Makerere University

Faculty of Technology

Department of Civil Engineering

Bachelor of Science in Civil Engineering

Curriculum for Accreditation

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TABLE OF CONTENTS

1 BACKGROUND TO THE PROGRAMME 3
2 JUSTIFICATION FOR THE PROGRAMME 3
3 OBJECTIVES AND EDUCATIONAL OUTCOMES 3
3.1 EDUCATIONAL OBJECTIVES 3
3.2 PROGRAM OUTCOMES 4
4 TARGET GROUP 4
5 REGULATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN CIVIL ENGINEERING 4
5.1 ADMISSION TO FIRST YEAR 4
5.2 THE DIRECT ENTRY SCHEME 4
5.3 THE MATURE AGE ENTRY SCHEME 4
5.4 DIPLOMA HOLDERS ENTRY SCHEME 4
5.5 ADMISSION TO OTHER YEARS 5
6 CONDUCT OF THE PROGRAMME 5
6.1 TYPE OF PROGRAMME 5
6.2 PROGRAMME DURATION 5
6.3 COURSE CREDITS 5
6.4 TYPE OF COURSES 5
6.5 COURSE ASSESSMENT 5
6.6 SEMESTER COURSE LOAD 5
6.6.1 Normal Semester Course Load 5
6.6.2 Maximum Semester Course Load 5
6.7 BOARD OF EXAMINERS 6
6.8 GRADING OF COURSES 6
6.9 PROGRESSION 6
6.9.1 Normal Progress 6
6.9.2 Probationary Progress 6
6.9.3 Discontinuation 6
6.10 RE-TAKING A COURSE 7
6.11 ABSENCE FROM EXAMINATION 7
6.12 CERTIFICATE OF DUE PERFORMANCE 7
6.13 WITHDRAWAL 7
6.14 APPROVAL OF EXAMINATION RESULTS 7
6.15 PUBLICATION OF EXAMINATION RESULTS 7
6.16 APPEALS 7
6.17 CHANGE OF COURSE 8
6.18 CHANGE OF ACADEMIC PROGRAMME 8
6.19 PAYMENT OF FEES 8
6.20 REFUND OF TUITION FEES WHEN A STUDENT HAS WITHDRAWN FROM STUDIES 8
6.21 OTHER SPECIFIC EXAMINATIONS REGULATIONS 8
6.22 DESIGNATION OF THE DEGREE 9
6.23 CLASSIFICATION OF DEGREE 9
6.24 CUMULATIVE GRADE POINT AVERAGE 9
7 REQUIREMENTS FOR AWARD OF THE BSC CIVIL ENGINEERING DEGREE 9
8 PROGRAMME STRUCTURE 9
9 DETAILED COURSE DESCRIPTIONS 12
10 RESOURCES 96
2.1 FACILITIES 96
2.2 STAFFING 96

1 BACKGROUND TO THE PROGRAMME

The Department of Civil Engineering was established in 1970 with a specific mandate of educating civil engineers in the country to the highest international professional standards. The Department's Mission Statement is:

> "To *provide quality education in Civil Engineering by supporting academic distinction and excellence in teaching, innovative research and technological services in the region.*"

The major objective in the Department is to exploit the exciting nature of the Civil Engineering profession to address the most basic needs of society. This can be attained through:

i) Giving students relevant skills and knowledge,
ii) Increasing awareness of latest advances in Science and Technology (S&T),
iii) Educating students on appropriate technology for national development; and
iv) Inculcating professional ethics into them.

Focus is on harnessing the creativity of civil engineering in conception, planning, designing, constructing, evaluating performance and maintaining physical systems that sustain human enterprise. It is envisaged that this leads to producing responsible and well-rounded civil engineers. Students need to always be prepared for professional practice in the major areas of Civil Engineering namely, transportation, water resources and hydraulics, structures, construction management, public health and environmental, and geotechnical engineering.

2 JUSTIFICATION FOR THE PROGRAMME

The recent past has been characterized by economic liberalization leading to broadening and diversifying the demand for civil engineering graduates. There is an upsurge in the private sector of both small and medium scale enterprises leading to creation of new jobs that require specialized graduates. Besides, reliance on foreign expertise needs to be tremendously reduced. In order to satisfy this demand, the Department of Civil Engineering has revised its curriculum to address this emerging issue and therefore attract more students. This curriculum would also suitably prepare the students for specialization at graduate level. The revised curriculum provides sound theoretical approaches to the various civil engineering disciplines supplemented by hands-on laboratories and computer skills to apply the theoretical knowledge to practical engineering problems. Additional practical training components such as Workshop Practice in the first year and Industrial Training in the recess terms of the second and third years of study introduce students to actual field practice. The program is conducted through coursework and examinations. At the third and fourth year of study, students are prepared to do independent supervised study in the area of their choice.

Students can enroll for the programme with the intention of achieving the qualification of a Bachelor of Science in Civil Engineering (BSC.CE).

3 OBJECTIVES AND EDUCATIONAL OUTCOMES

The BSc.Civil Engineering Degree programme aims at producing professionals who will address the most basic needs of society that is, conceive, plan, design, construct and maintain the physical systems that sustain human enterprise and meet national development objectives.

3.1 Educational Objectives

The educational objectives of this programme are to:

(a) Train and produce graduates who are well grounded with skills and knowledge of the in Civil Engineering discipline
(b) Train students in aspects of research and development
(c) Instil entrepreneurship skills in students so as to ensure competitiveness
(d) Employ practical thinking with commitment to economic, innovative and optimum use of resources
(e) Train engineers who are aware of the latest global challenges and how to handle them
(f) Promote professionalism, work ethics and social values
(g) Have a good understanding of the technical vocational foundation of Civil Engineering to facilitate self learning and professional development.
(h) Prepare graduates who are capable of entering and succeeding in an advanced degree program in a field such as engineering, science, or business.

3.2 Program Outcomes

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in Civil engineering practice. At the end of the programme, the graduate should be able to:

(a) design and conduct simple engineering related experiments as well as to analyze and interpret data
(b) work effectively as part of a multidisciplinary team with both peers and in cross-level collaboration
(c) identify/diagnose and solve the basic Civil engineering problems.
(d) understand the professional and ethical responsibilities at the place of work.
(e) communicate effectively in all written and oral forms at different levels and with different parties involved in the process of civil engineering design.
(f) understand the impact of Civil Engineering in the global, economic, environmental and social context.
(g) recognize the need for and the ability to engage in life-long learning.
(h) have knowledge of contemporary issues.
(i) use techniques, skills and modern engineering tools necessary for engineering practices

4 TARGET GROUP

The programme targets holders of the Advanced Level Certificate of Education, or its equivalent, holders of Diplomas in related Science and Technology fields and Practitioners with relevant experience in the field of Engineering, who desire to acquire further training at Degree level.

5 REGULATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN CIVIL ENGINEERING

Studies and examinations for the degree of Bachelor of Science in Civil Engineering shall be governed by the general regulations and statutes of Makerere University and in addition by the regulations of the Faculty of Technology:

5.1 Admission to first year

Admission into the first year is through any of the three avenues, the Direct Entry Scheme, the Mature Age Scheme and the Diploma Holders Scheme.

5.2 The Direct Entry Scheme

An applicant must have obtained at least two advanced level passes, one in Mathematics and one in Physics, at the same sitting of the Uganda Advanced Certificate of Education or its equivalent. For purposes of computing entry points, the advanced level subjects shall carry the following weights:

- Weight 3 - Mathematics, Physics - as **Essential** subjects
- Weight 2 - Chemistry, Economics, Technical Drawing, Applied Mathematics or Pure Mathematics- as **Relevant** subjects
- Weight 1 - General Paper - as **Desirable** subject
- Weight 0.5 - Any other subject.- as **Other** subjects

5.3 The Mature Age Entry Scheme

Admission may also be via the Mature Age Entry Scheme, after the passing of two special mature age University Examinations, one in aptitude and the other in specialised knowledge.

5.4 Diploma Holders Entry Scheme

Holders of the Uganda National Examinations Board Ordinary Technical Diploma or its equivalent can be admitted to the programme. Applicants should have obtained a Credit Class diploma with at least a Credit Pass in Mathematics.

5.5 Admission to other Years

Admission other than to the first year of the programme shall require a special resolution of the Faculty Board and permission of the Senate. The Departments will work out all appropriate Credit transfers, which shall not exceed 40% of the minimum degree Credit Units. Persons holding Higher National Diploma from a recognised Institution can be admitted to 2nd year, with the proviso that they will be required to take some courses from the 1st year that the Faculty Board will have identified and deemed mandatory.

6 CONDUCT OF THE PROGRAMME

6.1 Type of Programme

This programme shall be conducted through coursework and examinations. There will be one type of Programme, namely Day Programme (DAY).

6.2 Programme Duration

The minimum duration of this programme shall be FOUR (4) years. The programme is designed to be taken over a minimum period of eight semesters and three Recess Terms for Industrial training. The Duration of a semester is seventeen (17) weeks. There shall be University Examinations to be conducted in the last two weeks of each Semester. The duration for a Recess Term shall be ten (10) weeks.

6.3 Course Credits

The programme shall be conducted on credit unit (CU) basis. One credit unit shall be equivalent to one contact hour (CH) per week per semester, or a series of 15 contact hours.

One Contact hour is equivalent to one hour of lectures (LH) or two hours of practical work (PH) or ten hours of workshop practice/industrial training (FH).

No course shall carry less than one credit unit.

6.4 Type of Courses

The Course content to be covered in this Programme shall be based on the Curriculum approved by the Makerere University Senate. The method of teaching and examination will adhere to the Senate approved syllabi. This programme shall be composed of a set of prescribed Courses that shall be registered for by every student in order for him or her to qualify for the award of the Degree of Bachelor of Science in Civil Engineering.

Courses in the programme shall be classified as follows:

(a) A core course is one which must be registered for and passed by a student in order to obtain a degree.
(b) An elective course is one which may be taken to make up the minimum requirements of the degree.
(c) An audited course is one which a student attends but is not examined in it.
(d) A pre-requisite course is one which must be taken and passed before a related higher level course.

6.5 Course Assessment

a) Each course shall be assessed on the basis of 100 total marks with proportions as follows:
   - Course Work 40%
   - Written Examination 60%
b) Course work shall consist of laboratory work and progressive assessment (assignments/tests).
c) For a course without laboratory work, progressive assessment shall carry 40%.
d) A minimum of two coursework assignments/tests shall be required per Course.
e) For practical courses (industrial/field training) assessment shall be by field supervisor assessment and by a report compiled by the candidate.

6.6 Semester Course Load

6.6.1 Normal Semester Course Load

The minimum number of Credit Units per Semester shall be fifteen (15). The maximum number of Credit Units per Semester shall be twenty one (21).

6.6.2 Maximum Semester Course Load

The maximum number of Credit Units per Semester shall be twenty eight (28) to cater for students who have courses to retake or those who are able to complete the requirements for their respective Academic Awards in less than the stipulated minimum duration.

6.7 Board of Examiners

(a) There shall be a Faculty Board of examiners, composed of external and internal examiners appointed by Senate on the recommendation of the Board of the Faculty of Technology and chaired by the Dean of the Faculty of Technology.

(b) The Board of Examiners shall receive, consider and recommend to the Faculty Board the examination results of each candidate.

(c) The Faculty Board shall recommend the results of examinations to the Senate for consideration and approval.

(d) In an emergency, the Dean may act on behalf of the Faculty Board or the Board of Examiners but must report the action taken to the next Meeting of these Boards. In so doing the Dean shall, however, act in consultation with the relevant head of Department.

6.8 Grading of Courses

Each course shall be graded out of a maximum of 100 marks and assigned appropriate letter grades and grade point average as in Table 1.

Table 1: Course Grade Criteria

Marks	Letter Grade	Grade Point	Interpretation
90-100	A+	5	Exceptional
80-89	A	5	Excellent
75-79	B+	4.5	Very good
70-74	B	4	Good
65-69	C+	3.5	Fairly good
60-64	C	3	Fair
55-59	D+	2.5	Pass
50-54	D	2	Marginal pass
45-49	E	1.5	Marginal Fail
40-45	E-	1	Clear Fail
Below 40	F	0	Bad Fail

6.9 Progression

Progression of a student shall be classified as Normal, Probationary or Discontinuation.

6.9.1 Normal Progress

Normal Progress shall occur when a student has passed all the specified Courses. This occurs when a student passes each course taken with a minimum grade point (GP) of 2.0.

6.9.2 Probationary Progress

This is a warning stage and it will occur if:

- A student fails a Core or Compulsory Course.
- A student obtains a Cumulative Grade Point Average (CGPA) of less than two (2) at the end of any semester.
- When the Grade Point Average of a student goes up in the following semester after the student has retaken and passed the failed Courses, then the probation shall be removed.

6.9.3 Discontinuation

(a) When a student accumulates three consecutive probations based on CGPA, he/she shall be discontinued;

(b) A student who has failed to obtain at least the Pass Mark (50%) during the Third Assessment in the same Course or Courses he/she had retaken shall be discontinued from his/her studies at the University;

(c) A student who has overstayed in an Academic Programme by more than Two (2) Years shall be discontinued from his/her studies at the University.

6.10 Re-Taking a Course

(a) A student shall retake a Course when next offered again in order to obtain at least the Pass Mark (50%) if he/she had failed during the First Assessment in the Course or Courses.

(b) A student who has failed to obtain at least the Pass Mark (50%) during the Second Assessment in the same Course he/she has retaken shall receive a warning.

(c) A student may retake a Course when next offered again in order to improve his/her Pass Grade(s) got at the first Assessment in the Course were low.

(d) While retaking a Course or Courses, a student shall:

(i) Attend all the prescribed lectures/tutorials,/Practicals/Fieldwork in the Course;

(ii) Satisfy all the requirements for the Coursework Component in the Course; and

(iii) Sit for the University Examinations in the Course.

(e) A student shall not be allowed to accumulate more than five (5) Retake Courses at a time.

(f) A final year student whose final Examination Results have already been classified by the relevant College/School/ Board and has qualified for the Award of a Degree/Diploma/Certificate, shall not be permitted to retake any Course.

(g) When a student has retaken a course, the better of the two Grades he/she obtained in that Course shall be used in the computation of his/her Cumulative Grade Point Average (CGPA).

(h) Whenever a Course has been retaken, the Academic Transcript shall indicate so accordingly.

A student who does not wish to retake a failed Elective Course shall be allowed to take a substitute Elective.

6.11 Absence from Examination

(a) If the Board of the Faculty of Technology found out that a student has no justifiable reason for having been absent from a Particular examination, such a student shall receive a fail (F) Grade for the Course(s) he/she had not sat the examination in. The Course(s) in which the Fail (F) Grade was/were awarded shall also account in the calculation of the CGPA.

(b) If the Board of the Faculty of Technology is satisfied that a student was absent from a final examination due to justifiable reason(s) such as sickness or loss of a parent/guardian, and then a Course Grade of ABS shall be assigned to that Course(s). The student shall be permitted to retake the final examination when the Course would be next offered or at the next examination season, if the Lecturer concerned can make the appropriate arrangements for the examination

6.12 Certificate of Due Performance

A student who does not have coursework marks shall be denied Certificate of due Performance and will not be allowed to sit the University Examinations.

6.13 Withdrawal

A student can apply to the Board of the Faculty of Technology for permission to withdraw from studies at any time of the semester.

A student will be allowed only a maximum of two withdrawals in an Academic Programme and each withdrawal shall be a maximum of one academic year only.

6.14 Approval of Examination Results

Approval of all examination results will be by the Board of the Faculty of Technology, but the results shall not be regarded as final until they are confirmed by Senate on submission of Appropriate Pass Lists to Senate.

6.15 Publication of Examination Results

The relevant faculty shall publish Provisional Examination Results of candidates in every examination soon after the meeting of the departmental Examinations Committee. The Examination Results shall be arranged and published in a manner as prescribed by the Senate.

6.16 Appeals

Any student or candidate aggrieved by a decision of the Board of Faculty of Technology may appeal to the Senate Examinations Committee for reversal or moderation of the decision of the Board.

6.17 Change of Course

A student may be permitted to change course(s) in an Academic Programme in order to substitute the Course(s) failed. The substitute Course(s) should be within the specified Course(s) for that Academic Programme.

6.18 Change of Academic Programme

(a) A student may be permitted to change from one Academic Programme to another on condition that:

(i) He/She had satisfied the admission requirements for the Academic Programme applied for;

(ii) He/She should not have been attending lectures/tutorials and other academic activities of the Academic Programme he/she would want to change from for more than one-half of the duration of the Programme;

(iii) He/She had not been previously dismissed on disciplinary grounds from the University.

(b) A student permitted to change his/her Programme may be allowed to transfer the Credits from the previous Academic Programme to the new Academic Programme, provided that the Credits being transferred are relevant to the new Academic Programme.

6.19 Payment of Fees

(a) Privately-sponsored students are required to pay registration fees within the first three (3) weeks at the beginning of an academic year in order for him/her to be registered and issued with the University Identity Card.

(b) A privately-sponsored student who fails to pay the registration fee at the end of the third week of the beginning of an academic year shall forfeit his/her place in the University in case the student is in the first year or be deregistered in the case of a continuing student.

(c) Tuition and other University fees are due on the first day of the academic year. Privately-sponsored students who can not pay full fees at the beginning of the academic year are required to pay at least 40% of the fees by the end of the sixth week of a semester and to complete payment of all tuition fees by the end of the twelfth week of a semester.

(d) A privately-sponsored student who shall not have paid at least 60% of the fees by the end of the sixth week shall be de-registered.

(e) A privately-sponsored student who shall not have completed paying fees by the end of the twelfth week will not be allowed to sit for University examinations.

6.20 Refund of Tuition Fees When a Student Has Withdrawn From Studies

A student who has been permitted to withdraw from studies shall be refunded the Tuition Fees already paid according to the following schedules:

	The time at which a Student has withdrawn in a Semester	***Percentage of the Tuition Fees already paid to be refunded to the Student***
(a)	By the end of the First week of a Semester	100%
(b)	By the end of the Second week of a Semester	80%
(c)	By the end of the Third week of a Semester	60%
(d)	By the end of the Fourth week of a Semester	40%
(e)	By the end of the Fifth week of a Semester	20%
(f)	After the fifth week	0%

Fees for Residence, Application, Faculty requirements, registration, Examinations, Identity Cards and the Guild charges are not refunded.

In case an Academic Programme to which a student has been admitted is not conducted in a particular academic year, the University will refund the full tuition fees paid by the student.

6.21 Other Specific Examinations Regulations

Subject to General University Examinations Regulations, there are other specific regulations pertaining to this programme, details of which can be sought from the Office of the Academic Registrar.

The following additional letters shall be used, where appropriate:

- **W -** Withdrawal from Course
- **I** - Incomplete
- **AUD -** Audited Course Only
- The Course Pass Grade Point is 2.0
- No Credit Unit shall be awarded for any Course in which a student fails.

6.22 Designation of the Degree

The degree awarded to the successful candidate shall be designated as B.Sc CE.

6.23 Classification of Degree

The B.Sc CE degree shall be classified according to the CGPA as follows:-

CLASS	**CGPA**
First	4.40 - 5.0
Second, Upper Division Second Lower Division Pass Pass	3.60 - 4.39 2.80 - 3.59 2.0 - 2.79

6.24 Cumulative Grade Point Average

The cumulative grade point average at a given time shall be obtained by:-

i) Multiplying the grade point obtained in each course by the credit units assigned to the course to arrive at the weighted score for the course.
ii) Adding together the weighted scores for all courses taken up to that time.
iii) Dividing the total weighted score by the total number of credit units taken up to that time.

7 REQUIREMENTS FOR AWARD OF THE BSC CIVIL ENGINEERING DEGREE 7.1 Graduation

Requirements

The Degree of Bachelor of Science in Civil Engineering shall be awarded to a Candidate who obtains a minimum of 161 credit units, gained from 48 Course Units. Of these, 41 shall be core course units and 7 shall be electives as indicated in Table 2.

Table 2: Requirements for Graduation

Year	*Core*	*Electives*	
One	**12**	**0**	12 Core Courses; No Electives
Two	**11**	**2**	11 Core Courses; Two Electives
Three	**11**	**1**	11 Core Courses; One Elective
Four	**7**	**4**	7 Core courses; Four Electives
Total Courses 41		**7**	41 Core Courses; Seven Electives

The minimum requirement for graduation is 161 Credit Units

8 PROGRAMME STRUCTURE

The BSc.CE programme shall have the following structure:-

Four Core Mathematics Courses,
- Two Core Computer Courses
- Twenty nine Core Civil Engineering Courses
- Three Core Practical Courses
- Twelve Elective Courses
- Final Year Project in the 1st and 2nd Semester of the fourth year.

Details of the programme structure with respect to the aforementioned are specified in Table 3.

***Table 3: Course Outline* YEAR 1**

Semester I	**Code**	**Course Name**	**CU**	**LH**	**PH**	**CH**
Core courses	EMT1101	Engineering Mathematics I	4	60	0	60

	CIV1101	Engineering Drawing	3	30	30	45
	CIV1102	Introduction to Civil Engineering	3	45	0	45
	EMT1104	Information and Communication Technology I	4	45	30	60
	CIV1103	Mechanics	3	45	0	45
	TEC1101	Communication Skills for Technology	3	45	0	45
			20			

Semester II	**Code**	**Course Name**	**CU**	**LH**	**PH**	**CH**
Core courses	EMT1201	Engineering Mathematics II	4	60	0	60
	CIV 1201	Strength of Materials	4	45	30	60
	EMT1202	Information and Communication Technology II	4	45	30	60
	CIV1202	Fluid Mechanics	3	45	0	45
	CIV1203	Electrical Engineering	3	30	30	45
			18			

Semester III (Recess)	**Code**	**Course Name**	**CU**	**LH**	**PH**	**CH**
Core course	TEC1301	Workshop Practice	2		300	30
		Total CUs for year 1	**40**			

YEAR 2

Semester I	**Code**	**Course Name**	**CU**	**LH**	**PH**	**CH**
Core courses	EMT2101	Engineering Mathematics III	4	60	0	60
	CIV2101	Theory of Structures I	3	45	0	45
	CIV2102	Engineering Geology	3	30	30	45
	CIV2103	Engineering Surveying I	4	30	60	60
	CIV2104	Hydraulics	4	45	30	60
Elective courses *(Choose one)*	CIV2105	Thermodynamics for Civil engineers	2	30	0	30
	TEC2101	Sociology and Engineering	2	30	0	30
			20			

Semester II	**Code**	**Course Name**	**CU**	**LH**	**PH**	**CH**
Core courses	EMT2201	Engineering Mathematics IV	3	45	0	45
	CIV2201	Soil Mechanics	4	45	30	60
	CIV2202	Theory of Structures II	3	45	0	45
	CIV2203	Civil Engineering Materials	4	45	30	60
	CIV2204	Engineering Surveying II	4	30	60	60
Elective course	CIV2205	Economics for Civil Engineering	3	45	0	45
			21			

Semester III (Recess)	**Code**	**Course Name**	**CU**	**LH**	**PH**	**CH**
Core course	CIV2301	Industrial Training I	2	0	300	30
		Total CUs for year 2	**43**			

YEAR 3

Semester I	Code	Course Name	CU	LH	PH	CH
Core courses	CIV3101	Organisational Theory for Engineering	3	45	0	45
	CIV3102	Design of Structures I (Concrete)	4	60	0	60
	CIV3103	Highway Engineering	4	45	30	60
	CIV3104	Hydrology I	4	45	30	60
	CIV3105	Construction Technology	3	45	0	45
Elective Courses *(Choose one)*	CIV3106	Environmental Chemistry	3	30	30	45
	CIV3107	Principles of Quantity surveying	3	45	0	45
			21			

Semester II	Code	Course Name	CU	LH	PH	CH
Core courses	CIV3201	Foundation Engineering	4	45	30	60
	CIV3202	Group Design Project	4	45	30	60
	CIV3203	Design of Structures II (Steel)	4	60	0	60
	CIV3204	Water Resources Engineering I	4	60	0	60
	CIV3205	Public Health Engineering I	4	45	30	60
			20			

Semester III (Recess)	Code	Course Name	CU	LH	PH	CH
Core course	CIV3301	Industrial Training II	2		300	30
		Total CUs for year 3	**43**			

YEAR 4

Semester I	Code	Course Name	CU	LH	PH	CH
Core courses	CIV4101	Civil Engineering Management	3	45	0	45
	CIV4100	Civil Engineering Project I	2	0	60	30
	CIV4102	Civil Engineering Infrastructure Maintenance	3	45	0	45
	CIV4103	Traffic and Transportation Engineering	3	45	0	45
	CIV4104	Public Health Engineering II	4	45	30	60
Elective courses *(Choose one)*	CIV4105	Design of Structures III (Timber and Masonry)	3	45	0	45
	CIV4106	Hydrology II	3	45	0	45
			18			

Semester II	Code	Course Name	CU	LH	PH	CH
Core courses	CIV4200	Civil Engineering Project II	4	0	120	60
	CIV4201	Civil Engineering Law	4	60	0	60
Elective courses *(Choose three)*	CIV4202	Water Resources Engineering II	3	45	0	45
	CIV4203	Civil Engineering Economy	3	45	0	45
	CIV4204	Civil Engineering Environmental Quality Management	3	45	0	45
	CIV4206	Introductory Dynamics of Structures	3	45	0	45
	CIV4209	Human Resources Management and Entrepreneurship	3	45	0	45
			17			
		Total CUs for year 4	**35**			

9 DETAILED COURSE DESCRIPTIONS EMT1101 Engineering Mathematics I

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
60	0	0	60	100	60	40	4

Course Description
Engineering Mathematics is fundamental to the study of Engineering. It provides the necessary analytical skills for the study of more advanced subjects.

Objectives
- To provide an introductory treatment of mathematical concepts fundamental to Engineering.
- Consolidates and advances the material covered in Pre-University Mathematics. This course also provides the mathematical tools needed in other semesters' course units.
- To develop the analytical and critical thinking abilities fundamental to problem solving in Engineering.

Course Content
1. Concept of a Function [10CH]
   - 1.1 Definition, Properties, Range, Domain of the elementary (Algebraic and Transcendental) Functions of a Real Variable
   - 1.2 Concept of a limit of a function of a real variable
   - 1.3 Continuity
   - 1.4 Indeterminate forms and L'Hopital's Rule

2. Complex Variable Algebra [6CH]
   - 2.1 Cartesian and Polar Algebra representations
   - 2.2 Absolute Values; Products, Powers and Quotients; Extraction of Roots
   - 2.3 De Moivre's Theorem
   - 2.4 Exponential and Hyperbolic Functions of the Complex Variable.

3. Differential Calculus [12CH]
   - 3.1 The Derivative: Definitions, notation, properties and Theorems;
   - 3.2 Differentiation of elementary functions of a real variable.
   - 3.3 Applications: Optimization, Curve Sketching, Approximations
   - 3.4 Multivariable Differentiation: Partial Derivatives, Optimization and approximations.

4. Integral Calculus [12CH]
   - 4.1 The Integral: Definition and Properties
   - 4.2 Fundamental theorem of Calculus
   - 4.3 Techniques of Integration
   - 4.4 Definite Integral; its interpretation as area under a curve
   - 4.5 Applications of the Definite Integral: Length of a curve, area bound between curves, volume of revolution, moments
   - 4.6 Improper Integrals and their evaluation using limits
   - 4.7 Integration of a Continuous Function; Inequalities; The Definite Integral as a Function of its Upper Limit
   - 4.8 Differentiation of an Integral Containing a Parameter; Double Integrals and their Applications

5. Linear Transformations and Matrices [12CH]
   - 5.1 Definitions and types of matrices
   - 5.2 Operations on Matrices: Sums, Products, Transposition of Matrices, Equality of Matrices;
   - 5.3 Determinants: Definition and Properties; Minors and Cofactors; Evaluation of Determinants by Cofactors; Rank of a Matrix; Inverse Matrices
   - 5.4 Solution of Systems of Linear Algebraic Equations; Consistent and Inconsistent Equations; Systems of Homogeneous Equations; Cramer's Rule; The Gauss-Jordan Method, Gaussian Elimination.

6. Vector Algebra [8CH]

6.1 Definitions: Scalars, Vectors, Unit Vector, and Dimensionality
6.2 Operations on Vectors: Addition, Subtraction, Multiplication, Dot and Cross Products
6.3 Position and Distance vectors

Learning Outcomes

On completing the course the student should be able to:

- Consolidate fundamental Mathematical principles learned in high school that are relevant at University
- Relate mathematics to the physical world, providing a sound basis for later specialization
- Acquire persistence and manipulative skills required by engineers
- Analyze a variety of complex relationships present in modern engineering systems and products **Mode of**

teaching/delivery

The course shall be conducted through lectures and tutorials. **Mode of Assessment**

Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff Mr. Dominic
Ssemukuutu Mr. Andrew
Katumba Mr. Cosmas
Mwikirize

Reading/Reference Materials

1. K. A. Stroud, *Engineering Mathematics,* 5th ed., Palgrave Macmillan, 2005
2. Alan Jeffrey *Advanced Engineering Mathematics,* Harcourt/Academic Press, 2002
3. C. Ray Wylie and Louis C. Barrett *Advanced Engineering Mathematics,* 6th ed., McGraw Hill, New York, 1995.
4. Erwin Kreyszig, *Advanced Engineering Mathematics,* 8th ed., John Wiley and Sons.
5. Edward & Penney, *Calculus,* International ed., Prentice Hall, 2002
6. J.L. Smyrl, *Introduction to University Mathematics,* Edward Arnold, 1978
7. Anthony Croft, Robert Davison, Martin Hargreaves, *Introduction to Engineering Mathematics,* Addison- Wesley, 1995

CIV 1101 Engineering Drawing

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
30	30	0	45	100	60	40	3

Course Description

This course introduces students to drawing a means of professional engineering communication. It covers sketching, line drawing, shape description, projections, drawing standards and dimensioning.

Objectives

- To inculcate in students the ability to produce, read and comprehend engineering drawings, so that they are able to convey their creative ideas effectively.
- To expose students to various building components.
- To create awareness of modern techniques used in Engineering communications.
- To enable students gain experience in transforming ideas into 2D drawings.

Course Content

1. Introduction to Simple Geometrical Construction [2CH]

1.1 Points, lines, angles, planes and applications,

1.2 Drawing equipment, drawing papers and sizing, title blocks and applications, lettering and printing methods.

2. Tangency [2CH]
   2.1 Internal and external tangents to circles,
   2.2 Curved tangents, inscribing and circumscribing arcs.
3. Simple Plane Figures [2CH]
   3.1 Definitions, triangles, rectangles, trapezium, rhombus, circle and regular polygons.
4. Transformation of Plane Figures [4CH]
   4.1 Transformation, reduction and enlargement of figures.
5. Special Curves and Loci [4CH] 5.
   1 Ellipse, parabola and hyperbola,
   5.2 Epi and hypo cycloid, Link mechanisms.
6. Principles of Orthographic Projection [8CH]
   6.1 Drawing paper planning,
   6.2 1st and 3rd projection,
   6.3 Three-view drawing of regular objects,
   6.4 Dimensioning of orthographic drawings.
7. Principles of Sectioning [4CH]
   7.1 Definition, where and how to section,
   7.2 Types of sections (full/half, local/resolved, part/removed and offset/aligned sections),
   7.3 Dimensioning of isometric drawings.
8. Isometric and Oblique Drawings [4CH]
   8.1 Principles,
   8.2 Objects with isometric and non-isometric lines,
   8.3 Projections - use and applications.
9. Engineering Drawing Practicals [15CH]

Learning Outcomes

On completing the course the student should be able to demonstrate basic drafting skills and interpretation of engineering drawings and drawings from related disciplines.

Mode of teaching/delivery

The course shall be conducted through lectures and practical drawing sessions. **Mode of Assessment**

Assessment will be done through continuous interim assessments (assignments, practicals and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff

Mr. Geoffrey Muyonjo Mukiibi

Reading/Reference Materials

1. Representation Techniques in Building Drawing by R. W. Rukwaro and A. G. Mugenda.
2. Architectural Graphics by Francis D. K. Ching.
3. Engineering Drawing with Worked Examples by M. A. Parker and F. Pickup.
4. Basic Engineering Drawing by R. S. Rhodes and L. B. Cook
5. Engineering Drawing with CAD Applications by O.OSTROWSKY
6. Fundamentals of Engineering Drawing by Cecil Jensen/Jay Helsel

CIV1102 Introduction to Civil Engineering

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	0	45	100	60	40	3

Course Description

This course intends to orient students towards university engineering studies; give them an understanding of science, engineering technology, innovation, the different engineering disciplines, as well as analytical methods. It is intended to make students appreciate the growth of science and technology over the centuries and more recent times. The growth of a professional engineer and his role in national development are also discussed.

Objectives

- Teach students strategies for University Engineering studies
- Teach students, science, engineering, technology, innovation and appropriate technology
- To introduce the History of Science and Technology
- To introduce the Scientific, Experimental and Engineering methods
- To learn about professionalism and the role of professional bodies
- To learn about the role and challenges of an engineer in our society

Course Content

1. University studies and Engineering [3CH]
   1.1 Introduction, Orientation, Learning and Strategies for Success

2. Engineering, Science, Technology and Innovation [9CH]
   - 2.1 The extension of man
   - 2.2 The different disciplines and their interrelationships
   - 2.3 The Universe of Engineering
   - 2.4 Technology appreciation
   - 2.5 Appropriate Technology

3. Analytical methods [9CH]
   - 4.1 Creativity
   - 4.2 The Scientific methods and Experimental methods
   - 4.2 Engineering Method with examples across the disciplines

4. The Growth of Science and Technology [9CH]
   5.1 Professionalism, ethics and integrity.

5. The Professional Engineer [6CH]
   - 6.1 Professional bodies
   - 6.2 Development of a Professional Engineer
   - 6.3 Professionalism, Ethics and Integrity

7. The Engineer in National Development [9CH]
   - 7.1 Millennium Development Goals
   - 7.2 Government and Private Sector
   - 7.3 Client, Consultant, Contractor, Researcher
   - 7.4 Gender and engineering
   - 7.5 Health, safety, risk and environment
   - 7.6 Sustainable Development
   - 7.7 Challenges and prospects of the African Engineer

Learning Outcomes

On completing the course the student should be able to:

- be orientated towards University Engineering studies

- appreciate science, engineering, technology, innovation and appropriate technology and their interlinkages
- appreciate the History of Science and Technology and the roles of Black People
- appreciate the Scientific, Experimental and Engineering methods
- appreciate professionalism and the role of professional bodies
- understand the role and challenges of an engineer in our society

Mode of teaching/delivery

The course shall be conducted through lectures and assignments.

Mode of Assessment

Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff

Eng. Albert Rugumayo
Prof. J.A. Mwakali

Reading/Reference Materials

1. Landis, R.B., *Studying Engineering, A Roadmap to a Rewarding Career,* 2nd Edition, Discovery Press, 2000, Los Angeles CA, USA.
2. Wright, P.H., *Introduction to Engineering* 3rd Edition, John Wiley and Sons, 2002, New York, USA.
3. Mandy, F., *Self Engineering; My Success Story,* Famecon 2008, Kampala, Uganda
4. Rugumayo A. I. *An Introduction to Engineering, Lecture Notes,* Kampala, 2010

CIV1103 Statics and Dynamics for Civil Engineers

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	0	45	100	60	40	3

Course Description

This course introduces engineering students to the analysis of basic static and dynamic objects and systems encountered in engineering practice. It introduces force systems, simple structural elements and principles of work and energy.

Objectives

- Develop a clear understanding of the basic principles that govern the statics and dynamics of particles and rigid bodies
- Develop an ability to analyze Engineering problems systematically and logically
- Emphasize Newtonian Mechanics and the use of the SI system of units.

- Introduce the learners to the static analysis of simple structural systems of beams, trusses and frames. **Course**

Content

1. Statics of bodies [15CH]
   - 1.1 Particles, rigid bodies, free body diagrams
   - 1.2 Structures, force systems
   - 1.3 Shear and bending moments
   - 1.4 Body systems (beams and cables), friction, virtual work, moment of inertia
2. Kinematics of particles [8CH]
   - 2.1 Rectilinear motion
   - 2.2 Plane/space curvilinear motion
   - 2.3 Relative motion
3. Kinetics of particles [8CH]
   - 3.1 Newton's second law
   - 3.2 Work and energy
   - 3.3 Impulse and momentum

4. Kinematics of rigid bodies [6CH]
   - 4.1 Rotation
   - 4.2 Absolute and relative motion

5. Kinetics of rigid bodies [8CH]
   - 5.1 Force, mass and acceleration
   - 5.2 Work and energy
   - 5.3 Impulse and momentum

Learning Outcomes

On completing the course the student should be able to:

- Construct free body diagrams and calculate reactions necessary for static equilibrium
- Use kinematic and kinetic analyses as well as energy and momentum methods in solving the several dynamic problems encountered in Engineering
- Calculate centroids and moments of inertia
- Appreciate internal forces in loaded structural members and construct shear, axial and bending moment diagrams

Mode of teaching/delivery

The course shall be conducted through lectures and tutorials.

Mode of Assessment

Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff

Mr. Richard Kizza
Mr. Apollo
Buregyeya

Reading/Reference Materials

1. Andy Ruina and Rundra Pratap: *Introduction to Statics and Dynamics,* Oxford Press, 2002
2. Beer and Johnson: *Vector Mechanics for Engineers: Statics and Dynamics,* 8th Ed. McGraw-Hill, 2007
3. R.C. Hibbeler: *Engineering Mechanics: Statics and Dynamics,* 11th Ed, Prentice Hall, 2007
4. J.L Meriam and L.G. Kraige: *Engineering Mechanics: Statics,* Vol.1, 5th Ed., John Wiley, 2003
5. J.L Meriam and L.G. Kraige: *Engineering Mechanics: Dynamics,* Vol.2, 5th Ed., John Wiley, 2003

EMT1104 Information Communication and Technology I

Hours per Semester	Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units

LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	0	60	100	60	40	4

Course Description

This course draws upon evolution of Information Communication Technologies as a precursor to applications of computers in day-to-day life. This is critical for any student going into the field of engineering.

Objectives

- To discuss the evolution of the computing and information communication technology,
- To enable students identify the types of computers,
- To enable students identify the hardware components of the computer,
- To enable students execute basic office automation tasks including word processing, working with spreadsheets and preparing computer-aided presentations,
- To introduce students to browsing of the internet and use of email.

Course Content

1. Introduction and Overview [2CH]
   - 1.1 Definition of Information and Communication Technology
   - 1.2 History and Evolution of Computing and Information Communication Technology
   - 1.3 The changing role of Information and Communication Technology in society
   - 1.4 Current domains of application of Information Communication Technology: Mobile Communication, Broadcasting, Internet, Enterprise applications, Office automation, Specialised Applications (Engineering, Entertainment, Simulation etc.)

2. The Computer [3CH]
   - 2.1 Definition of a computer, Types of computers, Elements of Computer Information Systems (CIS)
   - 2.2 Introduction to components of the computer: the user, hardware and the software

[6CH]

Personal Computer Hardware
   - 3.1 Motherboard, Child-boards, and Circuitry
   - 3.2 Central Processing Unit: Control Unit, Registers and the Arithmetic Logic Unit
   - 3.3 Storage: Memory and Auxiliary Storage
   - 3.4 Buses: Types, USB and its advantages
   - 3.5 Chassis
   - 3.6 Peripherals: Input and Output devices
   - 3.7 Expansion cards
   - 3.8 Power Supply and the Un-interruptible Power Supply (UPS)
   - 3.9 Connectors

Firmware Definition [2 CH]
   - 4.1 Types of firmware: BIOS and others
   - 4.2

Software Definition Evolution [4CH]
   - 5.1 System software (operating systems, device drivers, utilities and file management)
   - 5.2 Application software (definition and categorization) Software development tools
   - 5.3 Licensing (Proprietary, Shareware, freeware, General Public License (GPL))
   - 5.4
   - 5.5 Office Automation [2CH]
   - 5.6 6.1 Definitions
   - 6.2 Benefits of office automation
   - 6.3 Overview of office automation tools (Personal Information Management, Office Suites)

Word Processing [6CH]

7.1 Definition and Evolution
7.2 Types of Word Processors
7.3 Features of a word processor
7.4 Word processing exercise

Spreadsheets [8CH]

8.1 Definition and Evolution
8.2 Limitations of spreadsheets
8.3 Features of a spreadsheet
8.4 Types of spreadsheet applications
8.5 Spreadsheet exercises

Presentations [4CH]

9.1 Definition
9.2 Preparation
9.3 Features of presentation packages
9.4 Presentation exercise

10. Email and Browsing the Internet [8CH]

10.1 Definition of the Internet
10.2 Uses of the Internet
10.3 Netiquette
10.4 Internet Browsers
10.5 Search engines and Web directories
10.6 Email (Definition, Composing, Sending, Archiving, etc.)
10.7 Email clients
10.8 Information Literacy and lifelong learning (Definition and Implications of Internet Resources)

11. Practicals [15CH]

Learning Outcomes

On completing the course the student should be able to:

- Identify different types of computers
- Identify and utilize the main computer ICT tools
- Produce appropriately formatted documents in his/her own style using available ICT tools
- Analyze scientific data
- Utilize acquired skills in communication and efficient data management in everyday life **Mode of**

teaching/delivery

The course shall be conducted through lectures, tutorials and practical sessions. **Mode of Assessment**

Assessment will be done through continuous interim assessments (assignments, practicals and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff Dr.
Bennie Mangeni Mr.
Martin Tumutungire

Reading/Reference Materials

1. *Computer Appreciation* by T.F Fry
2. *How Computers Work* by Ron White
3. *Information and Communication Technology in organizations* by Harry Bauwman et al 2005

4. The Internet
5. International Computer Driving Licence (ICDL)
6. *Information and Communication Technology* by N.Sareen 2005

TEC1101 Communication Skills for Technology

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	0	45	100	60	40	3

Course Description

The applications of engineering occur in society, as thus effective communication to varied audiences and clientele is a key virtue a civil engineer must possess. Communication is a tool through which work gets done, ideas get sold and defended. This course introduces to students the principles of organization, development, and writing of technical documents; and instills in them skills of listening, speaking and interaction.

Objectives

- To impart effective skills in reading, listening, speaking and interaction
- To enable the student prepare technical and academic documents
- To enhance the student's capacity to effectively deliver Public and Formal Oral Presentations using appropriate Visual and Computer aids

Course Content

1. Interpersonal Skills [15CH]
   - 1.1 Reading both individual and public
   - 1.2 Listening Skills
   - 1.3 Speaking, Interaction, and Conversational Skills
   - 1.4 The Concept Team Work
   - 1.5 Inter-Office and Intra-Office Communication
   - 1.6 Conduct of Discussions and Dynamics of Meetings

2. Writing and Documentation Skills [15CH]
   - 2.1 Note-taking
   - 2.2 Writing Minutes
   - 2. 3 Writing Notice of Meeting and Agenda
   - 2.4 Preparing Formal Documents (Resume, Application Letters, Acceptance Letters, Resignation Letters, Memos, Circulars, Responses, Letters of Introduction etc)
   - 2.5 Development of Technical and Academic Documents (Theses, Proposals, Dissertations, Laboratory Reports, Papers, Articles, Abstracts)

3. Oral Presentation Principles [15CH]
   - 3.1 Visual and Computer-assisted presentation
   - 3.2 Analysis and Design of Web Presentation
   - 3.3 Choice and use of appropriate presentation tools
   - 3.4 Organizing and presenting effective talk

Learning Outcomes

On completing the course the student should be able to:

- Speak professionally in varied speaking situations
- Listen beyond the verbal word
- Read and write professionally to suit different register

Mode of teaching/delivery
The course will be conducted through a mixture of lectures, group discussions and reading assignments. Basic lecture materials and data will be provided by the Lecturer and this will be supplemented by individual reading effort by students.

Mode of Assessment
Assessment will be done through continuous coursework and final written examination. Continuous assessment will include assignments, classroom tests and practical exercises. A final examination will be offered at the end of each semester. Coursework will carry a total of 40% and a written examination will carry 60%. Coursework marks will be divided into: assignments-15%, attendance-5% and written tests-20%.

Proposed Staff

Mr. Joseph Magongo

Reading/Reference Materials

1. Meriwether, W. (1998). *Writing Essays: Strategies for success,* National Textbook Company
2. Steinberg, S. (2003). *Introduction to Communication Course Book One,* Juta & co. Lonsdowe
3. Hargie, O, & Dickson, D & Tourish, Dennis, (1999) *Communication in Management,* Gower Publishing Limited.
4. Sussams, J. (1998). *How to Write Effective Reports. London.* Gower Publishing Ltd
5. Steyn E & Van Der Merwe (1998). *A Guide to Effective Spoken and Written Communication.* Cape Town. Juta and Co. Ltd

EMT1201 Engineering Mathematics II

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
60	0	0	60	100	60	40	4

Course Description
Against the foundation of the Calculus and Algebra covered in Engineering Mathematics I, this course develops the fundamental aspects of Mathematical Analysis critical to Engineering. The major themes include; Ordinary Differential Equations, Real Analysis, and Numerical Analysis.

Objectives

- To introduce students to the concept of Single Predictor-Response mathematical modelling in areas such as electrical circuit problems and vibratory and oscillatory mechanical systems
- To expose students to analytical solutions of classical ordinary differential equations in mathematical physics.
- To expose students to the fundamentals of Real Analysis.
- To introduce students to the foundations of Scientific Computing and Numerical Analysis. **Course Content**

1. Ordinary Differential Equations [16CH]

1.1 Definition of Differential Equations
1.2 Definition and Classification of Ordinary Differential Equations
1.3 Formulation of Ordinary Differential Equations - electrical circuit problems and vibratory and oscillatory mechanical systems.

1.4 Solution Techniques for First Order ODE's
- Method of Separation of Variables
- Methods for Exact Equations
- Equation Reducible to Exact Form (The Integrating Factor)

- Applications to electrical circuit problems and vibratory and oscillatory mechanical systems

1.5 Solution Techniques for Higher Order ODE's
- The General nth Order ODE
- Existence and Uniqueness of Solution of Linear Equations
- Second Order Homogeneous ODE's with Constant Coefficients (auxiliary equation and method of variation of parameters)
- Second Order Non-Homogeneous ODE's with Constant Coefficients (The Complimentary and Particular Solution, Method of Undetermined Coefficients)
- Special Cases (Equations Reducible to 1st Order or 2nd Order with Constant Coefficients)
- Applications to electrical circuit problems and vibratory and oscillatory mechanical systems

1.6 Solutions of Systems of Linear First Order ODE's

[16CH]

2. Real Analysis

2.1 Sequences - Definitions and Examples. Convergence of Sequences, Sequences of Real and Complex Numbers. Some Limit Theorems of Sequences.

2.2 Series - Definition, Series as a Summation of Terms of a Sequence, Necessary Condition for Convergence, Sufficient Conditions for Convergence (Cauchy's n^{th} Root Test, D'Alembert Ratio Test, Comparison Test), Convergence of Series with Negative Terms, and Absolute Converge

2.3 Power Series - Definitions, Maclaurin's and Taylor's Series and Approximations, Arithmetic Operations on Power Series (Sum, Products, Shifting of Summation Indices, and Differentiation), Convergence (Radius, Interval and Tests)

2.4 Differentiability, Rolle's Theorem, The Mean Value Theorem, Cauchy's Mean Value Theorem, Proof of L'Hospital's Rule

2.5 Proof of the Fundamental Theorem of Calculus

2.6 Riemann Integral-Definition and Characteristics

2.7 Fourier Series - Motivation, Definition, Existence, Fourier Series of General Functions (of period 2n or arbitrary), Fourier Series of Odd and Even Functions, Half-Range Fourier Series Expansions, Determination of Fourier Series without Integration. Dirichlet's Theorem (Limit theorems).

[14CH]

Application of Fourier Series to Electric Circuits.

3. Scientific Computing and Numerical Analysis using MATLAB and Spreadsheets

3.1 Definition and Rationale for Scientific Computing

3.2 Error Analysis

3.3 Numerical Solutions of Polynomial Algebraic Equations, Interpolation Formulae

3.4 Numerical Differentiation and Integration, Trapezoidal and Simpson's Rules of Integration

3.5 Numerical Solutions of Ordinary Differential Equations: Euler method, Modified Euler method and Runge-Kutta

4. Vector Analysis [14CH]

4.1 Scalar and Vector Fields

4.2 Classification of vector fields

4.3 Scalar and Vector Functions

4.4 Directional Derivatives of Scalar Functions and Derivatives of Vector Functions

4.5 Gradient, Divergence, Curl and Laplacian of Vector Functions

4.6 Physical Interpretation of the Divergence and the Curl of a Vector Field

4.7 Green's theorem, Line Integrals Independent of Path, Exact Differential Forms

4.8 Differential length, Area and Volume; Line, surface and Volume integrals

4.9 Coordinate systems and Transformation: Cartesian; Cylindrical; Spherical coordinate

Learning Outcomes

On completing the course the student should be able to:

■ Relate mathematics further to the physical world, providing a sound basis for later specialization

- Acquire extra persistence and manipulative skills required by engineers
- Analyze a variety of complex relationships present in modern engineering systems and products
- Develop a high level of analytical capability as modern engineering design demands of it.
- Develop habits of logical thinking and effective communication

Mode of teaching/delivery

The course shall be conducted through lectures and tutorials.

Mode of Assessment

Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff

Dominic Ssemukuutu
Andrew Katumba
Cosmas Mwikirize

Reading/Reference Materials

1. K. A. Stroud, *Engineering Mathematics*, 5th ed., Palgrave Macmillan, 2005
2. Alan Jeffrey *Advanced Engineering Mathematics,* Harcourt/Academic Press, 2002
3. C. Ray Wylie and Louis C. Barrett *Advanced Engineering Mathematics,* 6th ed., McGraw Hill, New York, 1995.
4. Erwin Kreyszig, *Advanced Engineering Mathematics,* 8th ed., John Wiley and Sons.
5. Murray R Spiegel, *Theory and Problems of Vector Analysis, 3rd* ed., McGraw Hill
6. Murray R Spiegel, *Applied differential equations,* SI (Metric) ed., Prentice-Hall, 1981
7. Bajpai, Calus, Fairley and Walker, *Mathematics for Engineers and Scientists*
8. L. R. Mustoe, 1988. *Worked Examples in Advanced Engineering Mathematics.* John Wiley & Sons Ltd. Great Britain.
9. G. Stephenson, 1988. *Mathematical Methods for Science Students.* 2nd Edition. Longman
10. Group UK
11. Thomas M. Creese and Robert M. Haralick, 1978. *Differential Equations for Engineers,* McGraw-Hill, N. Y. US
12. Shepley L. Ross, 1966. *Introduction to Ordinary Differential Equations.* Blaisdell Publishing Company, Massachusetts, US.

CIV1201 Strength of Materials

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	0	60	100	60	40	4

Course Description

This course deals with basic mechanics of materials and is crucial in understanding mechanical behaviour and capacity of engineering materials.

Objectives

- To enable students evaluate behaviour of materials subjected to normal, shear, twisting and bending loads
- Expose students to derivation of stress transformation formulas and thus determine the principle stresses on any loaded element, and
- To enhance appreciation of the theory behind failure of ductile and brittle engineering materials.

Course Content

Concept of Stress [8CH]
1.1 Forces and Stresses in (axial), shear, twisting and bending modes
1.2 Oblique planes, ultimate and allowable stress, factor of safety

Stress and Strain [6CH]
2.1 Axial loading and Hooke 's law
2.2 Poisson ratio, Shear and Bulk modulus

Torsion of Circular Shafts [6CH]
3.1 Stresses and deformations in a shaft in the elastic range, angle of twist
3.2 Statically indeterminate shafts
3.3 Design of transmission shafts

Pure Bending [6CH]
4.1 Prismatic members
4.2 Stresses and deformations in symmetrical members in the elastic rang,
4.3 Composite materials
4.4 Eccentric Axial loading in a Plane of symmetry
4.5 Unsymmetrical bending

Transverse Loading on Beams [6CH]
5.1 Prismatic members
5.2 Distribution of the Normal Stresses
5.3 Shear on a horizontal plane
5.4 Shear in beams

Transformations of Stress [8CH]
6.1 Plane stress, Principal stresses, Maximum shear stresses
6.2 Mohr's circle
6.3 General state of stress
6.4 Application of Mohr's circle to 3-D

Failure Theories [5CH]
7.1 Yield Criteria for ductile materials under plane stress
7.2 Tresca yield criterion and von Misses yield criterion
7.3 Fracture Criteria for brittle materials under plane stress
7.4 Coulomb's criterion, Mohr's criterion

8 Practicals in the laboratory [15CH]

Learning Outcomes

On completing the course the student should be able to:

- Use the basic strength of material formulae to calculate the stresses and deformations of elements subjected to pure actions of axial, torsion and bending
- Superpose the results of the basic loading modes to solve relatively more complex problems
- Evaluate the principle stresses and strains
- Discuss the failure theories of ductile and brittle materials followed by experiments to appreciate the behaviour of such materials at failure

Mode of teaching/delivery

The course shall be conducted through lectures, tutorials and practicals.

Mode of Assessment

Assessment will be done through continuous interim assessments (assignments, practicals and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff Dr.
Yasin Naku Ziraba Eng.
Paul Mujugumbya

Reading/Reference Materials

1. *Mechanics of Materials,* Second Edition, by Ferdinand P. Beer and E. Russel Johnston Jr.
2. *Mechanics of Engineering Materials,* by P.P. Benham, R.J. Crawford, C.G. Armstrong
3. *Mechanics of Materials,* Fourth SI Edition by J.M. Gere and S.P. Timoshenko

EMT1202 Information Communication Technology II

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	0	60	100	60	40	4

Course Description

Competency in a programming language is prerequisite to the study of computer engineering. Object-oriented programming, event-driven applications, and the use of extensive APIs (application programming interfaces) are fundamental tools that computer engineering students need early in their academic program.

Objectives

- Describe how computer engineering uses or benefits from programming fundamentals.
- Identify the appropriate paradigm for a given programming problem.
- Use a suitable programming language to implement, test, and debug algorithms for solving simple problems.
- Describe the way a computer allocates and represents these data structures in memory.
- Outline the philosophy of object-oriented design and the concepts of encapsulation, subclassing, inheritance, and polymorphism.

Course Content

1. History and Overview [2CH]
   - 1.1 Indicate some reasons for studying programming fundamentals
   - 1.2 Influential people; important areas such as programming constructs, algorithms, problem solving, data structures, programming paradigms, recursion, object-oriented programming, event-driven programming, and concurrent programming
   - 1.3 Contrast between an algorithm and a data structure
   - 1.4 Distinguish between a variable, type, expression, and assignment
   - 1.5 Highlight the role of algorithms in solving problems
   - 1.6 Describe some of the fundamental data structures such as array, record, stack, and queue
   - 1.7 Explain how divide-and-conquer strategies lend themselves to recursion
   - 1.8 Explore some additional resources associated with programming fundamentals
   - 1.9 Explain the purpose and role of programming fundamentals in computer engineering

2. Programming Languages [2CH]
   - 2.1 Definition and History
   - 2.2 Characteristics (Pragmatics, Semantics and Syntax)
   - 2. 3 Distinction between Text-based and Visual Programming
   - 2.4 Classification (Categorical, Chronological and Generational)
   - 2.5 Comparison of common programming languages (C, C++, C#, Java)
   - 2.6 Programming errors and warnings (syntax, logical, etc.)

3. Programming Paradigms [2CH]
   - 3.1 Definition and rationale of a programming paradigm
   - 3.2 Types: Structured, Unstructured, Procedural, Object-oriented, Event-Drive, Generic etc.
   - 3.3 Separation of behaviour and implementation

4. ISO/ANSI C++ Programming Fundamentals [33CH]
   - 4.1 Bjarne Stroustrup Design rules
   - 4.2 Console applications basics (Source file, Basic I/O, Standard I/O Consoles, Function main
   - 4.3 Fundamental data types

4.4 Expressions and operators
4.5 Control constructs (Conditional and Iterative)
4.6 Pointers and Named collections (Arrays, Enumerators, Bit-fields, Unions)
4.7 User-defined data types (Structures and Classes)
4.8 Functions (In-built and User-defined)
4.9 Object -oriented programming (Abstraction, Encapsulation, Inheritance, Composition, Polymorphism, Friend and Virtual Functions)
4.19 File I/O

5. Algorithms and Problem-Solving [4CH]
5.1 Problem-solving strategies
5.2 The role of algorithms in the problem-solving process
5.3 Implementation strategies for algorithms
5.4 Debugging strategies
5.5 The concept and properties of algorithms
5.6 Structured decomposition

6. The Integrated Development Environment (IDE) [2CH]
6.1 Definition
6.2 Toolchains
6.3 Advantages of IDEs
6.4 Comparison of IDEs

6.5 Using a typical IDE (Visual Studio)

7. Practical Sessions [15CH]

Learning Outcomes

On completing the course the student should be able to:

- Identify important programming languages
- Compare and contrast Low Level Languages and High Level Languages in computer programming
- Identify languages most suited to the solution of engineering problems
- Develop optimal input/output structures in a computer process
- Develop coding methods that optimally use flow control structures in structured programming
- Design, Code, Compile, Run, Test and Validate computer programs
- Execute programming case studies in scientific and engineering problem solving

Mode of teaching/delivery

The course shall be conducted through lectures, tutorials and practicals. **Mode of Assessment**

Assessment will be done through continuous interim assessments (assignments, practicals and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff

Dr. Bennie Mangeni Mr.
Martin Tumutungire

Reading/Reference Materials

1. *Programming Guide to Fortran 90* by Brainard W.S et al Unicomp, 1994
2. *Fortran 90 Programming* by T.M.R Ellis et at Addison Wesley, 1994
3. *Object Oriented Programming via Fortran 90/95* by J.E.Akin, 2000
4. *Programmer's Guide,* MSDEV (online)
5. *Fortran 90 for Scientists and Engineers* MSDEV (Online)
6. *Information and Communication Technology for Development* by World Bank, 2009
7. *Information and Communication Technology and real-life Learning* by Van J van Weert and Arthur Tatnall, 2005

CIV1202 Fluid Mechanics

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	0	45	100	60	40	3

Course Description

This course introduces general fluid flow principles to Civil Engineering students. It demonstrates the principles through examples where the fluid is water. Civil Engineering projects such as hydropower development, water supply, drainage and flood defences require knowledge of fluid mechanics.

Objectives

- Introduces fluid mechanics and establishes its relevance in Civil engineering.
- Develops the fundamental principles underlying the subject.
- Demonstrates how these are used for the design of simple hydraulic components.

Course Content

1. Introduction [9CH]
   - 1.1 Fluid definition, units, flow
   - 1.2 Equilibrium conditions
   - 1.3 Viscosity and Newtonian fluids
2. Fluid Statics [9CH]
   - 2.1 Hydrostatic pressure,
   - 2.2 Manometry and pressure measurement,
   - 2.3 Hydrostatic forces on submerged bodies
3. Fluid Dynamics [12CH]
   - 3.1 Continuity equation
   - 3.2 Bernoulli equation and applications
   - 3.3 Momentum equation and applications
4. Flow in Pipes [12CH]
   - 4.1 Viscosity, Reynolds number,
   - 4.2 Boundary layer, Laminar, transition and Turbulent motion
   - 4.3 Hagen - Poise Uille theory
   - 4.4 Friction factors, Head loss coefficients
   - 4.5 Valves, Bends, Pipe networks and Quasi steady flow problems
5. Dimensional analysis and Similitude [3CH]

Learning Outcomes

On completing the course the student should be able to:

- Understand the fundamental theory of Fluid Mechanics
- Understand the different applications of Fluid Mechanics in Civil Engineering
- Carry out simple analyses of hydraulic problems

Mode of teaching/delivery

The course shall be conducted through lectures and tutorials.

Mode of Assessment

Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff

Mr. Michael Kizza Dr.
Max Kigobe

Reading/Reference Materials

1. *Mechanics of Fluids,* Massey B S., Van Nostrand Reinhold.
2. *Fluid Mechanics,* Douglas J F, Gasiorek J M, and Swaffield J A, Longman.
3. *Civil Engineering Hydraulics,* Featherstone R E and Nalluri C, Blackwell Science.
4. *Hydraulics in Civil and Environmental Engineering,* Chadwick A, and Morfett J., E & FN Spon - Chapman & Hall.

CIV1203 Electrical Engineering

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
30	30	0	45	100	60	40	3

Course Description

This course focuses on fundamentals of electrical engineering, circuit analyses of simple electrical systems (DC & AC), single and three phase supplies, basic electrostatics and electromagnetics.

Objectives

- To provide students with basic knowledge or fundamentals in Electrical Engineering mainly laws, principles and Theorems.
- To introduce students to circuit analyses of simple electrical systems by being able to draw electrical circuits and determine electrical quantities of real systems under different system conditions.
- To predict behaviour or performance of electrical systems/circuits under both transient and steady state conditions
- To enable students acquire diagnostic skills in identifying electrical faults (fault tracing) electrical tests and troubleshooting simple electrical equipment.
- To provide students with knowledge in magnetic circuits which form a basis for understanding of electrical machines.
- To provide students with basic knowledge in electrostatics to enable them appreciate the electrical safety in buildings mainly Lightning Protection.
- To equip students with basic knowledge in electrical safety in buildings and measures taken to enhance it.

Course Content

1. Fundamentals of Electrical Engineering [10CH]
   - 1.1 Simple electrical circuits with Active and Passive elements under steady and transient conditions
   - 1.2 Active elements (DC /AC sources of Power/energy).
   - 1.3 Passive elements linear and non linear (Resistance, Inductance and Capacitance).
   - 1.4 State the Laws, Theeorems and Principles which are used to study/analyse the electrical circuits.
   - 1.5 Kirchoffs laws, Thevenin and Norton's, Principle of Superposition.
   - 1.6 Series and Parallel connections
   - 1.7 Computations of quantities (Impedence, Current,voltages, Power flows)

2. Transient analysis of DC and AC circuits [5CH]
   - 2.1 Purely Resistive, Resistive and Inductive, resistive and Capacitive and all the three elements in a circuit (series and Parallel connection).
   - 2.2 Applications (Energy storage).

3. Single Phase and Three Phase supplies [5CH]
   - 3.1 Advantages and disadvantages of each circuit
   - 3.2 Star and delta connected sources and loads
   - 3.3 Average and RMS quantities and Computation of Average Power
   - 3.4 Computations of Phase, and line currents and Power factors
   - 3.5 Unbalanced loads, Neutral currents

4. Electrostatics [5CH]
   - 4.1 Laws.Coloumbs law,Gauss Law.
   - 4.2 Point charges, Electric field, Potential, Electric field strength and explanation of Kirchoff s laws. Basis of Understanding Electric circuits.

4.3 Application. Safety in buildings. Lightning Protection

5. Electromagnetics [5CH]
   - 5.1 Classification of Materials
   - 5.2 Quantities,Magnetic Flux, Flux linkages,Flux Density
   - 5.3 Laws- Faraday's and Lenz's law.Amperes, Circuit law
   - 5.4 Analysis of Magnetic Circuits
   - 5.5 Analogies between Electric and Magnetic circuits
   - 5.6 Applications
   - 5.7 Principle of Operation of Transfomers,Motors and Generators a basis for understanding how electric machines operate what parameters influence their operation

6. Practicals in the Laboratory [15CH]

Learning Outcomes

On completing the course the student should be able to:

- appreciate the fundamentals of Electrical Engineering and apply them to solve simple problems of electrical circuits
- derive/draw electrical circuits representing real life Electrical systems and determine the responses of such systems to different Input condition
- compute electrical quantities like power, current or Voltage which determine the performance of electrical equipment (Predict the response or behaviour of electrical circuits)
- appreciate the electrical safety concerns in buildings and take preventive measures at all times
- have more knowledge and better understanding of the construction and operation of electrical machines.
- to undertake a higher course in Electrical Engineering for better understanding of electrical services in Buildings, Energy systems and Safety Engineering specifically a course on Introduction to electronics.

Mode of teaching/delivery

The course shall be conducted through lectures, practicals and tutorials. **Mode of Assessment**

Assessment will be done through continuous interim assessments (assignments, practicals and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff

Mr. Patrick Mugisha
Ms. Sheila Mugala

Reading/Reference Materials

1. Vincent Del -Toro; *Principles of Electrical Engineering*
2. Edminister; *Electric Circuits.*
3. C.A.Gross and David Irwin; *Basic Engineering Circuit Analysis,* 3rd Edition.
4. Smith and Alley; *Electrical Circuits.*
5. Shepherd, Morton, Spence; *Higher Electrical Engineering.*

TEC 1301 Workshop Practice

Hours per Semester				Weighted Total Mark	Weighted Supervisor and inspector assessment Mark	Final Report	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
0	300	0	30	100	70	30	2

Course Description

At the end of first year students should be subjected to vocational training in which they attain practical skills in a workshop environment. Depending on the level of facilitation of the university this can be arranged either at the university or organized with the industries.

Objectives

- To help students acquire practical skills in a workshop environment **Course**

Description

Some of the modules to be offered are summarized as follows:

1. Safety Precautions [6CH]

Use and care of tools and measuring instruments
Electric shock and its treatment, use of insulation meter, multi-meters wire-guage, phase tester and other electrician's tools
Cables: sizes, current rating, jointing and termination Solders and soldering
Main features of domestic installations and appliances, e.g. D.B. system, fluorescent lamps, fans etc. Necessity and methods of earthing, faults and remedies, in wiring circuits. Winding practice of machine coils

Elementary Machine Shop [3CH]
Detailed study of centre lathe and accessories Plain and taper turning, simple screw cutting Cutting tools and their grinding
Introduction of shaper, slotter, planner, pillar and radial drilling machines.

3. Fitting Shop [3CH]

Use and care of fitter's tools. Marking out ofjobs
Practice in metal filing, sawing, drilling, Die sinking, tapping and reaming
Introduction and use of power jack saw and arbor press

Smithy Shop [6CH]
The use and care of forging tools and blacksmith tools
Open hearth forge, practice in upsetting, drawing out spreading, bending, cutting and punching, hardening and tempering of small cutting tools. Brazing, electric and gas welding.

Electronics and Computer Shop [6CH]
Windows XP, Office automation and use of internet Software and hardware maintenance

[6CH]

6. Building Construction
- Brick work, concrete work, trusses and plumbing
- Building finishing processes; painting, varnishing and decorating.

Learning Outcomes

On completing the course the student should be able to:
- Have attained the hands-on skills and working experience in the repair of roads, use of road materials in road and building works, handling and using of simple surveying tools, arranging of bricks in masonry work, mixing of cement/sand/water to make mortar, painting of old building surfaces, and others.
- Write a simple report reporting on what technical work he/she has been involved in. **Mode**

of teaching/delivery

The course shall be conducted through a few lectures but mainly by practical work in workshops/laboratories and on sites.

Mode of Assessment

Assessment will be based on super-vision (Academic and Field supervisor), inspection and a technical report compiled by the student. The Academic and field supervisor assessments will carry a total of 70% and the final report will carry 30% of the final grade mark.

Proposed Staff

Mr. Ivan Rwendeire Mr.
John Clifton Mr. Fred
Mukasa Mr. Yunus
Luswa

Reading/Reference Materials

1. Written pamphlet with Guides on how to do Workshop Practice.
2. Previous reports by Students in Higher classes.

EMT2101 Engineering Mathematics III

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
60	0	0	60	100	60	40	4

Course Description

Drawing from the concepts covered in Engineering Mathematics I and II, this course is designed to consolidate and advance analytical techniques for solution of ordinary differential equations; and introduces concepts fundamental to the study of other courses in Computer Engineering. The major themes covered include integral transforms, series solutions to ordinary differential equations and special functions.

Objectives
- Introduce the student to Integral Transforms and their application to the solution of Ordinary Differential Equations
- Introduce the Power Series solution technique to Ordinary Differential Equations
- Expose the student to some special functions fundamental to engineering specifically Gamma, Beta, Bessel and Legendre.

- To develop problem solving skills and proof skills by working on specific problems in which it is natural to look at special or simpler cases in order to try to discover patterns. An integral part of the process of mathematical thinking is to wander into blind alleys, sometimes being frustrated, before ultimately obtaining a solution or proof. In this process mathematical scientists often work together with colleagues, and this group work and sharing of ideas often adds great value to a mathematical investigation.
- To give a balanced introductory treatment of the area of Partial Differential Equaitons (PDEs) so that a student appreciates the power of PDE modeling; and is aware of major techniques for their solution. The focus of the course is on analytical techniques for the classical linear PDE of physics and engineering (heat, wave and Laplace equations), and their frequent occurrence in applications.

Course Content

1. Fourier Integrals and Transformations [8CH]
   - 1.1 Motivation for the Fourier Integral
   - 1.2 Definition of Fourier Integral as a limit to the Fourier Series with period tending to infinity
   - 1.3 Conditions for existence of a Fourier Integral representation (Dirichlet's conditions, Existence of the absolute integral for the entire real axis)
   - 1.4 Complex exponential Fourier Integral representation, Standard Fourier Integral representation, Fourier Cosine and Sine Integral representations
   - 1.5 Definition of the Fourier Transform and its Inverse
   - 1.6 Frequency spectrum of periodic and continuous functions
   - 1.7 Distinction between the Fourier Transform and Integral
   - 1.8 Properties of the Fourier Transform Transform: Linearity, First Shift Theorem, Second Shift Theorem, t-ra duality, Time differentiation, Frequency Differentiation, Convolution, Correlation
   - 1.9 Fourier Transform of special functions: Delta function (Sifting property), Heaviside Step function,
   - 1.10 Applications: Parseval's theorem, RCL circuits, Frequency shifting in Communication theory (carrier signals and Antenna design)
   - 1.11 Solution of Ordinary Differential Equations with constant coefficients
2. Laplace Transformations [8CH]
   - 2.1 Motivation for the Laplace transform
   - 2.2 Definition of the Laplace transform
   - 2.3 Comparison of the Laplace and Fourier Transforms
   - 2.4 Conditions for existence of the Laplace transform (Dirichlet's conditions, Piecewise continuity of thee function)
   - 2.5 Properties of Laplace Transforms: Linearity, First Shift Theorem, Second Shift Theorem, Time differentiation, s-domain Differentiation, s-domain Integration
   - 2.6 Laplace Transforms of special functions: Delta function and Heaviside function
   - 2.7 Solutions of Ordinary Differential Equations by Laplace Transform Techniques
   - 2.8 Solutions of Simultaneous Linear Ordinary Differential Equations with constant coefficients
   - 2.9 Applications in RLC Circuit Analysis
3. Power Series Solutions to Ordinary Differential Equations [10CH] 3.
   - 1 Motivation of the Power Series solution method
   - 3.2 Concept of the Power Series method (Ordinary points, Singular points)
   - 3.3 Series solutions about Ordinary points
   - 3.4 Series solutions about Regular Singular points (Method of Frobenius)
4. Gamma and Beta Functions [4CH]
   - 4.1 Integral Definition of Gamma and Beta Functions
   - 4.2 Properties of Gamma and Beta Functions
   - 4.3 Generalisation of the factorial by Means of the Gamma function
   - 4.4 Relations Between Gamma and Beta Functions
   - 4.5 Definition of Gamma Function for Negative Values of Argument
5. Bessel Functions [6CH]

5.1 Bessel's Equation and its Solutions.
5.2 Familiarisation with Characteristics and Graphs of Bessel Functions
5.3 Properties of Bessel Functions of the First Kind: Differentiation, Recurrence relationships, Generating functions
5.4 Ordinary Differential Equations solvable using the notion of Bessel's equations
5.5 Integral Representations of Bessel Functions
5.6 Integrals Involving Bessel Functions
5.7 Laplace Transforms of Bessel functions

Legendre Functions [4CH]

6.1 Legendre's Equation and its Solutions
6.2 Legendre's Polynomials; the Generating Function for Legendre's Polynomials; Orthogonality of Legendre's Polynomials
6.3 Rodriguez's formula
6.4 Orthogonality Relations for the Associated Legendre Functions,
6.5 Familiarisation with Characteristics and Graphs of Legendre's Polynomials and Associated Legendre Functions
6.6 Integrals involving Legendre Polynomials

Definition of a Partial Differential Equation [20CH]

7.1 Derivation of Some Typical PDEs of Mathematical Physics
- The One-Dimensional Wave Equation (Vibrating String)
- The One-Dimensional Heat Conduction Equation
- The Telegraph or Transmission Line Equation
- The Two-Dimensional Wave Equation (Vibrating Membrane)
- The Two-Dimensional Heat Conduction Equation
- The Three-Dimensional Heat Conduction Equation

7.2 Classification of Partial Differential Equations
- Homogeneous and Non Homogeneous PDE's
- Linear and Non-Linear PDE' s
- N-Order PDE's
- Parabolic, Elliptic and Hyperbolic PDE's

7.3 Classification of Boundary Conditions to PDE's
- Homogeneous and Non Homogeneous BC's
- Linear and Non-Linear BC's
- Dirichlet BC's
- Neumann BC's
- Robin BC's
- Cauchy BC's

7.4 Overview of Methods of Solving Boundary Value Problems

7.5 Solutions of Boundary Value Problems Using the Method of Separation of Variables
- 2nd Order Linear and Homogeneous BVP's with Period BC's
- Use of Fourier Series in the Solution of 2nd Order Linear and Homogeneous Dirichlet and Neumann BVP's
- Solution of Non-Homogeneous BVP's
- Direct Originality with Mixed BVP's
- The Cauchy BVP's
- Sturm-Liouville Problems

7.6 Use of Laplace Transforms in Solving PDEs

7.7 FDM Solutions of Boundary Value Problems involving PDEs
- Parabolic BVP's
- Elliptic BVP's

- Hyperbolic BVP's

- Use of MATLAB in the Solution of PDE's

Learning Outcomes

On completing the course the student should be able to:

- Apply concepts of Integral transform to practical engineering appliances like measuring instruments
- Explore several methods of solution to complex practical engineering products and systems
- Stretch levels of imagination in practice in order to try to discover and solve patterns of societal problems
- Understand the foundation of Partial Differential equations that analytical modelling techniques that arise in may complex engineering applications

Mode of teaching/delivery

The course shall be conducted through lectures and tutorials. **Mode**

of Assessment

Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff

Mr. Paul Isaac Musaasizi
Mr. Andrew Katumba
Dr Peter Lating
Mr. Dominic Ssemukuutu

Reading/Reference Materials

1. C. Ray Wylie and Louis C. Barrett *Advanced Engineering Mathematics*, 6th ed., McGraw Hill, New York, 1995.
2. Erwin Kreyszig, *Advanced Engineering Mathematics,* 8th ed., John Wiley and Sons.
3. Mary L. Boas, 1983. *Mathematical Methods in the Physical Sciences.* 2nd Edition. John Wiley & Sons, INC. New York
4. Thomas M. Creese and Robert M. Haralick, 1978. *Differential Equations for Engineers.* McGraw-Hill, N. Y. US
5. L. R. Mustoe, 1988. *Worked Examples in Advanced Engineering Mathematics.* John Wiley & Sons Ltd. Great Britain
6. Murray R. Spiegel, 1981. *Applied Differential Equations.* 3rd Edition. Prentice-Hall, Inc., Englewood Cliffs, N.J. 07632

CIV2101 Theory of Structures I

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	0	45	100	60	40	3

Course Description

This course introduces the student to various structural forms that support structures and convey an understanding of the primary aspects of their behaviour. Methods of static analysis of linear statically determinate elastic structures subjected to both fixed and movable loads are introduced; as well as computation of displacements using classical methods and its importance in the solution of statically indeterminate systems.

Objectives

- The student will be able to apply principles of mechanics in the determination of the reactions and q internal forces in statically determinate structures such as beams, trusses, frames and arches.
- The student should be able to categorise the different types of actions, quantify their corresponding deformations and appreciate the final displaced shape of simple structures.
- The student should be able to assess the effect of placement of the loads on the structure using influence lines

Course Content

1. Definitions and Geometry [9CH]
   - 1.1 External equilibrium and internal forces in members
   - 1.2 Stability and determinacy
   - 1.3 Principal of Virtual work
   - 1.4 Principal of superposition
2. Stresses and strains [9CH]
   - 2.1 Direct and shear stresses, Principal stresses
   - 2.2 Maximum shear stresses
   - 2.3 Mohr's circle, direct and shear strains
   - 2.4 Isotropy and Elasticity
   - 2.5 States of stress and strain for axial, bending, shear, torsion, flexural and combined effects
3. Statically determinate members [9CH]
   - 3.1 Beams, trusses and frame analysis
   - 3.2 Moment, shear force and axial diagrams
   - 3.3 Internal forces at cut sections
4. Statically Indeterminate members [9CH] 4.1
   Method of consistent deformations of indeterminate beams and frames
5. Deflection analysis [9CH]
   - 5.1 Displacements in beams and frames due to loads and temperature change
   - 5.2 Differential equation of flexure
   - 5.3 Macaulays' methods
   - 5.4 Influence lines

Learning Outcomes

On completing the course the student should be able to:

- Apply basic mathematics, science and engineering principles to solve structural engineering problems
- Recognise, formulate and analyse statically indeterminate beams, frames and trusses using several basic methods
- Student should be prepared to learn how to extend the acquired knowledge to statically indeterminate systems covered in the subsequent course (theory of structures II)

Mode of teaching/delivery

The course shall be conducted through lectures and tutorials.

Mode of Assessment

Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff

Mr. Moses Matovu Dr.
Yasin Nakuziraba

Reading/Reference Materials

1. *Fundamentals of Structural Analysis* by S. T. Mau
2. *Structural Analysis in Theory and Practice* by Alan Williams
3. *Structural Analysis,* R.C.Hibbler
4. *Structural Engineering Volume-1 Introduction to Design Concepts and Analysis* by Richard N. White, Peter Gergely and Robert G. Sexsmith
5. *Theory and Analysis of Structures* by A. Zingoni, JA Mwakali and A. Salahuddin
6. *Structural Analysis* Volume 1, by S. S. Bhavikatti
7. *Elementary Theory of Structures* by Yuan-Yu Hsieh
8. *Theory of Structures* by R. S. Khurmi
9. *Principles of structures* by Ariel Hangor
10. *Structural analysis* by LS Negi. RS Jangio

CIV2102 Engineering Geology

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
30	30	0	45	100	60	40	3

Course Description

This course deals with basic geological materials and earth processes and how they influence mechanical behaviour and capacity of engineering materials, processes and structures. The linkage to Rock Mechanics and Hydrogeology are emphasized. It is divided into physical and historical Geology.

Course Objectives

- Introduces students to assessment of the influence of geological factors on the conception, location, planning, feasibility, design, construction, cost, safety and management of Civil Engineering works.
- Creates an understanding of how to choose appropriate geological materials that can be used for specific Civil Engineering projects.
- Evaluate the effects of geological processes on Civil Engineering activities and structures.
- Exposes students on how to carry out geotechnical site investigations for Civil Engineering projects.
- Enables students to utilize knowledge about the earth structure, surface processes, sedimentology, geormorphology, sedimentation and stratigraphy.
- Demonstrates to students the linkage of geology to rock mechanics and hydrogeology

Course Content

1. The Earth and Historical perspective [4CH]
   - 1.1 Physical and Historical geology
   - 1.2 Principle of Uniformitarianism
   - 1.3 Earth structure, mineralogy, dynamic geology
   - 1.4 Surface processes
2. Structural Geology [4CH]
   - 2.1 Petrology and sedimentology
   - 2.2 Geomorphology, sedimentation and stratigraphy
   - 2.3 Folds and faults
   - 2.4 Joints and unconformities
3. Elements of Rock Mechanics [4CH]
   - 3.1 Weathering and denudation
   - 3.2 Assessment and effects on rock masses
   - 3.3 Rock mass quality, assessment and improvement
4. Geological processes and structures [4CH]
   - 4.1 Rock formation and classification
   - 4.2 Rock mineralogy and hardness

4.3 Excavation and mining of rocks
4.4 Hydrogeology/Geo-hydrology - aquifers, wells, springs, boreholes and seepage
4.5 Soils, slope stability, rock mass improvement

[4CH]

5. Tunneling
   - 5.1 Excavations, tunnels, disposal of excavated material
   - 5.2 Shape and type of channels
   - 5.3 Geological considerations
   - 5.4 Consolidated and unconsolidated rocks

[4CH]

6. Geotechnical investigation of Sites
   - 6.1 General techniques
   - 6.2 Desk study
   - 6.3 Reconnaissance
   - 6.4 Boring, drilling, profiling, borehole records, interpretation and reporting

[3CH]

7. Earthquakes
   - 7.1 Definition and types
   - 7.2 Causes, waves, location of epicenter
   - 7.3 Intensity and magnitude
   - 7.4 Seismic zones

[3CH]

8. Use of Geological Maps
   - 8.1 Introduction and scales of geological maps
   - 8.2 Drifts and outcrops
   - 8.3 Sub-surface geology
   - 8.4 Geomorphologic and geotechnical maps
   - 8.5 Age relationships, outliers and inliers

9. Practicals and Fieldwork [15CH]

Learning Outcomes

On completing the course the student should be able to:

- Evaluate the influence of site geological conditions on planning, design, cost, feasibility, construction, operation and management of a civil engineering works
- Execute a credible site geotechnical investigation
- Establish the linkage of engineering geology to Rock Mechanics and Hydrogeology
- Evaluate a few typical case studies of site geotechnical investigation exercises

Mode of teaching/delivery

The course shall be conducted through lectures, tutorials and practicals.

Mode of Assessment

Assessment will be done through continuous interim assessments (assignments, practicals and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff

Dr. Bennie Mangeni
Dr. Denis Kalumba
Mr. Richard Kizza

Reading/Reference Materials

1. *Introduction to Geology* by H H Read and Janet Watson, 1962
2. *Engineering Geology* by F.G.Bell, 2007
3. *Geology for Civil Engineers* by A.C Mclean and C.D.Gribble, 1978
4. *A Geology for Engineers* by F.G.H.Blyth and H.H.de Freitas, 1988
5. *Engineering Geology; Principles and Practices,* 2009

6. *Handbook of Geology in Civil Engineering* by Robert F. Legget and Paul F.Karrow, 1982
7. *Foundations of Engineering Geology* by Tony Waltham, 2009

CIV2103 Engineering Surveying I

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
30	60	0	60	100	60	40	4

Course Description

This course develops fundamental skills in the theoretical and practical aspects of surveying for civil engineering field data collection, through the use and care of modern instruments and the associated computations. Topics include the classification of errors incurred in observed field data and necessary correction applications, the use and care of surveying equipment, traversing, differential leveling, tacheometry and mapping, and electronic data transfer. Computer applications are used where appropriate.

Objectives

- To obtain a full understanding of the methods of measurement, errors to be expected, and their control.
- To gain knowledge of referencing systems, horizontal and vertical control.
- To recognize field data relevant to different Civil Engineering project types.
- To be able to use survey instruments with efficiency.
- To learn of the methods of data recording, display, and storage.
- To carry out topographic mapping in an engineering context.

- To able to calculate and carry out computations from field data to obtain the results required. **Course Content**

Introduction [6CH]

1.1 Surveying for Civil Engineering purposes
1.2 Principles of surveying
1.3 Units of measurement
1.4 The 3D reality of the field, and the 2D reality of the map
1.5 Plans, maps, resolution, scale

Theory [24CH]

2.1 Types of error
2.2 Corrections to distance measurements
2.3 Theory of EDM
2.4 Plane Control with checking methods
2.5 Use of Total Station and like instrumental combinations for xyz measurements
2.6 Bearings, Coordinates, Joins
2.7 Map and scaled drawing techniques
2.8 Public survey records
2.9 Setting out techniques

Practice [22CH]

3.1 Elements of surveying instruments, tapes, hand held instruments, level, theodolite, total station
3.2 Distance, height and angle measurements
3.3 Booking methods
3.4 Reduction of readings
3.5 Traversing and other control methods
3.6 Detailing by offset, ties and radial means
3.7 Plotting of scaled drawings so as to bring out the data relative significance
3.8 Field data recognition in regard to feasibility study, preliminary design and final design of project types. [8CH]

Learning Outcomes

On completing the course the student should be able to:

- Recognise civil engineering data in the field
- Collect it using survey instruments and methods
- Carry out the necessary reductions and computations
- Plot it to scale to show its relative significance
- Set out reliably

Mode of teaching/delivery

The course shall be conducted through lectures, tutorials and fieldwork. **Mode**

of Assessment

Assessment will be done through continuous interim assessments (assignments, practicals and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff

Mr. J Clifton
Mr. Y Luswa

Reading/Reference materials

1. *Engineering Surveying* Uren and Price
2. *Site Surveying* John Muskett

CIV2104 Hydraulics

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	0	60	100	60	40	4

Course Description

This course provides the fundamentals needed to understand the application of hydraulics to the environment and to Civil engineering works. The course covers aspects of open and closed flow in machines and other structures of practical relevance to civil engineering.

Objectives

The course is intended to provide the student with:

- an understanding of hydraulics as applied to the environment and to Civil Engineering works.
- an understanding of the factors affecting fluid flows in pipes and open channels.
- tools for measurement of flow in pipes and open channels.
- an understanding of the use of hydraulic machines in Civil Engineering projects.

Course Content

1. Introduction [2CH]
   - 1.1 Historical development
   - 1.2 Application of hydraulics
2. Open channel flow [15CH]
   - 2.1 Pipe flow and open channel flow and fundamental equations of flow
   - 2.2 Velocity distribution in open channels
   - 2.3 Computation of uniform, gradually varied and rapidly varied flows
   - 2.4 Critical, sub-critical and super-critical flow: the Froude Number
   - 2.5 Specific energy
   - 2.6 Structures and critical depth

3. Pipe flow [12CH]
   - 3.1 Pressure loss (friction, laminar and turbulent flow)
   - 3.2 Choice of friction factor (Laminar flow, Blasius equation, Nikuradse, Colebrook-White equation)
   - 3.3 Local head losses (Sudden enlargement, Sudden contraction, Other local losses)
   - 3.4 Pipeline analysis (Pressure, velocity, potential and total head in a pipeline, pipelines in series parallel and branched).

4. Hydraulic structures [8CH]
   - 4.1 Flow regulation structures
   - 4.2 Flow measuring structure
   - 4.3 Discharge structures

5. Hydraulic machines [7CH]
   - 5.1 Pumps
   - 5.2 Turbines

6. Laboratory practice [15CH]
   - 6.1 Design of hydraulic experiments
   - 6.2 Physical models
   - 6.3 Flow measurement in the Laboratory

Learning Outcomes

On completing the course the student should be able to:

- Extend the fundamental equations of Fluid Mechanics to solving Hydraulic Engineering problems of open channel flow, pipe flow, hydraulic structures and machines
- Carry out assessment and design of simple hydraulic systems
- Carry out independent experimental assessment of hydraulic problems

Mode of teaching/delivery

The course shall be conducted through lectures, tutorials and practicals. **Mode of Assessment**

Assessment will be done through continuous interim assessments (assignments, practicals and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff

Mr. Michael Kizza Dr.
Max Kigobe

Reading/Reference Materials

1. *Fluid Mechanics,* Douglas J F, Gasiorek J M, and Swaffield J A, Longman.
2. *Civil Engineering Hydraulics,* Featherstone R E and Nalluri C, Blackwell Science.
3. *Hydraulics in Civil and Environmental Engineering,* Chadwick A, and Morfett J., E & FN Spon - Chapman & Hall.

TEC2101 Sociology for Technology

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
30	0	0	30	100	60	40	2

Course Description

This course deals with how technologies have altered the fabric of society. It crosses disciplines and academic traditions with an open mind, curiosity, and willingness to engage in fun. The course arouses analytical thinking about everyday technologies affecting our life. It therefore examines how engineers, scientists, humanists, social scientists, and artists work together in their respective professions.

Objectives

- To explore the social and cultural impact of engineering innovations.

- Discuss how technology shapes culture and how culture shapes technology.
- Teach how human behavior affects design decisions within engineering.
- Demonstrate that values are embedded within technology.
- Show international focus on specific technologies.

Course Content

1. Social structures [2CH] 1.
   1 Individual - Society - Civilisation
   1.2 Historical perspective - Relation between Individual and Society
   1.3 Theories - Personal needs and Societal needs as related to development of Technology
2. Evolution of Society [8CH]
   2.1 Ancient Society
   2.2 Development of Science and Technology based on Societal needs
   2.3 Examples from Ancient Civilisations
3. Industrial Development [8CH] 3.
   1 Technological changes and their influence on social, economic and political systems
   3. 2 Industrial Revolution
   3.3 Fall out - Recession and Impact on Society
4. Knowledge and Information revolution [6CH]
   4.1 Basic influence on rural and urban development strategies
   4.2 Feature of society to individual relationship
5. Civil Engineering from ancient Civilizations to modern times [6CH]
   5.1 Impact of development in the area of Civil engineering on individual and society
   5.2 Importance of considering societal needs
   5.3 Interaction with society at different stages of planning and implementation
   5.4 Other issues - Gender, HIV/AIDS, Status, Corruption, Child labour and Malaria
   5.5 Professional ethics

Learning Outcomes

On completing the course the student should be able to:

- have developed an understanding of the concepts, theories and methodologies of sociology and where they can be applied in real life situation.
- acquire conceptual tools necessary to plan, monitor and evaluate technological projects with a sociological focus.
- transfer the theoretical knowledge obtained in this course to the civil engineering application. **Mode of**

teaching/delivery

The course shall be conducted through lectures, individual reading and tutorials.

Mode of Assessment

Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff

Mr. Davis Khayangayanga

Reading/Reference Materials

1. David B. Brinkerhoff & Lynn K. White: *Sociology;* 2nd Edition
2. Giddens Anthony: *Capitalism and modern social theory,* Cambridge, 1996
3. Gilbert No: *Researching social life,* Cambridge, 1996
4. Tony Bilton: *Introductory Sociology,* MacMillan 1996
5. Richard T. Schaefer. Sociology.11th Ed. 2007. ISBN- 10: 0073404144
6. Richard Gelles, Ann Levine: *Sociology; An introduction.* 6th Ed.(1999) ISBN-10:0072359676
7. Bruce J. Cohen: *Introduction to Sociology.* (1989) ISBN-10:0070116024

8. Margaret Andersen. *Sociology; Understanding a diverse society.* 4th Ed. (2007). ISBN-10:0495007420

CIV2105 Thermodynamics for Civil Engineers

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
30	0	0	30	100	60	40	2

Course Description
This course introduces students to the basic principles of electricity and thermodynamics relevant to buildings and other Civil Engineering infrastructure.

Objectives
- develop ability to value the contribution of electrical and thermodynamic engineering principles to Civil Engineering profession
- Create an appreciation of flow of current
- develop ability to apply the laws of thermodynamics in solving heat related problems in systems

Course Content
1. Thermodynamic principles [12CH]
   - 1.1 Energy, temperature and heat transfer.
   - 1.2 Heat engines, radiation by black bodies,
   - 1.3 Heat transfer through plane and cylindrical walls
2. Thermodynamic systems [12CH]
   - 2.1 Laws of thermodynamics
   - 2.2 Entropy, enthalpy, and internal energy
   - 2.3 Change of state
   - 2.4 Critical points
3. Applications to Civil Engineering [6CH]

Learning Outcomes
On completing the course the student should be able to:
- Exhibit working knowledge of the basic thermodynamics principles especially those applied in energy technology.
- understand the laws of thermodynamics and appreciate their importance in the study of thermodynamics.

Mode of teaching/delivery

The course shall be conducted through lectures, individual reading and tutorials. **Mode**

of Assessment

Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff
Mr. Mr. Francis Nturanabo

Reading/Reference Materials
1. T.D. Eastop & A. McConkey: *Applied Thermodynamics for Engineering Technologists.* 4th Ed. Longman.
2. G.J.V. Wylen & R.E. Sonntag: *Fundamentals of Classical Thermodynamics.* 2nd Ed. John Wiley & Sons.
3. G.F.C. Rogers & Y.R. Mayhew: *Engineering Thermodynamics.* Work & Heat Transfer. 3rd Ed. Longman.
4. R. Joel: *Basic Engineering Thermodynamics.* 4th Ed. Longman.
5. P.K. Nag: *Engineering Thermodynamics.* 2nd Ed. TATA McGraw-Hill.

EMT2201 Engineering Mathematics IV

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
60	0	0	60	100	60	40	4

Course Description

This course discusses basic theory of probability and statistics and its applications in engineering. Materials given include basic understanding of statistics, mathematics, population and sample, data presentation, methods of calculating mean, standard deviation, mean estimation, outliers tests, simulation and probability theory, models of distributions, statistical tests of distributions, mean and standard deviation, linear regression, coefficient of correlation, and computer application for statistical analysis. This course is intended to develop the ability in design research, in data analysis, and in decision analysis using valid statistical approach.

Course Objectives

- Develop in the engineering student the ability to plan, collect and analyze data leading to valid and reliable findings applicable to natural phenomena.

Course Content

1. Complex Variable Analysis [14CH]
   - 1.1 Functions of a Complex Variable
   - 1.2 Mapping and Conformal Mapping
   - 1.3 Line Integrals
   - 1.4 Cauchy-Goursat Theorem
   - 1.5 Taylor and Laurent Series
   - 1.6 Residue Theory
   - 1.7 Complex Analysis Applied to Potential Theory
2. Discrete Mathematics [6CH]
   - 2.1 Functions, Relations, and Sets
   - 2.2 Basic Logic
   - 2.3 Applications of logic to computer engineering Proof Techniques
   - 2.4 Basics of Counting
   - 2.5 Graphs and Trees

2.6 Recursion

Probability Basic [10CH]

3. β. Introduction: Basic concepts Random experiments & events
3.2 Elementary Theorems
3.3 Probabilistic Modelling
3.4 Independence
3.5 Transformations
3.6 Moments
3.7 Reliability and failure rates
3.8 Transforms of PDF
3.9 Tail inequalities
3.10 A vector Random variable
3.11 Joint CDF & Joint PDF Conditional Probabilities & Densities
3.12 Expectation, Covariance & correlation coefficient
3.13 Joint distributions.

Statistics [8CH]

4. 4.1 Overview of Statistics (Descriptive and Inferential)
4.2 Role of Statistics in Engineering
4.3 Misuse and Abuse of Statistics
4.4 Design of Survey Experiments
4.5 Descriptive Statistics
4.6 Simple Linear Regression and Correlation Analysis
4.7 Tests of Hypothesis
4.8 Use of a Statistical Data Analysis Software Package

Random Processes [16CH]

5. 5.1 Definition of a random process, qualitative discussion of examples of random processes: Poisson process
5.2 Markov process, Brownian motion process
5.3 Digital modulation using phase-shift keying
5.4 Stationary and Ergodic processes
5.5 Power spectral density (PSD): Properties of PSD, PSD applied to base band signals; PSD of white noise process
5.6 Gaussian random processes and their application in communication theory.

6. Estimation Theory [8CH]

6.1 Definitions: Estimators, Point-Estimators, Interval Estimators
6.2 Properties of Point Estimators
6.3 Types of Estimation: Estimation of a Distribution's Unknown Parameter; Estimating the value of an inaccessible variable in terms of an accessible variable
6.4 Maximum Likelihood Estimator
6.5 Bayesian Estimator
6.6 Mean Square Linear Estimator: Univariate Linear Regression; Orthogonality; Basic extension to Multivariate Linear Regression

Learning Outcomes

On completing the course the student should be able to:

- Apply concepts complex variables to practical engineering problems
- Explore several methods of solution to complex practical engineering products and systems
- Apply probability and statistics in inferential cases.

Mode of teaching/delivery

The course shall be conducted through lectures, tutorials and assignments.

Mode of Assessment

Assessment will be done through continuous interim assessments (assignments, practicals and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff
Mr. Dominic Ssemukuutu Mr.
Paul Isaac Musaasizi Mr.
Andrew Katumba Dr Peter
Lating

Reading/Reference Materials

1. Erwin Kreyszig, *Advanced Engineering Mathematics,* 8th ed., John Wiley and Sons.
2. Mary L. Boas, 1983. *Mathematical Methods in the Physical Sciences.* 2nd Edition. John Wiley & Sons, INC. New York
3. L. R. Mustoe, 1988. *Worked Examples in Advanced Engineering Mathematics.* John Wiley & Sons Ltd. Great Britain
4. Murray R. Spiegel, 1981. *Applied Differential Equations.* 3rd Edition. Prentice-Hall, Inc., Englewood Cliffs, N.J. 07632

CIV2201 Soil Mechanics

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	0	60	100	60	40	4

Course Description
In this course, students are trained to acquire knowledge and skills in assessment of soils for suitability as engineering materials. It covers aspects on analysis of soil response to loading, flow of water in soils and its effects, soil supporting capacity and stability, soil explorations in the field and other theories relevant to soil behaviour.

Objectives
- Provide an understanding of the physical properties of soils and its classification
- Enable students to assess soil supporting capability for applied loads
- Enable students to analyse stresses and strains imparted by applied loads
- Introduces students to assessment of soil compressibility in relation to loading
- Train students on how to conduct investigations of soils in the laboratory and in the field

Course Content
1. Introduction to soil mechanics [4CH]
   - 1.1 Nature of soils
   - 1.2 Phase relationships
   - 1.3 Physical properties (Plasticity, Grading size distribution, classification)
2. Soil compaction [4CH]
   - 2.1 Theory of compaction, standard and modified compaction
   - 2.2 Field control of compaction
3. Groundwater flow [6CH] 3.
   - 1 Permeability and capillarity
   - 3.2 Darcy and Bernoulli laws
   - 3.3 Seepage through soils
   - 3.4 Flow nets
   - 3.5 Pore water pressure and Piping
4. Mechanical properties of soils [6CH]
   - 4.1 Principle of effective stress
   - 4.2 Shear strength of soil

4.3 Stresses and displacements
4.4 Direct shear box test, Triaxial test, Shear vane test

5. Bearing capacity of soils [6CH]
   5.1 Introduction
   5.2 Ultimate and allowable bearing capacity
   5.3 Ground improvement

6. Stability analysis of soils [7CH]
   6.1 Introduction
   6.2 Rankine's theory and Coulombs theory
   6.3 Retaining walls
   6.4 Types of slopes, Methods of slope analysis, Fellenius and Bishop Methods, Slope stability charts

7. Compressibility of soils [8CH]
   7. 1 Terzaghi' s theory
   7.2 Consolidation curves
   7.3 Pre-consolidation
   7.4 Oedometer test
   7.5 Settlement computation

8. Soil exploration [4CH]
   8. 1 Methods of investigation
   8.2 Sampling
   8.3 Borehole logs
   8.4 Geophysical methods

9. Practicals [15CH]

Learning Outcomes
On completing the course the student should be able to:

- Perform phase calculations on soil/air/water mixtures
- Classify soil using different International classification systems like the UCS
- Determine effective stress under hydrostatic situations
- Determine groundwater flow through a homogenous , isotropic soil and hence assess seepage
- Predict consolidation-settlement in cohesive soils
- Determine Mohr-Coloumb failure envelope from Direct Shear box and Triaxial tests
- Perform simple check-calculations on bearing capacity and stability problems
- Appreciate the application of different soil exploration and soil improvement techniques

Mode of teaching/delivery

The course shall be conducted through lectures, tutorials and practicals. **Mode of Assessment**
Assessment will be done through continuous interim assessments (assignments, practicals and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff
Dr. Denis Kalumba Mr.
Richard Kizza

Reading/Reference Materials

1. Coduto, D.P: *Geotechnical Engineering: Principles and Practices.* Upper Saddle River, NJ, Prentice Hall , 2001
2. Craig. R.F : *Soil Mechanics, 7th Ed.* Spon press, 2010
3. Muni Budhu: *Soil Mechanics and Foundations 2nd Ed.* John Wiley and Sons , Inc., 2007
4. PeterL.Berry and David Reid: *An introduction to Soil mechanics.* McGraw- Hill, 1987
5. Terzaghi.K, Peck.R.B and Mesri.G: *Soil Mechanics in Engineering Practice, 3rd Ed.* John Willey and Sons Inc.,1996
6. Verruijt, A: *Soil Mechanics.* Delfti University of Technology, 2001

CIV2202 Theory of Structures II

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
60	0	0	60	100	60	40	4

Course Description

This course develops further the structural principles introduced in Theory of Structures I. It deals with analysis of statically indeterminate elastic structures using slope-deflection methods and moment distribution. More emphasis is placed on the matrix methods of analyzing structures.

Objectives

- Enable students select an appropriate analysis method for beams, frames and trusses.
- Enable students to recognise and analyse frames with/without sway using several methods.
- Enhance student's capacity to recognise and use computing and IT skills (in particular spreadsheets) in the analysis of structures.

Course Description

1. Analysis of deformation
   1.1 Virtual work and Energy methods.
2. Slope deflection and Moment distribution [10CH
   2.1 Derivation of basic displacement equations
   2.2 Application to statically indeterminate beams]
   2.3 Application to statically indeterminate frames with and without sway
   2.4 Settlement (joint translations)
   2.5 Matrix formulations [15CH
3. Stiffness and flexibility methods
   3.1 Trusses beams and frames]
   3.2 Force-displacement relationships
   3.3 Flexibility coefficients and matrices
   3.4 Temperature changes
   3.5 Pre-strains and support displacements
   3.6 Stiffness matrices
4. Influence Lines [15CH
   4.1 Statically indeterminate beams and frames with load combinations]
5. Computer applications
   5.1 Analysis using spread sheets [10CH

Learning Outcomes]

On completing the course the student should be able to:

- Recognise statically indeterminate systems from their counterparts and be able to invoke different methods in their solution [10CH
- Use spread-sheets in the analysis of structures and extend this ability to the usage of structural software that they make come across in their practice]

Mode of teaching/delivery
The course shall be conducted through lectures, tutorials and assignments. **Mode of Assessment**
Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff
Mr. Moses Matovu
Dr. Y. Nakuziraba
Prof. J. A. Mwakali

Reading/Reference Materials
1. *Structural Analysis* Volume 2, by S. S. Bhavikatti
2. *Structural Analysis in Theory and Practice* by Alan Williams
3. *Structural Engineering Volume-2 Indeterminate Structures* by Richard N. White, Peter Gergely and Robert G. Sexsmith
4. *Structural Analysis; A Classical and Matrix Approach* by McCormac Nelson
5. *Structural Analysis, a matrix approach* by G. S. Pandit and S. P. Gupta

CIV2203 Civil Engineering Materials

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	0	60	100	60	40	4

Course Description
This course deals with the properties, applications and analysis of important materials of construction/civil engineering. It offers coverage on how materials are made or obtained, their physical properties, their mechanical properties, how they are used in construction, how they are tested in the lab, quality control and their strength characteristics; information that is essential for material selection and elementary design. The class work is divided into modules which are subdivided into units and topics taught sequentially. The course also consists of laboratory modules for selected material tests, which provide a practical dimension to the theory acquired through class work. This course therefore forms an essential component in training towards a civil engineering degree.

Objectives
1. To comprehensively discuss examples of principle materials used in Engineering.
2. To emphasise the properties and behaviour of these materials in the construction industry.
3. To enable the student apply the materials within the general context of analysis and design of structures.
4. To enable the student choose materials that will ensure the final product will adequately fulfill the purpose for which it is intended.
5. To promote the awareness of the importance of material behaviour in both design and construction and how this affects engineering decisions.
6. To create awareness of the diverse usage of materials in Civil Engineering structures (roads, bridges, buildings, water supply systems etc)

Course Content
1. Introduction to Civil Engineering Materials [3 CH]
   1. 1 General
   1.2 Basic Requirements of Engineering Materials
   1.3 Standards and Specifications 1.4 Uganda and Materials.

2. Concrete I: Cement [8CH]
   2.1 Definition of concrete, Codes/Standards
   2.2 Classification of concrete
   2.3 Constituent materials of concrete

2.4 Cement occurrence
2.5 Cement manufacture
2.6 Portland cement and its properties
2.7 High Alumina Cement and its properties
2.8 Special Cements
2.9 Cement Hardening
2.10 Storage of Cement
2.11 Cement in Uganda

3. Concrete I: Aggregates, Water & Admixtures [8CH]
3.1 Definition of aggregates
3.2 Functions of aggregates
3.3 Requirements of aggregates
3.4 Classification of aggregates
3.5 Basic characteristics of aggregates
3.6 Aggregate Tests
3.7 Storage of Aggregates & Maximum size of coarse aggregates
3.8 Definition, functions, requirements of Water
3.9 Effect of contaminants on concrete
3.10 Admixtures (effects and types)

4. Concrete II [8CH]
4.1 Properties of fresh concrete - Workability
4.2 Measurement of Workability
4.3 Slump test
4.4 Compacting factor test
4.5 Factors affecting workability
4.6 Properties of fresh concrete - Stability
4.7 Segregation
4.8 Bleeding
4.9 Properties of hardened concrete
4.10 Design, mix and control of concrete
4.11 Ordinary Mass Concrete
4.12 Types of mixing
4.13 Common mixe s
4.14 Tests on hardened concrete
4.15 Pre-cast concrete - Normally reinforced
4.16 Pre-cast concrete - Pre-stressed reinforced

5. Bricks and Blocks [8CH]
5.1 Definition, functions, requirements of walling units
5.2 Forms of construction
5.3 Definition and history of bricks
5.4 Types of bricks
5.5 Brick terminology, Choice of bricks
5.6 Properties of bricks (strength, weight, absorption etc.)
5.7 Classification of bricks (by variety, quality, type etc.)
5.8 Mortar bonding and patterns (mortar types, mixes, purposes, etc.)
5.9 Definition and history of blocks
5.10 Types of blocks (Clay and Concrete)
5.11 Manufacture of concrete blocks
5.12 Types of concrete blocks

Properties of concrete blocks

Timber [6CH]

6.1 Definition and historical purposes of timber
6.2 The structure of wood
6.3 Classification of timber (hardwood and softwood)
6.4 Manufacture of timber - Logging
6.5 Sawmilling or conversion,
6.7 Seasoning
6.8 Stress grading of timber (Visual and Mechanical)
6.9 Major characteristics of timber
6.10 Properties of timber for design
6.11 Timber Moisture Content, Timber Infestation
6.12 Fire resistance, Defects of timber
6.13 Classification of timber preservatives
6.14 Preparation of timber for preservative treatment
6.15 Methods of preservative application
6.16 Timber products

Metals [6CH]

7.1 Definition, importance and crystal types of metals
7.2 Categories of metals
7.3 Definition, standards and specifications of Steel
7.4 Manufacture of steel (iron making, steel making, and rolling)
7.5 Basic properties of steel (elasticity, ductility, fatigue, creep, etc.)
7.6 Protective coatings for steel
7.7 Strengthening mechanisms
7.8 Use of steel structures
7.9 Definition of aluminium
7.10 Manufacture of aluminium
7.11 Basic properties and characteristics of aluminium
7.12 Handling aluminium in buildings
7.13 Durability and corrosion protection
7.14 Manufacture, properties, uses of Lead
7.15 Manufacture, properties, uses of Tin
7.16 Manufacture, properties, uses of Copper

Polymeric Materials [4CH]

8.1 General classification of polymers, manufacturing process
8.2 Basic structure of the polymer molecule (individual, cross-linked etc.)
8.3 Properties of polymeric materials (density, mechanical, thermal etc.)
8.4 Polymer degradation elements
8.5 Uses of polymers in Civil Engineering
8.6 Polymer abbreviations

Protection and decorative materials [5CH]

9.1 Definition of coatings
9.2 Importance of coatings
9.3 Types of coatings
9.4 Components of paints
9.5 Definition, types, composition, properties paints (oil-based, alkyd, etc)
9.6 Paint standards
9.7 Application of paint
9.8 Definition, types, composition, properties of Varnishes
9.9 Definition, types, composition, properties of Enamels
9.10 Definition, types, composition, properties of Shellac
9.11 Definition, types, composition, properties of Lacquers
5.13

9.12 Definition, types, composition, properties of Stains
9.13 Definition, types, composition, properties of Fillers
9.14 Definition, types, composition, properties of Sealers

10. Bituminous Materials [4CH]
10.1 Definition and types of bituminous materials
10.2 Standards and specifications
10.3 Functional requirements of bitumens
10.4 Types of bitumens (tar & pitch bitumens and asphalt bitumens)
10.5 Properties of bitumen
10.6 Viscosity tests of bitumen (Penetration, Softening point and Ductility)
10.7 Uses of bituminous materials

Learning Outcomes
On completing the course the student should be able to:
- Exhibit understanding of the different principle materials used in Engineering, their application in Civil Engineering structures (roads, bridges, buildings, water supply systems etc), their properties and behaviour in construction and their application within the general context of analysis and design of structures.
- Be able to choose materials that will ensure the final product will adequately fulfill the purpose for which it is intended by promoting the awareness of the importance of material behaviour in both design and construction and how this affects engineering decisions

Mode of teaching/delivery
The class work is divided into modules which are subdivided into units and topics taught sequentially. The course also consists of laboratory modules for selected material tests, which provide a practical dimension to the theory acquired through class work.

Mode of Assessment
Assessment will be done through continuous interim assessments (assignments, practicals and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff
Mr. Apollo Buregeya
Mr. David Kaddu Mr.
Ivan Rwendeire

Reading/Reference Materials
- *Civil Engineering Materials* by N. Jackson and R. K. Dhir
- *Properties of Concrete* by A. M. Neville
- *Civil Engineering Materials* (2nd Edition) by Shan Somayaji
- *Fundamentals of Building Construction; Materials and Methods* (4th Edition) by Edward Allen and Joseph Iano

CIV2204 Engineering Surveying II

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
30	60	0	60	100	60	40	4

Course Description
Whereas the previous surveying course (CIV2103) was oriented to basics and site surveying, this course is oriented to route surveying. It also includes a number of advanced concepts in surveying.

Objectives
- To provide the knowledge and skill in curve ranging
- To widen capabilities in both measurement and engineering applications
- To provide skill in field data recognition

e content

Theory [30CH]

1.1 Definition and determination of accuracy
1.2 Curvature and refraction
1.3 Engineering application of aerial photos and aerial mapping
1.4 Measurement of deformations
1.5 Sight distances
1.6 Super-elevation application
1.7 Widening application
1.8 Earthwork quantities and mass haul diagrams

Practice [22CH]

1.1 Horizontal circular curves
1.2 Horizontal curves with transitions
1.3 Compound curves
1.4 Problems with curve setting
1.5 Vertical curves
1.6 Curve problems
1.7 Deformation
1.8 Field data supply and recognition in regard to construction, supervision of construction, monitoring for maintenance and rehabilitation of a project types. [8CH]

Learning outcomes

On completion the student should be able to:

- Design and set out horizontal curves
- Design vertical curves, taking sight distances into account
- Understand how to measure deformations
- Apply super-elevation and widening
- Calculate earthwork quantities and manipulate mass haul diagrams
- Recognize field data at the construction and maintenance stages of a project.

Mode of teaching/delivery

The course shall be conducted through lectures, tutorials and fieldwork.

Mode of Assessment

Assessment will be done through continuous interim assessments (assignments, practicals and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff

Mr J Clifton Mr
Y Luswa

Reading/reference materials

1. *Engineering Surveying* Uren and Price
2. *Site Surveying* John Muskett

CIV2205 Economics for Civil Engineering

Hours per Semester	Weighted Weighted	Weighted	Credit

				Total Mark	Exam Mark	Continuous Assessment Mark	Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	0	45	100	60	40	3

Course Description

The Course of Economics for Civil Engineering introduces students to economics principles and methods which will enable them to understand the socio-economic environment. This course emphasizes the application of basic Microeconomic concepts to current economic events. Students will study key principles such as scarcity, opportunity cost, supply and demand, elasticity, market efficiency, consumer/producer behaviour, and market structures. In addition, the course will examine key Macroeconomic topics, such as key indicators of a healthy economy and stabilization policy. A combination of theory and practice will be stressed. To the greatest extent possible, the course will be tailored towards exuding engineering economics concepts.

Objectives

- To understand the role and importance of economics as a social science and an academic discipline.
- Identify alternative uses for limited resources and obtain appropriate data.
- To show students how to analyze data that can easily be obtained by civil engineering and demonstrate how it can be used to make judgment about preferred alternative.
- To introduce and expand upon key economic concepts and to place them in a real world context facilitating practical insights.
- To establish a framework of basic economic theory which can be extended and applied at later stages of the degree programme.
- To develop an appreciation of the importance of economic forces in shaping the contemporary world.
- To utilize a range of teaching practices to develop presentational and written skills, cognitive skills and the ability to work as a group.

Course Content

Introduction of Economics

1 History of economic thought and definition of economics [3 CH]

2 Macro and Micro economic

3 Economics laws and applications

4 Assumptions and methods of economics

1 5 Economic planning and development

2. Price Mechanism and Systems [7 CH]

2.1 Theory of consumer behavior and demand

2.2 Basic Supply analysis

2.3 Market Analysis

3. Accounting [5 CH]

3.1 Its components and determinants

3.2 Methods of estimating costs

3.3 Single price methods - annual rate of return

3.4 Unit methods

3.5 Superficial area methods

3.6 Elemental methods

3.7 Approximate methods

5. Production, Costs, and Completive Markets [10 CH]

5.1 Production Theory

5.2 Cost and Breakeven Analysis

5.3 Price and output under Perfect Competition

6. Theories of Firms [5 CH] 6.1

Objectives of Business Firms

6.2 Introduction to Alternative theories of the firm

7. Structural Analysis of Alternatives [5 CH]
   1. Introduction to cost planning and cost control techniques
   2. Development of Alternatives
   3. Classification of Alternatives
   4. IIR .of mutually exclusive alternatives
   5. Analysis of independent alternatives
   6. Return-on investment calculations
   7. Benefit-Cost analysis

8. Contemporary Issues in Engineering Economics and Structure of Ugandan Economy [10 CH]

Learning Outcomes

On completing the course the student should be able to:

- The ability to analyze a range of straightforward microeconomic problems and to understand how the economic approach goes about addressing more complex issues.
- Knowledge of a basic framework of the macro economy which will enable an appreciation of many topical macroeconomic issues and to appreciate the distinction between the long and short run.
- The ability to conceptualize economic problems, and to critically apply economic analysis.
- Enhanced written and verbal presentational skills.

Mode of teaching/delivery

Both learner centered and teacher centered learning methods will be applied. As such, standard delivery and teaching methods that included straight lectures, demonstrations, self study on specific topics etc will be used.

Mode of Assessment

Assessment will be done through continuous interim assessments (assignments, laboratory sessions and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff Mr.

Francis Ejones

Reading/Reference Materials

1. Riggs, J. L., Bedworth, D. D., and Randhawa, S. U. (1996). *Engineering Economics*. Tata McGraw - Hill, 4Th Edition.
2. Dominick, S. (2003). *MicroEconomics - Theory and Applications.* Oxford University Press. 4th Edition.
3. Ahlersten Krister. (2008). *Essentials of Microeconomics.* Ventus Publishing. Free download from BookBooN.com
4. Sachs, J. D. (1993). *Macroeconomics in The Global Economy*. Prentice Hall, Upper Saddle River, New Jersey.
5. Amacher, R. C. and Ulbrich, H. H. (1995). *Economic Principles and Policies*. Sixth Edition. South Western College Publishing.
6. Snowdon, B., et al., *A Modern Guide to Macroeconomics. An Introduction to Competing Schools of Thought,* Edward Elgar, Cheltenham 1994

CIV2301 Industrial Training I

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
0	300	0	30	100	60	40	2

Course Description

This course introduces students to various technological skills in industries and provides on-the-job training and exposure.

Objectives

- Expose students to practical aspects of engineering and construction activities
- Provide an opportunity to students to relate the knowledge obtained during lectures to actual field operations
- Create an understanding of the roles played by different project personnel during project execution
- Enable students learn how to work in a team (casual workers, technicians, engineers, etc).
- Teach students different engineering ethics necessary for career building
- Enhance problem solving capacity of the students using available appropriate technology and surrounding conditions
- Enable students to have a hands-on with tools and equipment not readily available in the University laboratories and are of great importance in the engineering field.
- Enable students appreciate various challenges faced in the field and critical areas necessitating further research studies.

Course Content
The student is required to participate in the day-to-day activities at the organization's premises as a regular worker. This activity lasts at least eight (8) weeks starting immediately after the end of examination of Semester II of the second year of study.

Learning Outcomes
At the end of this course, a student should be able to:
- identify and describe the major activities of the sections where he/she was attached
- describe the technical aspects of the training that was undertaken
- identify technical areas of improvement of the sections where he/she was attached
- write a clear and understandable technical report

Mode of teaching/delivery
The student will be attached to an organization. During this period, training is provided by the organization's personnel. The activity is closely supervised by a senior member of the organization as the industry supervisor. A member of the academic staff of the department is assigned to visit the organization at least two times and monitor the progress of the attachment. The student keeps a daily log of the activities which is reviewed weekly by the industry supervisor and academic supervisor during the visits.

Mode of Assessment
This shall be by the performance of the student in the organization (industry supervisor assessment) and a report written by the student (Academic Supervisor assessment) after the training. The combined assessment will be out of 100%.

Proposed Staff
All Academic staff

CIV3101 Organizational theory for Engineering

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	0	45	100	60	40	3

Course Description
Organisation theory is a fundamental subject within modern managerial education. The purpose of the course is to present the fundamental concepts of the organisation theory. Introduction to various approaches to an organisation must teach the students to complete macro- and micro-analysis of organisations in the context of

their development and interaction with the environment. The main purpose of the course is to create modern outlook that could be a basis for practical work in any management position.

Objectives

- Describes the essential features of organizations
- Enables students to understand the factors shaping these features
- Enables students to appreciate the evolution of different organizational designs/types
- Creates an understanding of how managers may build and change organizations
- Creates an understand of how different organizational forms impact on the individual within organizations

Course Content

1. Evolution of management theory [10CH]
   - 1.1 Classical/Scientific Approach
   - 1.2 Human Relations Approach
   - 1.3 Systems Approach
   - 1.4 Contingency Approach
2. Leadership [7CH]
   - 2.1 Leadership traits - Personality/physical appearance
   - 2.2 Leadership styles
   - 2.3 Situational leadership
   - 2.4 Team development
3. Motivation [8CH]
   - 3.1 Basic aspects of human motivation
   - 3.2 Content theories
   - 3.3 Process theories
4. Group theory [10CH]
   - 4.1 Purposes of groups
   - 4.2 Group effectiveness
   - 4.3 Determinants
   - 4.4 Environment
5. Rules and power in organisations [10CH]
   - 5.1 Nature of power, Authority and influence
   - 5.2 Bargaining power
   - 5.3 Sources of power
   - 5.4 Power and participation/decentralization

Learning Outcomes

On completing the course the student should be able to:

- Understand how civil engineering project organizations are formed, structure, and efficiency issues related to project execution.
- Understand the role of motivation in civil engineering projects especially effect on project delivery and quality control.
- Introduce students to leadership skills required in daily execution of civil engineering projects.

Mode of teaching/delivery

The course shall be conducted through lectures and tutorials. **Mode of Assessment**

Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff

Dr. Denis Kalumba Mr. Godfrey Mwesige

Reading/Reference Materials

1. *Organizational Behaviour: Individuals, Groups and Organisation,* 4th Edition by Ian Brooks.
2. *Essentials of Organizational Behaviour,* 2nd Edition by Laurie J. Mullius.
3. *Organisational Theory* by David Crowther, Miriam Green
4. *Organisational Theory* by Gareth R. Jones, 2001.

CIV3102 Design of Structures I (Concrete)

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
60	0	0	60	100	60	40	4

Course Description

The course deals with design principles of concrete structural components that are used in Civil Engineering infrastructure under different possible modes of loading.

Objectives

- create appreciatation of the importance of concrete as a structural material.
- enhance appreciation of the shortcomings of concrete and how to overcome them.
- Design various structural concrete elements loaded in tension, compression, bending and torsion.
- Design connections of concrete with other materials like steel, masonry and timber.

Course Content

1. Materials and design theories [8CH]
   - 1.1 Limit state design,
   - 1.2 Ultimate and serviceability limit state designs,
   - 1.3 Design standards,
   - 1.4 Properties of structural concrete - Advantages and disadvantages,
   - 1.5 Types of loading - Dead, live and wind loads and Factors of safety,
   - 1.6 Concepts of axial, biaxial, bending, eccentric and torsion loading.
2. Analysis and design of reinforced concrete elements [24CH]
   - 2.1 Axially loaded reinforced concrete short columns,
   - 2.2 Axially loaded reinforced concrete slender columns,
   - 2.3 Eccentrically loaded columns,
   - 2.4 Shear, bending and torsion,
   - 2.5 Reinforced concrete beams - ultimate and serviceability limit state, simply, supported and continuous, singly and doubly reinforced beams,
   - 2.6 Reinforced concrete Slabs - Classification, one way and two way, shear, deformation and cracking control, Anchorage,
   - 2.7 Reinforced concrete Staircase - Transverse and longitudinal spanning, shear, deformation and cracking control, Anchorage,
   - 2.8 Shear bond and torsion (links, bent up bars, hooks, bends, laps, joints, etc).
3. Pre-stressed concrete [12CH]
   - 3.1 Pre-stressed concrete - simple beams,
   - 3.2 Pre-stressed concrete - continuous beams,
   - 3.3 Pre tensioned and Post tensioned concrete units
   - 3.4 Design of prestressed beams.
4. Detailing [16CH]
   - 4.1 Bar bending schedules,
   - 4.2 Practical design and detailing,
   - 4.3 Use of AUTOCAD.

Learning Outcomes
On completing the course the student should be able to:

- To design the reinforced concrete structure/buildings
- To analyse and design the structural elements
- To competently be able to supervise the R.C. structure/buildings
- Make appraisals to old building and make appropriate recommendations

Mode of teaching/Delivery

The course shall be conducted through lectures and tutorials. **Mode**

of Assessment

Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff Eng.
Paul Mujugumbya Dr.
Yasin Nakuziraba

Reading/Reference Materials

1. *Reinforced and Pre-stressed Concrete* (to BS 8110) by Kong and Evans (3rd Edition) Essential text book.
2. *Reinforced Concrete Design* (to BS 8110 and Euro Code) by Bill Mosley, John Bungey and Ray Hulse (Sixth Edition) Essential text book.
3. *Reinforced Concrete Designers Handbook* (Tenth edition and any edition) for reference.

CIV3103 Highway Engineering

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	75	60	100	60	40	4

Course description
This course introduces students to aspects conceptualization, planning, designing, supervision and maintenance of roads. The students requires to have skills and knowledge about road construction materials, mixture design and structural design aspects for flexible and rigid pavements, drainage and maintenance using machine and labour based methods.

Objectives

- Conduct and analyze data from test methods used to assess materials used in road construction.
- Independently use various standard approaches in planning and designing of paved and unpaved roads.
- Understand the causes of deterioration and hence poor performance of roads.
- Understand the methods used to assess road condition.
- Undertake design and evaluate maintenance of surface and subsurface drainage.
- Develop road maintenance and rehabilitation plans.
- Oversee implementation of maintenance and rehabilitation plans of roads.

Course Content
1. Introduction to Highway Engineering [6 CH]
   - 1.1 History of road development,
   - 1.2 Road development plans,
   - 1.3 Types and classes of roads.

2 [6 CH]

Road location, earthworks and compaction of soils

2.1 Route selection and location surveys,
2.2 Centreline location and carriageway staking,
2.3 Soil surveys and site investigations,
2.4 Earthwork equipment, cuts/fills and haulage.

Highway pavement materials [9 CH]

3.1 Soils engineering for roads (AASHTO classification, compaction and tests),
3.2 Soil stabilization (Lime, cement and bitumen stabilisers),
3.3 Binders - Bitumen, cutbacks, emulsions (production and properties),
3.4 Recycled materials,
3.5 Additives - Lime, cement, polymers, amines, etc.,
3.6 Mix design concepts.

Design of Highway Pavements - Flexible and Rigid [9 CH]

Types of pavements - Flexible, rigid, composite, earth roads and low cost, Alignment - Cross-section elements, design speeds, sight distances, horizontal and vertical alignment, gradients, climbing lanes, Intersections, widening of circular curves, Structural design of flexible and rigid highway pavements, Environmental Impact Assessment of Highway Projects.

[6 CH]

4.1
4.2 [9 CH]
4.3

Pavement drainage

5.1 Basic principles and concepts,
5.2 Estimation of runoff from catchments - hydrological principles,
5.3 Design of hydraulic drainage facilities,
5.4 Design of subsurface drainage systems. [15 CH]

Construction and maintenance of paved and gravel roads

6.1 Pavement condition survey methods,
6.2 Distresses on road surfaces,
6.3 Equipment in road construction and maintenance,
6.4 Evaluation of structural condition of pavements,
6.5 Machine and labour based methods for road maintenance.

Practicals and tutorials

Learning Outcomes

On completing this course the student should be able to design and oversee construction of roads using computer methods.

Mode of Teaching/delivery

The course will be conducted through a mixture of lectures, practicals, tutorials, and site visits. Basic lecture materials and data will be provided by the Lecturer and this will be supplemented by individual reading effort by students.

Mode of Assessment

Assessment will be done through continuous interim assessments (assignments, practicals and tests) and a final examination. Interim assessment will carry a total of 40% (assignments-10%, practicals-20% and tests-10%) and the final examination will carry 60% of the final grade mark.

Proposed Staff
Dr. Umaru Bagampadde
Ms. May Namutebi Mr.
David Kaddu

Reading /Reference Materials

1. Ministry of Works, Transport and Communications, Republic of Uganda, *Road Design Manual,* 2005.
2. MoWHC Uganda, *Road Design Manual, Road Safety Revision,* July 2004.
3. *A policy on Geometric Design of Highway and Street,* American Association of State Highway and Transportation Officials (AASHTO) 1994.
4. *Road design manual, part 1, geometric design of rural roads,* Republic of Kenya Ministry of works January 1979.
5. *Geometric design manual,* Federal Democratic Republic of Ethiopia, Ethiopian Roads Authority, 2001.
6. Yoder E J, Witczak M W, *Principles of Pavement Design,* John Wiley and Sons Inc. 1975.

CIV3104 Hydrology I

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
60	0	0	60	100	60	40	4

Course Description

This course is intended to make students appreciate the availability of water, its current use and the challenges; climate change; introductory water resources planning; meteorology; the hydrological cycle and processes of precipitation, surface runoff, infiltration, interception, depression storage, evapo-transpiration; their estimation and analysis. It will include the carbon cycle; drought, its effects and mitigation, reservoir planning and sedimentation.

Objectives

- To learn about the availability, the use and challenges in the management of water resources worldwide, including climate change
- To learn about the importance of meteorology and the planning of a water resource project
- To learn about the processes of precipitation, infiltration and soil moisture, surface runoff and evapotranspiration in the hydrological cycle, and their estimation.
- To learn about the carbon cycle, drought and its mitigation

Course Content

1. Water Availability [9CH]
   - 1.1 The uses, control, challenges and case studies
   - 1.2 Climate change
   - 1.3 Meteorology and its significance
   - 1.4 Introductory water resources planning

2. Hydrological Processes [27CH]
   - 2.1 The atmosphere, solar radiation
   - 2.2 Precipitation, its formation, its measurement and analysis
   - 2.3 The Climate of Uganda
   - 2.4 Infiltration and Soil Moisture, its measurement
   - 2.5 Evaporation and its estimation
   - 2.6 Surface runoff, streamflow and its measurement

3. Drought [8CH

   ] 3. 1 The Carbon Cycle

   3.2 Causes, Types and Impacts 3. 3 Analysis and Mitigation

4. Reservoir Planning [8CH]
   - 4.1 Hydrological, geotechnical and topographical studies
   - 4.2 Environmental considerations
   - 4.3 Mass curve analytical and graphical methods
   - 4.4 Sequent Peak Algorithm
   - 4.5 Flow and Power Duration Curves
   - 4.6 Advanced Techniques

5. Sedimentation [8CH]

5.1 The causes, effects, estimation
5.2 River classification
5.3 Land degradation,
5.4 Sediment formulae
5.5 Mitigation measures

Learning Outcomes

- To appreciate the availability, the use and challenges in the management of water resources worldwide, including climate change
- To understand the importance of meteorology and the planning of a water resource project
- To understand the processes of precipitation, infiltration and soil moisture, surface runoff and evapotranspiration in the hydrological cycle, and their estimation.
- To understand the carbon cycle, drought and its mitigation
- To estimate the storage capacity of reservoir and the effect of sedimentation

Method of teaching/delivery

The mode of delivery is through lectures and tutorials.

Mode of Assessment

Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% (assignments-10%, practicals-20% and tests-10%) and the final examination will carry 60% of the final grade mark.

Proposed Staff

Eng. Albert Rugumayo
Mr. Martin
Tumutungire

Reading/Reference Materials

1. Shaw, E.M., *Hydrology in Practice,* Chapman and Hall, 1994, London, UK
2. Mansell, M.G. *Rural and Urban Hydrology,* Thomas Telford, 2003, London, UK
3. Arora, K.R. *Irrigation, Water Power and Water Resources Engineering,* Standard Publishers, 2007, New Dehli, India.
4. Subramanya, K., *Engineering Hydrology,* 2nd Edition 2001,Tata McGraw Hill, New Dehli, India.
5. Wilson, E.M., *Engineering Hydrology,* 4th Edition, Macmillan,1996, London, UK.
6. Duggal, K.N., Soni, J.P., *Elements of Water Resources Engineering,* New Age Publishers, 2007, Dehli, India.
7. Hornberger et al. *Elements of Physical Hydrology,* The John Hopkins University Press, 1998.
8. Rugumayo, A.I., *An Introduction to Hydrology and Water Resources Engineering,* Lecture Notes, Kampala, 2010

CIV3105 Construction Technology

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	0	45	100	60	40	3

Course Description

This course deals with the process of constructing a residence or commercial building involving mainly planning, environment and other aspects. It discusses the fundamentals of structures and building design, typical construction materials, procedures and methods, construction management and various aspects considered during the construction process.

Objectives

- To comprehensively discuss the process of domestic construction from foundation to finish.
- To emphasise the various forms, concepts and processes involved in building construction.

- To develop the students' knowledge and skills in appraising and designing site layouts, and developing adequate organisational schedules of works.
- To enable the student grasp the importance and means of quality control of materials and workmanship for any building project.
- To promote the awareness of various types of sub-structural and super-structural building systems, and their selection criteria.

Course Content

1. Forms, Concepts and Processes of construction [9CH]
   - 1.1 Forms of construction - General
   - 1.2 Traditional and Modified traditional building
   - 1. 3 Timber-framed building
   - 1.4 House foundations
   - 1.5 Elements of a house structure and process of construction - Integration
   - 1.6 Ground works; definition, composition and difficulties
   - 1.7 The substructure
   - 1.8 The drainage system
   - 1.9 The superstructure
   - 1.10 Site equipment
2. Domestic Construction [3CH]
   - 2.1 Function of internal walls
   - 2.2 Types of internal partition (brick, block, slab, stud etc.)
   - 2.3 Non-load bearing panel partitions 2.4 Timber stud partitioning
3. Site Design [6CH]
   - 3.1 Site layout - General
   - 3.2 Site investigation report
   - 3.3 Factors considered in planning a site layout (Activities, efficiency, etc.)
   - 3.4 Organisation of Works
   - 3.5 Case study of site layout and Organisation of works
4. Quality Control [6CH]

   4.1 Need for inspection
   - Waste minimisation,
   - Testing and storing of concrete materials (cement, aggregates, water),
   - Transportation, placing, curing and testing of concrete,
   - Reinforcement control,
   - Inspection and storage of bricks, blocks, timber, joinery, boards, plastering materials, metal work, sanitary ware, plumbing materials and iron mongery,
   - Quality control of workmanship.
5. Commercial and Industrial Construction [6CH]
   - 5.1 Factors affecting the choice of superstructure
   - 5.2 Structural forms (load-bearing walls, framed systems)
   - 5.3 Portal frames and framed multi-storey structures
   - 5.4 Provision of natural light
6. Civil Engineering Works - I [6CH]

   6.1 Substructure I - Soil investigation, soil characteristics, On-site tests - Visual examination, Other on-site tests, Laboratory tests, tests of engineering properties, Underpinning General factors for choosing a foundation, Types of continuous and isolated support, foundations in restricted condition,

   6.2 Substructure II - Principles of pile foundations, Types of piles (displacement, concrete, steel, replacement piles etc.). Under-reamed bored piles, Testing piles, Functions of high retaining walls, Forces in retained material. Failure of retaining walls, Types of retaining walls, Reinforced concrete walls, other methods of retaining soils.
7. Civil Engineering Works - II [2CH]
   - 7.1 Super-structure I - Scaffolding - Normal scaffolding, Complex scaffolding - Need for complex scaffolding and types of complex scaffolding

7.2 Super-structure II - Brickwork, blockwork and stonework, roofing

8. Carpentry & Joinery [7CH]
   - 8.1 Carpentry and Joinery Tools and Equipment,
   - 8.2 Care, Safety and Maintenance of Tools,
   - 8.3 Wood Working Machines, Operation and Safety,
   - 8.4 Timbers for Carpentry and Joinery Work. Preparation of Timber Joints. Carcases Work to Floors and Roofs. Joints to Hollow Floors. Preparation of Rafters, Cutting Bevels and Birds Mouth, Fixing to Plates and Ridge. Fixing Windows and Door Frames
   - 8.5 Preparation of Formwork for Concrete. Mouldings, Chamfers and Rebates,
   - 8.6 Fixing of Archives, Skirting, Picture Rails, Dado Rails, Cover Mouldings,
   - 8.7 Hanging Doors and Windows,
   - 8.8 Preparation of Woodwork for Polishing and Painting,
   - 8.9 Construction of Stairs,
   - 8.10 Fabrication of Timber Trusses and Beams,
   - 8.11 Bolted Joints and Timber Connected,
   - 8.12 Temporary Supports. Setting up a Production Unit for Joinery Work,
   - 8.13 Layout of a Simple Carpentry Workshop.

Learning Outcomes

On completing the course the student should be able to:

- understand the process of domestic construction from foundation to finish.
- appreciate the various forms, concepts and processes involved in building construction.
- appraise and design site layouts, and develop adequate organisational schedules of works.
- grasp the importance and means of quality control of materials and workmanship for any building project.
- Understand the various types of sub-structural and super-structural building systems, and their selection criteria.

Mode of teaching/Delivery

The course shall be conducted through lectures and tutorials. **Mode of Assessment**

Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff Dr.
Yasin Naku Ziraba
Mr. Feriha Mugisha

Reading/Reference Materials

1. *Construction Technology* (Level 2) by C.M.H Barrit
2. *Advanced Building Construction, Volumes 1 & 2* by C.M.H Barrit
3. *Construction Technology, Volume 4* by R. Chudley
4. *Advanced Construction Technology* by R. Chudley

5. *Construction Technology* by K. Roberts
6. *Construction Methods and Planning* by J.R. Illingworth

CIV3106

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
30	30	0	45	100	60	40	3

Environmental Chemistry

7. *Modern Construction Management* by Frank Harris and Ronald McCaffer

Course Description

Environmental chemistry involves studying the fate and effects of chemicals species in the environment. It defines the intended use of analytical data, preparing sampling plans for intended use, selecting appropriate analytical methods, advising on collection of field samples, interpreting laboratory analytical results, and assuring validity and legal defensibility of analytical results. It also involves evaluation of organic and inorganic chemical reactions as well as physical processes such as volatilization, cosolvency effects, and soil adsorption. The broad area of environmental chemistry encompasses a number of related fields, including: analytical chemistry, chemical engineering, organic chemistry, data quality assurance, radiation chemistry, and inorganic chemistry and their applications in water and wastewater treatment.

Objectives

- Develop sensitivity for the environmental impact of large quantities of industrially produced chemicals
- Develop an understanding of the chemical/physical processes in the natural environment
- Use simple mathematical models for quantitative prediction of chemical behaviour in the natural environment
- Demonstrate that chemistry is the backbone of water and wastewater treatment and environmental quality management [4CH]

Course Content

1. Fundamentals of Chemistry
   - 1.1 Water
   - 1.2 Wastewater and Water Pollution Control 1. 3 Industrial and Hazardous Wastes

   [8CH]
2. Concepts from General Chemistry
   - 2.1 Structure and Properties of Matter
   - 2.2 Traditional Classification of Matter
   - 2.3 Dalton's Atomic Theory and Consequences
   - 2.4 Symbols, Formulas and Nomenclature
   - 2.5 Chemical Reactions in General and Chemical Calculations
   - 2.6 The Gas Laws
   - 2.7 Solutions & Equilibrium

   [8CH]
3. Physical Chemistry
   - 3.1 Thermodynamics, Osmosis, Reverse Osmosis, Dialysis
   - 3.2 Principles of Solvent Extraction
   - 3.3 Chemical Reaction Rates and Equilibrium
   - 3.4 Catalysis and Adsorption

   [6CH]
4. Colloidal chemistry
   - 4. 1 Description of Colloidal Systems
   - 4.2 Methods of Formation and Appearance of Colloids

   [4CH]

4.3 General Properties
4.4 Colloidal Dispersions in Liquid
Water and waste water analysis

5.1 Parameters in Water and Wastewater Analysis
5.2 Chemical and Physical Analysis

6. Practical session [15CH]

Learning Outcomes

On completing the course the student should be able to:

- Have gained an understanding of the fundamental chemical processes that are central to a range of important environmental problems and to utilize this knowledge in making critical evaluations of these problems
- Be able to apply the appropriate practical chemical techniques to measure key environmental quality indicators or parameters.

Mode of teaching/delivery

The mode of delivery is through lectures, tutorials and practicals. **Mode of Assessment**

Assessment will be done through interim course assessments (assignments, tests and practicals) and a project report. The interim course assessments will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff

Mr. Herbert Kalibbala
Dr. Robinah Kulabako
Mr. James Semuwemba

Reading/Reference Materials

1. G. W. VanLoon and S. J. Duffy, 2005, *Environmental Chemistry: A Global Perspective.* 2nd edition, Oxford University Press, Oxford
2. Colin Baird and Michael Cann, 2008, *Environmental Chemistry.* 4th edition, W. H. Freeman and Co, New York, 2008
3. *Fundamentals of Environmental Chemistry.* 2nd or 3rd edition, by Stanley E. Manahan. CRC Press 2001
4. Lenore, S.C., Greenberg, A.E., Eaton, A.D. (Eds) (1998). *Standard methods for the examination of water and wastewater,* 20th Edition. American Public Health Association, American Water Works Association and Water Environment Federation (APHA/AWWA/WEF) Publication. ISBN: 0-87553-235-7

CIV3107 Principles of Quantity Surveying

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	0	45	100	60	40	3

Course Description

This course deals with determination of quantities of Civil Engineering works and subsequently valuing them to determine project costs.

Objectives

- create an understanding of how to take measurements on Civil works
- create an understanding of how to obtain prices at the current market
- create an understanding of how to prepare bills of quantities

Course Content

1. Introduction [3CH]
   1. 1 History of Quantity Surveying
   1.2 Functions of a Quantity Surveyor in the Construction Industry
2. Communication [6CH]
   2.1 Communicating Information within the Construction Industry
   2.2 Forms of Communication Medium in Tendering and Construction Processes
3. Measurement [30CH]

3.1 Evolution of Codes of Measurement used in the Construction Industry
3.2 Analysis of Work Content into Units and Groups Suitable for Tendering
3.3 Construction Management and Post Contract Administration
3.4 Interpretation of the Measurement Codes to Identify Measurable Items and Need for Accurate Descriptions
3.5 Taking off - Setting Out and Order of Dimensions, Side Notes, Waste Calculations and Use of Schedules
3.6 Measurement of Building Works Based on the Current Standard Method of Measurement of Building Works
3.7 Site Preparation and Substructure Works,
3.8 Walls in Brickwork, Block work and Stonework, Fair faced Work, Concrete and Steel Structural Frames
3.9 Pitched and Flat Roofs, Roof Structures in Timber and Steelwork, Roof Coverings - Tiles, Steel Sheets
3.10 Coatings, Windows and Doors in Steel and Timber, Ironmongery, Glazing and Adjustments for Openings. Common Simple Finishing to Walls, Floors and Ceilings
3.11 Painting and Decorating
3.12 Measurement of Mechanical and Electrical Services

4. Bill Preparation Process [6CH] 4.
1 Specification Writing
4.2 Schedules, Preambles and Preliminaries, Day works, Prime Costs, Provisional Sums and Contingencies
4.3 Compiling Tender Documents

Learning Outcomes
On completing the course the student should be able to apprehend fully the concepts of taking-off quantities and billing of building and civil works.

Mode of teaching/delivery

The mode of delivery is through lectures and tutorials. **Mode of Assessment**
Assessment will be done through interim course assessments (assignments and tests) and a project report. The interim course assessments will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff
Mr. Muyonjo Geoffrey Mukiibi

Reading/Reference Materials
1. The Architectural Association of Kenya (1996). *Standard Method of Measurement of Building Works,* 2nd Edition, D.L. Patel Press (Kenya) Limited
2. Behangana N. R. *Quantity Surveying in Practice* , 2000
3. *Building Quantities Explained,* 5th Edition, by Ivor H. Seeley and Roger Winfield

CIV3201 Foundation Engineering

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	0	60	100	60	40	4

Course Description
In this course, students acquire knowledge and skills in planning and designing of economical and stable foundation of soils. It involves ground investigations (lab and field tests), providing solutions to difficult soils, prediction of structural behaviour loading the soil and construction aspects.

Objectives
- Understand the physical, mechanical and mathematical principles of soils

- Introduce the learners to different foundation systems both the shallow and deep types.
- Measure soil properties in accordance with accepted standards
- Apply the basic principles of Soil Mechanics, physics and mathematics in solving real Engineering problems.
- Select and design appropriate foundation systems based on economy and safety
- To introduce participants to the different soil retaining systems, their selection criteria and design.
- To introduce the participants to different soil improvement techniques used on the different problematic soils.

Course Content

1. Introduction [6CH]
   - 1.1 Review of Bearing capacity
   - 1.2 Terms and definitions
   - 1.3 Prantl, Terzaghi, Meyerhof and Brinch-Hansen analysis
   - 1.4 Consolidation/settlement
2. Types of Foundations [8CH]
   - 2.1 Classification of foundations - Strip, Raft, Pad and Pile foundations
3. Design of Shallow Foundations [10CH]
   - 3.1 Essentials on design
   - 3.2 Axially and Eccentrically loaded foundations
4. Design of Pile foundations [9CH]
   - 4.1 Pile driving
   - 4.2 Bearing capacity of piles (skin friction and end-bearing)
   - 4.3 Pile groups
5. Earth retaining structures [12CH]
   - 5.1 Types of structures
   - 5.2 Lateral active and passive earth pressures 5. 3 Surcharge on backfill
   - 5.4 Design of earth retaining structures, (Gravity walls, cantilever walls, walls with counter forts, etc)
   - 5.5 Backfill drainages
6. Practicals [15CH]

Learning Outcomes

On completing the course the student should be able to:

- Perform consolidation analysis both time and stress dependent
- Design a budget and proposal for a Geotechnical investigation
- Design appropriate foundation systems based on ground-investigation data
- Select appropriate ground improvement methods for problematic soils encountered in Engineering practice
- Perform stability analysis for slopes and retaining walls using simple classical hand calculations and software.
- Select boring depth , location and associated laboratory tests for simple construction projects **Mode of teaching/delivery**

The course shall be conducted through lectures, tutorials and practicals. **Mode**

of Assessment

Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff

Dr. Denis Kalumba
Mr. Richard Kizza

Reading/Reference Materials

1. Bowles, J.E: *Foundation Analysis and design, 4th Ed.* Mac.Graw-Hill, 1988
2. Braja. M. Das: *Principles of Foundation Engineering, 6th Ed.* McGraw-Hill, 2003
3. Muni Budhu : *Soil Mechanics and Foundations, 2nd Ed.* John Wiley and Sons Inc., 2007

CIV3202 Group Design Project

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	0	60	100	70	30	4

Course Description

The class will be divided into groups of about ten students each, with a member of staff as the overall coordinator, who will assign supervisors to each of the groups. The groups will undertake a design project of an engineering structure that is intended to improve the quality of life in the environment from any of the fields of civil engineering. They will then prepare a design report in a specified format and make an oral presentation to members of staff.

Objectives

The overall objective of the course is to expose students to the engineering design process by assisting them to work in groups and assigning individuals responsibility and ensure they meet targets. This course is intended to train the students to:

- identify an engineering problem and prepare a proposal
- collect data and review existing relevant literature
- propose alternative solutions and select the best solution to a problem
- prepare a preliminary design of a engineering structure
- prepare approximate bills of quantities and cost estimates
- prepare a design report and oral presentation

Course Content

1. Problem Identification
2. Proposal Preparation
3. Data Collection and Literature Review
4. Alternative Solutions to a Problem
5. Preliminary Design and Cost Estimates
6. Design Report
7. Oral Presentation

Learning Outcomes
On completing the course the student should be able to:

- work in groups, assign responsibilities and meet targets
- learn patience, tolerance and teamwork
- identify an engineering problem and prepare a proposal
- collect data and review existing relevant literature
- propose alternative solutions and select the best solution to a problem
- prepare a preliminary design of a engineering structure
- prepare approximate bills of quantities and cost estimates
- prepare a design report and make oral presentations

Mode of teaching/delivery
The mode of delivery is through a few lectures offered at the beginning of the course and this is followed by fieldwork on a specific project.

Mode of Assessment
Assessment will be done through a group presentation and project report. The group presentation assessment will carry a total of 30% and final project report will carry 70% of the final grade mark.

Proposed Staff
Eng. Albert Rugumayo Mr. Moses Matovu

Reading/Reference Materials Handouts given by the Lecturer in charge.

CIV3203 Design of Structures II (Steel)

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
60	0	0	60	100	60	40	4

Course Description
The course deals with design principles of steel members and connections that are used in Civil infrastructure under different possible modes of loading.

Objectives

- Create appreciation of the importance of steel as a structural material
- Create appreciation of the shortcomings of steel and how to overcome them
- Design various structural steel elements (tensile, compressive, bending members)
- Design steel member connections, both bolted and welded
- Read at ease BS 5950 Part 1 and the CONSTRADO Structural Designer's Manual

[2CH]

Course Content 1. Introduction

1.1 History of steel development
1.2 Advantages and disadvantages of steel structures
1.3 Composition, classification and properties of steel

2. Design Principles [2CH]

1.4 Steel sections (Hot rolled, compound, Built-up and Cold-rolled sections)

2.1 Types of steel structures
2.2 Design principles
2.3 Load types - Dead, Live (imposed), wind and other loads
2.4 Design theories - Elastic, plastic and Limit state design

3. Tension Members [6CH]
3.1 Design equation
3.2 Determination of net and effective areas - Net and Effective Areas, Staggered and non- staggered holes Rows of holes staggered, Holes staggered on two legs of an angle, Single angle connected through one leg, Angles connected along their length, Angles connected to each side of a gusset

4. Compression Members [6CH]
4.1 Introduction - Effective length and Limiting slenderness
4.2 Design theories - Buckling and section classifications, and imperfections
4.3 Design steps - Perry-Robertson formula

5. Bending Members [14CH]
5.1 Introduction - Names of beams, standard sections and beam section classification,
5.2 Design - Buckling and Section Classifications, Determination of moment Capacity, Lateral- Torsional Buckling, Biaxial Bending, Determination of Shear Capacity, Determination of Deflection Capacity, Buckling and Bearing of Web.

6. Connections [15CH]
6.1 Bolts - Black bolts, HSFB bolts and Oversize holes,
6.2 Riveting,
6.3 Design Theories,
6.4 Welding - Welding processes, Advantages/advantages, weld defects, Types of welded joints, types of welds, inspection and testing, welded joint design.

Learning Outcomes
On completing the course the student should be able to carry out structural steel design in simple construction.

Mode of teaching/delivery
The mode of delivery is through lectures and tutorials.

Mode of Assessment
Assessment will be done through interim course assessments (assignments and tests) and a final examination. The interim course assessments will carry a total of 40% and final examination will carry a total of 60% of the final grade mark.

Proposed Staff
Prof. J.A. Mwakali
Dr. Y. Nakuziraba

Reading/Reference Materials

1. T.J. MacGinley and T.C. Ang: *Structural Steelwork: Design to Limit State Theory*
2. L. Gardner and David Nethercot, *Designers' Guide to EN 1993-1-1 Eurocode 3: Design of Steel Structures.* ICE Publishing
3. Any Steel Designers' Manual with steel section properties
4. J.A. Mwakali: *Steel structures: Notes for Civil Engineering Students,* 1985. Makerere University
5. A. Hayward and F. Weare: *Steel Detailers' Manual*
6. BS 5950: Part 1: 2000 and its companion design guides from the British Steel Institute
7. BS 4360
8. Eurocode (EN 1990)

9. Eurocode 1 (EN 1991)
10. Eurocode 3 (EN 1993)
11. EN 10025

CIV 3204 Water Resources Engineering I

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit units
LH	PH	TH	CH	WTM	WEM	WCM	CU
60	0	0	60	100	60	40	4

Course Description

This course is designed to review the fundamentals and practices of water resources engineering. Students explore water resources engineering processes in the theoretical and applied area in the fields of closed conduit (pipe) flow, open channel flow, surface water hydrology, water quality analyses, and groundwater flow. The water resources engineering curriculum is designed to prepare interested students for future careers in water supply, wastewater, floodplain, storm water, and groundwater management.

Objectives

- To learn about water resources planning and consider Case Studies.
- To learn about flood mitigation and flood routing.
- To learn about hydrological modelling using deterministic and stochastic methods.
- To learn about the occurrence of groundwater and to simulate different situations.
- To learn about rural water supply and sanitation in Uganda
- To learn about water resources management in Uganda.

Course Content

Case Studies in Africa [3CH]
1.1 Benefits and Environmental Impacts

Flood Mitigation [6CH]
1.1 Causes and Impacts
1.2 Structural methods including extensive and intensive measures
1.3 Non- Structural Methods; Flood Plain Management; Flood Proofing, Flood Forecasting
1.4 Design of Hydraulic Structures
1. 5 Flood Forecasting in Developing Countries

Flood Routing
1.1 Hydraulic and Hydrologic Routing [9CH]
1.2 Reservoir Routing
1.3 Channel Routing: Muskingum Equation

Deterministic Methods
4.1 Rainfall Runoff Relationships
4.2 Hydrographs [9CH]
4. 3 Unit Hy drograph
4.4 Rational Method
4.5 Time Area Method

Stochastic Methods
5. 1 Statistical Parameters
5.2 Return Period
5.3 Hydrological Data Series [9CH]
5.4 Frequency Distributions
5.5 Flood Frequency Models
5.6 Flood Design Standards

5.7 Time Series Analysis

6. Groundwater [12CH]
   - 6.1 Occurrence, Aquifers, the Groundwater Column
   - 6.2 Darcy's Equation Hydraulic Conductivity, Measurement, Factors
   - 6.3 Steady Groundwater Hydraulics, Dupuit's Theorem
   - 6.4 Unsteady Flow
   - 6.5 Pumping Test Analysis
   - 6.6 Soils as Drainage Filters
   - 6.7 Borehole Drilling Methods

7. Rural Water and Sanitation in Uganda
   - 7.1 Government Policies [6CH]
   - 7.2 Institutional Framework
   - 7.3 Sustainability
   - 7.4 Appropriate Technologies
   - 7.5 Key Issues
   - 7.6 Case Studies

8. Water Resources of Uganda
   - 1.1 Water Availability [6CH]
   - 1.2 Policy and Institutional Framework
   - 1.3 Water Management Issues
   - 1.4 Integrated Water Resources Management
   - 1.5 Case Studies

Learning Outcomes

On completing the course the student should be able to:

- To understand the steps involved in the planning of water resource project, its extent and environmental aspects and consider Case Studies.
- To understand measures for mitigating floods and flood routing.
- To introduce the concepts of hydrological modeling and to estimate stream flow using deterministic and stochastic methods.
- To understand the occurrence of groundwater in nature and to simulate different situations.
- To understand issues affecting rural water supply and sanitation in Uganda
- To understand issues affecting water resources management in Uganda.

Mode of teaching/delivery

The course shall be conducted through lectures and practicals. **Mode of Assessment**

Assessment will be done through continuous interim assessments (assignments, practicals and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff

Eng. Albert Rugumayo
Mr. Martin Tumutungire
Mr. Michael Kizza

Reading/Reference Materials

1. Shaw, E.M., *Hydrology in Practice,* Chapman and Hall, 1994, London, UK
2. Mansell, M.G. *Rural and Urban Hydrology,* Thomas Telford, 2003, London, UK
3. Arora, K.R. *Irrigation, Water Power and Water Resources Engineering,* Standard Publishers, 2007, New Dehli, India.
4. Subramanya, K., *Engineering Hydrology,* 2nd Edition 2001,Tata McGraw Hill, New Dehli, India

5. Todd, D.K., *Groundwater Hydrology,* 2nd Edition, John Wiley and Sons, 1980, New York, USA.
6. Micheal, A.M., *Irrigation Theory and Practice,* Vikas Publishing House, 2003, New Dehli, India
7. Chow V. T., Maidment D., L. Mays, *Applied Hydrology.* Mc Graw Hill, 1988, New York, USA,
8. *State of Environment Reports 1999-2008,* National Environment Management Agency, Kampala, Uganda.
9. *Water Sector Performance Report,* 2009, Ministry of Water and Environment, Kampala, Uganda
10. Rugumayo, A.I., *Lecture Notes, An Introduction to Hydrology and Water Resources Engineering,* 2010, Kampala, Uganda

CIV3205 Public Health Engineering I

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	0	60	100	60	40	4

Course Description

The course introduces sanitary engineering, in which the relationship between diseases, disease vectors and transmission routes are studied as well as engineering barriers to counter communicable disease transmission. The course covers: solid and hazardous waste management and its functional elements, i.e., generation, temporary storage, collection, transportation, treatment including recycling and ultimate disposal; water and wastewater quality characteristics / assessment - the physical, chemical and bacteriological quality parameters and their relevance in ensuring public health; and, onsite and sewered sanitation. Onsite sanitation covers the design and management of different types of non-water borne sanitation systems (traditional pit latrines and improved latrines, ROEC, compost latrines), water borne sanitation systems (aquaprivy, vaults, cesspools, septic tanks and pour flush toilets) and dry urine diverting ecological sanitation (ecosan) systems. Sewered sanitation covers the planning, design, operation and maintenance of waste stabilisation ponds (WSPs) for wastewater treatment. Lastly, the course introduces self-purification in surface water bodies.

Objectives

The objectives of the course are in line with the vision and mission of Makerere University, viz: to be the leading institution for academic excellence and innovations in Africa; and to provide innovative teaching, learning, research and services responsive to National and Global needs respectively.

The main objective of the course is to equip undergraduate students of the third year class of Civil engineering with the knowledge and skills to understand, appreciate and design interventions for solving public health and environmental challenges in society, namely;

The specific objectives are to enable students to:

- be aware of the importance of environmental sanitation and interventions to prevent spread of infectious / communicable diseases,
- to design interventions in solid and hazardous waste treatment and management,
- Understand water and wastewater quality characteristics and their importance in ensuring good public health as well as environmental protection,
- be aware of the various factors affecting the choice of sanitation systems and to plan and design onsite and off-site sanitation technology options in any given situation (rural, urban, semi/peri-urban areas, low-lying areas; rocky and collapsing formations; the poor, middle income and the rich) as well as treatment systems for excreta, wastewater and grey water,
- choose appropriate sanitation and drinking water treatment units and processes for solving problems (i.e. improving sanitation and water supply) in communities,
- understand how natural self-purification processes impact on water quality and the environmental factors that can be manipulated to improve the situation.

Course Content

1. Introduction to Sanitary Engineering [3CH]
   1.1 Definitions, vectors and diseases, rodents, communicable diseases, sub-standard housing, In door ETS pollution.

1.2 Environmental transmission routes and measures to counter disease

2. Solid waste Management [6CH]
   - 2.1 Solid waste generation rates and quantification, solid waste sorting, biodegradable and non- degradable waste.
   - 2.2 Functional elements of solid waste management - generation, storage, collection, transportation, treatment and ultimate disposal
   - 2.3 Composting and Hazardous waste management

3. Aspects of Water and waste water quality [6CH]
   - 3.1 Physical and chemical water and wastewater characteristics
   - 3.2 Bacteriological water and wastewater characteristics
   - 3.3 Laboratory work

4. Onsite Sanitation [15CH]
   - 4.1 Introduction - Objectives and definition of sanitation, historical developments in sanitation, sanitation coverage in Uganda, definition of sewage, sewage strength, factors affecting selection of a sanitation system.
   - 4.2 Types of on-site sanitation systems - Various types of non-water borne (traditional pit latrines and improved latrines, ROEC, compost latrines) and water borne sanitation systems (aquaprivy, vaults, cesspools, septic tanks and pour flush toilets)
   - 4.3 Ecological sanitation systems (Dry urine diverting ecosan systems)

5. Sewered (Offsite) Sanitation [15CH]
   - 5.1 Introduction - Some definitions, contaminants of concern in wastewater treatment, Classifications and comparison of wastewater treatment methods
   - 5.2 Waste stabilization ponds (WSPs) - Types and advantages of waste stabilization ponds, process of wastewater treatment in waste stabilization ponds, principles of pond design - Anaerobic, facultative and maturation ponds; pond lay out, pond construction, operation and maintenance of WSPs, Recent technology developments
   - 5.3 Self-purification in surface water bodies

6. Practicals [15CH]
   The practicals shall be conducted on water and wastewater sampling, sample preparation and analysis using state-of-the-art analytical procedures and equipment.

Learning Outcomes

On completing the course the student should be able to:

- design environmental sanitation interventions to prevent spread of infectious / communicable diseases,
- to design interventions in solid and hazardous waste treatment and management,
- describe water and wastewater quality characteristics and their importance in ensuring good public health as well as environmental protection,
- Understand the various factors affecting the choice of various sanitation systems and to plan and design onsite and off-site sanitation technology options in any given situation (rural, urban, semi/peri-urban areas, low-lying areas; rocky and collapsing formations; the poor, middle income and the rich) as well as treatment systems for excreta, wastewater and grey water,
- Apply planning methods to choose appropriate sanitation and drinking water treatment units and processes for solving problems (i.e. improving sanitation and water supply) in communities,
- Describe how natural self-purification processes impact on water quality and the environmental factors that can be manipulated to improve the situation.

Mode of teaching/delivery

The course shall be conducted through lectures, tutorials and practicals. Course delivery will be by use of state- of-the-art methods using power point presentations and student centred/learner-centred methods pedagogy.

Mode of Assessment

Assessment will be done through continuous interim assessments (assignments, practicals and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark. The course work shall comprise of the assignments, tests/quizzes contributing 20% and the practicals shall contribute 20%.

Proposed Staff Dr. Charles Niwagaba Dr. Robinah Kulabako Mr. James Semuwemba Mr. Ronald Musenze

Reading/Reference Materials

1. Ali, M. (Ed.) 2004. Sustainable Composting. Case studies and guidelines for developing countries. The Water Engineering and Development Center (WEDC), Loughborough University, Leicestershire, UK. ISBN 1 84380 071 3.
2. Benenson, A.S. 1985. Control of communicable diseases in man, 4th Edition.
3. Bitton, G. 1999. Wastewater Microbiology, 2nd Edition. Wiley-Liss Inc., New York. ISBN: 0-471-32471.
4. Bjorklund, A. 2002. The potential of using thermal composting for disinfection of separately collected faeces in Cuernacava, Mexico. Minor Field Studies No 200. Swedish University of Agricultural Sciences, International Office. ISSN 1402-3237.
5. Chiumenti, A., Chiumenti, R., Diaz, L.F., Savage, G.M., Eggerth, L.L. & Goldstein, N. 2005. *Modern Composting Technologies.* The JG Press. Inc. ISBN 0-932424-29-5.
6. Esrey, S.A., Gough, J., Rapaport, D., Sawyer, R., Mayling, S-H., Vargas, J., Winblad, U., (Eds.) 1998. *Ecological Sanitation.* Novum Grafiska AB. ISBN 91 586 76 12 0.
7. Jo Smet and Christine van Wijk (Editors) (2002). *Small Community Water Supplies, Technology, People and Partnerships,* Technical Paper series No. 40, International Reference Centre (IRC) for Community Water Supply and Sanitation, John Wiley & Sons, New York.
8. Kulabako, N.R., Nalubega, M., Thunvik, R. 2004. *Characterisation of peri-urban anthropogenic pollution in Kampala.* In: Proceedings of the 30th WEDC International Conference, Vientiane, Lao PDR.
9. Mara, D.D. 1976. Sewage Treatment in Hot Climates, John Wiley & Sons.
10. Metcalf & Eddy (2003). *Wastewater Engineering: Collection, Treatment, Disposal and reuse,* McGraw- Hill, New York.
11. Niwagaba, C. 2009. *Treatment technologies for human faeces and urine.* Doctoral thesis no. 2009: 70. Swedish University of Agricultural Sciences, Uppsala, Sweden. ISBN 978-91-576-7417-3. Also available at: http://diss-epsilon.slu.se/archive/00002177/01/niwagaba c 091123.pdf
12. Robinson, W.D. (ed.). 1986. *The Solid waste Handbook, A practical guide.* John Wiley & Sons Inc. ISBN 0-471-87711-5.
13. Salvato, J.A. 1982. *Environmental Engineering and Sanitation,* 3rd Edition, John Wiley & Sons, Inc., U.S.A.
14. Mara, D. (1976). *Sewage Treatment in Hot Climates,* John Wiley & Sons. ISBN-13: 9780471567844.
15. Mara, D. (1997). *Design Manual for Waste Stabilisation Ponds in India.* Lagoon Technology International Ltd. ISBN: 0 95 19869 10.

CIV3301 Industrial Training II

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit units
LH	PH	TH	CH	WTM	WEM	WCM	CU
0	300	0	30	100	60	40	2

Course Description

This is similar to the one undertaken at level I. It introduces students to various technological skills in industries and provides on-the-job training and exposure.

Objectives

- Expose students to practical aspects of engineering and construction activities
- Provide an opportunity to students to relate the knowledge obtained during lectures to actual field operations
- Create an understanding of the roles played by different project personnel during project execution
- Enable students learn how to work in a team (casual workers, technicians, engineers, etc).
- Teach students different engineering ethics necessary for career building
- Enhance problem solving capacity of the students using available appropriate technology and surrounding conditions
- Enable students to have a hands-on with tools and equipment not readily available in the University laboratories and are of great importance in the engineering field.

- Enable students appreciate various challenges faced in the field and critical areas necessitating further research studies.

Course Content
The student is required to participate in the day-to-day activities at the organizations premises as a regular worker. This activity lasts at least eight (8) weeks (180 hours) starting immediately after the end of examination of Semester II of the second year of study.

Learning outcomes
At the end of this course, a student should be able to:
- Identify and describe the major activities of the sections where he/she was attached
- Describe the technical aspects of the training that was undertaken
- Identify technical areas of improvement of the sections where he/she was attached
- Write a clear and understandable training report

Mode of teaching/delivery
The student will be attached to an organization. During this, training is provided by the organizations personnel. The activity is closely supervised by a senior member of the organization as the industry supervisor. A member of the academic staff of the department is assigned to visit the organization at least two times and monitor the progress of the attachment. The student keeps a daily log of the activities which is reviewed weekly by the industry supervisor and academic supervisor during the visits.

Mode of Assessment
This shall be by the performance of the student in the organization (Industry supervisor assessment), Student's log book and a report written by the student after the training (Academic supervisor assessment). The Industry supervisor's assessment shall be 30% of the final mark while the Academic Supervisor's assessment shall be 70% of the final mark.

Proposed Staff
All Staff

CIV4101 Civil Engineering Management

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	0	45	100	60	40	3

Course Description
The course comprises of Project Management (an overview of organisation theory, component characteristics of projects, coordination theory, organisational structures and introduction to procurement methods), Project Modelling (CPM and PERT methods, linear problems of transportation models and simplex technique types) and Site Management and Practice (supervision techniques, productivity, build-ability, and case studies on pre- site and site management).

Objectives

- Describes the essential features of organizations
- Creates an understanding of the factors shaping these features
- Introduces the evolution of different organizational designs/types.
- Creates an understanding of how managers may build and change organisations.
- Creates an understanding of how different organizational forms impact on the individual within organizations.

Course Content

1. Introduction to management [4CH]

1.1 Principles and functions of management

1.2 Structures and relationships in organisations

2. Organizational theory overview [6CH]

2.1 Evolution of management theory

2.2 Leadership theory 2. 3 Motivation theory

2.4 Group theory

2.5 Plant and equipment organization

3. Project management [13CH]

3.1 Introduction to theory of Proj ect Management

3.2 Component characteristics of projects

3.3 Coordination devices

3.4 Organisational structures

3.5 Introduction to procurement methods

4. Project planning and scheduling [13CH]

4.1 Project Network Techniques - Project planning and modelling, AoA Networks, AoN Networks, Analysing AoA and AoN networks, Resource analysis, Preparing Ghant Charts,

4.2 Linear Programming - Linear problems, the transportation model (North-west corner solution method, Initial feasible solution, Degeneracy, Shadow costs, Vogel's approximation method, Special issues in the transportation problem), The Simplex technique.

5. Site management theory and practice [9CH]

1.1 Supervisory techniques - The project environment, Project start-up techniques Communication in the project hierarchy and outstanding information list (OIL)

1.2 Build-ability theory and case study

1.3 Productivity theory and examples

1.4 Construction site planning and assessment techniques

1.5 Site safety, health and welfare, employment legislation and incentive schemes

Learning Outcomes

On completing the course the student should be able to:

- Define Civil Engineering Management
- Analyse component characteristics of projects
- Understand project coordination devices and their importance
- Conceptualise the different management hierarchies and their change consequences on spans of control
- Explain the different design strategies that help to reduce the need for information
- Understand and explain the complexity in conception and implementation of modern building and Civil engineering projects and therefore need for a Civil Engineering project manager.
- Analyse the various contractual networks that are commonly found in construction projects.
- Understand project modelling and explain different project network techniques
- Understand the different characteristics of planning, differentiate between strategic plans and tactical plans
- Relate site management theory and practice

Mode of teaching/delivery

The course shall be conducted through lectures and tutorials.

Mode of Assessment

Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff

Mr. Hilary Bakamwesiga
Mr. Godfrey Mwesige

Reading/Reference Materials

1. Newcombe R., Langford, D and Fellows, R.: *Construction Management*, 1991
2. Harris, F. and McCaffer, R.: *Modern Construction Management,* 1999
3. Hannagan, T: *Management: Concepts and Practices,* 2008
4. Bennet, J.: *Project Management,* 1991
5. Murdoch, J. and Hughes, W.: *Construction Contracts Law and Management,* 2000

CIV4100 Civil Engineering Project I

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit units
LH	PH	TH	CH	WTM	WEM	WCM	CU
30			30	100	60	40	2

CIV4200 Civil Engineering Project II

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit units
LH	PH	TH	CH	WTM	WEM	WCM	CU
	120		60	100	60	40	4

Course Description

In this course, final-year students perform a research project largely of their own design and direction in the field of engineering under the guidance of academic supervisors. Students submit a proposal at the beginning and a bound research report at the end summarizing their findings. They also deliver an oral presentation to a panel of examiners describing their research findings - one mini presentation at the end of semester I and a final presentation at the end of semester II.

Objectives

Main objective of the course is for the student to learn the art of problem solving through the scientific method of project formulation, data collection, analysis and drawing of conclusions and presenting of the findings through a public defence and technical report. Specific objectives include:

- Do independent practical original research in Civil Engineering,
- Review and appraise existing literature,
- Develop research, analysis, writing and editing and organisation skills through an extended exploration of a single topic, and
- Disseminate research findings through presentation and publication.

Course Content

- Producing a research proposal clearly defining the problem, objectives and methodology, and securing the agreement of selected academic supervisors
- Exploring an area that has hitherto not been investigated (new method, community welfare, poverty eradication, environmental preservation, new structure demonstrating a unique understanding of the subject matter, material technology, etc.)

- Maintaining a research notebook, recording notes on material read, draft chapters, questionnaire responses, or other relevant material
- Presenting a work-in-progress talk to their supervisors,
- Submitting a project report by the specified deadline.

Learning Outcomes
On completing the course the student should be able to:
- Independently formulate a research project out of a given problem, do a literature survey and develop a research proposal.
- Carry out the research following the guidelines formulated in the proposal
- Prepare a report and adequately defend its findings in front of a panel

Mode of teaching/delivery
The course shall be conducted through weekly meetings between the student and academic supervisors during which discussions are held on student progress, point out gaps not addressed, ensure that student remains on track and planned activities.

Mode of Assessment
Assessment will be done through project proposal (10% of the final course mark), oral project presentation at the end of Semester I (10% of the final course mark) and oral final project presentation at the end of Semester II (20% of the final course mark), Project report following the University guidelines (60% of the final course mark).

Proposed Staff (Programme coordinators)
Dr. Naku Ziraba
Dr. Robinah Kulabako

Reading/Reference Materials
Several Internet links including "Conducting a Literature Review" from the Universities of Melbourne and that of the University of Toronto.

CIV4102 Civil Engineering Infrastructure Maintenance

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	0	45	100	60	40	3

Course Description
This course considers the status and operation of public infrastructure facilities generally, with particular attention to the responsibilities and roles of public works engineers. It explores the relationships between the engineering, administrative (managerial and economic) and political aspects of public works management. It focuses on critical infrastructural issues like diagnosis, analysis and repair of civil infrastructure.

Objectives
- Inculcate a maintenance culture in future engineers
- Understand the techniques for monitoring the quality of construction of infrastructure
- Know the characteristics and how to use some tools to evaluate the condition or state of infrastructure
- Know how to reduce problems of construction and maintenance on infrastructure
- Analyse and evaluate measures for rehabilitation of infrastructure like roads, building, bridges, drainage systems, and others

Course Content
1. Diagnosis, assessment and repair of Civil Engineering Infrastructure [13CH]
2. Terminology, deterioration, process and diagnostic procedures [8CH]

3. Assessment procedures [8CH]
4. Some repair procedures [8CH]
5. Life cycle planning and maintenance management [8CH]

Learning Outcomes
On completing the course the student should be able to appreciate that maintenance of infrastructure is a prerequisite for its longevity and therefore important for prudent use of public and private resources.

Mode of teaching/delivery

The course shall be conducted through lectures and tutorials. **Mode of Assessment**
Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff
Prof. Jackson Mwakali
Dr. Denis Kalumba

Reading/Reference Materials

1. Cigolini, R.D.; Deshmukh, A.V.; Fedele, L.; McComb, S.A. (Eds.), *Recent Advances in Maintenance and Infrastructure Management.* Springer
2. Fedele, Lorenzo, *Methodologies and Techniques for Advanced Maintenance.* Springer
3. UN-Habitat, *The Maintenance of infrastructure and its financing and cost recovery*
4. Alan Molof, *Infrastructure Maintenance and Repair of Public Works.* Annals of the New York Academy of Sciences

CIV4103 Traffic and Transportation Engineering

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit units
LH	PH	TH	CH	WTM	WEM	WCM	CU
60	0	0	60	100	60	40	4

Course Description
The traffic and transportation engineering course trains students to plan and conduct traffic management designs of different elements of streets, highways and abutting lands and the traffic operations thereon. The major control parameters in their planning and design include safety, convenience (comfort) and economic operation of freight and passengers.

Objectives
- Enable students assess and understand traffic characteristics on roads and other facilities
- Expose students to the conduct of traffic studies and analyses
- Enable students to plan traffic operation controls and regulations
- Design traffic handling facilities • Equip students with the skills necessary to undertake administration and management of traffic.

Course Content
1. Introductory concepts [7 CH]
   - 1.1 Scope of traffic engineering
   - 1.2 Transportation administration
   - 1.3 Road network
   - 1.4 Road classification in Uganda
2. Traffic characteristics [7 CH] 2.
   - 1 Vehicular characteristics
   - 2.2 Road user characteristics
   - 2.3 Road characteristics

3. Traffic studies and analysis [7 CH]
   - 3.1 Traffic volume study
   - 3.2 Traffic speed study
   - 3.3 Origin and destination studies
   - 3.4 Traffic capacity studies
   - 3.5 Parking studies
   - 3.6 Road accident studies

4. Transportation planning [7 CH]
   - 4.1 Present year inventories
   - 4.2 Trip generation
   - 4.3 Trip distribution
   - 4.4 Modal split
   - 4.5 Network assignment

5. Level of service analysis [8CH]
   - 5.1 Selection of Level of service
   - 5.2 Multilane and suburban highways
   - 5.3 Two lane highways
   - 5.4 Service volume

6. Elements of traffic analysis [8 CH]
   - 6.1 Traffic flow, speed and density
   - 6.2 Basic traffic stream models
   - 6.3 Models of traffic flow
   - 6.4 Queuing theory and traffic flow analysis
   - 6.5 Traffic analysis at highway bottlenecks

7. Signalised Intersections [10CH]
   - 7.1 Pros and cons of signalization
   - 7.2 Traffic control signal needs studies
   - 7.3 D/D/1 queuing with arrivals below capacity
   - 7.4 D/D/1 queuing with arrivals exceeding capacity
   - 7.5 Probabilistic arrivals
   - 7.6 Optimal traffic signal timing
   - 7.7 Traffic signal timing in practice
   - 7.8 Other traffic control devises

8. Highway lighting [6 CH]
   - 8.1 Terminology
   - 8.2 Basic lighting concepts
   - 8.3 Design of highway lighting

Learning Outcomes

On completing the course the student should be able to:

- Carryout alignment design of two-lane highways considering safety and economy
- Develop phase plans and timing for new signalized junctions as well as carrying out operational analysis of existing junctions
- Carryout capacity analysis of roundabouts and other at-grade junctions
- Understand the basic principles of traffic flow, and transportation planning as foundation for graduate specialization

Mode of teaching/delivery

The course shall be conducted through lectures and tutorials.

Mode of Assessment

Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff Mr.
Godfrey Mwesige Ms.
May Namutebi

Reading/Reference Materials

1. Gurcharan, S., (2004). *Highway Engineering,* Standard Publishers Distributors.
2. Ministry of Works, Housing and Communications (2005), *Road design manual Vol. 1; Geometric Design Manual.* Republic of Uganda.
3. Roess, R.P., Prassas, E.S. & McShane, W.R., (2004). *Traffic Engineering.* Third Edition, Pearson Prentice Hall.
4. Transportation Research Board (2000). *Highway Capacity Manual.* Metric Units.

CIV4104 Public Health Engineering II

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	0	60	100	60	40	4

Course Description

This course introduces concepts of planning and design of water and wastewater treatment systems, design concepts and calculations of water transmission and distribution systems. It also covers wastewater conveyance systems and creates awareness of environmental aspects of water supply and wastewater management projects.

Objectives

- introduce concepts in the planning and design of water and wastewater treatment systems
- introduce the design criteria for water supply and wastewater treatment systems and thereafter the design of unit processes in conventional water and wastewater treatment systems
- introduce the design concepts and calculations of water transmission and distribution systems including net work configurations, balancing of distribution systems and pumping systems as well as detailed design of the systems
- enable the students to understand the design of wastewater conveyance systems
- enable the students to be aware of environmental aspects of water and wastewater systems and use them to conduct environmental impact assessments for water supply and wastewater projects

Course Content

1. Planning of Water Supply and Wastewater Management Systems [6CH]
   - 1.1 Introduction/Definitions, community planning, functional and definitive planning, constraints of project planning, planning and design considerations
   - 1.2 Basis of volume-design period, Design population, Design demand, Peaking factors,
   - 1.3 Sustainability of water and wastewater management system
2. Design of Water Treatment Plants [10CH]
   - 2.1 Objectives of treatment of drinking water, characteristics of different water sources, Intake works-Ground and surface water sources
   - 2.2 Aeration and Gas Transfer
   - 2.3 Coagulation and Flocculation
   - 2.4 Sedimentation- Discrete, hindered and flocculent settling
   - 2.5 Filtration- Mechanical filtration, slow sand filtration, rapid sand filtration
   - 2.6 Disinfection- Physical and chemical methods of drinking water disinfection
3. Water Transport and Distribution [10CH]
   - 3.1 Introduction, pipe materials and fittings, network configurations/layouts (Branched vs Grid systems)
   - 3.2 Network design- Layout of networks, hydraulic formulae for network calculations, distribution systems i.e., gravity flow vs pumped systems, Branched vs Grid systems, equivalence method, Hardy-cross method, Reservoirs and pumping stations

4. Wastewater Collection and Transportation [4CH] 4.
1 Sewer layout and appurtenances
4.2 Types of collection systems
4.3 Design of sewer systems (Separate vs Combined)

5. Design of Wastewater Treatment Plants [10CH]
5.1 Review of treatment plant layout
5.2 Design of suspended growth/activated sludge systems, O & M of activated sludge systems
5.3 Design of attached growth/trickling filter systems, sludge treatment and disposal

6. Environmental Impact Assessments [5CH]
6.1 Definitions
6.2 Why EIAs?
6.3 Projects likely to be exempted from EIAs vs those where EIAs are a must
6.4 The EIA process (screening, EI study, Decision making), some case studies

7. Field excursions / Practicals [15CH]

Learning Outcomes

On completing the course the student should be able to:

- plan and select a combination/combinations of appropriate unit treatment processes in a given situation (for both water and wastewater) and design conventional water and wastewater treatment systems,
- design wastewater conveyance, water transmission/distribution systems and pumping systems,
- understand environmental aspects of water supply and wastewater systems and know how to carry out environmental impact assessment for water and wastewater projects.

Mode of teaching/delivery

The course shall be conducted through lectures, tutorials and field excursions. **Mode of Assessment**

Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff Dr.
Robinah Kulabako Dr.
Charles Niwagaba Mr.
Herbert Kalibbala
Mr. James Semuwemba

Reading/Reference Materials

1. DWD (Directorate of Water Development) (2000). *Water Supply Design Manual,* 1st Edition.
2. Twort, A.C., Law, F. M., Crowley, F. W (1985). *Water Supply,* 3rd Edition, Edward Arnold Publishers.
3. Metcalf & Eddy (2003). *Wastewater Engineering: Collection, Treatment, Disposal and reuse,* McGraw-Hill, New York.
4. Jo Smet and Christine van Wijk (Editors) (2002). *Small Community Water Supplies, Technology, People and Partnerships,* Technical Paper series No. 40, International Reference Centre (IRC) for Community Water Supply and Sanitation, John Wiley & Sons, New York.
5. Walski M. T., Chase V. D., Savic A. D. (2001). *Haestad methods - Water Distribution Modeling.* First Edition. Haestad Press, Waterbury, CT, USA. IABN 0-9657580-4-4.
6. Canter, L. W. (1996). *Environmental Impact Assessment,* 2nd Edition. McGraw-Hill International (Singapore).
7. Glasson J., Therivel R., Chadwick A. (1996). *Introduction to Environmental Impact Assessment,* 4th Edition. UCL Press Limited.
8. NEMA (1997). Guidelines for Environmental Impact Assessment in Uganda. Printed by The leading Edge, Nasser Road, Kampala, Uganda.
9. Ahmed F. M., Rahman M., (2000). *Water Supply and Sanitation, Rural and Low Income Urban Communities,* 1st Edition, ITN-Bangladesh.
10. WHO (1984). *Guidelines of Drinking-Water Quality, Vol.1-3,* WHO Geneva.

CIV4105 Design of Structures III (Timber and Masonry)

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	0	45	100	60	40	3

Course Description

This course is intended to cover the basic design of structural elements constructed of masonry and timber. The extensive use of masonry and timber in building construction renders the course on design of masonry and timber structures an important part in training of a well rounded and practical degree in Civil engineering. Naturally, the course is divided into two parts, namely masonry and timber.

Objectives

- Introduce the nature and inherent characteristics of masonry in relation to BS 5628 leading to a practical design and detailing of masonry building structures.
- Introduce the nature and inherent characteristics of timber in relation to requirement of structural Eurocodes leading to a practical design and detailing of timber structural components.

Course Content

MASONRY

1. Structural Masonry [4CH]
   - 1.1 Materials
   - 1.2 Structural Forms
   - 1.3 Material Properties
   - 1.4 Limit State Design
2. Axially Loaded Walls [6CH]
   - 2.1 Design Criteria
   - 2.2 Single-Leaf Masonry Walls
   - 2. 3 Stiffened Single-Leaf Masonry Walls
   - 2.4 Cavity Walls, including Jointed Wall and Grouted Cavity Walls
   - 2.5 Walls subjected to Concentrated Walls
   - 2.6 Masonry Column
3. Laterally Loaded Walls [7CH]
   - 3.1 Design Criteria
   - 3.2 Single-Leaf Wall
   - 3.3 Stiffened Single-Leaf Wall
   - 3.4 Cavity Wall
   - 3.5 Single-Leaf Wall with Pre-Compression
   - 3.6 Free Standing Boundary Wall
   - 3.7 Walls Containing Openings
4. Reinforced and Prestressed Masonry [5CH]
   - 4.1 Reinforced Masonry
   - 4.2 Reinforced Masonry Beam
   - 4.3 Reinforced Masonry Wall
   - 4.4 Prestressed Masonry

TIMBER

5. Wood Buildings [4CH]
   - 5.1 Design Loads: Gravity Loads (Dead Loads and Live Loads)
   - 5.2 Deflection Criteria
   - 5.3 Lateral Loads (Wind Loads, Earthquake and Load Combinations
6. Properties of Wood & Grading of Timber [4CH]
   - 6.1 Classification of trees

6.2 Cellular makeup
6.3 Effects of Moisture and shrinkage
6.4 Growth characteristics and defects
6.5 Strength modifiers for natural defects
6.6 Grading of Timber

7. Structural Glue-Laminated Timber [4CH]
7.1 Sizes of Glulam members
7.2 Fabrication
7.3 Design Parameter

8. Elements Design [5CH]
8.1 Bending Elements (beams, girders and built-up beam sections)
8.2 Axial Loaded Elements (Tension; Tension + Bending)
8.3 Axial Loaded Elements (Compression; Compression + Bending)

9. Nailed and Bolted Connections [6CH]
9.1 Types of Nails
9.2 Factors affecting strength
9.3 Laterally Loaded Connections
9.4 Withdrawal Type Connections
9.5 Spacing Requirements
9.6 Bolted Connection

Learning Outcomes
On completing the course the student should be able to:
- design and detail masonry building structures according to requirements of BS 5628.
- design and detail timber structures and components according to requirements of Eurocode EC5.

Mode of teaching/delivery
The course shall be conducted through lectures and tutorials.
Mode of Assessment
Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff
Dr. Yasin Naku Ziraba
Mr. Feriha Mugisha

Reading/Reference Materials
1. *Design of Structural Masonry* by W.M.C. McKenzie
2. *Design of Structural Timber to Eurocode 5* by William M C McKenzie and Binsheng Zhang

CIV4106 Hydrology II

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	0	45	100	60	40	3

Course Description
This course is intended to make students appreciate the advanced statistical methods and systems approach in the analysis and design of hydrologic problems. Urban runoff models will be used to develop storm water management systems. Climate systems will be modelled and projected changes, with their impacts and mitigation measures discussed. Models for water quality will also be discussed.

Objectives
- To learn about advanced statistical methods in the estimation and prediction of hydrologic variables
- To learn about the systems approach in analyzing and forecasting hydrologic variables.
- To learn about runoff models in urban hydrology and their applications.

- To learn about climate change through the modelling of the climate system
- To learn about water quality modeling and solute transport.

Course Content

1. Advanced Statistical Methods [10CH]
   - 1.1 Data requirements in Hydrology
   - 1.2 Time Series Modelling
   - 1.3 Estimation Theory
   - 1.4 Testing of a Hypothesis

2. Hydrologic Systems [10CH]
   - 2.1 Systems Analysis
   - 2.2 Classification of Models
   - 2.3 Linear Models
   - 2.4 Rainfall Runoff Models

3. Urban Hydrology [10CH]
   - 3.1 Urban surface runoff models
   - 3.2 Storm water Management
   - 3.3 Operations and Maintenance

4. Climate Change [9CH]
   - 4.1 Climate Systems and Models
   - 4.2 Observed and Projected Changes
   - 4.3 Impacts and Responses 4.4 Adaptation and Mitigation

5. Water Quality Modelling [6CH]
   - 5.1 Modelling
   - 5.2 Solute Transport

Learning Outcomes

At the end of the course the students should be able to:

- apply advanced statistical methods in the estimation and prediction of hydrologic variables
- apply the systems approach in analyzing and forecasting hydrologic variables.
- know the runoff models used in urban hydrology and their applications to storm water management.
- appreciate climate change through the modelling of the climate system with projected changes, their impacts and mitigation measures.
- model water quality and solute transport

Mode of Delivery

The mode of delivery is through lectures and tutorials. **Mode of Assessment**

Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

References

1. Shaw, E.M., *Hydrology in Practice,* Chapman and Hall, 1994, London, UK
2. Mansell, M.G. *Rural and Urban Hydrology,* Thomas Telford, 2003, London, UK
3. Subramanya, K., *Engineering Hydrology,* 2nd Edition 2001, Tata McGraw Hill, New Dehli, India.
4. Haan, C.T. *Statistical Methods in Hydrology,* Iowa University Press 2002, Iowa, USA
5. Wilson, E.M., *Engineering Hydrology,* 4th Edition, Macmillan, 1996, London, UK.
6. Duggal, K.N., Soni, J.P., *Elements of Water Resources Engineering,* New Age Publishers, 2007, Dehli, India.
7. Singh, V. P. *Hydrologic Systems,* Prentice-Hall Englewood Cliffs,1989 New Jersey, USA
8. Rugumayo, A.I., *Lecture Notes, An Introduction to Hydrology and Water Resources Engineering, Lecture Notes,* Kampala, 2010

CIV4201 Civil Engineering Law

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit units
LH	PH	TH	CH	WTM	WEM	WCM	CU
60	0	0	60	100	60	40	4

Course Description

This course covers aspects of construction law and its applicability in Civil Engineering projects. It includes aspects of professional conduct and ethics, contract procurement and conditions of contract.

Objectives

- Appreciate the role of engineers, local authorities, insurance companies and other stakeholders in enforcement of the law in construction.
- Know the role of engineers in transforming society
- Understand the laws of procurement and contracts
  Understand the law of contract and tendering process Manage the tendering process and contract

Course Content

1. Civil Engineering and the law [20CH]
   - 1.1 Professional Ethics
   - 1.2 Legal responsibility for engineers
   - 1.3 Responsibility of local authorities
   - 1.4 Insurance
   - 1.5 The Law of Torts
   - 1.6 Codes of Ethics
   - 1.7 Environmental laws
2. Labour laws [10CH]
   - 2.1 Workman's compensation
   - 2.2 Risk and moral responsibility
   - 2.3 Gender issues
3. Law of contract [20CH]
   - 3.1 Contract management
   - 3.2 Contract procurement - FIDIC/ICE Conditions of Contract
   - 3.3 Subcontracting and subcontracting agreement
   - 3.4 The role of client/customer, the contractor, subcontractor, Suppliers and consultants
   - 3.5 Engineer's professional responsibilities and fees
   - 3.6 Liability and indemnity
   - 3.7 Claims, Disputes and their resolutions
4. Tendering [10CH]
   - 4.1 Types of contract and basis of tender
   - 4.2 Contractual agreement
   - 4.3 Contract management

Learning Outcomes

On completing the course the student should be able to:

- Understand the roles and obligations of different participants on a construction project
- Get applied knowledge of construction contracts and contract administration locally and internationally
- Appreciate the contractual relations between different parties on a construction project
- Understand the engineers professional and moral obligations in the construction industry

Mode of teaching/delivery

The course shall be conducted through lectures and tutorials.

Mode of Assessment

Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff
Eng. Dans Naturinda

Reading/Reference Materials

1. Murdoch J & Hughes W. (1994), *Construction Contracts - Law and Management,* E & FN Spon, London
2. Tuhumwire W. (1995), *Elements of the Law of Contract,* WIT Publications, Kampala
3. Hibberd (1990), *Contractor's Design Liability under the Standard Forms of Building Contract,* CIOB, Technical Information Service, TIS No 118.
4. Fenn P & Gameson R., Construction Conflicts Management and Resolution
5. Horgan M. O., *Competitive Tendering for Engineering Contracts*
6. Horgan M. O. & Roulston F. R., *The Foundations of Engineering Contracts*
7. Knocke J., *Post-Construction Liability and Insurance*
8. Masterman J. W. E., *Introduction to Building Procurement Systems*
9. Pike A., *Practical Building Forms and Agreements*
10. Stephenson D. A., *Arbitration Practice in Construction Contracts*
11. Trickery G., *The Presentation and Settlement of Contractors' Claims*

CIV4202 Water Resources Engineering II

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	0	45	100	60	40	3

Course Description
This course is intended to build on the earlier courses of hydrology and water resources engineering by discussing more of the recent applications in water resources management. These include advanced techniques for groundwater assessment, integrated water resource management, remote sensing techniques and global information systems, hydropower engineering, river engineering and rainwater harvesting.

Objectives
- To learn about advanced techniques for assessing groundwater availability
- To learn about the principles of integrated water resource management
- To learn about remote sensing and GIS concepts
- To learn about hydropower and river engineering
- To learn about irrigation and drainage management
- To learn about rainwater harvesting

Course Content
1. Groundwater [9CH]
   - 1.1 Geophysical Surveys
   - 1.2 Well Design and Construction
   - 1.3 Contaminant Flow and Remediation
   - 1.4 Groundwater Models
   - 1. 5 Groundwater Quality

2. Integrated Water Resources Management [6CH]
   - 2.1 Definitions and Case Studies
   - 2.2 Water Economics
   - 2.3 Health And Agriculture 2.4 Water Governance

3. Remote Sensing Techniques [9CH]

3.1 Digital Image Processing
3.2 Geographic Information Systems
3.3 Spatial Analysis
3.4 Applications

4. Hydropower Engineering [6CH]
4.1 Planning and the Environment
4.2 Design Components
4.3 Types of Dams

5. River Engineering [6CH] 5.
1 River Hydraulics
5. 2 River Mechanic s
5.3 River Surveys and Models
5.4 River Management

6. Irrigation and Drainage [6CH]
6.1 Crop Water Requirements
6.2 Irrigation Practice
6.3 Soil Water Plant Relationships
6.4 Salinity in Soils
6.5 Water Application
6.6 Drainage Systems

7. Rainwater Harvesting [3CH]
7.1 Benefits
7.2 System Components
7.3 Quality

7.4 Agriculture and Domestic

Learning Outcomes

On completing the course the student should be able to:

- To appreciate advanced techniques for assessing groundwater availability
- To appreciate the principles of integrated water resource management
- To apply remote sensing and GIS techniques
- To apply techniques in hydropower and river engineering
- To design irrigation and drainage schemes
- To design rainwater harvesting schemes

Mode of teaching/delivery

The mode of delivery is through lectures and tutorials. **Mode of Assessment**

Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff

Dr. A. Rugumayo
Mr. Max Kigobe
Mr. Michael
Kizza **References**

1. Shaw, E.M., *Hydrology in Practice,* Chapman and Hall, 1994, London, UK
2. Mansell, M.G. *Rural and Urban Hydrology,* Thomas Telford, 2003, London, UK
3. Arora, K.R. *Irrigation, Water Power and Water Resources Engineering,* Standard Publishers, 2007, New Dehli, India.
4. Subramanya, K., *Engineering Hydrology,* 2nd Edition 2001,Tata McGraw Hill, New Dehli, India
5. Todd, D.K., *Groundwater Hydrology*, 2nd Edition, John Wiley and Sons, 1980, New York, USA.
6. Julien, P. Y., *River Mechanics* ,Cambridge University Press, 2002, Cambridge UK

7. Rugumayo, A.I., *An Introduction to Hydrology and Water Resources Engineering, Lecture Notes,* Kampala, 2010

CIV4203 Civil Engineering Economics

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	0	45	100	60	40	3

Course Description

Engineering Economics course introduces students to economics principles and methods, and accounting principles which will enable them to understand the socio-economic environment.

Objectives

- understand economic and accounting principles
- carry out a cost analysis and estimation of project costs

Course Content

1. Introduction of Economics [15CH]
   - 1.6 History of economic thought and definition of economics
   - 1.7 Macro and Micro economic
   - 1.8 Economics laws and applications
   - 1.9 Assumptions and methods of economics
   - 1.10 Cost benefit analysis, prices, wages, rent, interest and profit
   - 1.11 Economic planning and development

2. The social framework [8CH]
   - 2.1 Population, allocation of economic resources, demand and supply concepts
   - 2.2 The structure, organization and ownership the means of production
   - 2.3 National income, GDP, GNP

3. Accounting [15CH]
   - 3.1 Its components and determinants
   - 3.2 Methods of estimating costs
   - 3.3 Single price methods - annual rate of return
   - 3.4 Unit methods
   - 3.5 Superficial area methods
   - 3.6 Elemental methods
   - 3.7 Approximate methods

4. Introduction to cost planning and cost control techniques [7CH]

Learning Outcomes

On completing the course the student should be able to:

- Explain the strengths and weaknesses of the various investment decision criteria.
- Use capital budgeting techniques to analyse the profitability of any investment.
- Use MS-Excel to build cash flow models that can be used for investment decision making and valuation.

Mode of teaching/delivery

The course shall be conducted through lectures and tutorials.

Mode of Assessment

Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff

Mr. Muyonyo Geoffrey Mukiibi

Reading/Reference Materials

1. Brealey, Myers and Allen (2008). *Principles of Corporate Finance* (9th ED). McGraw-Hill, New York.
2. S. Lumby (1994). *Investment Appraisal and Financing Decisions,* Chapman & Hall, London.

CIV4204 Civil Engineering Environmental Quality Management

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	0	45	100	60	40	3

Course Description

This course deals with ecosystems-life support systems in the environment, water quality management, air pollution and control, noise pollution, land use & control of soil pollution, wetlands use and management, environmental legislation and policies, environmental impact analysis and monitoring of development projects.

Objectives

- Understand the major causes of environmental pollution and its impacts locally and globally.
- Appreciate the range of pollution mitigation strategies (Best Management Practices).
- Introduce the legislation designed to protect the environment both locally and internationally
- Introduce the economic aspects of pollution and its control and the role of environmental assessments and education in pollution control.

Course Content

1. Introduction and definitions [5CH]
   - 1.1 Ecosystems
   - 1.2 Natural cycles (Biogeochemistry, hydrologic, nitrogen, carbon and sulphur)

2. Environmental legislation, policies and guidelines [5CH]
   - 2.1 Acts (Environment, Water, Mining etc)
   - 2.2 Conventions
   - 2.3 Policies
   - 2.4 Institutions

3. Environmental impact analysis [5CH]
   - 3.1 Definitions
   - 3.2 Objectives
   - 3.3 Components and Process
   - 3.4 Tools
   - 3.5 Environment Audit Introduction

4. Environmental monitoring of construction works [5CH]
   - 4.1 Stages of construction
   - 4.2 Pollution sources, effects and control

5. Water pollution control [5CH]
   - 5.1 Water quality and effluent standards
   - 5.2 Pollution sources, effects and control

6. Waste load allocations [4CH]
   - 6.1 Point and Non-Point sources
   - 6.2 Mass balance
   - 6.3 System models

7. Air pollution and control [4CH]
   - 7.1 Air quality

7.2 Pollution sources, effects and control

Noise pollution [4CH]
8.1 Pollution sources, effects and control

9. Wetlands protection [4CH]
   9.1 Types of wetlands
   9.2 Importance of wetlands
   9.3 Wetlands in Uganda
   9.4 Wetland protection

10. Control of land use/soil pollution [4CH]
    10.1 Pollution sources, effects and control

Learning Outcomes

On completing the course the student should be able to:

- Identify environment pollution, causes and related impacts in a given situation
- Identify and plan for pollution mitigation measures
- Design for pollution control systems in a civil engineering project
- Use environmental protection tools such as EIA

Mode of teaching/delivery

The course shall be conducted through lectures and practicals. **Mode of Assessment**

Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff Dr.
Robinah Kulabako Dr.
Charles Niwagaba Mr.
Herbert Kalibbala Mr.
Ronald Musenze

Reading/Reference Materials

1. *Environmental Engineering,* 1998 by Gerard Kiely, McGraw Hill International editions, 979 pp.
2. *Environmental Engineering and Sanitation* by Joseph A. Salvato. Fourth Edition. John Wiley & Sons, 1418 pp.
3. *The Civil Engineering Handbook,* 1995, W.F. Chen (Editor-in-Chief), CRC Press.
4. *Environmental Chemistry - a global perspective* by Gary W. vanLoon & Stephen J. Duffy, Second edition, 515 pp.
5. *NEMA Laws and Regulations.* Uganda National Environment Management Authority (NEMA) website: http://www.nemaug.org
6. Bruce, N., Perez-Padilla, R., Albalak, R. 2000. Indoor air pollution in developing countries: a major environmental and public health challenge. *Bulletin of the World health Organisation* 78(9), 1078-1092.
7. Cairncross, S., Feachem,, R.G. 1993. *Environmental Engineering in the Tropics, An introductory Text,* John Wiley & Sons.

CIV4206 Introductory Dynamics of Structures

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM		CU
45	0	0	45	100	60	40	3

8.

Course Description

This course deals with effects of dynamic loads (particularly earthquakes) on structures and the basis of seismic building codes

Objectives

- Enable the student to acquire an understanding of the dynamic effects on structures
- Introduce the students to the fundamental analysis methods of dynamic systems
- Introduce the students to seismic effects and to the design of seismic resistant systems.

Course Description

1. Basic Concepts [5CH]
   - 1.1 Static vs. Dynamic System
   - 1.2 Mass, Stiffness and Damping
   - 1.3 Linear and Non-linear systems
2. Methods of Discretisation [6CH]
   - 2. 1 Degrees of Freedom
   - 2.2 Lumped Mass Approach
   - 2.3 Generalised Displacements
   - 2.4 Finite Element Method
3. Single Degree of Freedom Systems [8CH]
   - 3.1 Equation of motion
   - 3.2 Single Degree of freedom system with force input
   - 3.3 Simple Pendulum system and other example of SDOF
   - 3.4 Direct equilibration method
   - 3.5 Energy method of formulating the equation of motion
4. Solutions to Equations of Motion [6CH]
   - 4.1 Undamped and damped free vibration response
   - 4.2 Response to Harmonic and Periodic loading

5. Multi Degrees of Freedom Systems [8CH]
   - 5. 1 Equations of Motion for simple 2DOF system
   - 5.2 Eigen values and Eigen vectors
   - 5.3 Damping in MDOF Systems

6. Applications [12CH]
   - 6.1 Influence of support excitation
   - 6.2 Accelerometers and Displacement meters
   - 6.3 Earthquakes, earthquake effects and Seismic Codes
   - 6.4 Seismic Coefficient Method
   - 6.5 Base isolation systems

Learning Outcomes

On completing the course the student should be able to:

- Create simpler computer models for engineering structures
- Better appreciate the seismic codes of practice
- Apply the theory in the design of earthquake resistant systems

Mode of teaching/delivery

The course shall be conducted through lectures, tutorials and assignments.

Mode of Assessment

Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff

Mr. Moses Matovu Prof. J. A. Mwakali

Reading/Reference Materials

1. Handout from the lecturer
2. *Dynamics of Structures: Theory and Applications to Earthquake Engineering,* by A. Chopra
3. *Structural Dynamics and Vibrations in Practice* by Douglas Thorby
4. *Elements of Vibration analysis* by L. Meirovitch
5. *Protection of Educational Buildings Against Earthquakes,* a manual for designers and builders
6. US 319: *Seismic code ofpractice for structural designs*

CIV4209 Human Resources Management and Entrepreneurship

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	0	45	100	60	40	3

Course Description

Human resource management is concerned with managing people effectively in the workplace. This function is carried out by most managers in organisations. However, it is the duty of a specialist human resource manager to provide advice, guidance, assistance and support on employment matters to all those who have direct responsibility for the management of people in the organisation.

Objectives

- Emphasize skills and knowledge in human resource management
- Introduce entrepreneurship education

Course Content

1. Introduction [5CH]
   - 1.1 Nature of entrepreneurship and human resource management
   - 1.2 Human Resource Planning

2. Employment Legislation [10CH]
   - 2. 1 Employment law
   - 2.2 Civil rights legislation
   - 2.3 Employee protection laws

3. Human Resource Recruitment, Development and Management [15CH]
   - 3.1 Staffing
   - 3.2 Recruitment
   - 3.3 Compensation
   - 3.4 Progressive test

4. Managing Human Assets and Performance [15CH]
   - 4.1 Essentials of entrepreneur
   - 4.2 Developing a new venture business plan
   - 4.3 Business plan and formation
   - 4.4 Productivity and total quality management
   - 4.5 Labour-management relations

Learning Outcomes

On completing the course the student should be able to:

- Evaluate the History and Evolution of Human Resource Development
- Differentiate between Human Resource Management and Personnel Management

- Understand the linkage between Human Resource Management and Business Strategy
- Describe the basic scope and implications of major employment laws.
- Describe the legal restrictions governing employment including civil rights and employee protection laws
- Develop a human resource plan and design a valid staffing, recruitment and selection system.
- Understand the need of Training and Development in of individuals in organizations
- Analyze common selection methods.
- Identify techniques and approaches to employment interviewing.
- Design and implement a compensation system that is equitable, legal, motivating, and cost-benefit effective.
- Analyse the different disciplinary actions against employees and their consequences
- Understand principles in developing a good a business plan
- Provide guidelines for employee discharge and termination
- Evaluate productivity and total quality management
- Design and implement a Labour-management relations strategy

Mode of teaching/delivery

The course shall be conducted through lectures and tutorials.

Mode of Assessment

Assessment will be done through continuous interim assessments (assignments and tests) and a final examination. Interim assessment will carry a total of 40% and final examination will carry 60% of the final grade mark.

Proposed Staff
Mr. Hilary Bakamwesiga

Reading/Reference Materials

1. Dessler, G., Cole, N., and Sutherland, V. (2002). *Human resources management in Canada* (8th ed.). Scarborough: Prentice-Hall
2. Beardwell, I, Holden, L and Clay don, T (2004). *Human Resource Management - A contemporary approach* (4th ed), Financial Times Prentice Hall, Harlow
3. Bratton, J. and Gold, J (2003). *Human Resource Management - theory and practice,* Macmillan
4. Rob Adams, (2002). A Good Hard Kick in the Ass: *Basic Training for Entrepreneurs,* Crown Business

10 RESOURCES

2.1 Facilities

The Department, under the Faculty of Technology is housed in the old Faculty of Technology Building with additional laboratory and office space in the New Faculty of Technology extension (Environmental Engineering). Details of the available infrastructure within the Department are presented in Table 4.

2.2 Staffing

The Department has staff members that are sufficient to handle the courses under the programme. Where need arises, staff from other units of the University and part-time staff (in exceptional circumstances) are planned to be engaged in the teaching. The detailed list of staff is given in Table 5.

Table 4 Current infrastructure status

Infrastructure item	Number of rooms	Area Coverage (m^2)	Comments
Lecture room space	4	300	Additional space to be acquired in the new building

Soil Mechanics Lab	1	180	New Equipment to be acquired through the Presidential Pledge Initiative
Materials Lab	1	140	New Equipment to be acquired through the Presidential Pledge Initiative
Hydraulics Lab	1	140	New Equipment to be acquired through the Presidential Pledge Initiative
Public Health and Environmental Engineering Lab	1	160	Some state of the art equipment available with some few still needed. This is to be acquired through the Presidential Pledge Initiative, Millenium Science Initiative and development Partners (Sida, Italian Cooperation).
Computer Lab (School of Engineering)	1	60	80 computers, available and over 100 m^2 needed. Additional space will be available in the new building.
E-Lab (School of Engineering)	1	60	50 computers, 1 LCD projector
Office space	8	450	Quite sufficient

18	M. Namutebi	BSc, MSc	Full-time	Highway Engineering	Assist. Lec.	12
19	G. Kasangaki	BSc, MSc	Full-time	Geotechnical Engineering	Assist. Lec.	6
20	A. Buryegyeya	BSc, MSc	Full-time	Water Resources Eng.	Assist. Lec	4
21	G. Muyonjo	BSc, MSc	Full-time	Construction Mgt	Assist. Lec	4
22	R. Kizza	BSc, MSc	Full-time	Geotechnical Engineering	Assist. Lec	3
23	F. Mugisha	BSc, MSc	Full-time	Water Resources Eng.	Assist. Lec	4
24	H. Alinaitwe	BSc, MSc, PhD	Part-time	Construction Mgt	Sen. Lecturer	6
25	A. Rugumayo	BSc, MSc, PhD	Part-time	Water Resources Eng.	Lecturer	13
26	H. Bakamwesiga	BSc, MSc	Part-time	Environmental Mgt	Assist. Lec.	5
27	P. Musaasizi	BSc, MSc	Part-time	ICT and Eng. Mathematics	Assist. Lec.	3
28	G. Mwesige	BSc, MSc	Part-time	Highway Engineering	Assist. Lec.	7
29	D. Ssemukuutu	BSc, Msc	Part-time	Engineering Mathematics	Assist. Lec	2
30	A. Katumba			Engineering Mathematics		
31	C. Mwikirize			Engineering Mathematics		
32	Dr. Peter Lating	Bsc, Msc, PhD	Full time	ICT and Eng. Mathematics		
33	J. Clifton	Dip., Survey	Contract	Engineering Surveying	Surv/Assist	11
34	J. Magongo	BA (Arts)	Temporary	Communication Skills, English Language and Linguistics	Teaching Assist	
35	F. Ejones		Part-time	Economics for Civil Engineering		
16	R. Kulabako	BSc, MSc, PhD	Full-time	Public Health/ Environmental Engineering	Assist Lec.	14
17	M. Tumutungire	BSc, MSc	Full-time	Water Resources Eng.	Assist. Lec.	6