 1

ECNG 1000 (EE10A)
Electrical Circuits
3 Credits

Introduction to signals and systems, modelling of electrical systems and devices, network theorems, nodal and loop analysis, circuits with reactances. Transient response, AC steady state analysis, phasor analysis of single phase systems.
(Prerequisites: None)

ECNG 1002 (EE12E)
Engineering Science & Technology
3 Credits

Materials used in electrical and electronics engineering: conductors, insulators, ferromagnetic materials, semiconductors, optical fibres. Types and production of discrete elements and integrated circuits. Workshop technology - basic skills, tools and techniques in mechanical and electrical engineering practice. Measuring equipment and techniques. Introduction to Fluid Mechanics.

ECNG 1003 (EE13D)
Electronics
3 Credits

Introduction to semiconductors. Diode characteristics and equivalent circuits. Diode applications: clipping, clamping and rectification. Bipolar transistor characteristics. Biasing. Bipolar transistors as amplifiers and switches. H-parameters. JFET and MOSFET characteristics. Equivalent circuits. JFET and MOSFET as amplifiers and switches. Zener diodes. LEDs and optoelectronic devices. Operational amplifiers: inverting amplifier, non-inverting amplifier and other applications.

ECNG 1004 (EE14B)
Introduction to Electrical Energy Systems
3 Credits

Steady state power analysis, polyphase circuits, magnetically coupled circuits, introduction to magnetic circuits, variable frequency-networks and filters, two-port networks.

ECNG 1006 (EE17D)
Laboratory & Project Design I
3 Credits
Characteristics of linear elements. Modelling of simple electrical devices. Use of electrical instruments. Measurements of R, L and C. Use of operational amplifiers. Measurement of efficiency of electrical equipment. Rating of electrical and electronic equipment.

ECNG 1009 (EE10C)
Introduction to Programming
3 Credits
Standard algorithms and general problem-solving using algorithms. Number representations and binary number manipulation. Algorithm coding on a language-independent platform and in C++. Evaluation is 100% by coursework.

ECNG 1010 (EE10G)
Communication Skills for Engineers
2 Credits
This course is an introduction to technical writing and oral presentation. It covers the basics of analysing and writing for audiences; writing technical reports, instructions, proposals; preparing for and presenting oral reports; using headings, lists, and notices; creating tables, charts, graphs, illustrations; finding and documenting information; technical-writing-specific mechanics and style; and a review of grammar, usage, and punctuation.

ECNG 1013 (EE12F)
Introduction to Thermodynamics
2 Credits
Macroscopic approach to energy analysis. Energy transfer as work and heat, and the First Law of thermodynamics. Properties and states of simple substances. Control-mass and control-volume analyses. The essence of entropy, and the Second Law of thermodynamics. The Carnot cycle and its implications for practical cyclic devices. Introduction to heat transfer by conduction, convection, and radiation. Basic formulation and solution of steady and transient problems. Issues relevent to the cooling of electrical devices.

ECNG 1014 (EE19D)
Digital Electronics
3 Credits
Boolean algebra, number systems, binary arithmetic and number codes. Karnaugh map representations. Function minimisation using the Karnaugh map. Introduction to logic families, common logic devices, noise levels. Sequential logic and design. Logic design using CPLDs and FPGAs.

LEVEL 2

ECNG 2000 (EE20A)
Electromechanical Energy Conversion Systems
3 Credits
Principles of operation, steady state analyses and application of: transformers, three-phase induction motors, synchronous machines and DC machines. Polyphase connections and parallel operation of transformers; auto transformers. Steady state analysis of single-phase induction motors, servos and stepper motors.
(Prerequisite: EE14B Electrical Circuit Analysis II)

ECNG 2001 (EE22A)
Communications I
3 Credits
Amplitude modulation and demodulation. Single sideband transmission. Frequency division multiplexing. Radio receivers. Cables and transmission lines. Propagation equations, reflections, Smith charts and impedance matching. Electroacoustics: telephone speech, loudspeakers and microphones. Noise: types, noise bandwidth, noise figure and temperature. Frequency and phase modulation. Frequency spectrum and FM receivers. Telephone networks: L, T and PI networks, image and iterative impedances.

ECNG 2004 (EE24C)
Laboratory & Project Design II
3 Credits
Non-routine laboratory exercises and simple design projects, based on the courses covered in Year 1 and Semester 1 Year 2; Computer-aided electrical network analysis.

ECNG 2005 (EE24D)
Laboratory & Project Design III
3 Credits
Advanced laboratory exercises including design and application of computer programmes. Design of common sub-systems and systems used in electrical engineering.

ECNG 2006 (EE25M)
Introduction to Microprocessors
3 Credits
Microprocessor overview. Architecture of the PIC 16F877 micro-controller. Microprocessor development and support systems (MPLAB). ALU: Binary, integer and floating point arithmetic operations. PIC assembly programming language. System Performance: memory cache, pipelining, and buses. PIC Interfacing: I/O ports, timer, Polling vs. Interrupts, A/D conversion, PWM, Serial Communication. Case Studies: Serial/ Parallel Port Controller. Interrupt Controller.
40% coursework; 60% examination.

ECNG 2007 (EE26A)
Computer Systems & Software Design
3 Credits
Problem analysis. Algorithm development. Review of basic C++ syntax. Variables, classes, selection, repetition. Design and construction of simple classes. File access. Dynamic memory management: pointers, linked lists. Use of the vector class. Case studies.

ECNG 2008 (EE26B)
Electronics & Instrumentation
3 Credits
Op amp applications: linear and non-linear, waveform generators, precision rectifiers, comparators, enhancements using external transistors, limitations. Multiple transistor amplifier design. Design of special transistor circuits and feedback amplifiers. Introduction to power amplifiers. Introduction to active filters. Voltage regulator design using discrete and integrated devices. Principles of oscillators. Design of Wein bridge, phase-shift, Hartley and Colpitts oscillators.

ECNG 2009 (EE27B)
Control Systems *
3 Credits
Dynamical linear system control using the classical approach. (Prerequisite: EE15B Signals & Systems)

ECNG 2010 (EE29B)
Introduction to Software Engineering
3 Credits
What is software engineering. The software development life cycle. Software engineering phase. Software requirement analysis. Software design phase. Implementation - coding phase. Software quality assurance.

ECNG 2011 (EE20C)
Signals & Systems
3 Credits
Introduction to continuous and discrete linear time invariant (LTI) systems including State Space Representation. Fourier, Laplace and Z transforms (LTI) models. Applications of these models in system analysis and simple design.

LEVEL 3

ECNG 3001 (EE31B)
Communication Systems II
3 Credits

Introduction to information transmission: system capacity and information content. Linear system review: Fourier integrals, signals through linear systems, convolution and frequency response. Digital communication systems: sampling theorem, pulse code modulation, delta modulation, time division multiplexing, waveshaping, noise, examples. Modulation techniques: AM and FM, amplitude shift keying, frequency shift keying, phase shift keying, multisymbol signalling, demodulation. Frequency division multiplexing. Satellite and fibre-optic systems. Digital radio.
(Prerequisite: EE22A Communication Systems I)

ECNG 3002 (EE31D)
Data Communication
3 Credits

Applications and requirements of data communication. Concept of protocols and standards. Network architecture. Overview of OSI, TCP, TCP/IP and ATM reference models. Detailed treatment of the communications subnet (the physical, data link and network layers). Example protocols. Channel allocation in broadcast networks. Basic performance measures. Internet working. Introduction to popular transport layer protocols.

ECNG 3003 (EE31T)
Telecommunication Networks
3 Credits

Telecommunication vs. data communication networks. Structure, functional components and operating principles of telecommunication networks. The following subsystems are treated in detail: transmission systems (examples drawn from PDH and SONET), switching systems (circuit, packet, frame and cell switching using time and space division technologies), signalling systems (examples drawn from SS7) and access systems (examples drawn from cellular radio and digital subscriber line technology).

ECNG 3004 (EE32E)
Control Systems Applications
3 Credits

Introduction to Chemical Processes, Chemical process control elements, actuators, electrical, hydraulic and pneumatic instrumentation, Signal Protocols, PLCs, Instrumentation installation standards, SCADA and DCS systems. The course entails a mini project which contributes to the final grade.
(Prerequisite: EE27B Control Systems)

ECNG 3005 (EE32D)
Modern Control Systems
3 Credits

Eigenvalues and eigenvectors. Functions of a square matrix and Cayley-Hamilton theorem. State variables and the state space description of dynamic systems. Solution of state equations. Controllability and observability for linear systems. State feedback and state estimators. Introduction to non-linear systems. Stability of linear systems. Introduction to optimal control theory.
(Prerequisite: EE27B Control Systems)

ECNG 3006 (EE33A)
Microprocessor Systems - Design & Applications
3 Credits

Software development as applied to embedded systems. Real-time concepts. Periodic model. Tasks and jobs. Pre-emption. Hard and Soft systems, etc. Scheduling algorithms. EDF. LST. Clock-driven scheduling. Semester-long project incorporating real-time concepts.
(Prerequisite: EE25M Introduction to Microprocessors)

ECNG 3007 (EE33B)
Network Synthesis
2 Credits

Positive real functions and their use in the synthesis of active filters. Active network synthesis using operational amplifiers. Design of Butterworth and Chebyshev low and high order filters. Consideration of filters with other characteristics. Voltage controlled voltage source, multiple feedback and biquadratic filters. Sensitivity. Design of low pass, highpass, bandpass and bandstop filters.

ECNG 3008 (EE33D)
Power Electronics Circuits
3 Credits
Characteristics of thyristors, switching devices; commutation principles; controlled rectifiers, choppers, AC phase controllers, inverters and cyclo converters; applications.

ECNG 3009 (EE35E)
Instrumentation Systems
3 Credits
Instrument performance. Sensors and sensing techniques. Review of signal conditioning, non-linearity and linearisation, transmission, conversion system design, computer-based instrumentation, noise and error analysis, computer communications in instrumentation, reliability, case study, e.g., in biomedical instrumentation.

ECNG 3010 (EE35M)
Electrical Machines & Drive Systems
3 Credits
Power electronics and drive systems for control of electrical machines; general characteristics, rectifier fed DC motors; induction motor drives with AC phase controllers; inverter fed induction motor drives; slip energy recovery schemes. Electric traction.
(Prerequisite: EE20A Electromechanical Energy Conversion)

ECNG 3011 (EE35P)
Power Systems Protection
3 Credits
Operating principles of relays - electromagnetic relays - static relays - overcurrent relays - directional relays - differential relays - distance protection - protection of transformers, generators, busbars, feeders - CTs and PTs - pilot wire and other communications used in protection - microprocessors and computer applications in protection - testing and maintenance of protective systems.

ECNG 3012 (EE35S)
Power Systems Analysis
3 Credits
Modelling of power system components. Computer-aided analysis: load flow, fault and stability studies. Economic operation: optimal active and reactive power scheduling. Introduction to dynamics of synchronous machines. 25% coursework weighting.

ECNG 3013 (EE35T)
Electrical Transmission & Distribution Systems
3 Credits
Analysis and design of transmission and distribution systems - insulators and cables - power system economics - tariff structures - power factor correction - maintenance techniques and reliability analysis.

ECNG 3014 (EE36A)
Discrete Signal Processing
2 Credits
Sampling. Time and frequency domain analysis. Data reconstruction. Z transform analysis of discrete systems. Sinusoidal steady state analysis. Recursive and non-recursive discrete time systems. Digital filtering.

ECNG 3015 (EE36C)
Industrial & Commercial Electrical Systems
3 Credits
Symmetrical components: fault levels/fault calculations; protection devices and their applications; earthing and earthing design; basic illumination engineering and lighting layout design; switchgear and applications; parallel operation of transformers; codes/standards.

ECNG 3016 (EE37C)
Digital Electronics III
3 Credits

Quine-McKluskey minimisation for large-scale problems and automation of the minimisation process. Multifunction minimisation. Use of CUPL and ABEL in logic simplification. Special synchronous sequential topics: state assignment. State minimisation. Johnson counters. Linear feedback. Shift registers. Practical issues: synchronisers and synchroniser failure. Clock skew. Testability and reliability. Asynchronous devices: feedback sequential networks. Analysis using flow tables. Races and hazards. Simple synthesis. Pulse mode sequential circuits. PLCs as asynchronous logic systems. Logic design with FPGAs (XILINX environment). Coursework contributes to the final grade.

ECNG 3017 (EE38B)
Computer Applications in Energy Systems
3 Credits

Use and design of software for power system applications. Computer-aided planning, design and operation of power systems. Computer-aided design of electrical machines. Introduction to SCADA and real time systems as applied to energy systems.

ECNG 3018 (EE38D)
Advanced Software Engineering
2 Credits

Propositional and predicate calculus. System modelling and analysis: Functional, operational modelling and analysis using primitive date types; visualisation tools. Introduction to design: methodologies; policies; decomposition; implementation bias. Implementation; documents; maintenance; software engineering software tools.

Bachelor of Applied Technology (BTech) Degree in Electrical Engineering

Effective September 2002, The University of the West Indies began awarding the Bachelor of Applied Technology Degrees (BTech) in Electrical Engineering and Mechanical Engineering. These degrees are offered at the Trinidad & Tobago Institute of Technology (TTIT) at Brechin Castle, Couva, on a part-time basis, i.e., on evenings and weekends. The Bachelor of Applied Technology degree programmes are intended to produce Engineering Technologists or Incorporated Engineers. Full details of these programmes are available at TTIT, Brechin Castle, Couva.

ECNG 3019 (EE39B)
Digital Control System Design
2 Credits

Overview of the control problem; review of discrete time. System modelling, state space methods; feedback designs, performance criteria, stability considerations; optimal discrete time control, microprocessor implementation of digital controllers; real time control systems; computers in industrial control; distributed data processing and control.

ECNG 3020
Special Project
6 Credits

Special projects will be undertaken by all students under the supervision and direction of academic staff of the department. Examination will be by coursework.(Coursework)

ECNG 3021 (EE30A)
Introduction to Engineering Management & Accounting Systems
4 Credits

Accounting and Finance: Introduction to Financial Accounting, financial statements and analysis; Time Value of Money; NPV and DCF; capital budgeting cash flows & techniques. Management & Organisational Theory: Theory of Organisations; motivation; leadership, communication, human resource development / strategic planning; Organisational Development and Change. Marketing: conceptual framework and analytical skills required for the analysis of markets and marketing activities of firms in a dynamic environment. Production Management, planning and control: Demand Forecasting and analysis; Break even analysis; Inventory control; Project Management, PERT, CPM, Project evaluation; Quality Management. Introduction to Business Law: formation of companies and general legal requirements; general principles of Contract and Tort; Law of Agency; sale of goods and Hire Purchase Act.

ECNG 3022 .(EE30C)
Electromagnetic Field Theory
3 Credits

Fields and field operators: review of vector analysis, scalar and vector fields, line and surface integrals, differential operators. The electric field. The magnetic field. Conduction. Maxwell's equations. Time-varying fields, power and energy relationships. Plane waves.

DEPARTMENT OF MECHANICAL & MANUFACTURING ENGINEERING

The mission of the Department is to provide high quality education at undergraduate and graduate levels in order to provide well-informed, highly motivated engineering graduates with the necessary technical, analytical and management competence and social awareness to have the potential to become the future leaders and to enhance the quality of life within the Caribbean and beyond, particularly the creation of products, systems and service.

Mechanical Engineering is concerned with the design, manufacture, testing, operation and maintenance of various types of machinery, industrial plants and systems and often includes the executive management of industries.

Manufacturing Engineering deals with creative and innovative activities and operations involving product design, materials selection, production planning, quality assurance and management, and marketing of consumer products, intermediate and capital goods. It includes the concurrent design and development of tooling, processes, machines and equipment, and methods for integrating facilities and systems by which products may be manufactured for local, regional and global markets.

Industrial Engineering is concerned with the analysis, design and improvement of integrated industrial systems that stress enterprise development, entrepreneurship and technological innovation. It includes process and systems design, operations research, human factors, information technology and project management that cut across other major engineering and management disciplines. Industrial engineering has applications to a broad range of industries including manufacturing firms, processing plants, off-shore operations, banks, insurance companies, hospitals and government departments.

Mechanical Engineering with Minor in Biosystems Engineering –
Biosystems Engineering is defined as the application of engineering principles to modern food and fibre production, and to bulk handling, storage and processing systems for biological products. It covers the areas of mechanisation (field, transport and plant), infrastructural development, post-harvest technology and food engineering, including food plant machinery. All the courses are rooted in the fundamentals of engineering, e.g., heat and mass transfer, fluid mechanics, dynamics and mechanics of machines, engineering mathematics, etc. However, engineering applications are focused in the biological/food production areas. This will be the definition followed in the pro-

posed Minor and, as can be seen from the course structure appended to Mechanical Engineering.

Head of Department
Dr. Winston G. Lewis

Secretary
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Academic Staff

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(Materials Technology)

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(Controls)

Schedule of Courses

BSc (Hons) Programmes in the Department of Mechanical and Manufacturing Engineering have been accredited by the Institute of Mechanical Engineers (IMechE) of the UK to the BEng level, en route to CEng.

BSc in Industrial Engineering

LEVEL 1

Semester 1		**18 Credits**
ENGR 1001	Information Technology for Engineers (FE11A)	C3
MATH 1180	Engineering Mathematics I (M17A)	E3
MENG 1000	Engineering Graphics (ME10A)	C3
MENG 1003	Engineering Statics (ME13A)	E2
MENG 1005	Workshop Technology (ME14B)	C3
MENG 1006	Introduction to Engineering (ME15A)	E2
MENG 1007	Introduction to Strength of Materials (ME16A)	E2

Semester 2		**18 Credits**
CHNG 1003	Science of Materials (CH13A)	E3
CVNG 1001	Mechanics of Fluids I (CE11B)	E3
ECNG 1007	Electrical Engineering Technology (EE18B)	E3
MENG 1001	Engineering Thermodynamics I (ME11B)	E3
MENG 1002	Engineering Drawing & Design (ME12B)	C3
MENG 1004	Engineering Dynamics (ME13B)	E3

LEVEL 2

Semester 1		**15 Credits**
IENG 2000	Work Study & Ergonomics (IE20A)	E3
IENG 2001	Accounting (IE21A)	E2
IENG 2002	Operations Research I (IE23A)	E2
MATH 2230	Engineering Mathematics II (MI7A) (M26A)	E3
MENG 2004	Mechanics of Machines I (ME22C) (MENG 1004) (ME13B)	E3
MENG 2005	Engineering Design I (ME23A)	C2

Semester 2		**17 Credits**
COMP 2800	Fundamentals of Information Systems Development (ENGR 1001) (FE11A) (CS22E)	E4
IENG 2003	Engineering Economics & Financial Management (IE24B)	E2
MATH 2250	Industrial Statistics (M17A) (M26C)	E3
MENG 2000	Heat and Mass Transfer (ME20A)	E3
MENG 2006	Engineering Design II (MENG 102) (ME23B) (ME12B)	C2
MENG 2008	Manufacturing Technology (ME25B) (MENG 1005) (ME14B)	E3

LEVEL 3

Year-long Course:

IENG 3012	Industrial Engineering Project (IE302)	C6

Semester 1		**12/13 Credits**
IENG 3000	Industrial Management (IE30A)	E3
IENG 3005	Quality Control & Reliability Engineering (IE32B)	E2
IENG 3011	Industrial Instrumentation (IE35A)	E3

Together with TWO (2) courses, subject to the approval of the Head of Department, to be chosen from:

IENG 3006	Automation (IE32C)	E2
IENG 3009	Industrial Database Design (CS22E) (IE34A)	E2
IENG 3010	Project Management (IE34B)	E2
MENG 3013	Product Design & Development (ME34A)	E3
MENG 3015	Materials Technology (ME35A)	E2
MENG 3016	Maintenance & Safety Engineering (ME36A)	E2

Semester 2		**13/14 Credits**
IENG 3001	Production Planning & Control (IE30B)	E3
IENG 3004	Control Systems Technology (IE32A)	E2
IENG 3007	Operations Research II (IE23A) (IE33A)	E2

Together with THREE (3) courses, subject to the approval of the Head of Department, to be chosen from:

ENGR 3000	The Technology of the Steelpan (M26A) (FE30B)	E3
IENG 3002	Plant Layout & Materials Handling (IE31A)	E2
IENG 3003	Behavioural Science in Management (IE31B)	E2
IENG 3008	Simulation (IE33B)	E2
MENG 3014	Computer-Aided Design & Manufacture (ME 34B)	E2

Students doing Level 3 courses must first register for compulsory courses listed above. They must then select one (1) of the two (2) streams of specialty listed below by registering for those courses which are listed under that stream in the Undergraduate Students' Guide of the Department of Mechanical Engineering.

- Industrial Systems Technology & Integration
- Engineering & Operations Management
- Manufacturing (Design, Processes & Systems)

Students are asked to note that:

(i) Selection of a particular stream of specialisation does not exclude the possibility of registering for courses in other areas.

(ii) Registration for Level 3 courses will not be approved until credits for all required Level 1 courses have been attained.

Note: The letter "E" or "C" preceding the credit allocation indicates evaluation by written examination paper(s) (and may also include a coursework component) or by coursework only, respectively.

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FOR COURSE CODES, SEE PAGE 27

BSc in Mechanical Engineering

LEVEL 1

Semester 1		**18 Credits**
ENGR 1001	Information Technology for Engineers (FE11A)	C3
MATH 1180	Engineering Mathematics I (M17A)	E3
MENG 1000	Engineering Graphics (ME10A)	C3
MENG 1003	Engineering Statics (ME13A)	E2
MENG 1005	Workshop Technology (ME14B)	C3
MENG 1006	Introduction to Engineering (ME15A)	E2
MENG 1007	Introduction to Strength of Materials (ME16A)	E2

Semester 2		**18 Credits**
CHNG 1003	Science of Materials (CH13A)	E3
CVNG 1001	Mechanics of Fluids I (CE11B)	E3
ECNG 1007	Electrical Engineering Technology (EE18B)	E3
MENG 1001	Engineering Thermodynamics I (ME11B)	E3
MENG 1002	Engineering Drawing & Design (ME12B)	C3
MENG 1004	Engineering Dynamics (ME13B)	E3

LEVEL 2

Semester 1		**17 Credits**
ECNG 2000	Electromechanical Energy Conversion (EE20A) (ECNG 1007) (EE18B)	E3
MATH 2230	Engineering Mathematics II (M17A) (M26A)	E3
MENG 2001	Strength of Materials I (ME21A) (MENG 1007) (ME16A)	E3
MENG 2004	Mechanics of Machines (MENG 1004) (ME22C) (ME13B)	E3
MENG 2005	Engineering Design I (ME23A)	C2
MENG 2007	Engineering Thermodynamics II (ME24B) (MENG 1001) (ME11B)	E3

Semester 2		**15 Credits**
MATH 2240	Statistics (M26B)	E2
MENG 2000	Heat & Mass Transfer (ME20A)	E3
MENG 2002	Strength of Materials II (ME21B) (MENG 1007) (ME16A)	E2
MENG 2003	Mechanical Vibrations (ME22B) (MENG 1004) (ME13B)	E3
MENG 2006	Engineering Design II (ME23B) (MENG 1002) (ME12B)	C2
MENG 2008	Manufacturing Technology (ME25B) (MENG 1005) (ME14B)	E3

Level 3

Year-long Course:

MENG 3019	Mechanical Engineering Project (ME302)	C6

Semester 1		**14/18 Credits**
IENG 3011	Industrial Instrumentation (IE35A)	E3
MENG 3000	Engineering Management I (ME30A)	E3

Together with FOUR (4) courses, subject to the approval of the Head of Department, to be chosen from:

ECNG 3015	Industrial & Commercial Electrical Systems (EE36C)	E3
IENG 3006	Automation (IE32C)	E2
MENG 3003	Traction and Earthworking Equipment (ME30T)	E2
MENG 3006	Production Management (ME31C)	E3
MENG 3009	Energy Engineering (MENG 2007) (ME24B) (ME32C)	E3
MENG 3011	Advanced Mechanics of Solids (MENG 2001) (MENG 2002) (ME33A) (ME21A) (ME21B)	E3
MENG 3013	Product Design & Development (ME34A)	E3
MENG 3015	Materials Technology (ME35A)	E2
MENG 3016	Maintenance & Safety Engineering (ME36A)	E2

Or other Mechanical Engineering or Industrial Engineering Level 3 course(s) subject to the approval of the Head of Department.

Semester 2		**12/13 Credits**
IENG 3004	Control Systems Technology (IE32A)	E2
MENG 3001	Engineering Management II (ME30B)	E2

Together with THREE (3) courses, subject to the approval of the Head of Department, to be chosen from:

ENGR 3000	The Technology of the Steelpan (M26A) (FE30B)	E3
MENG 3010	Power Plant Engineering (MENG 2007) (ME32D) (ME24B)	E3
MENG 3012	Environmental Control Engineering (MENG 2007) (ME24B) (ME33C)	E3
MENG 3014	Computer-aided Design & Manufacture (ME34B)	E2
MENG 3017	Finite Element Methods in Engineering Practice (CENG 1001) (MENG 2000) (MENG 2001) (CE11B) (M26A) (ME20A) (ME21A) (ME37B)	E3

Or other Mechanical Engineering or Industrial Engineering course(s) subject to the approval of the Head of Department.

Students doing Level 3 courses must first register for compulsory courses listed above. They must then select one (1) of the three (3) streams of specialty listed below by registering for those courses which are listed under that stream in the Students' Guide of the Department of Mechanical Engineering.

- Thermal Engineering & Energy Systems
- Engineering Mechanics & Design
- Manufacturing (Design, Processes & Systems)

Students are asked to note that:

(i) Selection of a particular stream of specialisation does not exclude the possibility of registering for courses in other areas.

(ii) Registration for Level 3 courses will not be approved until credits for all required Level 1 courses have been attained.

BSc in Mechanical Engineering with a Minor In Biosystems Engineering

LEVEL 1

Semester 1		**18 Credits**
ENG 1001	Information Technology for Engineers (FE11A)	C3
MATH 1180	Engineering Mathematics I (M17A)	E3
MENG 1000	Engineering Graphics (ME10A)	C3
MENG 1003	Engineering Statics (ME13A)	E2
MENG 1005	Workshop Technology (ME14B)	C3
MENG 1006	Introduction to Engineering (ME15A)	E2
MENG 1007	Introduction to Strength of Materials (ME16A)	E2

Semester 2		**18 Credits**
CHNG 1003	Science of Materials (CH13A)	E3
CVNG 1001	Mechanics of Fluids I (CE11B)	E3
ECNG 1007	Electrical Engineering Technology (EE18B)	E3
MENG 1001	Engineering Thermodynamics I (ME11B)	E3
MENG 1002	Engineering Drawing & Design (ME12B)	C3
MENG 1004	Engineering Dynamics (ME13B)	E3

FOR COURSE CODES, SEE PAGE 27

LEVEL 2

Semester 1		**17 Credits**
ECNG 2000	Electromechanical Energy Conversion (ECNG 1007) (EE18B) (EE20A)	E3
MATH 2230	Engineering Mathematics II (M17A) (M26A)	E3
MENG 2001	Strength of Materials I (MENG 1007) (ME21A) (ME16A)	E3
MENG 2004	Mechanics of Machines (ME22C) (MENG 1004) (ME13B)	E3
MENG 2005	Engineering Design I (ME23A)	C2
MENG 2007	Engineering Thermodynamics II (ME24B) (MENG 1001) (ME11B)	E3

Semester 2		**15 Credits**
MATH 2240	Statistics (M26B)	E2
MENG 2000	Heat & Mass Transfer (ME20A)	E3
MENG 2002	Strength of Materials II (MENG 1007) (ME16A) (ME21B)	E2
MENG 2003	Mechanical Vibrations (ME22B) (MENG 1004) (ME13B)	E3
MENG 2006	Engineering Design II (ME23B) (MENG 1002) (ME12B)	C2
MENG 2008	Manufacturing Technology (ME25B) (MENG 1005) (ME14B)	E3

LEVEL 3

Year-long Course		
MENG 3019	Mechanical Engineering Project (ME302)	C6

Semester 1		**16 Credits**
CVNG 3007	Environmental Engineering I (CE34A)	E3
FOST 3000	Principles of Food Science (FS31A)	E3
IENG 3011	Industrial Instrumentation (IE35A)	E3
MENG 3000	Engineering Management I (ME30A)	E3

Together with TWO (2) courses, subject to the approval of the Head of Department, to be chosen from:

MENG 3003	Traction & Earthworking Equipment (ME30T)	E2
MENG 3004	Soil & Water Engineering (ME30W)	E2
MENG 3020	Elements of Food Engineering (ME30F) (inactive)	E2

Semester 2		**12/13 Credits**
IENG 3004	Control Systems Technology (IE32A)	E2
MENG 3001	Engineering Management II (ME30B)	E2

Together with THREE (3) courses, subject to the approval of the Head of Department, to be chosen from:

MENG 3002	Post-harvest Technology (ME30P)	E3
MENG 3005	Infrastructure for Biosystems (ME31B)	E3
MENG 3007	Drainage & Irrigation Engineering (ME31D)	E3
MENG 3008	Field Machinery & Equipment (ME31M)	E2

Note: The letter "E" or "C" preceding the credit allocation indicates evaluation by written examination paper(s) (and may also include a coursework component) or by coursework only, respectively.

Registration for Level 3 courses will not be approved until credits for all required Level 1 courses have been attained.

Syllabus

LEVEL 1

MENG 1000 (ME10A)
Engineering Graphics
3 Credits

Instruments and their use; orthographic drawing and sketching; points, lines and planes in space; auxiliary views: point, edge and normal views; isometric and perspective drawings, sectional views.

MENG 1001 (ME11B)
Engineering Thermodynamics I
3 Credits

Concepts and definitions of work, heat and temperature. First and second laws of thermodynamics. Flow and non-flow processes. Properties of fluids. Simple cyclic and non-cyclic processes.

MENG 1002 (ME12B)
Engineering Drawing & Design
3 Credits

The design and manufacturing processes; intersections and developments; technical drawings - sections and conventional practices, fasteners and joining, machine elements; size description - dimensions, notes, limits, tolerances; working drawing; introduction to computer graphics.

MENG 1003 (ME13A)
Engineering Statics
2 Credits

Force systems: two-dimensional and three-dimensional force systems (rectangular components, moments and couple resultants), graphical methods of determining resultants and reaction. Equilibrium: equilibrium in two and three dimensions (free body diagrams, equilibrium conditions). Distributed forces: centres of mass and centroids of areas and volumes. Composite bodies and areas. Area of moments of inertia: definition, composite areas, parallel axis theorem. Structures: plane trusses (method of joints, method of sections and graphical methods). Space trusses, frames and machines. Friction: types of friction, dry friction, application of friction in machines. Virtual work: introduction, work, equilibrium, potential energy and stability.

MENG 1004 (ME13B)
Engineering Dynamics
3 Credits

Review of basic mechanics. Kinematics of particles: rectilinear and angular motion, plane curvilinear motion, relative motion in a plane. Kinetics of particles: equation of motion, work and energy, impulse and momentum. Introduction to central-force motion. Kinetics of systems of particles: generalised F-m-a. Work-energy (introductory section). Impulse-momentum (introductory section). Conservation laws. Plane kinematics of rigid bodies: absolute motion, relative motion - translating axes, relative motion - rotating axes. Plane kinetics of rigid bodies: review of moments of inertia. Force, mass and acceleration. Work and energy. Impulse and momentum.

MENG 1005 (ME14B)
Workshop Technology
3 Credits

Basic workshop tools and procedures. Health and safety issues - OSHA Act, Factories Ordinance; ergonomic hazards; liability; safety training and promotion. Engineering materials, workshop measurements, processes (material removal), forming and joining, machine tools and special equipment. Precision fits and tolerances, fabrication techniques, jigs and fixtures. Ventilation of workshops. Lifting gear for heavy workpieces. Machinery hazards. Electrical safety. Precautions for welding/cutting/gouging operations. Proper use of hand tools. Workshop fire safety.

MENG 1006 (ME15A)
Introduction to Engineering
2 Credits

An introduction to the following: historical development of engineering; formation of the engineer; role and functions of engineers and professional organisations; technical communications; ethics; liability; safety; legal forms of association; contracts; company law; intellectual property; engineering economics and business operations; infrastructure; energy systems and economics, environment and sustainable development. Scope of safety engineering. Hazardous materials used in engineering practice. Non-destructive testing. Introduction to plant maintenance. Condition monitoring. Hazards in the process industries. Rupture of process vessels.

MENG 1007 (ME16A)
Introduction to Strength of Materials
2 Credits

General concepts - stresses and strain, two and three-dimensional systems. Generalised Hooke's law - stress - strain relationships. Statically determinate stress systems. St. Venant's principle. Stress analysis of axially loaded bars. Strains and deformations in axially loaded bars. Statically - indeterminate stress systems. Properties of materials - tension, compression, hardness and impact tests. Analysis of stresses in two dimensions, principal stresses, Mohr's circle. Torsion of circular cross-sections. Shear force and bending moment in beams. Mathematical relationships between load intensity, shearing force and bending moment. Bending stresses in beams. Beams of two materials. Deflection of beams - simple cases. Direct integration and moment-area method.

LEVEL 2

IENG 2000 (IE20A)
Work Study & Ergonomics
3 Credits

Productivity; method study; work measurement - rating, allowances, standard time, PMTS; work sampling; fatigue and boredom; job enlargement; working conditions and influence on output; work place design.

IENG 2001 (IE21A)
Accounting
2 Credits

Basic accounting concepts and policies, financial statements, analysis of financial statements, management accounting, financial planning and control with budgeting, cost-volume-profit relationships, cost analysis and estimating.

IENG 2002 (IE23A)
Operations Research I
2 Credits

Operations research methodology. Linear programming: applications, graphical methods, simplex and dual simplex algorithms, sensitivity analysis and duality. Transportation and assignment models. Goal programming models. Network models. PERT/CPM. Inventory control models. Queuing models. Decision theory.

IENG 2003 (IE24B)
Engineering Economics & Financial Management
2 Credits

Techno-economic evaluation of capital investment projects, capital budgeting techniques, manufacturing systems economics, capital structure/leverage, financial planning for initial capitalisation, working capital management, valuation of securities, multi-national financial management topics.

IENG 2004 (IE26A)
Industrial Database Systems & Design
3 Credits

Introduction to Information Systems; data requirements; Industrial Database Applications; conceptual database design; Database and Systems Planning; database design techniques and methods; Relational Database Design; Relational and Distributed Systems; database systems implementation and maintenance; Introduction to HTML, XML and Web Applications.
Note: To be offered from Academic year 2005/2006.

MENG 2000 (ME20A)
Heat & Mass Transfer
3 Credits

Steady and unsteady state heat conduction. Analytical, graphical and numerical solutions, convection - forced and free convection on flat plates and in pipe flow; Radiation - properties, shape factor and exchange between surfaces, Introduction to heat exchangers; combined mode of heat transfer. Introduction to mass transfer.

MENG 2001 (ME21A)
Strength of Materials I
3 Credits

Elastic theorems, three-moment theorem, distribution of shear stresses, Struts and beam columns. General concept of stresses, strains, true stress and true strain, theories of failure, thin shell theory, design of bolted and welded joints. Concept of product of inertia, principal axes of moment of inertia, asymmetrical bending combined stresses, stress concentration, plastic behaviour of solids. Creep, fatigue.

MENG 2002 (ME21B)
Strength of Materials II
2 Credits

Stresses due to shock, stresses due to rotation, analysis of thick cylinders, bending of curved beams, design of springs, practical applications of strain gauge circuitry, fatigue, introduction to finite element analysis.

MENG 2003 (ME22B)
Mechanical Vibrations
3 Credits

Mechanical vibrations: fundamentals. Single degree of freedom systems. Free vibrations with and without damping. Forced vibrations. Vibration of multi-degree-of-freedom systems. Free and forced vibrations of two-degree-of-freedom systems. Vibration isolation. Transmissibility. Dynamic absorber-undamped and damped. Torsional vibrations. Lateral vibrations and whirling speeds. Introduction to controls.

MENG 2004 (ME22C)
Mechanics of Machines
3 Credits

Introduction and principles. General dynamics. Kinematics of mechanisms. Velocity and acceleration in link mechanisms. Simple harmonic motion and the reciprocating engine. Cams. Toothed gearing and geared systems. Epicyclic gears. Dry friction. Lubrication. Belt drives and brakes. Friction clutches. Kinetics of machine elements. Static forces in machines. Inertia forces in machines. Turning moment diagrams and flywheels. Balancing of machines. Gyroscopes.

MENG 2005 (ME23A)
Engineering Design I
2 Credits

Presentation of Design reports, assembly and detail drawings, notes and specifications, bills of materials and costs. The design process - problem formulation, conceptualisation, consideration of alternatives, evolution of final design. Load analysis, stress and strain calculations. The influence of geometry and discontinuities, stress concentration and related factors. Theories of failure, dynamic loading and fatigue. Special design factors, based on current design data. Selection of materials including wood and plastics. Selection of standard sections. Selection of components. Limits, fits and tolerances. Evolution of a design.

MENG 2006 (ME23B)
Engineering Design II
2 Credits

Review of fabrication/manufacturing methods. Introduction to CAD hardware and software. Detailing and specifications for component selection/manufacture - mechanical, hydraulic, pneumatic and special components. Use and creation of CAD database. Matching material selection to manufacturing methods as well as to operating conditions. Cost and related considerations. Special topics including local practices and application of new materials/methods. Preparation of operation/service instruction manuals.

MENG 2007 (ME24B)
Engineering Thermodynamics II
3 Credits
Non-reactive and reactive mixtures, psychrometry, one-dimensional compressible fluid flow; vapour and gas power cycles; reciprocating engines and machine systems; refrigeration and heat pump cycles.

MENG 2008 (ME25B)
Manufacturing Technology
3 Credits
Review of properties and applications of engineering materials. Elements of the theory and practice of metal-forming, metal-cutting, foundry technology, joining processes, heat treatment, finishing operations, industrial coatings, and polymer technology.

LEVEL 3

IENG 3000 (IE30A)
Industrial Management
3 Credits
Formal and informal organisation. Corporate planning. Marketing. Human resource management. Industrial relations. Competitive strategy. Management game. Performance and appraisal systems. Communication in organisations.

IENG 3001 (IE30B)
Production Planning & Control
3 Credits
Production systems; forecasting; resource planning; production planning; aggregate planning; master schedule; requirements planning systems; production scheduling; progress control; integrated production control systems.

IENG 3002 (IE31A)
Plant Layout & Materials Handling
2 Credits
Plant location; plant layout - types, layout planning and evaluation of layouts; plant services; principles of materials handling system design; techniques for analysis and solution of plant location, plant layout and material handling problems. Materials handling equipment. Warehousing - principles, design and operations.

IENG 3003 (IE31B)
Behavioural Science in Management
2 Credits
Motivation: history of the approaches to motivation: need theories and their current status. Cognitive theories: expectancy, equity, goals, current status. Laboratory approaches: classical conditioning, operant conditioning. Current status. Some applications. Leadership: history of the approaches to leadership. Trait theory and problems with this approach. Behavioural approach: Ohio State studies. Methodology. Situational (contingency) approach: current status, experiential exercises. VDL model, alternatives to leadership. Communication: defensive or problem-solving, climate, interpersonal communication. The communication process. Perception: experiential exercises. The perception process.

IENG 3004 (IE32A)
Control Systems Technology
2 Credits
Structure of control systems; modelling of analog and discrete system; stability techniques; pneumatic, hydraulic, analog and digital electronic controllers. Introduction to control system design.

IENG 3005 (IE32B)
Quality Control & Reliability Engineering
2 Credits
Number systems, Boolean algebra, combinational logic design, Karnaugh maps, hazards, MSI logic devices, state machines, state minimisation and assignment, design of sequential systems, microprocessor and microcomputer process automation, microprocessor interfacing, programmable logic controllers and ladder logic. Automation elements: stepper motors, encoders, lead screws, etc.

IENG 3006 (IE32C)
Automation
2 Credits
Number systems, Boolean algebra, combinational logic design, Karnaugh maps, hazards, MSI logic devices, state machines, state minimisation and assignment, design of sequential systems, microprocessor and microcomputer process automation, microprocessor interfacing, programmable logic controllers and ladder logic. Automation elements: stepper motors, encoders, lead screws, etc.

IENG 3007 (IE33A)
Operations Research II
2 Credits
Advanced topics in linear programming: revised simplex, bounded variable and decomposition algorithms, parametric programming. Integer programming: applications, cutting plane, additive and branch and bound algorithms. Non-linear programming: classical optimisation, Lagrange methods, Kuhn-Tucker conditions, quadratic and separable programming. Markov processes. Deterministic dynamic programming. Simulation.

IENG 3008 (IE33B)
Simulation
2 Credits
Introduction to simulation, components of a simulation model, hand simulation, random number generation, random variate generation, common distribution functions used in simulation, collection of data and goodness of fit, output data analysis, presenting simulation results, basic concepts of promodel.

IENG 3009 (IE34A)
Industrial Database Design
2 Credits
Production systems and data requirements; evolution of database systems and technology; database applications and systems development; conceptual database design: principles and modelling; systems planning and database design; data element design; relational database design; introduction to E-business, E-commerce, and enterprise resources planning systems; introduction to HTML, XML and Web applications.

IENG 3010 (IE34B)
Project Management
2 Credits
Introduction, feasibility of projects, definitions, organising for projects, steps in project management, project management systems, project planning, project organising, project controlling, project evaluation, project management information systems

IENG 3011 (IE35A)
Industrial Instrumentation
3 Credits
Characteristics of measurement systems - steady state: calibration accuracy, sensitivity, linearity; transient response: time constant, settling time, overshoot. Systematic and random errors. Active and passive sensors and transducers. Signal conditioning - instrumentation amplifiers; bridges: AC and DC, null and deflection; filters: active and passive. Transmission techniques and systems - telemetry; shielding and guarding techniques; voltage and current transmission; optical isolators; boosters. Interfacing multiplexers; A/D and D/A converters, counters; displays; data storage; data logging; microprocessors. Introduction to industrial instrument system design - project.

IENG 3012 (IE302)
Industrial Project
6 Credits
Special project in the field of Industrial Engineering will be undertaken by all students under the supervision and direction of academic staff in the Department. Examination will be by coursework - a presentation and project report.

IENG 3013 (IE33C)
Simulation of Industrial & Business Processes
3 Credits
Overview of simulation systems; components of simulation models; simulation processes; modelling methodologies and techniques; computer interfacing and networking fundamentals; system dynamics approach to modelling and decision support; simulation applications in manufacturing and service operations.
Note: To be offered from Academic year 2005/2006.

IENG 3014 (IE34C)
Applied Project Management
3 Credits
Definitions and feasibility of projects; project management processes; project management knowledge areas; project management information systems; team communication and conflict resolution; experimental/action-learning workshop.
Note: To be offered from Academic year 2005/2006.

IENG 3015 (IE36A)
Enterprise Information Systems
3 Credits
Organisation dynamics; Enterprise resource planning; data sources and data quality requirements; design, development and deployment of data warehouses; web-enabled data management and e-commerce; Knowledge management; strategic implications of EIS.
Note: To be offered from Academic year 2005/2006.

MENG 3000 (ME30A)
Engineering Management I
3 Credits
Management functions - corporate governance, planning and control. Strategic management - SWOT analysis, strategy formulation, strategy implementation. Marketing - marketing mix (products, pricing, promotion, distribution). Human resources - legal and ethical issues in managing people, motivational theories, management styles and leadership, labour-management relations. Accounting and finance - financial statements and analysis, capital budgeting and project evaluation, financial and risk management.

MENG 3001 (ME30B)
Engineering Management II
2 Credits
Management science - linear programming, decision analysis, queues, etc; the Engineering manager and the legal environment (legal forms of association, contracts, torts, company law, intellectual property).

MENG 3002 (ME30P)
Post-harvest Technology
3 Credits
An introduction to post-harvest physiology, physical properties of plant material; materials handling, cleaning and grading; handling, pre-treatment, packaging, and storage requirements for fruits, vegetables, root crops and cut flowers, modified and controlled atmosphere storage; packing-house layout and design; drying and drying systems, processing of durable Caribbean crops, e.g., rice, coffee, coconuts, cocoa, nutmeg, peas; milling and mixing.

MENG 3003 (ME30T)
Traction & Earth Working Equipment
2 Credits
Mechanised field operations - field capacities, field efficiencies, costing, traction theory. Performance parameters and stability of 2WD, 4WD and track-type tractors. Tillage and earth working equipment. Power calculations and machine/tool selection and matching. Tool-hitching systems. Power take-off and tractor hydraulic systems.

MENG 3004 (ME30W)
Soil & Water Engineering
3 Credits
Soil constituents, texture, structure and plasticity. Phase relations. Soil water content and potential. Soil compression, strength and stress-strain relations. Prediction of forces on soil engaging tools. Hydrologic cycle. Rainfall measurement and analysis. Stream flow measurement. Run-off analysis. Open channel flow and channel design for steady uniform flow. Introductory ground water hydrology. Computer applications.

MENG 3005 (ME31B)
Infrastructure for Biosystems
3 Credits
Layout, structural design and environmental requirements for agricultural buildings and structures. Access road construction and maintenance. Local water supplies: planning water source works including design of ponds, boreholes and farm reservoirs. Introduction to aquaculture engineering.

MENG 3006 (ME31C)
Production Management
3 Credits
Operations strategy; product-process-capacity planning; forecasting and investment analysis; operations layout; materials management - inventory, JIT, MRP; shop-planning and scheduling; quality assurance/quality control; project management.

MENG 3007 (ME31D)
Drainage & Irrigation Engineering
3 Credits

Basic soil-plant-water relations. Irrigation water requirements, sources, quantity and quality of irrigation water. Irrigation planning, scheduling and efficiencies. Design of irrigation systems and structures. Design of drainage systems and structures. Computer applications and simulation modelling.

MENG 3008 (ME31M)
Field Machinery & Equipment
2 Credits

Land and seed bed preparation, seeding and transplanting equipment. Chemical applications and applicators. In-crop cultivation. Harvesting and handling equipment for grains and grain legumes, root crops, forages, orchard crops. Use of tractor PTO and hydraulic systems for auxiliary equipment. Auxiliary equipment for handling and pre-processing operations.

MENG 3009 (ME32C)
Energy Engineering
3 Credits

Energy, energy analysis and applications to design and operations. Fundamentals of Energy Management: the energy audit, energy use planning, targeting and monitoring, costing and financing. Introduction to alternate energy technology.

MENG 3010 (ME32D)
Power Plant Engineering
3 Credits

Power plants: the steam power plant, the gas turbine power plant and the reciprocating internal combustion engine - their selection and applications in electrical power generation systems and process/power generation systems. Co-generation systems. Plant and component performance characteristics and analysis. Power plant economics.

MENG 3011 (ME33A)
Advanced Mechanics of Solids
3 Credits

Elasticity, plasticity, torsion of prismatic bars, thin plates, shells, thermal stresses, photo-elasticity and fracture mechanics. Applications of the finite element method.

MENG 3012 (ME33C)
Environmental Control Engineering
3 Credits

Refrigeration systems, analysis, applications and operations. Sizing and selection of equipment. Environmental requirements for human comfort conditions. Air-conditioning systems, analysis, design, applications and operations. Use of computer software and databases. Sizing and selection of equipment.

MENG 3013 (ME34A)
Product Design & Development
3 Credits

Synthesis of materials, design and processes into final products/ components. Emphasis will be placed on the following:- sheet metal products, case or moulded metal products, plastics, composites, machined products. Special machining processes. Generation of forms, tooling design, use of jigs and fixtures. Assembly processes, costing.

MENG 3014 (ME34B)
Computer-aided Design & Manufacture
2 Credits

Review of the role and elements of computer-aided design. Development of integrated databases for design and manufacture. Solid and surface modelling techniques for design and manufacture. Generation of tool path data from solid and surface models. Numerical Control technology:- manual part programming, computer-assisted part programming, CAI applications for tool path generation, e.g.: SMARTCAM.

MENG 3015 (ME35A)
Materials Technology
2 Credits

Basic background to the relationship between structure and properties of engineering materials with respect to selection of materials for design, processing and fabrication, the behaviour of materials in service and methods of evaluating performance. Topics include: metal alloy systems, metal structure texture and strengthening mechanisms; non-metallic materials, destructive and non-destructive testing, failure analysis, corrosion and use of standard specifications.

MENG 3016 (ME36A)
Maintenance and Safety Engineering
2 Credits

Maintainability, corrective maintenance, preventive maintenance. Scheduling, organisation and control. Diagnostic and predictive techniques and programmes. Data acquisition and processing. Computer applications. Costs and cost benefits. Safety legislation. Accident prevention. Causation of industrial accidents. Ergonomic design. Safety management. Fire and explosion risks. Pressure vessels. Reliability and conditional probability. Environmental toxicity. Gaseous and particulate emissions. Noise and vibration. Hazard analysis techniques.

MENG 3017 (ME37B)
Finite Element Methods In Engineering Practice
3 Credits

Introduction to finite element analysis - determinations. Applications: analysis of problems described by parabolic differential equations - torsion and moisture diffusion. Multidimensional finite element formation and solutions for solid bodies subjected to various boundary conditions. One-dimensional finite element formation and solution for heat transfer with mass transport. Solution to an axisymmetric stress distribution problem using the constant strain triangle method. Applications to beam, plate and trip elements.

MENG 3019 (ME302)
Mechanical Engineering Project
6 Credits

Special projects in Mechanical Engineering will be undertaken by all students under the supervision and direction of academic staff of the Department. Examination will be by coursework - a presentation and project report.

Bachelor of Applied Technology (BTech) Degree in Electrical Engineering

Effective September 2002, The University of the West Indies began awarding the Bachelor of Applied Technology Degrees (BTech) in Electrical Engineering and Mechanical Engineering. These degrees are offered at the Trinidad & Tobago Institute of Technology (TTIT) at Brechin Castle, Couva, on a part-time basis, i.e., on evenings and weekends. The Bachelor of Applied Technology degree programmes are intended to produce Engineering Technologists or Incorporated Engineers. Full details of these programmes are available at TTIT, Brechin Castle, Couva.

DEPARTMENT OF SURVEYING & LAND INFORMATION

Land Surveying is the general term used to refer to several sub-disciplines; Geodetic Surveying: the theoretical basis and the control framework for all other surveys; Topographical Surveying: mapping of the physical and cultural features on the earth's surface; Engineering and Mining Surveying: the provision of spatial data for the design, construction and monitoring of engineering and mining works; Cadastral Surveying: delineation and parcellation of property rights and the establishment of a base for effective land administration: Hydrographic Surveying: offshore position-fixing, tidal studies and mapping of water features and coastal areas.

Land Surveying provides spatial (geographical) and attribute information in the form of maps and other manual records or computer-compatible format to meet the multitude of user needs. The products of Land Surveying are invaluable tools for informed decisions in all spatially-oriented land and marine-based activities. Satellites and computers have changed the technology of measurement, processing and presentation of information used by the surveying profession. Simultaneously, Spatial Information and Information theory and practice have acquired greater emphasis in Land Surveying.

Land Surveying requires a firm background in Mathematics, Computer Science, Information Systems, Law, Planning, Valuation and Management as well as surveying disciplines of Geodesy, Cadastre, Engineering surveys, Photogrammetry, Remote Sensing Cartography and Hydrography.

The graduate Land Surveyor can be usefully employed in many institutions other than those specially dedicated to the surveying profession.

Head of Department
Dr. Keith Miller

Administrative Assistant
Ms. Nancy Ayoung

Secretary
Ms. Monique Joseph

Telephone No: 662-2002; Ext: 2108

Academic Staff

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(Geosciences, Environmental Remote Sensing & Geographic Information Systems)

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(BPTT Chair in Planning & Development)(Design for Development, Human Settlements Planning, Coastal Zone Development & Planning)

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(Surveying, Digital Photogrammetry)

Kameel Khan,
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Part-time Lecturer
(Valuation)

David Neale,
Dip Hydrography (US Naval Ocean School), PG Dip Hydrography (Plymouth) MSc (Plan. & Dev.) (UWI)
Part-time Lecturer
(Hydrography)

Keith Scott,
BSc (UWI), LLB (London)
Part-time Lecturer
(Land Law, Conveyancing)

Deborah Heather-Dawn Thomas,
BA, MSc (Oxford Polytechnic), PhD (Cambridge)
Part-time Lecturer
(Planning & Development)

Paul Williams,
BSc (ITC), Dip Photo (UCL), Lic'd Surveyor, FRICS (UK), MACSM (USA)
Part-time Lecturer
(Professional Practice)

**On leave*

Schedule of Courses

Accredited by the Royal Institute of Chartered Surveyors (RICS) of the UK.

BSc in Surveying and Land Information

LEVEL 1

Semester 1		**20 Credits**
ENGR 1001	Information Technology for Engineers (FE11A)	C3
MATH 1180	Engineering Mathematics I (M17A)	E3
SURV 1000	Fundamentals of Land Development (SV11A) (inactive)	E3
SURV 1001	Surveying I (SV12A)	E3
SURV 1002	Surveying Technology & Computing (SV13A)	E3
SURV 1004	Introduction to Cartography (inactive) (SV15C)	E2
SURV 1009	Cartography (SV15E)	E3

Semester 2		**16 Credits**
MATH 2240	Statistics (M26B)	E2
SURV 1003	Geometric Geodesy (M17A) (SV14B)	E3
SURV 1005	Cartography (inactive) (SV15D)	E2
SURV 1006	Surveying II (SURV 1001) (SV16B)	E3
SURV 1007	Geologic & Seismic Surveying (SV17B)	E3
SURV 1008	Surveying Project (SURV 1001) (SURV 1002) (SV12A) (SV13A) (SV18B)	C3

Level 2

Semester 1		**20 Credits**
MATH 2230	Engineering Mathematics II (M17A) (M26A)	E3
SURV 2001	Introduction to Photogrammetry (SV21A)	E3
SURV 2002	Planning & Valuation (inactive) (SV22A)	E3
SURV 2007	Adjustment Computations I (M17A) (SV26A)	E3
SURV 2008	Measurement Systems (SURV 1000) (SURV 1002) (SV11A) (SV13A) (SV26B)	E2
SURV 2009	Hydrographic Surveying (SURV 1006) (SV16B) (SV27C)	E3
SURV 2011	Elements of GIS (SV29B)	E3

Semester 2		**18 Credits**
SURV 2000	Geodetic Surveying (SURV 1006) (SURV 1008) (M17A) (SV16B) (SV18B) (SV20A)	E3
SURV 2006	Land Law (SV25A)	E3
SURV 2010	Mapping Project (SV28B) (SURV 1006) (SURV 1008) (SURV 2001)	C3
SURV 2012	Introduction to Planning (SV22C)	E3
SURV 2013	Remote Sensing (SV26C)	E3
SURV 2014	Digital Mapping (SURV 1009) (SV21B) (SURV 2001)	E3

LEVEL 3

Year-long Course:

SURV 3007	Research Project (SV340)	C6

Semester 1

MENG 3000	Engineering Management I (ME30A)	E3
SURV 3002	Surveying with Satellites I (SV26A) (SV32A) (inactive)	E3
SURV 3004	Cadastral Studies (SURV 2006) (SV25A) (SV33A)	E3
SURV 3006	Hydrography (SURV 2009) (SV27C) (SV34A)	E3
SURV 3015	Adjustment Computations II (SV31C) (SURV 2000) (SV20A)	E3

Together with one three (3) credit elective subject to the approval of the Head of Department.

Semester 2

SURV 3008	Engineering Surveying (SURV 2008) (SV35A) (SV26B)	E3
SURV 3009	Remote Sensing (SV36A) (inactive)	E2
SURV 3010	Professional Practice (SURV 2006) (SV36B)	E3
SURV 3011	Analytical Photogrammetry (SV37A) (inactive)	E2
SURV 3016	Valuation & Land Economy (SURV 2012) (SV32C) (SV22C)	E3

Together with one three (3)-credit elective subject to the approval of the Head of Department.

Electives

Candidates in Level 3 are required to gain 6 credits of elective courses from the list below, or other courses subject to the approval of the Head of Department.

AGSL 3004	Watershed Management (AS34C)	E3
AGEX 3002	Communication Skills for Professionals (AX36A)	E3
ENGR 3001	Natural Hazards & Disaster Management in the Caribbean (FE31B)	E3
SURV 3000	Gravimetric Geodesy (SV30A) (inactive)	E3
SURV 3001	Adjustment Computations II (SV31B) (inactive)	E2
SURV 3003	Surveying with Satellites II (SV32B) (inactive)	E2
SURV 3005	Land Information Systems (SV33B) (inactive)	E3
SURV 3012	Advanced Topics in Photogrammetry (SV37B) (inactive)	E2
SURV 3013	Digital Cartography (SURV 1005) (SV38B) (SV15D) (inactive)	E2
SURV 3014	Land Economy (SURV 2002) (SV39B) (SV22A) (inactive)	E2

Note: The letter "E" or "C" preceding the credit allocation indicates Examination by written papers or by Coursework, respectively.

FOR COURSE CODES, SEE PAGE 27

Syllabus

Level 1

SURV 1001 (SV12A)
Surveying I
3 Credits

Introduction to surveying. Theories of measurement errors and plane coordinate systems. Propagation of errors. Principles of basic survey instruments and their adjustment. Measurement of distance, direction, angle, height, position, area, volume, corresponding errors and computations. Establishing horizontal and vertical control. Detail survey methods - planimetry and hypsometry - including the use of aerial photographs. Setting out boundaries and construction works.

SURV 1002 (SV13A)
Surveying Technology & Computing
3 Credits

Introduction to measurements, booking, reporting. Conventional distance measurements. Height measurement, angular measurement, tests and adjustment of basic survey instruments, level circuit including adjustment of results. Traverse circuit including adjustment of results. Distance measurement: optical and electronic. Intersection and resection. Barometric heighting, sun azimuth. Introduction to FORTRAN programming.

SURV 1003 (SV14B)
Geometric Geodesy
3 Credits

Spherical trigonometry and its application to surveying. Concepts of geodetic astronomy, astronomic azimuths. Field astronomy. Gravity: anomalies, potential, the geoid. Earth rotation: precession, nutation and polar motion. Ellipsoidal geometry and its application to satellite surveying. Satellite mechanics: Keplerian motion, perturbed motion, coordinate and time systems. Coordinate systems and relationships between ECEF inertial and topocentric reference frames.

SURV 1006 (SV16B)
Surveying II
3 Credits

Topographical surveying including organisation and execution of projects, specification and representation of data in different formats. Route surveys including setting out vertical and transition curves and slope stakes. Introduction to the theory of adjustments computation. Coordinate transformation. Map projections.

SURV 1007 (SV17B)
Geologic & Seismic Surveying
3 Credits

Elements of resource management. Dynamic processes that have contributed to the formation of the earth's crust. Agents and processes that are responsible for the constant and continuous changes of the earth's crust. The properties, behaviour and movement of the soil and rock. Gravity, magnetic and seismic methods in determining earth structures. Seismology: Tectonics of the Caribbean and prospecting surveying for minerals.

SURV 1008 (SV18B)
Surveying Project
3 Credits

Topographic survey of selected site including land use, vegetation, soil types, location of services. Production of topographic maps and thematic plans, compilations and reports. Design layout to be prepared from given specifications. Setting out. (Coursework)

SURV 1009 (SV15E)
Cartography
3 Credits

Introduction to cartography, cartographic communication, representation of spatial data; symbol design, survey drawing, name design and placement, the components of a map, map design, map generalisation methods, map projection systems, topographic mapping, thematic mapping, map production methods, reprographics: emulsions, contact, copying, process camera, colour separation / non-photographic processing, proofing and printing, digital mapping.

LEVEL 2

SURV 2000 (SV20A)
Geodetic Surveying
3 Credits

Geodetic control: design and strength analysis of geodetic networks. Control survey methods, observations, data corrections and reductions. Height systems, trigonometric heighting. Network adjustment, analysis and quality control. Field work in the design, execution and analysis of control surveys. Statistical testing and reliability analysis of observations and parameters in adjustment.

SURV 2001 (SV21A)
Introduction to Photogrammetry
3 Credits

Aerial photographs and digital images. Photogrammetric cameras and camera calibration. Geometry of aerial photograph: scale, relief and tilt displacement. Extracting planimetric information. Binocular vision and stereoscopy. Parallax bar measurements. Introduction to analytical photogrammetry, space resection and intersection, collinearity equation, aerial triangulation and block adjustment. Stereo restitution and compilation.

SURV 2004 (SV24C)
Surveying for Civil Engineers
3 Credits

Plane surveying principles; plane tabling. Horizontal control: theodolite construction and adjustment, angle measurement, distance measurement, traversing, errors. Vertical control; optical level construction and adjustment, levelling errors. Topographical survey, tacheometry, plotting, area measurement, air survey and photographic interpretation. Electromagnetic distance measurement. Civil engineering surveying applications. Alignment instruments, including lasers: simple figure adjustment, intersection, resection, trigonometric heighting, hydrographic survey; deformation monitoring.

SURV 2005 (SV24D)
Surveying Project for Agricultural & Civil Engineers)
0 Credits
(Coursework)

SURV 2006 (SV25A)
Land Law
3 Credits

Caribbean legal systems including introduction to case laws. Sources of land law: equity, statutes. Doctrines of estates. Reception of English law in the Caribbean and its evolution. The meaning of "Law". Estates and Interests: freehold, leasehold, absolute, co-ownership, joint tenancies, tenancies in common, profits-a-prendre. Easements, restrictive covenants. Adverse possession, prescription. Contract for sale of land, the Doctrine of part performance, pre-contract enquiries and inspection. Title of unregistered and Forms of deeds and other documents. Registration of deeds, title. Registration of title, Torrens system.

SURV 2007 (SV26A)
Adjustment Computations I
3 Credits

Review of observables in geodetic surveying. Observation, condition and combined models for adjustment of terrestrial observations. Satellite time observations, corrections and adjustment. Stochastic models and weighting. Pre-analysis and post-analysis of geodetic survey data.

SURV 2009 (SV27C)
Hydrographic Surveying
3 Credits

Brief on different areas of interest. Introduction to various sounding data and establishment of marine data. Simple tidal analysis and studies. Position fixing - principles and techniques: planimetric - optical and electronic position fixing, vertical - lead lines and acoustic soundings. Sources of errors in position fixing. Instrument calibration. The hydrographic survey process - from pre-planning to chart production.

SURV 2010 (SV28B)
Mapping Project
3 Credits
Topographic mapping of a selected area using photogrammetry. Provision of control. Field completion and verification. Production of machine plot, computation and report.
(Coursework)

SURV 2011 (SV29B)
Elements of GIS
3 Credits
Concepts of systems, Information System and Geographic Information Systems, hardware and software systems, spatial data issues - acquisition and input, data structures, data management, data processing, data manipulation, data analysis, spatial data quality, designing and implementing GIS: data requirement, technical requirement, institutional requirement.

SURV 2012 (SV22C)
Introduction to Planning
3 Credits
The nature of planning, urban growth and urbanism. Evolution of modern planning. Economics of planning. Aspects of planning practice. Land settlement and housing development. Physical planning and infrastructural development. Challenges for town planning. Town and country planning law. Public health and building regulations.

SURV 2013 (SV26C)
Remote Sensing
3 Credits
Electromagnetic radiation properties and behaviour. Remote sensing sensors and systems. Digital images. Principles of digital image processing: geometric and radiometric image correction, image enhancement. Thematic information extraction. Applications in the environment and natural resource management.

SURV 2014 (SV21B)
Digital Mapping
3 Credits
Digital data sources, vectors and rasters. Acquisition, transformation and registration. Automation of cartographic processes: annotation, generalisation. Thematic mapping. Digital photogrammetry: automatic process for orientation, generation of DTM and orthophoto. Digital terrain models, elevation data collection and interpolation. Digital image map: photo rectification, orthophotography, mosaic.

LEVEL 3

SURV 3004 (SV33A)
Cadastral Studies
3 Credits
Historical development. Land parcel, identifiers, boundaries, interests. Property surveys in the context of common law. Registration of titles, also strata titles. Adjudication and demarcation. Compulsory purchase of property. National Cadastre, Cadastral Index Map, and their use in Land Information Systems and Land Administration. Cadastral systems in the Caribbean.

SURV 3006 (SV34A)
Hydrography
3 Credits
Hydrographic Surveying in four dimensions. Underwater acoustics, tidal and non-tidal sea level variations and their analysis. Physical properties of atmosphere, seawater and seabed. Demarcation of maritime boundaries with particular application to the Caribbean.

SURV 3007 (SV340)
Surveying Research Project
6 Credits
Research project generally involving literature review, data acquisition, processing, analysis and conclusions in respect of identified survey problems of interest to the region or individual states.
(Coursework)

SURV 3008 (SV35A)
Engineering Surveying
3 Credits

Instrumentation methods and specifications, high precision. Survey requirements: feasibility, design, construction, maintenance (as-built) and monitoring stages. Applications in surface transportation, airports, irrigation, utilities and buildings. Optical tooling and industrial applications. Building surveying. Underground service location techniques. Underground surveys: transference of planimetric and height control from surface to underground: techniques for controlling error propagation.

SURV 3010 (SV36B)
Professional Practice
3 Credits

Professional negligence and liability; misrepresentation; Law of Evidence; surveyor as a professional witness. Professional ethics and conduct. Practice of Land Surveying and Mapping in the State and private sectors in Trinidad & Tobago and the West Indies.

SURV 3015 (SV31C)
Adjustment Computations II
3 Credits

Satellite carrier phase observations and ambiguity resolution in real time. Adjustment computations: phased and sequential approaches, adjustment with constraints and conditions. Map projections: projection equations, the projection of observed and computed parameters onto the projection plane. Application of adjustment techniques in the design of 2 and 3-D networks and models. Network adjustment using GPS data and integrated with land survey data.

SURV 3016 (SV32C)
Valuation & Land Economy
3 Credits

Introduction to property management. Land acquisition - practice and procedures. The concept of economic rent. The impact of planning and statutes on property values. Land surveying in the context of the land economy of the Caribbean. Theoretical issues: the nature of real property; land rent theory; locational theory; the role of the State in the land economy and property taxation; the real estate industry and the finance sector; land and property speculation; relationship between formal and informal land economy.

OTHER COURSES

Syllabus

Computer Science

COMP 2800 (CS22E)
Fundamentals of Information Systems
3 Credits

Overview of computer systems, computer applications. Information systems in the organisation: information as a strategic resource. Organisational structure. Type of information systems. Systems development life cycle: SDLC model, project team, project management. Systems analysis: problem definition, information gathering. Feasibility study. Requirement specification. Systems modelling tools. Systems design: design of user interface, process design, data design, design of software structure, systems controls. Systems implementation, maintenance, evaluation and selection of application packages.

COMP 3100 (CS31A)
Operating Systems
4 Credits

Operating system functions: job control and command languages. Operating system structure. Primary and secondary storage management. Process management. Resource allocation. Performance evaluation. Protection. Reliability and recovery.

COMP 3700 (CS36E)
Compiling Techniques
4 Credits

Aims of a compiler. Planning a project. Lexical analysis. Use of regular grammars and automata theory. Interpreters and compilers. Diagnostics. Documentation. Testing, syntax and semantic considerations. Grammars, such as LL(K), LR(K), operators precedence; the symbol table. Run-time support: storage management, input/output, libraries, diagnostics. Code generation; optimisation.

COMP 3750 (CS37A)
Numerical Computing I
4 Credits

Floating point arithmetic: basic concepts of floating point number systems. Implications of finite precision. Illustrations of errors due to round-off. Use of mathematical sub-routine packages. Interpolation: finite differences. Polynomial interpolation. Inverse interpolation. Spline interpolation. Approximation: uniform approximation. Discrete least squares. Polynomial approximation. Fourier approximation. Chebyshev economisation. Solution of non-linear equations: bisection. Fixed point iteration. Newton's method. Secant method. Muller's method. Aitken's process. Rates of convergence. Efficient evaluation of polynomials. Bairstow's method. Direct methods for linear system of equations: Gaussian elimination. Operational counts. Implementation including pivoting and scaling. Direct factorisation methods. Error analysis and norms: vector and matrix norms. Condition numbers and error estimates. Iterative improvement. Iterative methods. Over-relaxation.

Faculty of Engineering

ENGR 1000 (FE10A)
Introduction to Engineering
3 Credits

An introduction to the following: historical development of engineering; formation of the engineer; role and functions of engineers and professional organisations; creative and critical thinking; technical communications; ethics; liability; safety; legal forms of association; contracts; company law; intellectual property; engineering economics and business operations; infrastructure; energy systems and economics, environment and sustainable development; approaches to design.

ENGR 1001 (FE11A)
Information Technology for Engineers
3 Credits

Word-processing: menus, checking documents for grammar and spelling, formatting by page, character and paragraph, outlines, tables, styles and sections, equation editing. Presentations: creating a presentation and templates, inserting objects from other applications, making the presentation. Spreadsheets: Introduction to spreadsheets for repeat computations, creating and editing graphs and charts, use of solver, introduction to analysis tools. Databases: constructing a database using tables and forms, retrieving information through reports and queries. The computer: Introduction to computer architecture, storage media and peripherals. Binary computations: storage of data within the computer, variable types and limitations imposed on computations. Algorithms: algorithms for simple numerical methods. Development of algorithms. Programming: coding of algorithms, syntax for data types, input and output, mathematical operations, loops, functions and pointers.

ENGR 3000 (FE30B)
The Technology of the Steelpan
3 Credits

This course attempts to summarise and present, in a formal fashion, current knowledge on various technological aspects of the steelpan musical instrument. The major technologies that impact on the instrument are acoustics, mechanical vibrations, metallurgy, physical structure and signal analysis. However, no special prerequisite knowledge is required in any of these areas. The course starts off with an overview of the very subjective area of the perception of music. This is essential as it provides a reference point for later discussions. Other topics include the manufacturing process, including a discussion on the types of metallurgical properties required for different instrument characteristics, the modal properties of the instrument and the dynamics of the stick impact. The course ends with some consideration of significant recent developments.

ENGR 3001 (FE31B)
Natural Hazards & Disaster Management in the Caribbean
3 Credits

Definitions and concepts, characteristics of natural hazards in the Caribbean, economic, social and environmental impacts; techniques for identification, mapping and prediction, vulnerability and risk assessment, the disaster management cycle, structural and non-structural mitigation, emergency planning, recovery and reconstruction, disaster management and development planning, disaster management and agriculture, tourism, public health, public policy and legislation, sociology of disasters, disaster education.

Mathematics

MATH 1180 (M17A)
Engineering Mathematics I
3 Credits

Calculus and algebra - functions of one variable: limits, continuity, differentiation and integration; common functions and inverse functions; mean value theorems; Taylor and Maclaurin expansions. Functions of two variables: limits, continuity and differentiation. Vectors: dot, cross and mixed products; geometrical problems - lines, planes. Matrices: definitions, properties, solution of linear equations. Complex numbers: polar representation. Ordinary differential equations - introduction: first order equations, separation of variables, equations with homogeneous coefficients, integrating factors; second order linear equation and its general solution; second order equations with constant coefficients, undetermined coefficients, variations of parameters. The Laplace transform: transforms of elementary functions, step functions and derivatives; derivatives of transforms; the inverse transform; shift theorems.

MATH 2230 (M26A)
Engineering Mathematics II
3 Credits

Ordinary differential equations; power series solution, Legendre's equation, Bessel's equation. Laplace transform: convolution theorem; application to simple initial value problems and integral equations; periodic function. Fourier series: Euler's formulae; even and odd functions; half range expansions; solution of some ordinary differential equations. Partial differential equations: classification; the one-dimensional wave equation, the heat conduction and diffusion equation; Laplace's equation in polar coordinates. Circular membrane; Laplace's equation in cylindrical and spherical polar coordinates. Vector calculus: scalar and vector fields; vector calculus; curves, arc length, tangent, curvature and torsion; directional derivatives, divergence and curl of a vector field; line integrals; surface integrals; Stoke's theorem and divergence theorem.

MATH 2240 (M26B)
Statistics
2 Credits

Statistics and probability; frequency distribution, frequency polygons and histograms; introduction to probability; basic axioms; conditional probability, Bayes theorem, mutual independence; introduction to random variables; probability distribution, Bernoulli trials, the binomial distribution and the Poisson distribution; probability density and mass functions of a continuous random variable; expectation and variance; the exponential and normal distributions; distributions of sample means; point estimates; confidence intervals; statistical inference - tests of significance; linear regression.

MATH 2250 (M26C)
Industrial Statistics
3 Credits

Statistics and probability; frequency distributions, frequency polygons and histograms; introduction to probability; basic axioms, conditional probability, Bayes theorem, mutual independence; introduction to random variables; probability distribution, Bernoulli trials, the Binomial distribution and the Poisson distribution; probability density and mass functions of a continuous random variable; expectation and variance; the exponential and normal distributions; distribution of sample means; point estimates; confidence intervals; statistical inference - tests of significance. Regression analysis; analysis of multiple regression; non-parametric statistical methods; analysis of variance; design of experiments; randomised block design and analysis.

MATH 3530 (M37A)
Mathematics III
3 Credits

Linear algebra: systems of equations, vector spaces, determinants, eigenvalues, similarity, positive definite matrices, singular value decomposition. Optimisation and mathematical programming, calculus of variations.

RULES FOR READERS
(Main Library)

1. **Hours**

Semesters	Mon - Thurs	Fri & Sat
	8:30 am - 10:00pm	8:30 am - 5:00pm

	Mon	Tues - Fri	Sat
Christmas Vacation	8:30 am 6:30 pm	8:30 am 5:00 pm	8:30 am 12:30 pm

	Mon	Tues & Wed	Thurs – Sat
Long/Summer Vacation	8:30 am 6:30 pm	8:30 am 5:00 pm	8:30 am 12:30 pm

Vacation hours will apply to the first week of each academic year.

Membership

2. **UWI**

The Library is open to all registered graduate and undergraduate students and staff of all campuses of The University of the West Indies.

3. **Non-UWI**

a. Visiting research workers, faculty and students of other universities and tertiary level institutions may be granted reading and reference privileges on recommendation of a faculty member and at the discretion of the Librarian.*

b. Other non-university persons over the age of 16 may be granted reading and reference privileges. This is, however, subject to a review by the Librarian on duty and is dependent on the specific need of the particular person.

c. A fee may be charged for long periods of use or repeated use as outlined in Information Bulletin No. 9 (Rev.)

d. Users in this category are not allowed loans.

Loans

4. **General**

No book, periodical or other library material may be removed from the Library unless it has been legitimately charged out at the Loans Desk and the date label stamped by the member of staff on duty. A user is responsible for any book or other item borrowed in his/ her name. This responsibility ends only when the loan is officially cancelled. Failure to comply with this rule will be treated as a major and deliberate offence.

5. Users' identification cards are not transferable. It is a major offence to lend or borrow identification cards. Persons contravening this rule may have their library privileges withdrawn or may be referred to the Principal for further action.

6. Certain publications may not be removed from the Library. These include all materials from the West Indiana and Special Collections Division as well as reference books, specially marked items from the closed reserve collection and works of special value. All such material will be clearly marked.

7. Loans may extend for varying periods depending on the extent of demand for each item. All material loaned will be subject to recall by the Librarian at any time. No loans may be renewed for more than seven (7) days. In cases where a book issued on loan is requested by another user it may be recalled after it has been on loan for a minimum of seven (7) days. A new date due is assigned and fines are charged for non-return of the item after the new date.

8. **Undergraduates**
Undergraduate students of the University may have on loan up to six (6) books at a time. They may not borrow serials. Two Reserve items may be borrowed at a time either for use in the Library or on overnight loan. Two additional items from the Reserve Collection may also be borrowed for three (3) or seven (7) days.

9. **Postgraduates**
Postgraduate students of the University may have on loan up to ten (10) items (including serials) at a time.

10. **Graduate Research Assistants/ Teaching Assistants (Non-Postgraduate Students)**
Research assistants may have on loan up to ten (10) items at a time (including serials).

11. **Academic and Senior Administrative Staff**
Academic and senior administrative staff of the University may have up to fifteen (15) items on loan (including serials). In case of special need, additional items may be loaned at the discretion of the Librarian. All loans are subject to recall by the Librarian at any time.

12. **Support Staff**
Support staff of the University may have two (2) items on loan. They may not borrow from the Reserve Collection.

13. Departments' library materials may be loaned for extended periods to departments of the University under certain conditions and at the discretion of the Librarian.

14. **Reserve Books**
All persons to whom the Library is open under Rule 2 may borrow two (2) books reserved for overnight use only and two (2) short loan items from the Reserve Collection. These may not be borrowed before the specified times posted at the Loans Desk and must be returned by 9:00 a.m. the next day, or on the following Monday if borrowed on a Saturday. Evening or part-time students shall have until 6:30 p.m. the following weekday or Monday (as the case may be) to return them. Copies for part-time students have a green sticker and are separately identified.

15. **Serials**
Periodicals and other serials (excluding certain titles and newspapers, which are not for loan) may be issued on loan for a period of seven (7) days to postgraduate students and to members of the academic and research staff only. These loans shall NOT be renewable. The most recently received issue of a periodical may not be borrowed except at the discretion of the Librarian.

16. **Overdues**
The Librarian is empowered to levy a fine upon all users who fail to return library material within the prescribed period. The fine for late return of books is fifty cents (0.50c) for each day the loan is overdue. This fine will apply to normal loans and books recalled to satisfy other borrowers' requests. The fine for late return of books in the Reserve Collection will be fifteen cents (0.15c) per hour for short loan, one dollar ($1.00) per hour for three-(3)-hour and overnight loans. The maximum for each overdue item in all categories is One Hundred Dollars ($100.00), after which further disciplinary action may be taken.

17. After a third overdue notice is dispatched, all borrowing privileges will be automatically suspended. Books which are not returned after due notice will be presumed lost and treated accordingly.

18. When, after due notice, a fine or replacement cost has not been paid, the Librarian is authorised to request the Bursar to arrange for the amount of the fine/ replacement cost to be recovered by the University.

19. The names of all those students who are not in good standing with the Library, that is, those who after due notice have failed to return overdue publications or to pay for books lost or other outstanding fines - will be submitted to the Principal once per year for further action.

20. The Librarian shall have power to remit or reduce fines in any case at his/her discretion.

21. All users are required to return promptly to the Library all items on loan on completion of his/her period of study or termination of employment.

22. **Conduct**
    a. The Library is provided exclusively for the purpose of academic study and research. Any conduct inconsistent with this purpose or detrimental to its pursuit by others shall constitute a breach of these rules.

    b. All library users must be prepared to present the appropriate identification cards entitling them to use the Library and/or its special collections at any time when asked to do so by a member of the Library or security staff. The use of such ID cards is mandatory for admission to the West Indiana and Special Collections Division.

    c. Silence shall be observed in the Library.

    d. No bags, briefcases, handbags, parcels or other receptacles exceeding 15 inches (10" x 6" x 4") or 30cm (20 cm x 15cm x 10 cm) may be brought inside the Library. Such bags, briefcases, handbags, etc. may be left in the lockers (open or rented) provided in the walkways leading to the entrance of the Library. The University accepts no responsibility for loss or damage of any articles so left.

    e. Laptop computers on battery power may be used in the Library.

    f. Pagers and cellular phones should be used with discretion and should not be a disturbance to other library users.

    g. Chairs and tables and other library equipment, fittings and furniture may not be marked, defaced or disarranged.

    h. Food or drink may not be brought into the Library's service areas or there consumed.

    i. The Library has been designated a smoke-free area and smoking is strictly forbidden.

    j. Books, periodicals, etc., taken from shelves and used in the Library should be left on the tables after use and NOT replaced on the shelves.

    k. All users leaving the library must show all books, folders, periodicals, papers, etc., in their possession whether these belong to the University or not. Users may also be required to open for inspection any receptacle carried out of the Library.

    l. All members of the Library and security staff are empowered to require users to comply with these rules.

    m. The Librarian shall at all times have authority to maintain good order in the Library and may exclude from it or suspend from its use any user who breaks these rules. The Librarian may report to the appropriate University authority any person responsible for serious or persistent breach of these rules; such conduct by any member of the University community shall be considered a breach of University discipline.

23. **Theft, Mutilation and Loss**
    Loss or damage to library material on loan to a user should be reported (book or other item), in addition to any fine which may have accrued.

    Replacement costs will include library processing costs up to Twenty-five Dollars ($25.00) per item. Where damage to library material is reported, the user may be subject to a fine appropriate to the extent of the damage. When such damage is not reported but discovered, this may be treated as a major offence.

24. The following will be considered a major offence against the University:

    a. The illegal removal of library materials.

    b. Any attempt to obtain library materials or to gain access to library facilities by false pretences or forgery.

    c. The intentional misplacement of books in the Library.

    d. The wilful mutilation or defacement of library material. Any University person who commits such offences will be reported to the appropriate University authority for disciplinary action, which may include suspension or expulsion. Non-University persons who commit such offences will be subject to legal action.

25. Any breach of these rules by a user may render him/her liable to a fine not exceeding One Hundred Dollars ($100.00) at the discretion of the Librarian.

26. The Librarian may institute such operating rules and procedures in addition to the above as may be deemed necessary and appropriate for good library economy and service.

NB: *a. "Librarian" means the Campus Librarian or anyone delegated by her/him.*

b. Major offences are specified in "The Charter of Principles and Responsibilities."

For further information, contact the
Office of the Dean
Tel: 1 (868) 662-2002; ext 2199/3396

CALENDAR

SEMESTER ONE – 2004

Sunday August 29	Semester I begins.
Monday August 30	Registration opens.
Friday September 3	Registration closes.
Monday September 6	Teaching begins.
Friday December 3	Teaching ends.
Monday December 6	Examinations begin.
Wednesday December 22	Examinations end.
Wednesday December 22	Semester ends.

SEMESTER TWO - 2005

Sunday January 16	Semester II begins.
Monday January 17	Teaching begins.
March 27 - April 2	Mid-semester break.
Friday April 22	Teaching ends.
Wednesday April 27	Examinations begin.
Friday May 13	Examinations end.
Friday May 13	Semester ends.

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