Makerere University
Faculty of Technology

Department of Civil Engineering

Diploma in Civil Engineering & Surveying

Curriculum for Accreditation

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1 BACKGROUND TO THE PROGRAMME

This programme was started in 2006, and was initially meant to be a Degree programme, but advice was given to start it as a Diploma programme to close the gap between the Civil Engineer and the Surveyor in the market, and thus reduce the risks of basing design and construction on faulty field data. Thus, it is market driven to lift the quality of service to the Civil Engineer from only measurements needed by the Civil Engineer to the collection and supply of FIELD DATA RELEVANT to the Engineer's design proposal. Thus a greater understanding of Civil Engineering projects, at field level, not design, is necessary than would be found in a Geomatics programme. This makes this programme somewhat unique, but it is entirely relevant to the high quality work expected from the modern Civil Engineer.

As it has always been hoped to replace this programme with a research based Degree programme, to produce graduates with the capability of coordinating relevant field data collection and supply in multi-disciplinary research projects, it was thought that the diploma holders be adjudged to have completed two years of the proposed degree programme when it is started. Thus, the entry qualifications for this Diploma programme should be that for a Degree programme.

2 JUSTIFICATION

The foremost justification for the training of field data collectors in civil engineering works is to **fill the gap** between the Surveyor and the Engineer to ensure projects are based upon adequate and reliable field data. The Civil Engineering Surveyor will protect the Civil Engineer's Client from a faulty project, protect the Financier and Insurer of the project from loss, and safeguard the reputation of the Civil Engineer.

The Civil Engineer is academically trained in design and needs a practically trained field-man to recognise all the relevant field data on which that design will be based. The Civil Engineering Surveyor needs to study matters relating to field recognition of data related to the different types of Civil Engineering project. This is an ever expanding study. His work is chiefly in the field, but professional, so field work is not considered as only for technicians. Therefore there must be a balance between Academic study and practice in his training.

In practice it has been found that Civil Engineering projects which fail, do so due to misconception, or are not feasible, or are due to poor preliminary design, each resulting from poor field data collection. Monitoring is seldom done, resulting in misconstrued maintenance of high cost which becomes necessary without notice. For this reason projects seldom last their design life period.

This programme is market driven, but it is also research led since what is taught is what has been gained from practical experience. The students are trained to derive theory from the particular, which is the essence of research work.

3. OBJECTIVES AND EDUCATIONAL OUTCOMES

The main objective of the programme of Civil Engineering Surveying is to educate students in order for them to achieve sufficient knowledge, skills and width of view to meet the demands of the job market and the national development objectives.

3.1 Educational Objectives Specifically,

the programme is intended:

i) To train and produce diploma graduates who are well grounded with skills and knowledge in the Civil Engineering Surveying discipline;
ii) To train students towards research and development;
iii) To instil entrepreneurial skills in students so as to ensure competitiveness;
iv) Employ practical thinking with commitment to economic, innovative and optimum use of resources;
v) Train engineering surveyors who are aware of the latest global challenges and how to handle them;
vi) Promote professionalism, work ethics and social values;
vii) Have a good understanding of the technical vocational foundation of Civil Engineering Surveying to facilitate self learning, particularly of experiential knowledge, and professional development.

3.2 Programme Outcomes

At the end of the course, the diploma graduate will be expected to have exposition of the following capabilities:

i) Ability to recognise adequately the normal field data relevant to the proposal of the Civil Engineer and how to collect it and present it significantly to the Civil Engineer.
ii) Ability to function adequately within a Civil Engineering Surveying team, whether working for a consultant Engineer, resident Engineer, Contractor, a Government body or a specialised private survey establishment.
iii) Ability to function on multi-disciplinary and multi-national teams.
iv) Ability to identify the basic survey field problems and compose an approach to the work in hand to avoid or overcome those problems.
v) Understanding of professional and ethical responsibilities at the place of work.
vi) Ability to communicate effectively in all written and oral forms.
vii) Understanding of the impact of Civil Engineering Surveying in the global, economic, environmental and social context.
viii) Recognition of the need for and the ability to engage in life-long learning.
ix) Knowledge of contemporary issues.
x) Ability to use modern surveying methods, instruments and software necessary for the collection of field data for modern Civil 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 a qualification at Diploma level.

5 REGULATIONS FOR THE DIPLOMA IN CIVIL ENGINEERING SURVEYING

Studies and examinations for the diploma in Civil Engineering Surveying shall be governed by the general regulations and statutes of Makerere University and in addition by the regulations of the College of Engineering, Design, Art and 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 Direct Entry Scheme:

An applicant should posses at least two advanced level passes of the Uganda Advanced Certificate of Education or its equivalent and the weighting system should be as follows:

Weight 3	Mathematics, and best of Geography, Physics, Economics, Surveying, Technical Drawing - as **Essential** subjects One of the remainder of Geography, Physics, Economics, Surveying; Technical Drawing - as **Relevant** subjects General Paper - as **Desirable** subject Any Other Subject **-** as **Other** subjects
Weight 2	
Weight 1	
Weight 0.5	

5.3 Mature Age Scheme:

Admission also can be granted by mature age entry scheme after passing two special mature age University examinations in aptitude and specialised knowledge relevant to Civil Engineering Surveying.

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.

All applicants, no matter the avenue of entry, must demonstrate, during their studies, a desire for an outdoor life.

5.5 Admission to other Years

Admission other than to the first year of the programme shall require a special resolution of the College Academic Board and permission of the Senate.

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 normally as follows:-

Course Work 40%
- Written Examination 60%

b) Course work shall consist of laboratory and practical work and progressive assessment (assignments/tests) each component assessed at 20%.

c) For a course without laboratory work, progressive assessment (coursework) shall carry 40%.

d) A minimum of two coursework assignments/tests shall be required per Course, preferably in the fifth and tenth weeks of each semester so that the examination is also a test for the third part of the semester, and the lead up to the examinations is not disturbed by the revision for, taking/conducting and marking a test. All practical coursework must be passed (at 50% of the mark allotted to coursework).

e) For industrial attachment/field training, assessment shall be by field supervisor assessment and by a report compiled by the candidate.

f) Courses CES xx02 and CES xx05 of the first and second year shall be examined by presentation before a panel which mark contributes up to 60% of the final course unit mark. A mark contributing up to 20% shall be allotted by the supervising lecturer for effort seen to be put into the practical work by the individual student. A mark contributing 20% of the marks shall be allotted as follows: for courses CES xx02 the text and drawings of interim reports should be separately marked; for courses CES xx05 a common mark given to each person of a student group engaged in a practical assignment.

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 School Board of examiners, composed of external and internal examiners appointed by Senate on the recommendation of the Academic Board of the College of Engineering, Design, Art and Technology (CEDAT) and chaired by the Dean of the School of Engineering.

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

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

(d) In an emergency, the Deputy Principal who is the chair of the Academic Board may act on behalf of the School Board of Examiners but must report the action taken to the next Meeting of these Boards. In so doing the Deputy Principal shall, however, act in consultation with the relevant Chair 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
90.0 - 100	A+	5.0	Exceptional
80.0-89.9	A	5.0	Excellent
75.0 - 79.9	B+	4.5	Very good
70.0 -74.9	B	4.0	Good
65.0 - 69.9	C+	3.5	Fairly good
60.0 - 64.9	C	3.0	Fair
55.0 - 59.9	D+	2.5	Pass
50.0 - 54.9	D	2.0	Marginal pass
45.0 - 49.9	E	1.5	Marginal Fail
40.0 - 44.9	E-	1.0	Clear Fail
Below 40	F	0.0	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 School of Engineering 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 School of Engineering 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 School of Engineering 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 College of Engineering, Design, Art and 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 College of Engineering, Design, Art and Technology shall publish Provisional Examination Results of candidates in every examination soon after the meeting of their Academic Board 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 College Academic Board 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 40% 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 College 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 Diploma

The diploma awarded to the successful candidate shall be designated as Dip.

6.23 Classification of Diploma

The diploma shall be classified according to the CGPA as follows:-

CLASS	**CGPA**
Distinction	4.40 - 5.0
Credit, Upper Division	3.60 - 4.39
Credit Lower Division Pass	2.80 - 3.59
Pass	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 DIPLOMA IN CIVIL ENGINEERING SURVEYING

7.1 Graduation Requirements

The Diploma in Civil Engineering Surveying shall be awarded to a Candidate who obtains a minimum of 79 credit units, gained from 27 Course Units all of which are core courses as indicated in Table 2.

Table 2: Requirements for Graduation

Year	***Core***	***Electives***	
One	**14**	**0**	14 Core Courses; No Electives
Two	**13**	**0**	13 Core Courses; No Electives
Total Courses	**27**	**0**	41 Core Courses; No Electives

The minimum requirement for graduation is 79 Credit Units

8 PROGRAMME STRUCTURE

The Diploma programme shall have the following structure:-

Two Preliminary Courses
- Four Core Practical Courses. They are prerequisite in the first three semesters
- Five Core Survey Courses
- Five Core Engineering Courses, They are prerequisite courses in the first three semesters
- Six Core General Courses
- Two Core Computer Courses
- Two Humanities/Art Courses
- One Industrial Attachment Course

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

Table 3: Course Outline

Semester I Core Courses (there are no electives)

Code	Course Name	CU	LH	PH	TH	CH
CES1101	Preliminary Surveying I	2	15	30	0	30
CES1102	Reading the Field (feasibility, preliminary design)	4	30	45	15	60
CES 1103	Environmental Studies I	2	30	0	0	30
TEC1101	Communication Skills for Technology	3	30	0	30	45
CES1104	Introduction to Data Collection	3	45	0	0	45
CES1105	Chainman Practice	4	0	120	0	60
CES1107	Journal, Double Entry Book-keeping	2	30	0	0	30
	Semester Totals	20	180	195	45	300

Semester II Core Courses (there are no electives)

Code	Course Name	CU	LH	PH	TH	CH
CES1201	Preliminary Surveying II	2	15	30	0	30
CES1202	Reading the Field (final design, construction) (prerequisite CES1102)	4	30	45	15	60
CES1203	Computer Studies I	4	45	30	0	60
CES1204	Data Collection (x y z fix)	3	45	0	0	45
CES1205	Leveller Practice (prerequisite CES1105)	4	0	120	0	60
CES1207	Materials	2	30	0	0	30
CES1208	Local Knowledge, Design Criteria	2	30	0	0	30
	Semester Totals	21	195	225	15	315
	First Year Totals	41	375	420	60	615

Recess Term Core Course

Code	Course Name	CU	LH	PH	TH	CH
CES1301	Industrial Attachment	5	0	300	0	75

Semester III Core Courses (there are no electives)

Code	Course Name	CU	LH	PH	TH	CH
CES2102	Reading the Field (maintenance, rehabilitation) (prerequisite CES1202)	4	30	45	15	60
CES2103	Computer Studies II	2	15	30	0	30
CES2104	Data Collection (instrument use and booking)	2	30	0	0	30
CES2105	Survey Assistant Practice (prerequisite CES1205)	4	0	120	0	60
CES2107	Insurance for Civil Engineering Surveyors	2	30	0	0	30
TEC2101	Sociology for Technology	3	45	0	0	45
	Semester Totals (incl. recess term)	22	150	495	15	330

Semester IV Core Courses (there are no electives)

Code	Course Name	CU	LH	PH	TH	CH
CES2201	Data Presentation	2	30	0	0	30
CES2202	Reading the Field (mutual influences) (prerequisite CES2102)	4	30	45	15	60
CES2203	Environmental Studies II	2	30	0	0	30
CES2204	Data Collection (further instruments and methods)	2	30	0	0	30
CES2205	Junior Surveyor Practice (prerequisite CES2105)	4	0	120	0	60
CES2207	Law for Civil Engineering Surveyors	2	30	0	0	30
	Semester Totals	16	150	165	15	240
	Programme Totals	79	675	1080	90	1185

9 DETAILED COURSE CONTENT CES1101: Preliminary Surveying I

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WE	WCM	CU
15	30	0	30	100	60	40	2

Course description

The beginners course in surveying. This course includes the very basics of surveying concepts and methods of measurement, using such equipment as tapes, rods, compass and hand held clinometers. The course is just to kick start the student in surveying. **Objectives**

- The purpose of this course is to introduce the student to what is meant by surveying, both theoretically and in practice.
- Grasp the student's interest in achieving by doing.
- Help the students to get to know each other and to work as a team. **Course outline**
- Units of measurement of length and angle;
- Simple measurement equipment and its care; [4CH]
- The 3D reality recorded on a 2D medium;
- Orientation;

- Establishment of survey stations;
- Control and detailing;
- Difference between a geometric and a survey line;
- Ranging;
- Well conditioned geometric figures; [20CH]
- Measurement of angles;
- Measurement of elevation;
- Picking of detail;
- Scale and plotting; [6CH]
- Simple setting out. **Learning outcomes**
- The student should be motivated sufficiently to seek further knowledge and skill in measurement practice.
- The student should distinguish between what makes up the control and what is the detailing;
- The student should be able to work along with his/her peers.
- The student should be able to accomplish the measurement of a simple topographical site survey and plot it to scale.

Method of teaching

Lectures and practicals, with self study (own notes and ideas) and group study (discussions). **Mode of assessment**

Coursework will include both assignments and plotting work (including booking methods). Written examination at end of semester.

Proposed staff

Mr. Yunis Luswa

Reading/reference materials

At this early stage, it is recommended that the students do not read text books, nor seek anything on the internet. The reason is twofold: The student cannot distinguish what is relevant and what is not, so there is danger of his/her picking up wrong ideas. The student must learn from doing (experiential knowledge), rather than from reading (theoretic knowledge).

CES1102: Reading the Field (general features, design concept)

LH	PH	TH	CH	WTM	WE	WCM	CU
30	45	15	60	100	60	40	4

Course Description

Reading the Field, or Field Data Recognition is a basic professional activity of the Civil Engineering Surveyor. This does not treat of design, but of those features in the field which may have a bearing on the design proposal of the Civil Engineer. The Engineer explains his/her viewpoint in the classroom, the Surveyor shows examples in the field. Then the students observe and explore for themselves. This semester the students will study the general features of different civil engineering project types and the manner in which a design concept is gained.

Objectives

- The purpose of this course is to acquaint the student with the different common project types found in civil engineering, and the manner in which a design proposal is conceived.
- It gives the experience of meeting field data through visits to sites
- It trains in field data collection (measuring, counting, sketching) and in report writing

- It brings an awareness of safety precautions that are incorporated into the design both for the project itself and the general public (including the Surveyor and his/her team while working)
- It gives a basic understanding of how to handle field work. **Course Outline**

1. The Surveyor's requirements while in the field

- Accommodation, security
- Availability of casual labour
- Camp needs (water, provisions, medical facilities)
- Datum points
- Fuels, vehicle repairs [1CH]
- Materials (cement, sand ballast, iron rods, pegs, hardware)
- public transport, means of communication
- letter of introduction

2. General

Common matters

Vested interests, Avoid verbal understandings. Have everything on paper Assurance that there is no dispute over ownership of the land Relationship with legal tenants of the land, Encroachment Depicting the legal/physical boundaries on mapping [1CH]

Drainage pattern coming onto site or nearby plots is all important Trial pits and/or auger holes to depth of foundations for soil sampling Depth to rock, water table, rock outcrops, Safety precautions

Power lines

Different types of power line (overhead, underground)
The reason for different voltages, how to recognise them and their different requirements
Phases, Cables in catenary [1CH]
Clearance, Fall distance ***Microwave linkage***
Different radio waves and their effects
Interference [1 CH]

Tower sites Intervisibility

Hydraulics Structures (Dams, Weirs, Barrages and Reservoirs)

Catchment area

River flow, delayed flow, regular flow, seasonal flow, peak, low, flow control, flooding, mean annual rainfall, length of dry season [1CH]

Dam wall, abutments, impermeable membrane, leakage, spillway, earth filled, concrete, fish bypass, debris

Impoundment area (reservoir capacity) ***Drinking Water Supply*** • Hydraulic gradiant [1CH]

Sewage Disposal

- Fluid carrying solids
- Combustible gases [1CH]
- Unpleasant smell

Refuse disposal

Recycling (types of refuse) Collection sites
Dumping site requirements (Influences) [1CH]

Collection schedules

Drainage & Flood Control Weight of water

Keep movement slow [1CH]

Keep volumes small

Irrigation

Keeping soil wet [1CH]

Architectural and Factory Sites

Will a simple slope measurement do? or is a contour plan necessary? Services near and on the site [1CH]

Access to the site

Roads Railways

Curves, horizontal, vertical

Super-elevation, widening [1CH]

Sight distances Drainage, structures

Airports

Types of aeroplanes and their ground needs Airspace

Airport facilities [1CH]

Ground space

Precision surveys (Tunnels, deformations)

- The control, connecting the two ends directly, or reliance on government points, or use of GPS
- Control in the tunnel during construction
- Obtaining direction in an excavation [1CH]
- Setting permanent stations for deformations
- Checking for movement in three dimensions
- Checking for rotation in each of three dimensions ***Sub-surface work***
- Contouring an underground layer
- Measuring dip and strike
- Electrical resistivity methods [1CH]
- Aquifer capacity

Sub-aquatic data

- Bridge or jetty piers
- Shipping lanes [1CH]
- Harbour clearance
- Shoreline protection

Surveys for Conception of proposal General

- Accessibility
- Later expansion
- Built up areas
- Climate, Vegetation [4CH]
- Terrain (sites and routes), Drainage pattern, Rock outcrops
- Way-leaves/reserves, Environmental effects

Power lines

- Economic activity at terminals and en route [4CH] ***Microwave linkage***
- Objects of interference

Hydraulics Structures (Dams, Weirs, Barrages and Reservoirs)

- Weir or dam (water depth)
- Siting [4CH]
- Geological structure
- Construction material availability ***Drinking Water Supply***
- Watershed, Population
- Livestock, Irrigation, Industry [4CH]
- Water quality ***Sewage disposal***
- Airport position, Aquifers, Existing water supply
- Factories and their type, Factory effluent needs [4CH]
- River reserves
- Treatment works site ***Drainage and Flood Control***
- Disposal area
- Topographical drainage system, Upstream vegetation cover [4CH]
- Urban or rural setting
- Erosion, Hydrological flows ***Irrigation***
- Access to inputs and market
- Water sources, natural drainage, opencast mining
- Natural vegetation [4CH]
- Land reclamation
- Type of irrigation (drip, basin, spray, furrow, provision of water to small-holders)

- Drainage from area ***Architectural & Factory sites***
- The conception is in the mind of the Principal Client, and the Architect or Engineer [4CH]

Highways (and railways where applicable) Airports

- Economic activity at each terminal, Economic activity en route
- National and Regional corridors
- Urban areas [4CH]
- Present road/railway network]
- Raw materials ***Precision Surveys (tunnels)***
- Geotechnical aspects
- Geological indications

Learning Outcomes

On completion of the course, the student will: [4CH]

- Have gained a general understanding of the common Civil Engineering project types met with in practice.]
- Have gained from the experience of a practising Engineer regarding the field data needs of the Engineer during his/her concept of a design proposal,
- Have experienced the field reality of field data collection under the guidance of an experienced Surveyor
- Have increased their powers of observation for engineering data
- Have learned to write simple reports
- Have learned the principles of safety in respect of field work on projects. **Method of teaching**

2 hours a week are taken up by a practising Engineer talking with the students. Then a further 2 hours a week are in the field under the guidance of an experienced Surveyor. Then the students are given an assignment to carry out in the field and report on. Students are encouraged to seek solutions to problems through discussions with Engineers and Surveyors, as also to make use of the library and the internet. **Mode of assessment**

The reports are marked as Coursework. Examination is by two individual oral presentations a semester. **Proposed Staff**

Dr. Musaazi	Eng. Peterson	Eng M Kizza
Dr. C Niwagaba	Dr. Max Kigobe	Eng. M Mutebi
Dr. B Mangeni	Mr. J Clifton	Dr. R Kulabako

Reading/reference materials

Most Books on Civil Engineering topics deal with design, which the student does not need.

[1] John J. Clifton, *Surveys for Civil Engineering Projects* Vols. I & II (Unpublished but available from the author to students for reading). Relevant sections.

[2] *Overhead Power Lines, Planning, Design, Construction* F Kiessling P Nefzger JF Nolasco U Kaintzyk ISBN 978-3-540-00297-0 *[3]* Keywords on internet: refuse refuse disposal

CES1103 Environmental Studies I

LH	PH	TH	CH	WTM	WE	WCM	CU
30	0	0	30	100	60	40	2

Course description

The Civil Engineering Surveyor must understand the site. Not all the students will have studied Geography at 'A' level, in particular physical geography. Here it is presented in a more practical form. The student learns the basics of natural landforms and their metamorphosis and the effect Civil Engineering projects have on the environment, and the environment on any Civil Engineering project. This subject is seen as important enough to be split into two courses (See CES 2203) **Objectives**

- Expound the environment, as the context of the site, within which the Engineer is working
- Show the effects the engineering project has on the environment
- Show the effects the environment has on the engineering project **Course Outline**

1. *Natural phenomena*

- Types of landforms
- Elements of weather: precipitation, temperature, winds and pressure.
- Weather patterns in tropical, sub-tropical and temperate areas
- Types of drainage [15CH]
- Natural vegetation: their characteristics and distribution
- Origin of soils

2. Human influence on the physical environment

- Types of land uses
- Land degradation and pollution
- Climatic change [15CH]
- Refuse disposal, sanitation, pollution. **Learning Outcomes**

The student should know

- What to expect of nature and what not to expect
- How nature reacts to human activity **Method of teaching**

Lectures, self study, group discussions of observations made.

Mode of assessment

Assignments, tests, written examination

Proposed Staff

Mr. H. Bakamwesiga

Reading/reference materials

There are a variety of publications on the Environment, Physical Geography and Geomorphology

[1] *Environmental Geotechnics* R W Sarsby ISBN 978-0-7277-2752-7 free reading on internet

[2] *Surface Processes and Landforms* Don Easterbrook 2nd Edition ISBN 978-0-1386-0958-0

[3] *Fundamentals of the Physical Environment* Peter Smithson Ken Addison Ken Atkinson 4th Edition ISBN 978-0-415-39516-8

TEC1101 Communication Skills for Technology

LH	PH	TH	CH	WTM	WE	WCM	CU
30	0	30	45	100	60	40	3

Course description

The engineering surveyor is in the field amidst society, so effective communication to varied audiences and clientele is a key virtue that a civil engineering surveyor must possess. Communication is a tool through which work gets done, ideas get sold and defended. This course introduces to the students to principles of organization, development, and writing of technical documents; and instils in them skills of listening, speaking and interaction. **Objectives**

- To develop the skills of reading, listening, speaking and interaction
- To cultivate technical writing and documentation skills
- To enhance the student's public and formal presentation skills **Course Outline**

1. ***Interpersonal Skills***
   - Reading both individual and public
   - Listening Skills
   - Speaking, Interaction, and Conversational Skills [15CH]
   - The Concept Team Work
   - Inter-Office and Intra-Office Communication
   - Conduct of Discussions and Dynamics of Meetings
2. ***Writing and Documentation Skills***
   - Note-taking
   - Writing Minutes
   - Writing Notice of Meeting and Agenda [15CH]
   - Preparing Formal Documents (Resume, Application Letters, Acceptance Letters, Resignation Letters, Memos, Circulars, Responses, Letters of Introduction etc)
   - Development of Technical and Academic Documents(Theses, Proposals, Dissertations, Laboratory Reports, Papers, Articles, Abstracts)
3. ***Oral Presentation Principles***
   - Visual and Computer-assisted presentation
   - Analysis and Design of Web Presentation
   - Choice and use of appropriate presentation tools [15CH]
   - Organising and presenting effective talk

Learning Outcomes

Upon completion of this course, the student should be able to:

- Exhibit effective skills in reading, listening, speaking and interaction
- Prepare technical and academic documents
- Effectively deliver Public and Formal Oral Presentations using appropriate Visual and Computer aids

Method of teaching

Lectures, self study

Mode of assessment

Assignments, tests, written examination

Proposed Staff

Mr. Joseph Magongo

Reading/reference materials

[1] Ros Jay, *How to Write Proposals & Reports that Get Results,* Pearson-Prentice Hall, 2003

[2] N. A. Saleemi, *Business Communication and Report Writing Simplified,* 1st ed., N. A. Saleemi Publishers, 1997

[3] *Messages: The Communication Skills Book* ISBN 1572240229
[4] *Conversationally Speaking* Alan Garner ISBN 1565656296
[5] *Creating Success: Successful Time Management* Patrick Forsyth

CES1104: Introduction to Field Data Collection

LH	PH	TH	CH	WTM	WE	WCM	CU
45	**0**	**0**	**45**	**100**	**60**	**40**	**3**

Course Description

Field Data Collection for the Civil Engineer is the first basic professional activity of the Civil Engineering Surveyor. It is the fieldwork of Surveying, but with a flexible approach suitable to the collection of field data (detail, features) that would be needed by the Civil Engineer. This course is a theoretic introduction and covers the background to field data collection.

Objectives

- The purpose of this course is to introduce Surveying in its general concept
- It shows the distinction between Civil Engineering Surveying and other types of Surveying, particularly Land Surveying with which it is often mistaken
- It presents the idea of field data collection for the Civil Engineer (inclusive) and how this differs from data collection in other forms of surveying (sampling)
- Field data collection is then expanded into its practical elements and constraints
- The first notions of the principles on which to act are introduced
- The major practical experiences to be encountered in the field are illustrated
- Many of the basics of instruments are introduced

Course Outline

1. ***The Work of the Civil Engineer and where the Civil Engineering Surveyor fits in***

- The variety of Civil Engineering project types and common field data related to each
- Objectives of Land Surveying and of Civil Engineering Surveying
  [6CH]
- Other branches of surveying

2. ***The Professional environment of the Surveyor***

- Balance of time, expense, logistics and flexibility while maintaining responsibility
- Mobility and accessibility
- Entry upon private, common and government land
  [5CH]
- Clearance of vegetation and compensation for damage

3. ***Principles of surveying***

- From known to unknown (Division of field data items into points)
- From whole to part (Types, location and establishment of survey stations and lines)
- Record only what is actually seen
  [6CH]
- Never make an assumption
- Every-thing must have a check

4. ***Precision and accuracy***

- Accuracy required for jobs: routes, sites

- Summation of accuracy
- Overview of measurement equipment and methods of measurement
- Precision of equipment and expected accuracy in their use (The eye; The telescope/optical magnification; Verniers; Micrometers; Scales; Vials; Hairs)

  [6CH]
- Units of measurement of length and angle
- Ranging of lines
- Establishment of well-shaped geometrical figures; Factors favouring well-conditioned triangles
- Copy errors

5. Control

- Construction of simple control frames using combination of linear and angle measurements, keeping the plotting in mind
- Construction of geometric shapes such as right angles, triangles, rectangles and squares and their interconnection
- Checks on measurements

  [6CH]
- Simple booking methods for readings
- Corrections to tape readings (Standardisation, temperature correction, tension, alignment)
- Slope correction; Determination of horizontal distance
- Obstructions to taping and sight, and solutions
- Types of errors arising from taping and their treatment (mis-readings,
- Detection of misclosure

6. Introduction to angular measurement

- Derivation of and measurement of horizontal angles
- Centring and levelling of instrument [6CH]
- Proper stance by pole-holder
- Magnetic attraction and remedies.

7. Introduction to levelling

- Distinction between a horizontal surface and a level surface
- Introduction of the concepts of back sight and foresight [6CH]
- Simple reduction of observations by rise and fall method;

8. Setting out

- Setting out a simple structure in plan; [4CH]

Learning Outcomes

On completion the student will:

Have a firm grasp of the fundamentals of Surveying in theory ready for the practice. Appreciate the work of the Civil Engineering Surveyor in relation to the Civil Engineer. Have met case studies of the collection of different types of field data. **Method of teaching** Lectures, case studies, group discussions.

Mode of assessment Assignments, tests, written examination

Proposed Staff

Mr. J Kakeeto

Reading/reference materials

At this early stage, it is recommended that the students do not read text books, nor seek anything on the internet. The reason is twofold: The student cannot distinguish what is relevant and what is not, so there is

danger of his/her picking up wrong ideas. The student must learn from doing (experiential knowledge), rather than from reading (theoretic knowledge).

CES1105 Practice at Chainman level

LH	PH	TH	CH	WTM	WE	WCM	CU
0	120	0	60	100	60	40	4

Course description

This course is a basic to the profession. It uses what has been learned in CES1101, CES1102 and CES1104. Practice should come instinctively, as with riding a bicycle. It must be flexible to cater for an international private sector (mostly) clientele. The practice of surveying cannot be taught by handouts and assessed by written examinations, nor made to comply with a single method of record keeping.

The chainman is characterised by having the right people and right equipment and materials in the right place at the right time.

The student groups are taught how to carry out tasks and then supervised as they work on their own.

Objectives

- The purpose of this course is to give practice with the instruments that can be handled at this level in the field
- To teach a methodical approach to field work at this level
- Face the problem of collecting field data relevant to a civil engineering proposal.
- Tackle some practical issues in the field at chainman level
- Promote practical creativity and vision.

Course Outline

- Timesheets for calculation of speed of performance. The necessity for filling in field sheet headings
- Experience Book, to record experiences in writing
- Measuring in the three dimensional world to produce two dimensional scaled plan drawings
- Caring for and using different types of tapes. Tape manipulation
- Use of Abney level, optical square and compass [60CH]
- Flat and catenary taping with their different booking methods and reductions
- Checks against gross error
- Calculation of accuracy obtained
- Practice in detailing with offsets, tie lines and sight lines
- Drawing of detail to scale.

Learning Outcomes

On completion of the course, the student should be able to:

- Write up the field sheets orderly and legibly with reading in tabulated form.
- Carry out simple tape site surveys efficiently and speedily, including foreseeing what is to be done next and having the equipment in the right place ahead of time
- Be familiar with the instrumentation.
- Reduce for slope in the tape readings
- Plot the control to scale, determining accuracy and adjusting small misclosures
- Plot Engineering field data onto the drawing
- Carry out field checks **Method of teaching**

Practicals in the field

Mode of assessment
Field sheets and scale drawings constitute the coursework, examined by two individual presentations during the semester.
Proposed Staff
Mr J Kakeeto Mr J Clifton
Reading/reference materials
"By virtue of the simplicity of the underlying principles of plane surveying, there is little of theory to be studied, and a training in the subject must chiefly be directed towards a thorough working knowledge of field methods and the associated instruments, as well as office routine. Success in the field is the outcome not only of skill in solving the larger problems connected with the general organisation of surveys, but also of attention to the methodical performance of the numerous details of field work. Frequent practice in the field under expert guidance saves the beginner much memorising of these details, makes for skill and speed in manipulating instruments, and promotes systematic habits of work." *Plane and Geodetic Surveying for Engineers* David Clark 5th edition revised by James Clendinning
Books can mislead in the early stages of practice. Practice should come first, so that books augment the practice, otherwise the student memorises rather than acquires skills.
[1] Surveying and Mapping for Field Scientists Robert Wright, Michael Wood, William Richie, David Tait
ISBN 9780582300866

CES1107 Journal and Double Entry Book-keeping for Civil Eng Surveying

LH	PH	TH	CH	WTM	WE	WCM	CU
30	0	0	30	100	60	40	2

Course description
Accounting for funds both in the field and in the survey firm is essential for an organised profession. It is extremely easy for funds to go astray in the field. The student has to learn to handle project funds when in the field and in the office and be properly accountable. **Objectives**
- Appreciation of funds security, even small amounts
- Realisation of the responsibility of the individual in respect of funds
- The necessity of having a loophole free system of accounting, and the means to approach that ideal

Course Outline
1. *Theoretical frame work of Accounting*
- Introduction
  Definition of accounting and its roles
  Users of accounting information [3CH]
  Desirable qualities of Accounting information
- Accounting regulatory framework (accounting rules)
  Accounting principles [3CH]
  Accounting standards

2. The Accounting Equation and the balance sheet [2CH]
3. Double Entry system and preparation of Accounts
- What is double entry? [1CH]
- Journals - Books of original entry General journal
  Day books, purchases journal. [3CH]
  Other office journals
  Field journals and transfer of funds between persons.
- Ledgers General ledger Subsidiary ledgers Cashbook

Analysis book [6CH]

Handling of cash; Banking & cash transfers Petty cashbook Payroll

- Checking accuracy of double entry, Trial balance
  [2CH]
- Preparation of final accounts/financial Statements

  Trading and profit account (income statement) [3CH]

  Balance sheet
- Bank reconciliation [2CH]
- Fixed Assets, Asset Registers, Depreciation and Disposal of Assets
  [2CH]

4. Suspense Accounts and Correction of Errors [1CH]

5. Control Accounts

[2CH] **Learning Outcomes**

- Reliably account for funds, particularly in the keeping of journals
- Understand double entry book-keeping.
- Be able to read accounts
- Use accounts as an entrepreneurial basis

Method of teaching Lectures
Mode of assessment
Assignments, tests and written examination **Proposed Staff**
Mr B Magara
Reading/reference materials
[1] Mastering Book-keeping (free reading on internet)

CES1201 Preliminary Surveying II

LH	PH	TH	CH	WTM	WE	WCM	CU
15	30	0	30	100	60	40	2

Course description
A continuation of the beginners' course in surveying. It includes the basic surveying concepts and methods of measurement, and the basic equipment, with an emphasis on levelling, which has a major role in Civil Engineering projects. Much of this is introductory, while the Field Data Collection course CES1204 goes into more depth in some of the same aspects. **Objectives**

- The purpose of this course is to reinforce what is meant by surveying, both theoretically and in practice.
- To interest the student in further methods of measurement and their purpose.
- To particularly interest the student in the level instrument as a means of measuring difference in height.
- Team work. **Course Outline**
- Fix, misposition, creep
- Corrections to linear measurements
  [2CH]
- The telescope
- Automatic level, its function and care [3CH]
- Permanent adjustments of level
- Point to point levelling, back sights and fore sights
- Grid levelling, intermediate sights
- Radial levelling, height of collimation [12CH]
- Profiling, cross-sectioning
- Curvature and refraction
- Bearings and angles
- The bubble vial, balancing by reversal [6CH]
- Theodolite structure, care
- Triangulation, traversing

Radial plotter, planimeter Conventional signs Interpolation of contours [5CH]

- Curve setting out by tape

[2CH]

Learning outcomes The student should:

- Have an interest in what can be achieved with the different methods of measurement, using the level and theodolite instruments..
- Should be able to take proper care, and adjust the instruments, or take the necessary action when an instrument is not in adjustment.
- Should be able to check his/her work.
- Produce contoured scaled drawings. **Method of teaching**

Lectures and practicals, with self study (own notes and ideas) and group study (discussions).

Mode of assessment

Coursework will include both assignments and plotting work (including booking methods). Written examination at end of semester.

Proposed Staff

Mr Y Luswa

Reading/reference materials

[1] John J. Clifton, *Surveys for Civil Engineering Projects* Vols. III & IV (Unpublished but available from the author to students for reading). Relevant sections.

CES1202 Reading the Field (feasibility, preliminary and final design)
(Prerequisite CES1102)

LH	PH	TH	CH	WTM	WE	WCM	CU
30	45	15	60	100	60	40	4

Course description

This course is a continuation of the first semester course, but at the first three stages of a project. The students are now familiar with the project types. They have now to recognise the field data needed by the Civil Engineer for the feasibility study, the preliminary design and the final design. Students are encouraged to read up on what interests them in Civil Engineering topics. The Engineer gives his/her view in class, the Surveyor shows examples in the field, and then the students must observe and explore for themselves.

Objectives

- The purpose of this course is to explain by the Civil Engineer what common field data he/she needs at these stages of projects
- To draw from the student what common field data would be needed by the Civil Engineer
- To give the student the opportunity of verifying his/her data list on visits to sites
- It trains in greater discernment of field data and site identification
- Safety is stressed both for the students and for others.

Course Outline ***Surveys in the Feasibility study General***

Terrain
Vested interests [2CH]
Environmental impact, including agricultural/pastoral and social impacts

Power lines

Assessment of power supply need Difficult areas

- Route considerations ***Microwave linkage*** [3CH]
- Possible tower sites (access, accommodation, security, low flying aircraft)

Intervisibility [2CH]

- Reflective surfaces

Hydraulics Structures (Dams, Weirs, Barrages and Reservoirs)

- Reservoir capacity
- River profile, Flow sufficiency (size and nature of catchment area, likely changes) [2CH]

Water quality (effluents)

- Location (bowl shaped reservoir site with narrow, contracting wall site, geological outcrops or faults, alternatives)
- Spillway site, Material sites
- Downstream situation ***Drinking Water Supply***
- Number of sources, and their flow , Type of source, Field data for intake type
- Potential routes of the transmission mains
- Distances to and heights of potential storage sites/reservoirs [3CH]
- Distribution area
- Consumers ***Sewage disposal***
- Disposal area
- Population distribution
- Position of drinking water intake [2CH]
- Stream crossings, Terrain, Urban or rural area
- Vehicle service stations ***Refuse disposal***
- Drainage pattern near disposal site [1CH]

Drainage and Flood Control

- Stream use, Transportation systems
- Sampling of water and residues [2CH]
- Wetlands, Water table investigation
- Spread or confine water flows, Flash flooding ***Irrigation***
- Productive areas

- Infiltration rate of soil, Soil samples (for chemical properties, fertility tests)
- Water samples (for chemical properties, particularly salt)
- Health hazards (malaria, bilharzia) [3CH]
- Deforestation, Environmental impact
- Erosion and sedimentation ***Architectural & Factory sites***
- Site suitability to concept [2CH]
- Site ownership dispute

Highways (and railways where applicable)

- Existing road network
- Growth rates
- Existing and potential civil works [3CH]
- Terrain
- Traffic census

Survey at the Preliminary design stage

General

- Alternatives [1CH]

Sewage disposal

- Buildings, Erosion areas, Existing roads
- Flood areas, Natural drainage pattern
- Possible lower limit of future building expansion [3CH]
- Market places, Restaurants and hotels
- Reticulation mains, Treatment works site

Drainage and Flood Control

- Drain location obstacles
- Steepness of routes [2CH]
- Structures near route
- Maintenance proposal of the Engineer ***Irrigation***
- Advection, Anticlines
- Small scale contour mapping in plan, Contour interval
- Head-point / command area [3CH]
- Access through site
- Labour accommodation
- Gradients, Gravity flow

Highways (and railways where applicable)

- Rock cut
- Bridge / culvert sites, Borrow pit, quarry and water point sites
- Causeways, Junctions [2CH]
- Ground control for aerial mapping

Survey at the Final design stage

Power lines

• Placement of corner pegs with references

Profile along centre line and on reserve edges
Detail plan Substation sites Soil/rock investigation [2CH]

Microwave linkage

Structural effects of structure on which tower is to be constructed
Wind load

• Connection of site with cadastral mapping (without defining boundaries) [3CH]
• Soil or rock investigation

Hydraulics Structures (Dams, Weirs, Barrages and Reservoirs)

• Contour survey (ground, aerial, sounding)
• Side valleys
• Spillway crest level

[3CH]

• Water level markers (surge, Freeboard)
• Intake, pump house (housing, stores, vehicular access) ***Drinking Water Supply***
• Intake site, Raw water main, Treatment works
• Fresh water main, Storage tank sites
• Gravity distribution mains, Stream crossings, road crossings

[3CH]

• Pumping mains, Marker posts, Way-leaves, Probes to rock
• Communal water points, Break pressure tank sites, Balancing tank sites ***Sewage disposal***
• Distance between manholes
• Grease traps
• Large trees and tree roots, Probes to rock

[3CH]

• Road crossings, Rocky areas, Route location
• Soil types and sampling, Trial pits, Underground services
• Vehicular access ***Drainage and Flood Control***
• Final route location
• Profile
• Detailing of channels and obstacles

[3CH]

• Detailing of structures
• Grid levelling/cross-sections ***Irrigation***
• Water table
• Beacon placement, Canal/pipeline route establishment, Profiles

[3CH]

• Flumes, Inverted siphons ***Architectural & Factory sites***
• Topographical mapping, but showing services available and access to site

- Drainage onto, through and away from site
- Geotechnical considerations ***Highways (and railways where applicable)***
- Existing traverse points and height control
- IP positions, Curve data
- Bridge sites, Junction sites, Box culvert sites, Materials sites [4CH]
- Centreline setting, Profile and cross-sections, Earthwork calculations
- Trial pits/hand augering/soil samples/ depth of top soil **Learning Outcomes**

On completion of the course, the student will:

- Have gained from the experience of a practising Engineer regarding the field data needs of the Engineer during feasibility study, preliminary design and detailed design, and where the Surveyor fits into the process.
- Have experienced the field reality of data recognition at these three stages of a project under the guidance of an experienced Surveyor.
- Have increased their powers of observation for engineering data.
- Have learned to write simple reports.
- To be able to anticipate what engineering field data to expect.
- Be able to locate routes for pipes.

Method of teaching

2 hours a week are taken up by a practising Engineer talking with the students. Then a further 2 hours a week are in the field under the guidance of an experienced Surveyor. Then the students are given an assignment to carry out in the field and report on. Students are encouraged to seek solutions to problems through discussions with Engineers and Surveyors, as also to make use of the library and the internet. **Mode of assessment**

The reports are marked as Coursework. Examination is by two individual oral presentations a semester.

Proposed Staff

Dr. Musaazi	Eng. Peterson	Eng M Kizza
Dr. C Niwagaba	Dr. Max Kigobe	Eng. M Mutebi
Dr. B Mangeni	Mr. J Clifton	Dr. R Kulabako

Reading/reference materials

Most Books on Civil Engineering topics deal with design, which the student does not need.

[1] John J. Clifton, *Surveys for Civil Engineering Projects* Vols. I & II (Unpublished but available from the author to students for reading) Relevant sections.

[2] Periodicals, found in the library, with articles on interesting matters relating to Civil Engineering projects.

[3] *Dams and Weirs - An Analytical and Practical Treatise on Gravity Dams and Weirs and Butress Dams, Submerged Weirs and Barrages* W G Blich Courthope Press

[4] *Dams and Weirs* William G Bligh

[5] *Dams and Irrigation* M I Narasaiah

[6] *Dams and Geomorphology* P J Beyer

[7] FAO Fisheries and Aquaculture Dept. *Dams, Fish and Fisheries* Available on internet

[8] *The Drinking Water Book: A Complete Guide to Safe Drinking Water* Colin Ingram ISBN 9780898154368

[9] *Safe Drinking Water Advisor: A Compliance Assistance Resource* Awwa staff ISBN 9781583214121

[10] *Handbook of Public Water Systems* Hdr Engineering ISBN 9780442024062 John Wiley & Sons inc

CES1203 Computer Studies I

LH	PH	TH	CH	WTM	WE	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 surveying. **Objectives**

- Impart the basics of computer literacy **Course Outline**

1. Introduction and Overview

- Definition of Information and Communication Technology
- History and Evolution of Computing and Information Communication Technology
- The changing role of Information and Communication Technology in society [3CH]
- 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

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

3. Personal Computer Hardware

- Motherboard, Child-boards, and Circuitry
- Central Processing Unit: Control Unit, Registers and the Arithmetic Logic Unit
- Storage: Memory and Auxiliary Storage
- Buses: Types, USB and its advantages [4CH]
- Chassis
- Peripherals: Input and Output devices
- Expansion cards
- Power Supply and the Un-interruptible Power Supply (UPS)
- Connectors

4. Firmware

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

5. Software

- Definition
- Evolution
- System software(operating systems, device drivers, utilities and file management)
- Application software (definition and categorization) [3CH]

- Software development tools
- Licensing (Proprietary, Shareware, freeware, General Public License (GPL))

6. Office Automation

- Definitions
- Benefits of office automation [2CH]
- Overview of office automation tools (Personal Information Management, Office Suites)

7. Word Processing

- Definition and Evolution
- Types of Word Processors
  [4CH]
- Features of a word processor
- Word processing exercise

8. Spreadsheets

- Definition and Evolution
- Limitations of spreadsheets
- Features of a spreadsheet
  [4CH]
- Types of spreadsheet applications
- Spreadsheet exercises

9. Presentations

- Definition
- Preparation
- Features of presentation packages
  [2CH]
- Presentation exercise

10. Email and Browsing the Internet

- Definition of the Internet
- Uses of the Internet
- Netiquette
- Internet Browsers
- Search engines and Web directories
  [4CH]
- Email (Definition, Composing, Sending, Archiving, etc.)
- Email clients
- Information Literacy and lifelong learning (Definition and Implications of Internet Resources)

11. Practical work on computers [30CH]

Learning Outcomes

On completion of this course the student should be able to:

- Discuss the evolution of the computing and information communication technology,
- Identify the types of computers,
- Identify the hardware components of the computer,
- Execute basic office automation tasks including word processing, working with spreadsheets and preparing computer-aided presentations,

- Browse the internet and use email. **Method of teaching**

Lectures, computer laboratory tasks

Mode of assessment

Assignments, tests, written examination

Proposed Staff

Mr Olupot

Reading/reference materials

Available software manuals and general books on computers available in the library **CES1204 Field Data**

Collection (x y z fix)

LH	PH	TH	CH	WTM	WE	WCM	CU
45	0	0	45	100	60	40	3

Course description

Following from the introductory course, this course concentrates on the positioning of data found in the field in a three dimensional environment, and positioning it numerically and at scale on paper in a two dimensional format. It has a decided bias towards measuring relative heights (levelling) as the level is the easiest instrument to learn, and the concept of the vertical, and how to describe it on paper is the most fundamental parameter used by the Civil Engineer. **Objectives**

- The purpose of this course is to present Surveying in its measurement and positioning aspect particularly in regard to relative heights
- The basics of methods of measurement, particularly of heights, and the help given by different instruments are expounded
- The common pitfalls in measuring and positioning are pointed out
- How different types of errors occur and are propagated and how they are dealt with are explained.
- Positioning by coordinates.

Course Outline

1. Datums

- Plan datum, height datum
- National Benchmark systems
- Trigonometric points
- GPS stations [4CH]
- Disposition sketches;
- Station location sketches
- Map reading and interpretation

• Photo-memory development

2. Positioning

- Concept of fix, misposition, creep
- The effect of a grazing ray and how to avoid it
- Curvature and refraction, reciprocal levelling [3CH]
- Triangle geometry, triangle solution
- Combination of elevation and plan fixing
- Simple traversing and co-ordinate computation
- Simple triangulation

3. Errors

- Types of common error and how to deal with them
- Determination of accuracy [3CH]
- Instrument precision, selection of equipment

4. Angles and bearings

- Measurement vertical angles
- Manipulation of bearings in computational work [3CH]
- Following a bearing

5. Corrections to measurements

- Understanding of the need for reduction of slope to horizontal, and the reverse when setting out
- Avoidance of, but use of misalignment to avoid obstacles
- How a tape is standardized [3CH]
- The measurement of air pressure, its uses
- the measurement of humidity and when it is needed

6. Instruments

- Assistance of eye by instruments
- Faces and rounds [3CH]
- Permanent adjustments of a theodolite

7. Point to point levelling

- Use of paragraphing
- Checking by cuts [3CH]

8. Grid levelling

- The type of site where grid levelling is appropriate
- Setting out of grid using two baselines
- Use of baseline points as TBMs for link circuits
- Introduction of intermediate sights

[3CH]

Unique positioning by grid reference Booking for same for rise and fall reduction method ***Radial levelling and detailing***

The type of site where radial levelling/detailing is appropriate

Numbering of readings Sketch of reading positions

- Introduction of stadia readings
- Reading of horizontal angle
- Booking for reduction by height of collimation method
- Differences between the two methods of reduction

[3CH]

10. Plotting

- Plotting by coordinates

11. Contouring

- Following a contour on the ground
- Following a gradient on the ground

[4CH]

[3CH]

12. Profiling (long-sectioning)

- Distance measurements for reduction to chainage
- Graphical display

[3CH]

- Scales to be used

13. Cross-sectioning

- Field methods and instruments used in cross-sectioning
- Booking method and field method that caters for left and right directions from centreline
- Graphical display

[3CH]

- Scales to be used
- Overlay of formation

14. Knowledge (only) of cadastral surveying

- Introduction and purpose
- Method of placing and checking beacon positions
- Simple layout of plots
- Construction of beacons
- Land Survey Act
- Land Survey Board, Director of Surveys, Land Survey Regulations, Land Survey Licence

[4CH]

Learning Outcomes

The student should:

- Be totally familiar with the level instrument
- Know whether the level instrument is beyond adjustment, and how to proceed with the work
- Be able to position by coordinates and compute between rectangular coordinates and polar coordinates.
- Know the difference between reduction by rise and fall method and by height of collimation method, knowing when there is a check and when there is no check
- The student can interpret and interpolate contours.
- Know the boundary between Civil Engineering Surveying and Land Surveying.

Method of teaching

Lectures, case studies, group discussions.

Mode of assessment

Assignments, tests, written examination

Proposed Staff

Mr J Kakeeto

Reading/reference materials

[1] A. Bannister and S. Raymond *Surveying*
[2] J. Uren and W. F. Price *Surveying for Engineers*

CES1205 Practice at Leveller level

(Prerequisite CES1105)

LH	PH	TH	CH	WTM	WE	WCM	CU
0	**120**	**0**	**60**	**100**	**60**	**40**	**4**

Course description

This course uses what has been learned in courses CES1201, CES1202 and CES1204 in combination in field work The level is the most used instrument in Civil Engineering Surveying and the most usual choice for height control. The leveller needs to be absolutely reliable. Much practice is needed, as the work must be professional, even though used by junior members of the survey team.

The student groups are taught how to carry out tasks, then partly supervised and partly left to fend for themselves in accomplishing the tasks.

Objectives

- The purpose of this course is to give practice with the level instrument so as to use it fast and efficiently, and in its many uses
- To give a practical understanding of back sights, fore sights, intermediate sights and stadia readings, rises, falls, height of instrument, height of collimation, reduced level and angle and distance measurements for positioning
- To give a practical grasp of loop circuits, link circuits and open circuits, misclosures, checking by cuts and adjustments
- To show in practice when to reduce by rise and fall method and height of collimation method, what uses the rises and falls can be put to without reduced levels, and when they can be avoided by 'paragraphing', when is a reduced level safe to accept
- How to tackle sighting over long distances (valley crossing)
- How to adjust the level instrument (permanent adjustment)

Course Outline

1. *The level instrument*

- The makeup of the automatic level and tilting level
- Care of the level instrument
- Setting up of the level instrument, for backsight and foresight use, and centring over a station for radial use

  [5CH]
- Permanent adjustment of the level instrument (the circular bubble, the long bubble/cross hairs) The two peg test

2. Point to point levelling

- Exercise involving a Bench Mark and three stations to reduce by rise and fall, with totals, differences, misclosure and evaluation of accuracy
- Exercise in levelling from one Bench Mark through stations along a route, and returning along the same route, paragraphing the booking to avoid the need for rises and falls by using total rise/fall between stations

  [10CH]

- A double exercise, first levelling along the top of a bank and along the bottom of the bank. Secondly levelling in the order top to bottom at each set of points on/below the bank. The rises and falls in the second case give the height of the bank.

3. Grid levelling

- Setting out the grid in the form of two base lines with pegs at regular intervals, and tying it in, in plan
- Point to point levelling along both base lines in a loop circuit from and to a Bench Mark, reduction by rise and fall method and adjustment
- Laying the tape from one base line to the other (preferably longer than the tape), aligned with the equivalent pegs on each base line. What to do if it is found later that the tape was laid towards the wrong peg

  [10CH]
- Levelling from one base to the other at the same regular interval, but along the tape, using intermediate sights as much as possible (swings in the contours and a field check will check out erroneous readings), positioning according to grid reference. Reduction by rise and fall method
- Overlapping the ends of the grid lines for levels beyond the grid
- Taking a level along a line, but not at a grid interval. Taking a level that is off the grid lines
- Using grid lines as control for collecting detail by offsets
- This exercise may be plotted and contours drawn in the Data Collection course above, but the drawing will be used at the presentations for this course (The fieldwork belongs to this course and the plotting and contouring to the Data Collection course)

4. Radial levelling

- Choice of already fixed (in plan) station at which to set up, Height of Instrument (HI), Reference Object (RO)
- Use of stadia hairs, Hair check, Reading horizontal angle
- Numbering and sketching level/detail point readings. Method of booking (which can include split booking, i.e. one person taking the instrument readings while another, at the staff, fills in the sketch/remarks column, the two synchronised by the numbering of the points [10CH]
- Reduction by height of collimation method
- Simple tacky traversing
- This exercise may be plotted and contours drawn in the Data Collection course above, but the drawing will be used at the presentations for this course (The fieldwork belongs to this course and the plotting and contouring to the Data Collection course)

5. Profiling

- Centreline levelling
- This exercise may be plotted in the Data Collection course above, but the drawing will be used at the presentations for this course (The fieldwork belongs to this course and the plotting and contouring to the Data Collection course)

  [10CH]

6. Cross-sectioning

- Levelling so as to connect to the profile
  - Interval chosen to suit terrain
  - Extra cross-sections [10CH]
  - This exercise may be plotted in the Data Collection course above, but the drawing will be used at the presentations for this course (The fieldwork belongs to this course and the plotting and contouring to the Data Collection course)

7. Valley crossing

- Point to point level, to and back, between two distant points (not necessarily over a valley) which are at approximately at the same level, and then level directly from one to the other by setting up close to or over one and then close to or over the other. Compare results [5CH]

Learning Outcomes

On completion of the course, the student should be able to:

- Understand the level instrument, and how to care for it.
- Know when to use the different styles of levelling.
- Know the different booking styles for levelling.
- Carry out simple level surveys efficiently and speedily, for Bench Marks, for earthworks, etc..
- Know when to reduce by rise and fall and by height of collimation method. **Method of teaching**

Practicals in the field

Mode of assessment

Field sheets and scale drawings constitute the coursework, examined by two individual presentations during the semester.

Proposed Staff

Mr J Kakeeto Mr J Clifton

Reading/reference materials

[1] John J. Clifton, *Surveys for Civil Engineering Projects* Vols. III & IV (Unpublished but available from the author to students for reading). Relevant sections.

CES1207 Materials for Civil Engineering Surveying

LH	PH	TH	CH	WTM	WE	WCM	CU
30	0	0	30	100	60	40	2

Course description

This course provides students with essential knowledge on the properties, use of some of the most important materials used in civil engineering, including soil, aggregate, concrete, and geotechnical materials.

Objectives

- To explain what materials the Civil Engineer uses, their characteristics and how they can be manipulated.
- To make the student aware of the types of materials encountered in Civil Engineering works, and how this can affect a project
- To explain what tests are carried out on materials to determine their properties
- To give simple field tests by which the Surveyor may classify materials. **Course Outline**

1. Introduction to soil (gravel, sand and clay) and rocks

- Nature of soils,
- Soil structure and grain shape
- Phase relationships, [2CH]
- Chemical properties
- Physical properties (Plasticity, Grading size distribution, classification).
- Proper identification of sand, silts and clays,
- Classification of rocks

2. Water

- Types and quality of water,
- Ground water flow, [2CH]
- Seepage through soils,
- Flow nets,
- Pore water pressure and Piping.

3. Soil improvement

- Soil compaction
- Field control of compaction, [2CH]
- Soil stabilisation

4. Bearing capacity of soils

- Water of subsurface soil,
- Bearing capacity.

5. Concrete

- Constituents, additives, admixtures [2CH]
- durability, corrosion, cracking
- properties: strength, thermal and moisture movement
- new materials; concrete investigation

6. Timber

- Hardwoods and softwoods;
- Structural timber; [2CH]
- Laminates;
- Properties and decay

7. Bitumen

- Properties,
- Application; [2CH]
- New materials.

8. Soil exploration

- Methods of investigation,
- Sampling,
- Trial pits, Augering, Borehole logs, [2CH]
- Geophysical methods.

9. Practical work

[14CH] **Learning Outcomes**

Upon completion of this course the student should be able to:

- Identify materials used on Civil Engineering projects
- Understand the physical properties of these materials as well as their classification
- Understand some basic geotechnical characteristics of soil
- Know the process of soil improvement, the main additives used to stabilise soil
- Differentiate between choices of concrete mixes, and other materials such as timber, bitumen etc.
- Sample water, soils by trial pit logging, rocks, etc.
- Conduct investigations of materials in the laboratory and in the field. **Method of teaching**

Lectures, some of which can take place in the soils laboratory

Mode of assessment

Assignments, tests, written examination

Proposed Staff

Dr. D Kalumba

Reading/reference materials

Craig R.F. (1997) Soil Mechanics (6th ed.), Chapman & Hall Smith, M. J. (1998) Soil Mechanics (4th ed.), Longman, Eastbourne

CES1208 Local Knowledge, Design Criteria

LH	PH	TH	CH	WTM	WE	WCM	CU
30	0	0	30	100	60	40	2

Course description

An understanding of the terms used by the Civil Engineer enables the Surveyor to understand the mind of the Civil Engineer, which is vital in any proposal. The Engineer should not have to translate what he/she requires into survey terminology as this would still lead to misunderstandings between the two. The Surveyor should understand civil engineering projects and the terminology used. The Surveyor should also be able to understand the lay view of proposed Civil Engineering projects, and what lies behind such views. **Objectives**

- The purpose of this course is to familiarise the students with the parlance used by the Civil Engineer and act on it.
- The Surveyor should be able to gain an understanding of the 6iEws of the people inhaBiting the area in proximity To the site.
- The Surveyor should be able to gather helpful informatio. from the local pEople. **Course Outline**
- Definition of locAL knowledge, its boundaries and limitations
- Methods of gathering local knowledge and disseminating it in understandable termS to whoMeVer needs it.

[2CH]

- Understanding of confidentiality in gathering of local knowledge
- Terminology used by Civil Engineers in describing terrain, materials, machinery, shapes, sizes, avents, structuRes, etc. in Civil Engineering.

[28CH]

Learning outcomes

After completion, the student:

- Should not be at a loss when in conversation with a Civil Engineer.

- Should recognise when local knowledge is useful.

Method of teaching

This course could be extremely boring, therefore different lively ways of teaching are necessary. Slide shows with plenty of pictures and diagrams may help. The students should be free to move about to ward off drowsiness. Quizzes, discussions. Lectures. **Mode of assessment**

Assignments, tests, written examination

Proposed Staff

Mr. J Clifton

Reading/reference materials

Dictionary of Civil Engineering terms

CES1301 Industrial attachment I

LH	PH	TH	CH	WTM	WEM	WCM	CU
00	300	00	75	100	60	40	5

Course description

The student should enter the actual work environment and not a training scheme on the sidelines. The student is attached to a firm using Civil Engineering Surveyors or Related Professionals. It is at the level of the practice courses (CES1105 & CES1205) and is for ten weeks supervised by a department staff member. The student prepares a report discussOing the training environment, lessons learnt, challenges faced and recommendations. This report has to be approved by both the training officer at the firm and the student's supervisor and should be handed in to them before the beginning of the academic year. **Objectives**

By undertaking the Industrial Training programme, the student will be able to: • Communicate effectively with fellow workers and supervisors in issues related to projects undertaken.

Demonstrate and practice good working ethics and to internalize excellence. Attest and practice high-quality organizational skills in enhancing individual and group effectiveness and productivity. Demonstrate creativity and innovation in solving problems related to real-life projects. Exhibit pleasant interpersonal skills in developing understanding and appreciation of individual differences and interpersonal skills in building self-confidence. Work independently or under very minimal supervision.

Demonstrate good planning, good management, constant monitoring and quality delivery of project undertaken.

Course Outline

- The student is required to participate in the day-to-day activities at the organizations premises as a regular worker.
- This activity lasts for ten (10) weeks (300 hours) starting immediately after the end of examination of Semester II of the first 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

Method of teaching

Attachment to a work force

Mode of assessment

Two visits to site by a supervisor, an assessment by the training officer of the attachment firm and marking of the report by the supervisor. **Proposed Staff**

Supervisors are chosen individually for each student from among Department staff

Reading/reference materials

As appropriate in the prevailing circumstances. Often the firms have handouts, booklets or books available. Often students are helped in ICT skills beyond their level.

CES2102 Reading the Field (construction, maintenance, rehabilitation)
(Prerequisite CES1202)

LH	PH	TH	CH	WTM	WE	WCM	CU
30	45	15	60	100	60	40	4

Course description

This course is a continuation of the previous semester's course, but now at the stages of Construction, maintenance and rehabilitation. Monitoring for maintenance requires a good understanding of what is taking place in the life cycle of Civil Engineering projects. The students are encouraged to consult the standard design manuals for the standards projects need to fulfil and do much of the investigative work on their own.

Objectives

- The purpose of this course for the Civil Engineer to explain what common field data he/she needs at the stages of constructing, maintenance and rehabilitation projects
- Construction needs setting out, monitoring for maintenance needs constant observation, and a knowledge of the design criteria of projects, rehabilitation needs an understanding of cost effectiveness.
- To make the student observant to see the deterioration of Civil Engineering projects, and why.

Course Outline

Survey during the Construction stage General

- Verification of levels, directions and distances

[2CH] ***Power lines***

- Finding line between corner pegs, Measuring distances to tower sites

Calculation angle of tower skew at corners and junction sites [2CH]

Setting out foundation excavations, with levels Setting out substation sites ***Microwave linkage***

Setting out structure and accessories

Verticality [2CH]

Hydraulics Structures (Dams, Weirs, Barrages and Reservoirs) Setting out (core trench), Spillway Vegetation and overburden

Borrow pits (quantities) [2CH]

Blasting ***Drinking Water Supply*** Setting out works at sites

Trenching for pipes [2CH]

Sewage disposal

Treatment works site

Benching for trench digging [3CH]

Manhole placing ***Drainage and Flood Control*** Benching for trench digging

Placing of culverts [2CH]

Irrigation

Division of area into frames Benches for canal construction

Laser level for unit construction [3CH]

Bridges, Crossings

Canal linings, Division boxes, Drop structures, Off-takes ***Architectural & Factory sites***

Fitting building to site (absolute positioning)

Excavation [3CH]

Setting out (relative positioning) Checking construction positions, shape and levels ***Highways (and railways where applicable)***

Preliminary centreline setting, Earthwork calculation verification vegetation and top soil stripping, precision setting of centreline Bridge positioning, Culvert positioning, Drainage diversions, Traffic diversions Slope staking, Formation pegs, layers of material [4CH]

Material volumes, spacing of heaps, Mass haul diagrams Application of widening / super-elevation, Junction sites, Bus / lay-bys

Survey for Supervision of construction (where different from construction)

Power lines

- Correctness of excavations, Correct use of levels
- Straightness of lines, Verticality of towers/poles [2CH] ***Sewage disposal***
- As-built drawings

Highways (and railways where applicable)

- Preliminary centreline setting, Earthwork calculation verification
- Precision setting of centreline, Bridge positioning, Culvert positioning
- Application of widening / super-elevation, String lining [3CH]
- Junction sites, As-built drawings, Material volumes
- Compact test sampling ***Survey for Monitoring for maintenance***

General

- Are design criteria still met?
- Change of context? [2CH] ***Power lines***
- Condition of towers/ poles, Condition of reserve
- Change in external situation that affects the power line [2CH] ***Microwave linkage***
- Structures, roads etc. are dealt with in another course ***Hydraulics Structures (Dams, Weirs, Barrages and Reservoirs)***
- Flow change, Sedimentation, River control measures
- Sand harvesting, Seepage, Slippage [3CH]
- Condition of spillway lining, Livestock and wildlife use
- Deformation, Tampering with wall or spillway crest ***Drinking Water Supply***
- Leaks (pipes, air valves, washouts)
- Unprotected springs, intakes, tank sites, valves

[2CH] ***Sewage disposal***

- Biogas disposal
- Checking of flows [2CH]

Drainage and Flood Control

- Sedimentation of drains and culverts
- Misuse of drains, Capture of water flows into drains [2CH]
- Flood barriers

Irrigation

- Change of water quality, Change of water quantity
- Crop damage, Damage by livestock/wildlife [2CH]
- Deforestation, Flooding, Leaching, Sedimentation ***Architectural & Factory sites***
- Usually catered for

Highways (and railways where applicable) Airports

- Are design criteria still met?
- Pavement surface condition
- Drainage [3CH]
- Road use
- Structures

Survey for maintenance (where needed)

Highways (and railways where applicable)

- Data for maintenance schedule
- Investigations into deterioration or inefficiency of projects [3CH]
- Master plan

Survey for rehabilitation General

- Usually, old projects are re-designed to cater for new circumstances [2CH] ***Sewage disposal***
- Numbering of manholes
- Existing sewers, Invert levels
- Township plan showing sewers, Updating of maps [3CH]
- Video record

Highways (and railways where applicable)

- Data to show the exact problem, its extent and ramifications
- Data for economic and efficient solution to the problem [3CH]
- Data fob decision of whether to r%ha"ilitate, a"andon or redesign **Learning Outcomes**

On completion of the course, the student will:

- Have a knowledge of the survey requirements of construction of Civil Engineering projects.
- Be able to report on the st!ndard of a proj%cp in respect of th% official design standards.
- Be capable of drawing up a maintenance schedule.
- Be able to advise on rehabilitation, or redesign of a project. **Method of teaching**

2 hours a week are taken up by a practising EnginEer talking with the studdnts. Then a further 2 hou2s a week are in the field under the guidance of an experieNced Surveyor. Then the students are

given an assignment to carry out in the fiel$ and report on. Students are encouraged to seek solUtions to problems through discussions with Engineers and Surveyors, as also to make use of the library and the internet. **Mode of assessment**

The reports are marked as Coursework. Examination is by two individual oral presentations a semester. **Proposed Staff**

Dr. Musaazi	Eng. Peterson	Eng M Kizza
Dr. C Niwagaba	Dr. Max Kigobe	Eng. M Mutebi
Dr. B Mangeni	Mr. J Clifton	Dr. R Kulabako

Reading/reference materials

Most Books on Civil Engineering topics deal with design, which the student does not need.

[1] John J. Clifton, *Surveys for Civil Engineering Projects* Vols. I & II (Unpublished but available from the author to students for reading) Relevant sections.

[2] Design Manuals of the Ministry of Works, Uganda National Roads Authority, National Water and Sewerage Corporation, UMEME, etc.

[3] Laws in this and other countries relating to Civil Engineering projects, or the supply of services.

[4] *Textbook of Land Drainage(1916)* Jeffery Joseph A (University of California (on Google)

[5] *Flood Control and Drainage Engineering* SN Ghosh 3rd Edition ISBN 978-0-415-39890-9 (Includes GIS and remote sensing)

[6] *Urban Drainage* David Butler John Davis 2nd Edition ISBN 978-0-415-30607-2

CES2103 Computer Studies for Civil Engineering Surveying II

LH	PH	TH	CH	WTM	WE	WCM	CU
15	30	0	30	100	60	40	2

Course description

Map drawing by computer and provision of field data in soft digital form is essential. This course builds up the input as well as the use of the necessary software for these purposes. **Objectives**

- To introduce the computer as a working tool on the job
- Its use to record reading, reduce readings and compute
- Its use in plotting maps in plan and interpolate contours
- Its use in the field to keep accounts and to keep administrative records
- To produce new software for field methods adapted to particular circumstances

Course Outline

1. Spreadsheets

- Survey reduction and computational formulae
- Accounting and keeping records [7CH]

2. Cad software

- Autocad use as a basics to more advanced software for surveying
- AutoCivil or Land Development as a basis of plotting [8CH]
- Land Development for plotting maps

3. Programming

- Introduction to an appropriate programming language.(Java or C#)

4. Practical work [15CH]

Learning Outcomes

- Capable of recording field work on the computer, both manually and by downloading from instruments.
- Capable of computing on a spreadsheet or specifically designed software.
- Capable of drawing maps and diagrams on the computer.
- Capable of composing simple software programmes for unusual cases.

Method of teaching

Lectures, Computer laboratory tasks

Mode of assessment

Assignments, tests, written examination

Proposed Staff

Mr C Tembo

Reading/reference materials

[1] *AutoCAD 2009for Dummies* David Byrne ISBN 978-0-470-22977-4

[2] *Drawing Maps* Kate Torpie ISBN 9780778742678 Crabtree Publishing Co.

[3] *Drawing maps on the Computer* Available on the internet

CES2104 Field Data Collection (Instrument use and Booking)

LH	PH	TH	CH	WTM	WE	WCM	CU
30	0	0	30	100	60	40	2

Course description

This course moves on to the study of survey equipment, including instruments, particularly of the theodolite type, such as the tacheometer and total station, and methods of measurement concerned with coordinated positions and how to plot them to scale on a grid. It has a decided bias towards bearing and distances measurements and positioning by coordinates. **Objectives**

- The purpose of this course is still to present Surveying in its measurement and positioning aspect, but particularly in regard to plannimetric positioning
- The more in depth methods of measurement and the help given by different instruments are expounded
- The pitfalls associated with these methods are pointed out
- Flexibility in the booking of readings by following certain principles so as to be readable by any Civil Engineering Surveyor, cover the field and not be prone to error

Course Outline *1. The theodolite*

- The capabilities of the instrument, The axes of the instrument
- The necessity of proper centring and levelling, The instrument must not be disturbed
- The effects of climate and the weather, Carrying the instrument
- Sighting, reading, booking and angle reduction. Faces and rounds
- Types of theodolite. Precision. Development of the theodolite into the tacheometer, with EDM and total station
- Permanent adjustments of the theodolite [5CH]
- Its use for ranging, compared with ranging rods. Obstructions to ranging
- Use for levelling. Grazing rays. Curvature and refraction. 'You cannot beat the level'
- Tacheometric use of the theodolite. Accuracies expected
- Misposition

2. The Tacheometer

- How it differs from the theodolite, Its use, Precision and accuracies expected

[2CH]

3. The Total Station

- How it differs from the theodoite, The theory of the EDM, Its use at fixed and at free stations
- Functionality e.g. reflectorless readings, setting out

[4CH]

- Precision and accuracies expected, Working with software programmes

4. Intersection

- Datum point(s), Baseline measurement, Angle measurement and conversion to bearings
- Coordination of intersected point

[2CH]

5. Triangulation

- Baselines, Triangle shapes, Adding triangles to triangles
- Check against known point, Braced quadrilaterals

[2CH]

6. Trilateration

- Fixing / coordinating points by measuring the sides of triangles [2CH]

7. Resection

- 3 point, 2 point, Checks
- Finding a coordinated point in the field by a resection method

[2CH]

8. Traversing

- Method of rapid angle measurement along roadside t, Methods of distance measurement
- Bearing and distance computation to coordinates, Accuracy of a loop / link traverse
- Finding which angle is in error, Finding which distance is in error

[3CH]

- Methods of finding the direction in the field between two un-coordinated and non-intervisible points
- Measurement of a traverse offset from another traverse, such as a river-bed

9. Joins

- Quadrantal bearings [2CH]

10. Plotting by coordinates [6CH]

Learning Outcomes

On completion the student will:

- Be totally familiar with instruments of the theodolite and EDM types
- Be able to ascertain whether the instrument is faulty, and if so, what can be done about it
- Know what action to take in the field if stuck with a faulty instrument
- Be able to traverse to a sufficiently high degree of accuracy for the Engineer's proposal
- Know when to use triangulation, trilateration and resection, and use them reliably
- Be able to detail accurately by radial means
- Be able to set out with accuracy. **Method of teaching**

Lectures, case studies, group discussions.

Mode of assessment

Assignments, tests, written examination

Proposed Staff

Mr J Kakeeto

Reading/reference materials

[1] *Survey Engineering: A Guide to First Principles* JAL Cavill Media Services, La Trobe University, Bendigo, Victoria, Australia

[2] *Engineering Surveying* 5th Edition W Schofield

CES2105 Practice at Survey Assistant level
(Prerequisite CES1205)

LH	PH	TH	CH	WTM	WE	WCM	CU
0	120	0	60	100	60	40	4

Course description

The Survey Assistant should be familiar, in practice, with all instruments and methods of measurement. This practical course gives the opportunity for students to practice with most types of equipment in all the common methods of measurement, both in trying out what was learned in the course on data collection and in preparing for presentations in case studies in the course on Reading the Field. The student groups are encouraged to carry out the tasks mostly on their own. **Objectives**

- Fixing position of unknowns from known positions
- Familiarisation with methods of measurement that require different computational methods
- Permanent adjustments of theodolite and other used instruments
- Exposing further sighting problems **Course Outline**

1. *Use of the theodolite and like instruments*

- Care and use of the theodolite and/or similar instrument
- Setting up, centring and levelling in different circumstances [15CH]
- Horizontal angles, vertical angles in combination for such exercises as carrying a level over a mountain.

2. Methods of measurement requiring computational solutions and accuracies

- Intersection, triangulation
- Resection (3 point and 2 point)
- Braced quadrilaterals [15CH]
- Precision traversing

3. The tacheometer

- Radial use in level and detail
- Deep valley levels [15CH]

4. The level

- Moving along a gradient
- Slope staking [15CH]

Learning Outcomes

On completion of the course, the student should be able to:

- Understand the theodolite, tacheometer and total station, and how to care for them
- Know how and when to use the different methods of measurement (traversing, triangulation, resection, etc.) and compute their accuracies.
- Know the computational methods involved with each method of measurement (slope staking, following a gradient, trigonometric levelling).
- Know the danger in trying to carry accurate levels with such instruments

Method of teaching

Practicals in the field

Mode of assessment

Field sheets and scale drawings constitute the coursework, examined by two individual presentations during the semester.

Proposed Staff

Mr J Kakeeto Mr J Clifton

Reading/reference materials

[1] John J. Clifton, *Surveys for Civil Engineering Projects* Vols. III & IV (Unpublished but available from the author to students for reading). Relevant sections.

CES2107 Insurance for Civil Engineering Surveying

LH	PH	TH	CH	WTM	WE	WCM	CU
30	0	0	30	100	60	40	2

Course description

Insurance companies, as well as financiers, are beneficiaries of this programme, for if projects are based upon the correct data, then there will be less failures and less claims. The Surveyor, though, runs risks, particularly to staff, vehicles, cash on the job, fire from stored fuels, equipment and labour. This course provides the student with the knowledge of how insurance works and the basic details of each type of insurance beneficial to him/her. **Objectives**

- To show that insurance is needed and in some instances is required by law.
- It is important to know how insurance works.
- The Surveyor and the Insurer should be seen as of mutual benefit. **Course Outline**
- Risk, Insurance pool
- Health insurance
- Life insurance
- Workers compensation insurance [2CH for each
- Field cash and field equipment security + 2Ch for summary]
- Transfer of assets insurance
- Public liability insurance
- Fire insurance
- Vehicle insurance
- All risks insurance
- Theft insurance
- Professional indemnity insurance
- Performance Bond

- Safety and Health at work.

Learning Outcomes On completion the student will:

- Understand the need to insure, and how his work lessens the risk for the Civil Engineer
- Understand the principles of insurance and how and what to insure.
- Know when and when not to claim **Method of teaching**

Lectures

Mode of assessment

Assignments, tests, written examination

Proposed Staff

Mr R Zake

Reading/reference materials

The internet gives a long list of books, many on international finance risks, which are meant for the insurer, or the individual.

[1] *Professional Indemnity Insurance* Howard Land RICS

[2] *Professional Indemnity Insurance Law* Enright & Jess

[3] *Workers Compensation: A Reference and Guide* PM Lenesis

[4] *Public Liability Insurance* Fred Collins

TEC2101 Sociology for Technology

LH	PH	TH	CH	WTM	WE	WCM	CU
45	0	0	45	100	60	40	3

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**

The course is intended to:

- Explore the social and cultural impact of engineering innovations.
- Discuss how technology shapes culture and how culture shapes technology.
- Teach how human behaviour affects design decisions within engineering.
- Demonstrate that values are embedded within technology.
- Show international focus on specific technologies. **Course Outline**

1. Social structures

- Individual - Society - Civilisation,
- Historical perspective - Relation between Individual and Society,

[9CH]

- Theories - Personal needs and Societal needs as related to development of Technology.

2. Evolution of Society

- Ancient Society,
- Development of Science and Technology based on Societal needs,

[9CH]

- Examples from Ancient Civilisations.

3. Industrial Development

- Technological changes and their influence on social, economic and political systems,

- Industrial Revolution, [9CH]
- Fall out - Recession and Impact on Society.

4. Knowledge and Information revolution

- Basic influence on rural and urban development strategies,
- Feature of society to individual relationship.

[9CH]

5. Civil Engineering from ancient Civilizations to modern times

- Impact of development in the area of Civil engineering on individual and society,
- Importance of considering societal needs,

[9CH]

- Interaction with society at different stages of planning and implementation,
- Other issues - Gender, HIV/AIDS, Status, Corruption, Child labour and Malaria,
- Professional ethics. **Learning Outcomes**
- Knowledgeable in social matters.
- Have a sense of history and development.
- Able to interact between industry, technology and their social impact. **Method of teaching**

Lectures

Mode of assessment

Assignments, tests, written examination

Proposed Staff

Reading/reference materials

[1] *Living in a Material World: Economic Sociology meets Science and Technology Studies* Trevor Pinch, Richard Swedberg ISBN 9780262162524

[2] *An Invitation to Environmental Sociology* Michael M Bell ISBN 9780761987758

CES2201 Field Data Presentation

LH	PH	TH	CH	WTM	WE	WCM	CU
30	0	0	30	100	60	40	2

Course description

During the design stages of a project, the Surveyor works directly for the Design Engineer, and indirectly with the Resident Engineer and the Contractor. During construction he/she works directly with the latter two. He/she has to be able to liaise with them, not only by word of mouth, but also in data form. Presentation of data is not only in map form, and not only in the office. There has to be a connection between map and field. The student is given the whole liaison process and presentation methods, the use of drawing instruments in the office and how that affects measurements in the field.

Objectives

- The nature and extent of liaison in Civil Engineering Surveying
- The extent to which liaison with the Principal client is suitable
- Liaison with the government administration
- Liaison with the general public **Course Outline**

1. The mind of the civil engineer

- Design engineer
- Resident engineer
- Contractor [6CH]

- Conceptual process
- The specific proposal

2. Discussions

- Ante-survey
- During survey [6CH]
- Means of communication
- Split communication/split authority
- Post survey

3. On site

- Site visits (Necessity; Form; Agenda)
- Setting out beacons (Pegging; Beaconing; Concrete mixes, etc.

[6CH]

4. At base

- Drawings (Conventional signs (water, irrigation, power, roads, etc.))

[6CH]

5. Reports

- What to whom?
- To civil engineer
- To future surveyor
- Costing report (timesheet)

[6CH]

- Legal report; Surveyor's diary)
- Electrical resistivity
- Soils density test
- Beaconing.

Learning Outcomes On completion the student should:

- Have a knowledge of what is presentation, what is presented and where it is presented.
- Have a knowledge of the value and danger of reports.
- Know the need for keeping an ongoing report (diary), progress report**.**
- Be capable of conducting a site visit, with a reliable record of events. **Method of teaching**

Lectures

Mode of assessment

Assignments, tests, written examination

Proposed Staff

Mr J Kakeeto **Reading/reference materials**

[1] Surveying: Theory and Practice JM Anderson

CES2202 Reading the Field (mutual influences)
(Prerequisite CES2102) LH PH TH

LH	PH	TH	CH	WTM	WE	WCM	CU
30	45	15	60	100	60	40	4

Course description

The influences of a Civil Engineering project on another Civil Engineering project is the basis of research work in this field, as well as core to the design and maintenance of Civil Engineering projects. Projects should enhance, not interfere with other projects, the environment, or social life. This course discusses this in depth. It is often a difficult concept for the student to understand, muddling it with the purpose of the project. Much supervision is necessary, but the student must be able to discover the influences themselves.

Objectives

- To give confidence to the student as a team mate of the Civil Engineer in the conception, design, construction and maintenance of Civil Engineering projects.
- To prepare the student for further studies in this same field.
- To prepare the student for employment in this profession.
- **Course Outline**

Mutual Engineering Influences Power lines

- Interferences between power lines and other projects (airports, vehicle parks, sewage treatment works, schools, dumps, water hoses, drainage)
- Advantages in having power lines for other projects [5CH]
- Interferences between power lines and the environment (scenery)
- Advantages in having power lines for the environment ***Microwave linkage***
- Interferences between Microwave linkage and other projects (corridor space)
- Advantage of having Microwave linkage for other projects
- Interferences between Microwave linkage and the environment [5CH]
- Advantage of having Microwave linkage for the environment ***Hydraulics Structures (Dams, Weirs, Barrages and Reservoirs)***

- Interferences between dams, weirs and reservoirs and other projects (airports, roads, sewers, settlements)
- Advantages of having dams, weirs and reservoirs for other projects (livestock, wildlife, water transport) [5CH]
- Interferences between dams, weirs and reservoirs and the environment (agriculture, water borne diseases, crocodiles, hippopotami)
- Advantages of having dams, weirs and reservoirs for the environment (fish, birdlife)

Drinking Water Supply

- Degree of compatibility between drinking water projects and other civil engineering projects and the environment [5CH]

Sewage disposal

- The social and other effects on the disposal area

- Degree of compatibility between sewage disposal projects and other civil engineering projects and the environment
  [5CH]

Refuse disposal

- Mutual engineering influences (smoke over solar panels, proximity to masonry storage tanks, airports, roads, habitation, power lines, microwave linkage, etc.)
  [5CH]

Drainage and Flood Control

- The social and other effects on the disposal area
- Degree of compatibility between drainage and flood control projects and other civil engineering projects and the environment
  [5CH] ***Irrigation***
- The health and other effects around the project area. [5CH]
- Degree of compatibility between irrigation projects and other civil engineering projects and the environment

Highways (and railways where applicable)

- The social and other effects in the project area
  [5CH]
- Degree of compatibility between road/railway projects and other civil engineering projects and the environment

Airports

- Position in relation to birdlife
- Nearness to source of produce, markets
  [5CH]

The professional limits that need to be adhered to

- Know who the client is and his/her status
- Never make a Civil Engineering decision
  - Do not violate the Surveyor's Registration Act (definition of boundaries, safeguarding of government survey beacons)
    [5CH]
  - Never enforce entry onto private land
  - Have legal backup for compensation for damage done during the survey
  - Keeping the client informed of any professional limit **Learning Outcomes**

On completion the student will:

- Be confident in carrying out the professional duties of a Civil Engineering Surveyor in whatever project, and at whatever project stage he/she is called upon to perform.
- Be aware of the influences of one thing upon another, and how such influences can be manipulated to be beneficial.
- Realise the position of the country is in respect of policy making, planning, provision of services, provision of legal safeguards, etc. in the development of the civil engineering infrastructure, what needs to be done and the possibility of achieving it.

Method of teaching

2 hours a week are taken up by a practising Engineer talking with the students. Then a further 2 hours a week are in the field under the guidance of an experienced Surveyor. Then the students are

given an assignment to carry out in the field and report on. Students are encouraged to seek solutions to problems through discussions with Engineers and Surveyors, as also to make use of the library and the internet. **Mode of assessment**

The reports are marked as Coursework. Examination is by two individual oral presentations a semester.

Proposed Staff

Dr. Musaazi	Eng. Peterson	Eng M Kizza
Dr. C Niwagaba	Dr. Max Kigobe	Eng. M Mutebi
Dr. B Mangeni	Mr. J Clifton	Dr. R Kulabako

Reading/reference materials

[1] *Design Manual for Roads and Bridges* Vol 6 Highway Agency Stationery Office Books ISBN 9780115507425

[2] *Highway Engineering* 2nd Edition Rogers, Martin Blackwell Science ISBN 9781405163583

[3] *Railway Engineering* BL GuptaAmit Gupta Oscar Publications

[4] *Airport Design and Operation* 2n Edition Antonin Kazda, Robert E Caves

[5] *Airport Builders* Marcus Binney

Keywords: Transport Engineering, Railway Engineering, Railroad Engineering

CES2203 Environmental Studies II

LH	PH	TH	CH	WTM	WE	WCM	CU
30	0	0	30	100	60	40	2

Course description

This course unit is a continuation of CES1103, presented to the student after familiarising him/herself in the field during practical work and perhaps during industrial attachment with the contents of the previous course. The student learns more of natural landforms and their metamorphosis and the effect Civil Engineering projects have on the environment, and the environment on any Civil Engineering project.

Objectives

- Expound the environment within which the Engineer is working
- Show the effects the engineering project has on the environment
- Show the effects the environment has on the engineering project

Course Outline

- Topographical features and their formation
- Slopes: types, gradient and aspect
- Soil formation process and soil types
- Development of soil types along slopes [3CH each]
- Types and causes of soil erosion
- Soil erosion deposition, Soil stability
- The role of vegetation in stabilizing soils and engineering structures
- Soil erosion impacts and control
- Filtration evaporation and water holding capacity of different soil types
- Water tables in the soils**. Learning Outcomes**

On completion the student should know:

- What to expect of nature and what not to expect
- How nature reacts to human activity **Method of teaching**

Lectures

Mode of assessment
Assignments, tests, written examination
Proposed Staff
Mr H Bakamwesiga
Reading/reference materials
There are a variety of publications on Physical Geography and Geomorphology
[1] *Environmental Geotechnics* R W Sarsby ISBN 978-0-7277-2752-7 free reading on internet
[2] *Surface Processes and Landforms* Don Easterbrook 2nd Edition ISBN 978-0-1386-0958-0
[3] *Fundamentals of the Physical Environment* Peter Smithson Ken Addison Ken Atkinson 4th Edition ISBN 978-0-415-39516-8

CES2204 Field Data Collection (Further Instruments and Methods)

LH	PH	TH	CH	WTM	WE	WCM	CU
		30 0 0 30		100	60	40	2

Course description
The student is made familiar with the capabilities of more instruments and methods of measurement. He/she becomes aware of how to learn to manipulate unfamiliar instruments and how to realise methods of collecting field data in a new situation. This course is a continuation of the similar one in the previous semester
Objectives
- The purpose of this course is to present still more instruments and methods of measurement to increase the student's repertoire of approaches to the field problems he/she may meet
- Some of the older methods of measurement and their instrumentation are expounded
- The pitfalls associated with these methods are pointed out
- Flexibility is again stressed **Course Outline**

1. Subtense
- Its usefulness and drawbacks
- The two metre bar, Longer bases
  [3CH]
- Accuracies

2. Satellite Station
- Its use and drawbacks [2CH]

3. Tangent distancing/levelling
- Onto the staff to obtain distance and level
- Height of an inaccessible point, from two points (5 cases)
  [5CH]

4. Plane Tabling
- Its use nowadays, The instruments that are needed for its use
- The methods of measurement associated with the plane table
  [5CH]
- The three point problem in orientation, Indian clinometer

5. Sounding
- With staff, With loose plumb line, With plumb line on drum
- With echo sounder (marking start and end) (double and triple echoes) (side echoes)
- In a current such as at a bridge site, Shorelines [6CH]

- Keeping a line across wide water surface (using ropes, outboard motor)

6. Ground control for aerial mapping

- Finding the way around
- Plannimetric points [6CH]
- Height points

7. Use of topographical, cadastral, land adjudication and geological maps

- Practising scale readings
- Finding the way around [3CH]

Learning Outcomes

On completion the student will:

- Be competent in the use of less common methods of measurement which often ease difficult situations.
- Be able to sound reservoirs, rivers and harbours
- Reliable in photo identification, knowing the requirements of the photogrammetrist in point selection.
- Able to navigate over large areas, with a sense of scale, using what detail maps, photographs, etc. have to offer.

Method of teaching

Lectures

Mode of assessment

Assignments, tests, written examination

Proposed Staff

Mr Y Luswa **Reading/reference materials**

[1] John Musket *Site Surveying* 2nd edition ISBN 978-0-632-03848-0 **CES2205**

Practice at Junior Surveyor Level

(Prerequisite CES2105)

LH	PH	TH	CH	WTM	WE	WCM	CU
0	120	0	60	100	60	40	4

Course description

The junior surveyor is much more aware of the engineering aspects of the work. Therefore, it would be expected that this practice course would concentrate on engineering aspects, but such would not fit into a single semester. In fact each semester the Reading the Field course covers much of this. This course is therefore devoted almost entirely with highway geometry. In the second half of the semester the student groups are each given a project to complete on their own.

Objectives

- The purpose of this practical course unit is to give practice in the setting of horizontal and vertical curves
- Diagnosis of what has gone wrong when errors occur, and how to correct them **Course Outline**

1. Curve ranging

- Circular horizontal curves, including common field problems.
- Transition curves
- Vertical road alignment [30CH]
- Application of widening and superelevation.

- Sight distances round horizontal and vertical curves

2. Other highway matters

- Earthwork calculations
- Mass haul diagrams [20CH]
- Slope staking
- Setting out for excavation (batter boards).
- Reference beaconing

3. Error problems

- Diagnosis of errors in curves
- Adjustment of incidental error

[10CH]

- Avoidance of cumulative error **Learning Outcomes**

On completion the student should be able to:

- Range horizontal circular and transition curves from centreline and from distant traverse.
- Compile tables for checking vertical curves, and superelevation, taking sight distances into account.
- Calculate earthworks and use mass haul diagrams for economical management of earthworks.
- Set out slope stakes and batter boards for cuts and fills. **Method of teaching**

Practicals in the field

Mode of assessment

Field sheets and scale drawings constitute the coursework, examined by two individual presentations during the semester.

Proposed Staff

Mr J Kakeeto Mr J Clifton

Reading/reference materials

[1] John J. Clifton, *Surveys for Civil Engineering Projects* Vols. III & IV (Unpublished but available from the author to students for reading). Relevant sections.

CES2207 Law for Civil Engineering Surveyors

LH	PH	TH	CH	WTM	WE	WCM	CU
30	0	0	30	100	60	40	2

Course description

The law protects everyone, including the Civil Engineering Surveyor and those with whom he/she deals in pursuance of his/her professional duties. The student learns to appreciate the law that protects him/her, and what his/her rights and duties are under the law. He/she will be guided as to how to conduct him/herself in court as a professional.

Objectives

Surveys are conducted under contract, so he/she needs to know contract law Surveyors work in public places, so he/she needs to know the law of tort

Surveyors may work on private land and so needs to know his/her legal relationship with the land owner and tenants, and anyone who has rights over the land

Surveyors employ labour, so they need to know the labour laws

Surveyors work in companies or partnerships, so need to know the legalities of such establishments
Surveyors need to know the laws that govern Civil Engineering projects **Course Outline**

1. Law of Tort

- Principles of vicarious liability
- Negligence
- Nuisance

[4CH]

- Trespass
- Damages
- Injunctions

2. Elements of Property Law

- Property rights
- Land law

[4CH]

- Survey Laws
- Public Health;

3. Labour Laws [3CH]

4. Law of Contract [5CH]

5. Companies Act, Partnership Act

[4CH]

6. Administrative law [2CH]

7. Bankruptcy Act [2CH]

8. Services Laws

- Water Act
- Electricity Act [6CH]
- Arbitration and Conciliation Act
- Wayleaves **Learning Outcomes**

On completion the student will:

Understand enough law to keep him/herself out of trouble. Be able to understand and discuss contracts. Have proper, legal labour relations. B able to administer a firm within the law Know where his/her legal limitations are. Be able to instruct a lawyer. Be able to defend him/herself in court. **Method of teaching**

Lectures

Mode of assessment

Assignments, tests, written examination **Proposed Staff**

Mr S Senkeezi **Reading/reference materials**

The actual laws being studied:

10 RESOURCES

a) Lecture Space

Room 19 in annex can hold 24 students - 2nd year has 20 students
Room 143 in old building can hold 50 students - 1st year has 41 students

b) Equipment

The programme shares the equipment of the BSc Civil Engineering programme. The equipment is minimal and old. Also, there is need to have a good policy in renewing/replacing equipment. Modern electronic survey equipment is extremely expensive, needs more care than can be expected from students, and does not last for more than five years at most. The
recent Presidential pledge has given the chance to obtain adequate modern equipment, but there needs to be a good policy of renewal (Present estimate is around UGX 20m per year. This can be divided between the two programmes, and some can be within research projects, although little surveying is presently associated with research projects.

c) Computer Laboratories

The Computer laboratories are shared between programmes. It is not physical space which is the problem for this programme, but space in the timetable.

d) Research Laboratories

Not needed for a Diploma programme.

e) Human Resource

See Appendix A

11 OTHER CURRICULUM MATTERS a) Entry Qualification

The ideal entry qualifications would be 'A' level principals in Mathematics, Geography and Physics, except that the emphasis would be on Physical Geography and only parts of Physics. The secondary schools do not put these three subjects together, so only a principal in Mathematics is made essential, with the best out of Geography, Physics, Economics, Surveying and Technical Drawing. Surveying is included since it once was a subject at 'A' level and from time to time the suggestion has been made to reintroduce it. Then, one other 'A' level subject out of this group of subjects is categorised as relevant.
As a width of view is needed by the Civil Engineering Surveyor, the General Paper is placed as Desirable.

In the Diploma programme, there are no additional mathematics nor physics courses. Diploma programmes train for technicians and such additional courses would overload the timetable unnecessarily. Both the mathematics and physics content needed are included within the courses without being stand-alone courses. There are, though, two environmental courses which fulfil the physical geography component. When the programme is upgraded to a degree, both mathematics and physics courses will be included.

As most of the work of the Surveyor is field based, another qualification is added: All applicants, no matter the avenue of entry, must demonstrate a desire for an outdoor life.

b) Practical Work Experience

This is what the programme is all about since Civil Engineering Surveying is field based and this is a programme for technicians.
The programme other than the Industrial Attachment has the following hours on the timetable: Lectures and tutorials 765 amounting to 720 contact hours
Practicals 780 amounting to 390 contact hours

With the practicals, the students/student groups have about 300 hours working with reduced supervision to make them face the field problems themselves and give them self confidence.

The Industrial Attachment is for ten weeks, though often there are problems for the training firms due to the period being too soon after Budget Day for them to have ongoing projects in which to place the students.

c) Programme Coordinator

John Joseph Clifton came up through industry, not through university. He attended a polytechnic programme, but was hospitalised during examinations and then missed sponsorship. He has worked from labourer up, through every grade to managing director of a company he founded himself. He was in practice for 32 years, training his own staff on the job and creating the accounting system and training and administrative policies of the company. Thus he understands the needs of the Civil Engineer in a wide variety of project types, and knows the market well.

He has started an association for Civil Engineering Surveyors to try to group their experience together for the benefit of the profession.

He has written a four volume work from his experiences. This is not yet published because of the difficulty and expense of peer review and publishing. He has been teaching at Makerere University since 1995.

He coupled with Jackson Kakeeto MSc, Principal Staff Surveyor of the Ministry of Works to create this programme which was approved by Makerere University Council in 2006. He is presently seeking membership of the Chartered Institution of Civil Engineering Surveyors of Britain. The result of his application should be out in April 2011.

12 CONSULTATION WITH STAKEHOLDERS

. The needs of the Civil Engineer, regarding surveying are readily understood: they need reliable field data (i.e. a proper understanding of the field situation) on which to base their design proposals. This occurs particularly at Concept of Proposal, Feasibility Study and Preliminary Design stages. The need of the Principal Client (e.g. UNRA, NWSC, etc.) is also at the Monitoring for Maintenance stage. Graduates of a normal Surveying programme can only produce topographical mapping at the Final Design stage and setting out at the Construction and Supervision of Construction stages. Even then, they need to learn much on site.

A questionnaire sent out in October 2008 to Civil Engineers in public and private practice. Q 1: Have you ever experienced problems with surveys carried out for your Civil Engineering projects in the past? Yes 15 No 2 Not Applicable 0 There were no comments. Q 2: Would you like to have a Surveyor with this specialized training? Yes 17 No 0 If "yes", what level? Diploma 6 Degree 12 Postgraduate Diploma 4 Other (specify) 0

Q 3: Does the market require Surveyors specifically trained in field data collection, or would they be just a luxury? Required 16 Luxury 1 Not needed 0

Q 4: Would you feel comfortable explaining your needs to a Surveyor, even though he/she has an understanding of Civil Engineering? Yes 17 No 0

Q 5: How do you evaluate the course descriptions shown? Very Good 6 Good 8 Fair 3 Inadequate 0 If "inadequate", please explain what needs to be strengthened (or what improvements may be necessary) There were a number of very useful comments.

Q 6: Would you like additions, subtractions, or any other alterations to the courses shown? Yes 11 No 6. Many of the additions were substantially already there. There was little of use in the comments. Q 7: Is this questionnaire adequate? Yes 12 No 4 . No real reasons were given.

There is much misunderstanding in regard to this profession, simply because "the pudding is not there for the eating".
Many Engineers see difficulties or inadequacies with their Surveyors, but have never got to the root of the problem. They find problems with their field data, but do not realise that the collection of that field data is within their own profession, yet they expect the Surveyor to collect it. Survey graduates in practice will not admit that they work commercially, not professionally for the Engineer, but their profession is Land Surveying, not Civil Engineering Surveying. The Survey Act does not include surveying for the Civil Engineer. Nor does their training enable them to recognise field data relevant to a Civil Engineering proposal. Civil Engineering Surveyors decry the fact that there are no qualifications for them. Thus, they have no professional body to control the profession. They come up through the ranks (if any), learn by experience, and take that experience away when they retire. They are often the scapegoat when projects fail.
The need is there to put this profession on a sound foundation, and let it develop naturally. Much research is needed, but that necessitates researchers in this field.

13 STUDENT INTAKE

For the 2006-2007 intake there were 6 students For the 2007-2008 intake there were 7 students For the 2008-2009 intake there were 7 students For the 2009 2010 intake there were 21 students For the 2010-2011 intake there were 41 students

In January 2009, there were 4 credit diploma graduates In January 2010, there were 4 credit diploma graduates In January 2011, there will be 6 credit diploma graduates
There will be many more in January 2012, made up from the present 20 second year students and retakers from other years. It is expected that there will be some distinction graduates.

The emploment rating is 100%, although some have left employment for further studies.

It is unfortunate that the number of female students is static. There was one in the 2008-2009 intake, who graduated with the highest CGPA of the group. There were three in the 2009-2010 intake and three in the 2010-2011 intake. Steps have been taken to encourage pupils of girls secondary schools to join the programme.

It is thought that the equipment and human resources available make an intake of around 30 students as optimal.

For the Reading the Field courses, different Engineers/Architects lecture the students for two hours a week. Taking them as one staff member, then the staff number is 11. Some of these are part timers who lecture in one semester a year only. Thus a realistic staff number for any semester is 8. Therefore the staff/student ratio is 8/30 which is 1 to 3.8. As with Architecture, where there is also much practical work, a low ratio is necessary.

Appendix A **Human Resources**

STAFF MEMBER	STATUS					CURRENT TEACHING LOAD	PROPOSED TEACHING LOAD	TOTAL LOAD
	Full Time/ Part Time	Gender	Highest Qualification	Area of Specialization	Rank			
J Clifton	Contract	M	31yrs practice 16 yrs teaching	Eng. Surveying	Senior Survey Assistant	10		
J Kakeeto	PT	M	MSc	Eng. Surveying	Principal Staff Surveyor	9		
Y Luswa	FT	M	Dip	Civil Eng.	Technician	5		
H Bakamwesiga	FT	M	MSc	Environment	Assistant Lecturer	2		
R Zake	PT	M		Insurance	Managing Director NIKO	2		
S Senkeezi	PT	M		Law	Practicing lawyer	2		
Dr D Kalumba	FT	M	PhD	Geotechnology	Lecturer	4		
B Magara	PT	M		Accounts	Auditor	2		
Dr Musaazi	FT	M	PhD	Electric Power	Senior Lecturer	2		
Mr M Peterson	FT	M	MSc	Telecom Eng	Teaching Assistant	2		
Mr M Kizza	FT	M	MSc	Water Resources	Assistant Lecturer	2		
Dr C Niwagaba	FT	M	PhD	Environmental Eng	Lecturer	2		
Dr R Kulabako	FT	F	PhD	Environmental Eng	Assistant Lecturer	2		
Dr M Kigobe	FT	M	PhD	Water Resources	Lecturer	2		
Miss M Namutebi	FT	F	MSc	Transport Eng	Assistant Lecturer	2		
Dr Mangeni	FT	M	PhD	Water Resources	Senior Lecturer	2		
Mr J Magongo	FT	M	BA		Teaching Assistant	3		
Dr SM Okodi	FT	M	PhD	ICT & Mechatronics	Assistant Lecturer	4		
Mr C Tembo	PT	M	MSc	Surveying	In Practice	2		
Dr A Nagenda	FT	F	PhD	Human Settlements	Lecturer	2		50

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