

## **BEng (Hons) Civil Engineering - E410**

### **1. Aim**

The aim of the degree programme is to provide students with a sound knowledge and understanding of the subject of Civil Engineering and the potential to practise in a range of contexts, with an awareness of their responsibilities to society and the environment. Graduates should be capable of becoming a professional civil engineer in governmental, industrial and commercial organisations worldwide, follow a postgraduate route or apply the skills they have learnt in a range of other careers.

### **Objectives**

The programme has been designed to enable students to

- solve civil engineering problems in practice by applying fundamental knowledge of mathematics, science, and engineering and by using modern engineering techniques, skills and tools, particularly recognising the role that computers play in engineering;
- identify, formulate and solve civil engineering problems, particularly the planning, design, construction and operation of systems, components or processes that meet specified performance, cost, time, safety and quality needs and objectives;
- obtain a broad education necessary to understand the impact of civil engineering solutions in a global, societal and environmental context consistent with the principles of sustainable development;
- design and conduct experiments and to analyse and interpret data within the various civil engineering disciplines;
- function and communicate effectively both individually and within multidisciplinary teams;
- obtain a solid understanding of professional and ethical responsibility and a recognition of the need for and ability to engage in lifelong learning; and
- experience an academic environment that facilitates and encourages learning and retention.

### **2. General Entry Requirements**

As per General Entry Requirements for admission to the University for Undergraduate Degrees.

### **3. Programme Requirements**

Credit in Chemistry at SC/ 'O' Level.

2 GCE 'A' Level Passes in Mathematics and one of the following subjects: Physics, Physical Science, Engineering Science, Physics with Chemistry, Design & Technology (Technology).

### **4. Minimum Requirements for the Award of Degree**

<b>Modules</b>	<b>Credits</b>
Engineering core	122
Electives	9
<b>TOTAL</b>	<b>131</b>

- For the degree award all core modules prescribed by the department must be completed.
- Industrial and vacation training must be completed satisfactorily for the award of the degree.

Note: Students who are unable to complete the BEng programme would be considered for the award of a **Diploma in Civil Engineering** provided that they attain a minimum of 60 credits as follows:

<b>Modules</b>	<b>Credits</b>
Engineering core	54
Project	6
<b>TOTAL</b>	<b>60</b>

#### 5. Programme Duration

	<b>Normal (Years)</b>	<b>Maximum (Years)</b>
BEng (Hons) Degree:	4	7

#### 6. Credits per Year (subject to Regulation 5 above)

Minimum:	18 credits
Maximum:	48 credits

Yearly modules and Semester Modules assessed jointly to be registered for only at the start of the module, at the beginning of the academic year.

#### 7. Assessment

Each module can either be taught in semester 1 only or in semester 2 only or throughout the two semesters.

Modules wholly taught in one semester are termed semester modules whereas modules taught throughout two semesters are termed yearly modules.

Each yearly module will be assessed over 100 marks whereas each semester module may either be assessed singly over 100 marks or it may be combined with another semester module and assessed jointly over 100 marks with details as follows (unless otherwise specified):

Assessment will be based on a written examination of 2 to 3-hour duration (normally a paper of 2 hour duration for modules carrying less or equal to 3.5 credits and 3 hour paper for modules carrying five-six credits) and on continuous assessment done during the semester or year.

Written examinations for all modules, whether taught in semester 1 or in semester 2 or both, will be carried out at the end of the academic year (unless otherwise stated).

The continuous assessment will count for 10-40% of the overall percentage mark of the module(s), except for a Programme where the structure makes for other specific provision(s). Continuous assessment may be based on laboratory work, seminars and/or assignments and should include at least 1 class test.

There will be a compulsory class test for all modules taught in semester 1 at the end of semester 1 of the given academic year unless stated otherwise in the Programme Structure.

A minimum of at least 30% should be attained in each of continuous assessment and written examination, with an overall total of 40% for a candidate to pass a module. For modules being assessed jointly, a minimum of at least 30% should be attained in each of continuous assessment and written examination, with an overall total of 40% for a candidate to pass the two modules. Note that the marks for the two modules will be considered together and not the individual marks for each of the two modules.

Special examinations (e.g. class tests) will be arranged at the end of semester 1 or semester 2 for exchange students who have registered only for one semester. In case of yearly modules, credits will be assigned on a pro-rata basis.

## 8. Modules of Special Nature

A student can take a maximum of 9 credits of Self-Study Subjects and Independent Study, subject to approval of the Department.

## 9. List of Modules – BEng (Hons) Civil Engineering

### CORE MODULES

Code	Module Name	Hrs/Wk L+P	Credits
CIVE 1001Y(1)	Building Construction and Concrete Technology	3+1	7
CIVE 1002Y(1)	Engineering Materials and Engineering Geology	2.5+1	6
CIVE 1004Y(1)	Structural Analysis I	3+1	7
CIVE 1005Y(1)	Surveying	3+1	7
MATHS 1111(1)	Mathematics 1	D.E.	3
MATHS 1211(1)	Mathematics 2	D.E.	3
CSE 1010e(1)	Introduction to Information Technology	O.E.	3
COMS 1010(1)	Communication Skills	D.E.	3
CIVE 1000	Vacation Training	-	0
CIVE 2001Y(3)	Numerical Methods and Statistics	3+0	6
CIVE 2002Y(3)	Environmental Engineering	3+1	7
CIVE 2003Y(3)	Fluid Mechanics I	3+1	7
CIVE 2004Y(3)	Geotechnical Engineering I	2+1	5
CIVE 2005Y(3)	Highway and Traffic Engineering	3+0.5	6.5
CIVE 2006Y(3)	Structural Analysis II	3+0	6
CIVE 2007Y(3)	Structural Design I	3+0.5	6.5
CIVE 3000	Industrial Training	-	0
CIVE 3001Y(5)	Civil Engineering Management and Economics	3+0	6
CIVE 3220(5)	Fluid Mechanics II	3+0	3
CIVE 3221(5)	Geotechnical Engineering II	3+0	3
CIVE 3222(5)	Structural Analysis III	3+0	3
CIVE 3223(5)	Wastewater Engineering	3+0	3
CIVE 4001Y(5)	Design Project	0+6	3
CIVE 4002Y(5)	Degree Project	-	12
CIVE 4003Y(5)	Structural Design II	3+0	6

### ELECTIVES

CIVE 3217(5)	Introduction to GIS	3+0	3
CIVE 3218(5)	Building Services	3+0	3
CIVE 3219(5)	Traffic Engineering	3+0	3
CIVE 4005Y(5)	Civil Engineering Management	3+0	6
CIVE 4006Y(5)	Environmental Sanitation and Management	3+0	6
CIVE 4007Y(5)	Hydraulics and Water Resources	3+0	6
CIVE 4008Y(5)	Integrated Infrastructural Planning and Development	3+0	6

**10. List of Modules – Diploma in Civil Engineering**

**CORE MODULES**

<b>Code</b>	<b>Module Name</b>	<b>Hrs/Wk L+P</b>	<b>Credits</b>
CIVE 1001Y(1)	Building Construction and Concrete Technology	3+1	7
CIVE 1002Y(1)	Engineering Materials and Engineering Geology	2.5+1	6
MATHS 1111(1)	Mathematics 1	D.E.	3
MATHS 1211(1)	Mathematics 2	D.E.	3
CIVE 1004Y(1)	Structural Analysis I	3+1	7
CIVE 1005Y(1)	Surveying	3+1	7
CSE 1010e(1)	Introduction to Information Technology	O.E.	3
COMS 1010(1)	Communication Skills	D.E.	3
CIVE 1000	Vacation Training	-	0

**AND ANY OF THE FOLLOWING ADDING TO AT LEAST 54 CREDITS**

CIVE 2001Y(3)	Numerical Methods and Statistics	3+0	6
CIVE 2002Y(3)	Environmental Engineering	3+1	7
CIVE 2003Y(3)	Fluid Mechanics I	3+1	7
CIVE 2004Y(3)	Geotechnical Engineering I	2+1	5
CIVE 2005Y(3)	Highway and Traffic Engineering	3+0.5	6.5
CIVE 2006Y(3)	Structural Analysis II	3+0	6
CIVE 2007Y(3)	Structural Design I	3+0.5	6.5

**AND**

CIVE 2000D(3)	Diploma Project	-	6
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**11. Programme Plan - BEng (Hons) Civil Engineering**

**YEAR 1**

<b>Code</b>	<b>Module Name</b>	<b>Hrs/Wk L+P</b>	<b>Credits</b>
<b>CORE</b>			
CIVE 1001Y(1)	Building Construction and Concrete Technology	3+1	7
CIVE 1002Y(1)	Engineering Materials and Engineering Geology	2.5+1	6
CIVE 1004Y(1)	Structural Analysis I	3+1	7
CIVE 1005Y(1)	Surveying	3+1	7
CSE 1010e(1)	Introduction to Information Technology	O.E.	3
MATH 1111(1)	Mathematics 1	D.E.	3
MATH 1211(1)	Mathematics 2	D.E.	3
COMS 1010(1)	Communication Skills	D.E.	3
CIVE 1000	Vacation Training	-	0

## YEAR 2

<b>Code</b>	<b>Module Name</b>	<b>Hrs/Wk L+P</b>	<b>Credits</b>
<b>CORE</b>			
CIVE 2001Y(3)	Numerical Methods and Statistics	3+0	6
CIVE 2002Y(3)	Environmental Engineering	3+1	7
CIVE 2003Y(3)	Fluid Mechanics I	3+1	7
CIVE 2004Y(3)	Geotechnical Engineering I	2+1	5
CIVE 2005Y(3)	Highway and Traffic Engineering	3+0.5	6.5
CIVE 2006Y(3)	Structural Analysis II	3+0	6
CIVE 2007Y(3)	Structural Design I	3+0.5	6.5

## YEAR 3

<b>Code</b>	<b>Module Name</b>	<b>Hrs/Wk L+P</b>	<b>Credits</b>
<b>CORE</b>			
CIVE 3000	Industrial Training	-	0
CIVE 3001Y(5)	Civil Engineering Management and Economics	3+0	6
CIVE 3220(5)	Fluid Mechanics II	3+0	3
CIVE 3221(5)	Geotechnical Engineering II	3+0	3
CIVE 3222(5)	Structural Analysis III	3+0	3
CIVE 3223(5)	Wastewater Engineering	3+0	3
<b>ELECTIVES      CHOOSE ONE FROM</b>			
CIVE 3217(5)	Introduction to GIS	3+0	3
CIVE 3218(5)	Building Services	3+0	3
CIVE 3219(5)	Traffic Engineering	3+0	3

## YEAR 4

<b>Code</b>	<b>Module Name</b>	<b>Hrs/Wk L+P</b>	<b>Credits</b>
<b>CORE</b>			
CIVE 4001Y(5)	Design Project	0+6	3
CIVE 4002Y(5)	Degree Project	-	12
CIVE 4003Y(5)	Structural Design II	3+0	6
<b>ELECTIVES      CHOOSE ONE FROM</b>			
CIVE 4005Y(5)	Civil Engineering Management	3+0	6
CIVE 4006Y(5)	Environmental Sanitation and Management	3+0	6
CIVE 4007Y(5)	Hydraulics and Water Resources	3+0	6
CIVE 4008Y(5)	Integrated Infrastructural Planning and Development	3+0	6

## 12. Outline Syllabus

This outline syllabus is not prescriptive and is intended to serve as a guide only.

Note: Pre-requirement (PQ); Pre-requisite (PR).

### **CIVE 1000 - VACATION TRAINING**

Students will have to satisfactorily complete 3 weeks of practical work in land surveying, electrical installation and AutoCAD.

### **CIVE 1001Y(1) - BUILDING CONSTRUCTION AND CONCRETE TECHNOLOGY**

Building Codes and Zoning. Types of Structures and Structural Elements. Site Preparation and Layout. Introduction to Architecture. Building Construction Drawing and Computer Aided Drafting. Constituent Materials. Properties of Fresh and Hardened Concrete. Concrete Mix Design and Quality Control.

### **CIVE 1002Y(1) - ENGINEERING MATERIALS AND ENGINEERING GEOLOGY**

Properties of Materials - Hydraulic and Bituminous Binders; Plastics; Glass; Ceramics and Composite Materials. Materials Science - Crystal Structure; Plastic Deformation; Properties and Behaviour of Materials. General Geology. Geology of Mauritius. Site investigation: objectives and methods of subsurface exploration. Engineering classification and physical properties of soils.

### **CIVE 1004Y(1) - STRUCTURAL ANALYSIS I**

Structures, Structural Behaviour and loading. Section Properties. Forces in structure. Tension and Compression. Torsion. Shearing Force and Bending Moment. Stresses in Beams and Columns. 2-D Stresses and Strains.

Slope and Deflection of Beams. Moment-Area Method. Moment Distribution. Analysis of Pinned Jointed Frames. Struts. Use of Software.

### **CIVE 1005Y(1) - SURVEYING**

Principles of Surveying. Control and Detailed Survey. Adjustments. Aerial Photography. Theory of Errors and Survey Adjustments. Control Surveys. Optical and Electronic Distance Measurement.

### **CIVE 2000D(3) - DIPLOMA PROJECT**

Student will work on a project under the guidance of a supervisor and will be trained to develop skills in the collection, evaluation and presentation of information.

### **CIVE 2001Y(3) - NUMERICAL METHODS AND STATISTICS**

Numerical Solution of Linear Equations; Techniques of numerical integration; Gauss-Legendre formulae; Techniques for solving first-order initial-value ordinary differential equations; Euler Method; Runge-Kutta Methods; Second order initial-value ordinary differential equations; Instability in numerical schemes; Applications.

Probability; descriptive statistics; distributions; estimation; central limit theorem; confidence intervals; significance tests; regression on one explanatory variable; multiple regression; categorical data; use of Excel spreadsheet for statistical calculations, Design of Experiments and Sampling Strategies.

### **CIVE 2002Y(3) - ENVIRONMENTAL ENGINEERING**

Water Quality. Measurement of Water Characteristics. Water Quality Standards for Specific Purposes. Components of Water Demand. Unit Operations and Processes used in Water Treatment.

Wastewater Characteristics. Environmental Impacts of Wastewater Discharge. Estimation of Wastewater Flows and Design of Wastewater Collection System.

### **CIVE 2003Y(3) - FLUID MECHANICS I**

Properties of Fluids. Hydrostatics. Stability of floating bodies. Basic Law of Continuous Media. Continuity. Introduction to Thermodynamics.

Energy and Momentum Principles and Applications. Pipe Flow. Dimensional Analysis. Hydrodynamics.

**CIVE 2004Y(3) - GEOTECHNICAL ENGINEERING I**

Compaction. Permeability and Seepage. Principles of Effective stress. Basic mechanics of soils. One-dimensional consolidation theory. Shear strength of soils.  
Stress paths. Engineering properties and behaviour of rocks. Bearing capacity and settlement analysis. Shallow and deep foundations.

**CIVE 2005Y(3) - HIGHWAY & TRAFFIC ENGINEERING**

Highway Planning. Traffic Studies and Surveys. Geometric Design and Setting Out. Earthwork Calculations. Road Design.  
Design, Construction and Maintenance of Highways: Aims of Highway Engineering, Pavement Design, Highway Construction Materials, Highway Maintenance.

**CIVE 2006Y(3) - STRUCTURAL ANALYSIS II**

Arches. Virtual Work and Energy Methods. Moving Loads and Influence Line. Plates and Shell Theory. Frames and Subframe Analysis. Use of software.  
Yield Line Analysis of Slabs. Strip Method of Slab Analysis. Flexibility (Matrix) Method. Instability of Frames. Use of softwares.

**CIVE 2007Y(3) - STRUCTURAL DESIGN I**

Introduction to structural design, estimation of loads on different structural elements, design of reinforced concrete, steel, timber and precast beams. Assignment.  
Design of reinforced concrete, steel and timber columns, design of concrete and steel portal frames, design of connections for timber and steel beams and columns. Design project.

**CIVE 3000 - INDUSTRIAL TRAINING**

Students will be attached to a firm for a period of at least 20 weeks. The objective is to provide the student with the opportunity to apply theoretical knowledge to solve real world problems in civil engineering and to function within the organisational structure of the firm. Students have to perform satisfactorily in this module before qualifying for the award of the degree.

**CIVE 3001Y(5) - CIVIL ENGINEERING MANAGEMENT AND ECONOMICS**

Structure of the Construction Industry. Planning and Programming. Estimating and Tendering. Contract Procurement. Civil Engineering and Building Quantities. Specifications. Site Management.  
Introduction to different branches of Economics. Microeconomics: Supply and Demand Analysis, Monopoly & Competition. Macroeconomics: National Income Accounting, Multiplier Effect, Open and Closed economies. Engineering Economics: Investment Appraisal Techniques, Resource and Environmental economics. Welfare Economics: Indifference curves, Choices for the development of society. Accounting for decision- making: concepts, Elements of Costing methods and Techniques, Accounting ratios, applications to civil engineering.

**CIVE 3217(3) - INTRODUCTION TO GIS**

Data structures, spatial referencing, geographic data processing and reporting, and GIS as a decision making tool. Applications of GIS in civil engineering, planning and the environment.

**CIVE 3218(5) - BUILDING SERVICES**

Mechanical and Electrical Services installed in Buildings: Procurement, Installation, Maintenance and Management.

**CIVE 3219(5) - TRAFFIC ENGINEERING**

Traffic Analysis and Forecasting. Design for Highway Traffic. Traffic Control and Management.

**CIVE 3220(5) - FLUID MECHANICS II**

Boundary Layer Theory. Steady Uniform and Non-Uniform Open Channel Flow. Introduction to Hydrology.

**CIVE 3221(5) - GEOTECHNICAL ENGINEERING II**

Earth pressure theory. Design of retaining structures. Slope stability. Ground improvements.

**CIVE 3222(5) - STRUCTURAL ANALYSIS II**

Stiffness (Matrix) Method. Instability of Trusses. Plastic Theory. Introduction to Dynamics. Use of softwares.

**CIVE 3223(5) - WASTEWATER ENGINEERING**

Wastewater treatment plant design: Primary, Secondary and Tertiary treatment operations/processes. Handling, treatment and disposal of wastewater sludge. On-site sanitation systems. Wastewater reuse and recycling.

**CIVE 4001Y(5) - DESIGN PROJECT**

Student will work in a team to solve a civil engineering problem involving analysis in areas of structural engineering, fluid mechanics, geotechnical engineering, environmental engineering highway and traffic engineering and materials, to select a design solution from a critical assessment of alternatives, to use relevant codes and standards for a detailed design of the selected option, to produce main working drawings using CAD packages and to defend the solution during an oral presentation.

**CIVE 4002Y(5) - DEGREE PROJECT (will include 15 hours of lecture on Research Concepts and Methods)**

Student will work on an individual research-oriented project. The project will involve the student in a critical review of the literature, in defining the problem and preparing a research methodology. The student will be trained to develop skills in the collection, evaluation and presentation of information, develop communication skills by writing a concise, clear and accurate report, and use the most appropriate visual aids to make oral presentations of the research findings.

**CIVE 4003Y(5) - STRUCTURAL DESIGN II**

Design of steel and timber trusses, design of reinforced concrete slabs, design of timber deck, and design of steel mezzanine, design of staircases. Assignment.

Design of reinforced concrete bases, design of steel base plates, design of reinforced concrete and solid filled block wall. Retaining walls. Introduction to the design of water retaining structures. Assignment.

**CIVE 4005Y(5) - CIVIL ENGINEERING MANAGEMENT**

Project Life Cycle, Conception, feasibility, implementation. Feasibility, Appraisal. Work Breakdown Structure. Network Analysis, Use of project management software. Budgeting. Operational estimating and cash flow. Quality, Quality Assurance, ISO 9001. Construction Management, Tracking of project in terms of time and cost, Earned value analysis and cost variance.

Tender documents and Contract Documents. FIDIC Contract, Obligations and Liabilities of Client, Contractor and Engineer. Standard Forms of Contract. Contract Administration. Site organisation, office records, price increases, extras and claims, instructions, supervision and correspondence. Risk Management. Law of Contract and Tort, general and Mauritian laws.

**CIVE 4006Y(5) - ENVIRONMENTAL SANITATION AND MANAGEMENT**

Water related diseases and control measures. Urban water drainage. Solid (domestic and hazardous) waste management: sources, handling, treatment processes and disposal methods.

Environmental Legislation. Environmental Impact Assessments. Environmental Norms (ISO 14000). Environmental Management Systems and Implementation. Environmental Compliance and Monitoring.

**CIVE 4007Y(5) - HYDRAULICS AND WATER RESOURCES**

Unsteady Flow in Bounded and Unbounded Systems. Rotodynamic Machines. Hydraulic Structures. Irrigation.

Hydrology and Water Resources; Groundwater flow; Surface Runoff; Rainfall-Runoff modelling and Flood Frequency analysis; Water abstraction and storage works; Water resources.

**CIVE 4008Y(5) - INTEGRATED INFRASTRUCTURAL PLANNING AND DEVELOPMENT**

Importance of Infrastructure Planning and Management. Systems Approach to Infrastructure Planning. Primary and Secondary Effects of Infrastructure Development. Spatial Organisation and Multipurpose Infrastructure Planning. Regional Infrastructure Development. Issues in Infrastructure Management. Social Aspects.

National, regional and local planning. The origins of planning in Mauritius. Planning procedures, preparation of plans for development and development control. Planning Legislations and organisations.

**COMS 1010(1) - COMMUNICATION SKILLS**

Writing skills; Non-verbal communication; Modes of speech delivery and presentation aids; Speeches; Perception and listening skills; Business and technical writing.

**CSE 1010e(1) - INTRODUCTION TO INFORMATION TECHNOLOGY**

IT and Computers; Stepping in the Computer; Input and Output Devices; Secondary Storage; Programming; Systems Software; Applications Software; Systems Development; Computer Networks; The internet; Computer Security; Software Utilities; Issues and Trends in IT.

**MATHS 1111(1) - MATHEMATICS 1 (PR: A-LEVEL MATHEMATICS)**

Calculus of one and several variables. Polar coordinates. Complex numbers. Hyperbolic functions. Limits. Ordinary differential equations.

**MATHS 1211(1) - MATHEMATICS 2 (PR: A-LEVEL MATHEMATICS)**

Matrix Algebra: Matrices and determinants. Solution of linear systems of equations. Eigenvalues and eigenvectors. Infinite Series: Comparison test and Ratio test for non-negative series. Vector Algebra: Scalar and vector products, triple products. Vector Analysis: Gradient, divergence and curl. Line and multiple integrals. Green's theorem in the plane, Divergence theorem and Stoke's theorem.

