Makerere University

Faculty of technology

Department of Electrical Engineering

Regulations and Curriculum for the Degree of Bachelor of Science in Electrical Engineering

Curriculum for Accreditation

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Table of Contents

1. INTRODUCTION 3

2. OBJECTIVES AND EDUCATIONAL OUTCOMES 3

2.1. Educational Objectives 3
2.2. Program Outcomes 4

2.3. Target Group 4

3. REGULATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING 4

3.1. Admission to First Year 4

3.2. Admission to other Years 5

4. CONDUCT OF THE PROGRAMME 5

4.1. Type of Programme 5
4.2. Programme Duration 5
4.3. The Academic Year 5
4.4. Registration of Students 6
4.5. Academic Programmes 6
4.6. Categorizing Courses 6
4.7. Academic Programme Load 7
4.8. Assessment 8
4.9. Retaking a Course or Courses 8
4.10. Progression 9
4.11. Examinations 9
4.12. Discontinuation 11
4.13. Change of Course 11
4.14. *Change of Academic Programme* 11
4.15. *Re-admission after being discontinued due to Weak Academic Performance* 12
4.16. Withdrawal 12
4.17. Approval of Examination Results 13
4.18. Publication of Results 13
4.19. Fees 13

5. REQUIREMENTS FOR AWARD OF THE BSC DEGREE IN ELECTRICAL ENGINEERING 14

5.1. Programme Minimum Graduation Load 14
5.2. Earning of Credits in a Course 15
5.3. Classification of the Degree 15
5.4. Awards 15
5.5. Calculation of the Cumulative Grade Point Average (CGPA) 15

6. ELECTRICAL ENGINEERING PROGRAMME STRUCTURE 15

7. DETAILED COURSE DESCRIPTIONS 18

8. Appendix A List of Academic Staff 113

1. INTRODUCTION

Electrical Engineering has grown exponentially in terms of new technologies, ideas, principles and applications. it is concerned with understanding, designing, implementing and using systems, ranging in complexity from simple electronic components, via integrated circuits and embedded systems to large scale semi-continental power systems and information networks as vast as the internet.

This intellectually challenging subject underpins the core technologies of the 21st century, and can be a route to many different career paths. The boundaries of Electrical Engineering extend from basic physics, chemistry, mathematics, statistics, computer science, to applied subjects in power systems, telecommunications, industrial automation, biotechnology etc. It is a multidisciplinary subject, with a unique role to play as a bridge between basic sciences, applied sciences and technological disciplines.

2. JUSTIFICATION FOR THE PROGRAMME

The recent past has been characterized by economic liberalization leading to broadening and diversifying the demand for Electrical engineering graduates. There is an upsurge in the private sector leading to creation of new jobs that require specialized graduates. In order to satisfy this demand, the Department of Electrical Engineering has revised its curricula to address this emerging issue and therefore attract more students. This document describes the regulations and curriculum for the Bachelor of Science degree programme in Electrical Engineering as offered at Makerere University. The curriculum was developed with the involvement of many stake holders following a top-down approach, i.e. identifying the projected on-job requirements after graduation and then organizing them in hierarchical manner with fundamentals at the beginning level and becoming more application oriented and advanced for subsequent years. At the same time, the suggested syllabi is at par, in content and scope, with Electrical engineering syllabi of various contemporary leading institutions across the globe.

The revised curriculum provides sound theoretical approaches to the various Electrical and Electronics engineering disciplines supplemented by hands-on laboratories and computer skills to apply the theoretical knowledge to practical engineering problems. Additional practical training components such as Workshop Practice in the first year and Industrial Training in the recess terms of the second and third years of study introduce students to actual field practice. The program is conducted through coursework and examinations. At the fourth year of study, students are prepared to do independent supervised study in the area of their choice. Students can enroll for the programme with the intention of achieving the qualification of a Bachelor of Science in Electrical Engineering (BSC.EE).

3. OBJECTIVES AND EDUCATIONAL OUTCOMES

The primary focus of this programme is to produce entrepreneurship-oriented graduates who are capable of propping up new companies, out of the prototypes that they will have developed at the undergraduate level. This demands that the final year projects should benchmark world class standards, capable of leading to Electrical Engineering incubations.

3.1. Educational Objectives

The educational objectives of this programme are to:

(a) Produce graduates who are able to practice electrical engineering to serve Uganda and the regional industries, government agencies, or national and international industries.
(b) Produce graduates with the necessary background and technical skills to work professionally in one or more of the following areas: Power systems generation, transmission and distribution, industrial electronics, renewable energy solutions, system integration, electronic design automation.
(c) Prepare graduates for personal and professional success with awareness and commitment to their ethical and social responsibilities, both as individuals and in team environments.
(d) Prepare graduates who are capable of entering and succeeding in an advanced degree program in a field such as engineering, science, or business.

3.2. Program Outcomes

The outcomes for the computer engineering program are:

(a) **To Understand -** to understand fundamentals of devices, electrical and electronic circuits, electronic design automation, and mathematics, and how these are used in electrical and electronic systems. An understanding that engineering knowledge should be applied in an ethically responsible manner for the good of society.
(b) **To Question -** to critically evaluate alternate assumptions, approaches, procedures, tradeoffs, and results related to engineering problems.
(c) **To Design -** to design and implement electrical and electronic systems power systems, industrial electronic systems and renewable energy systems.

(d) **To Lead -** to lead a small team of student engineers performing a laboratory exercise or design project; to participate in the various roles in a team and understand how they contribute to accomplishing the task at hand.
(e) **To Communicate -** to use written and oral communications to document work and present project results.

3.3. Target Group

The target group for this programme will be the annual outputs of Advanced Level Certificate Education, or its equivalent, and those individuals in the ***working sector*** possessing appropriate entry requirement, who desire to acquire further training at Degree level.

4. REGULATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING

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

4.1. 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.

4.1.1. The Direct Entry Scheme

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

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

4.1.2. The Mature Age Entry Scheme

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

4.1.3. 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 and passed building construction and drawing with at least a Credit Pass in Mathematics.

4.2. Admission to other Years

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

5. CONDUCT OF THE PROGRAMME

5.1. Type of Programme

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

5.2. Programme Duration

The minimum duration for this programme shall be f0ur (4) years. The course is designated to be taken over a minimum period of eight semesters and four Recess Terms for Industrial Training. The Duration of a Semester is seventeen (17) weeks. The duration for a Recess Term shall be ten (10) weeks. There shall be university examinations to be conducted in the last two weeks of each semester.

5.3. The Academic Year

In the Semester/Credit Unit System at Makerere University, the Academic Year shall be composed of Two (2) Semesters and One (1) Recess Term.

The Academic Programmes shall be designed per Semester/Recess Term per Academic Year, for example, Semester One, Semester Two and (where applicable) Recess Term for Year One, etc.

Length of Semester

The length of a Semester shall be Seventeen (17) weeks with Fifteen (15) weeks being for Teaching and Two weeks for Examinations. The duration of a Recess Term shall be Ten (10) weeks.

5.4. Registration of Students

The Central Registration of students is decentralized to Colleges /Faculties /Schools/ Institutes. The staff from the Office of the Academic Registrar are deployed to oversee the registration exercise at those Academic Units.

There shall not be a specific time set aside for registration exclusively. However, students shall be required to ensure that they register within the first three weeks from the beginning of the First Semester. Freshers normally register during the Orientation Week.

Continuing students shall indicate the Courses they would wish to offer/take in Semester Two while they would still be in Semester One. However, each Continuing student shall confirm the Courses they would actually offer/take in Semester Two in the First Week of that Semester Two. Arrangements can also be made for registration to start before the beginning of the Academic year.

5.5. Academic Programmes

i. The Academic Programme shall be defined by Courses
ii. An Academic Programme shall be composed of a set of prescribed Courses that shall be registered for by a student in order for him/her to qualify for the Award of a particular Degree/ Diploma/Certificate.
iii. The concepts of Subjects and Papers shall not be used in a Semester/Credit Unit System. Academic Programmes designed shall compare favorably with similar international ones.
iv. The structure of a particular Academic Programme shall show clearly the Core, Elective and Prerequisite Courses.

5.5.1. A Course

A Course is a unit of work in a particular Field/Area of a study normally extending through one Semester the completion of which normally carries credit towards the fulfillment of the requirements of certain Degrees, Diplomas, or Certificates.

5.5.2. Size of a Course

a) The smallest Course shall be Two (2) Credit Units.
b) A Course that has a Practical Component within it shall have a Maximum of Five (5) Credit Units.
c) A Course that has no Practical Component within it shall have a Maximum of Four (4) Credit Units.

5.5.3. Contact Hour

A Contact Hour shall be equivalent to One (1) hour of Lecture/Clinical or Two (2) hours of Tutorial/ Practical or four (4) hours of internship/Fieldwork.

5.5.4. Credit or Credit Unit

A Credit or Credit Unit is the measure used to reflect the relative weight of a given Course towards the fulfillment of appropriate Degree, Diploma, Certificate or other programmes required. One Credit Unit shall be One Contact Hour per Week per Semester or a series of Fifteen (15) Contact Hours.

5.6. Categorizing Courses

a) Courses shall be categorized as Core, Elective, Pre-requisite or Audited.
b) Not all the Courses in an Academic Programme shall be made Core.
c) The Courses for the First Year Studies shall be called Pre-requisite or Introductory Courses.
d) All the Courses having the same content shall have the same Names, Codes and Credit Units.
e) Only the Academic Departments that have the mandate to teach particular Courses shall be the ones to co-ordinate/teach such Courses wherever they are taught/offered.
f) The level of content of a particular Course has to match the Credit Units allocated to that Course.
g) The number of Elective Courses that each student shall be required to register for in every Undergraduate Academic Programme shall always be stated so as to guide the students when they are choosing them from a particular set of Elective Courses.
h) There shall always be a ceiling for the number of Undergraduate students who shall be allowed to register for particular Elective Courses.
i) The Undergraduate students should be encouraged to register for Audited Courses as well.
j) The Elective Courses for Postgraduate students shall be specialized or broad-based and shall be offered in any Semester.
k) The Course Content of Postgraduate Academic Programmes have to match the higher level of study required of Postgraduate students.

5.6.1. Core Course

a) A Core Course shall be a Course which is essential to an Academic Programme and gives the Academic Programme its unique features. Everyone offering that particular Academic Programme must pass that Course.
b) Core Courses shall be offered in all the Semesters.

5.6.2. Elective Course

An Elective Course shall be a Course offered in order to broaden an Academic Programme or to allow for specialization. It is chosen from a given group of Courses largely at the convenience of the student. Another Elective Course may be substituted for a failed Elective Course.

5.6.3. Audited Course

An Audited Course shall be a Course offered by a student for which a Credit/Credit Unit shall not be awarded.

5.6.4. Prerequisite Course

A Pre-requisite is a condition (either Course or Classification), which has to be satisfied prior to enrolling for the Course in question. A Pre-requisite Course, there-fore, shall be a Course offered in preparation for a higher level Course in the same area of study.

a. When a student fails a Pre-requisite Course, he/she shall not be allowed to take the higher level Course requiring a Pre-requisite.
b. A student will be required to retake the failed Pre-requisite Course before embarking on a higher-level Course requiring a Pre-requisite.

5.6.5. Major

A Major shall be a set of Courses in a Field/Area of specialization in which each student is encouraged to explore the Field/Area in considerable depth. The set of Courses for a Major shall constitute not less than two-thirds of the Programme Load.

5.6.6. Minor

A Minor shall be a set of Courses in a Field/Area that is of lesser importance than the Major. A Minor shall constitute not more than a third of the Programme Load.
Some Academic Programmes allow some degree of specialization within a particular Programme. A Programme specialization shall be a set of Courses combined from both a Major and Minor areas.

5.7. Academic Programme Load

Academic Programme Load shall be the essential set of Courses registered for/offered by a particular student for the Award of a certain Degree/Diploma/Certificate. It has both Core and Elective Courses.

5.7.1. Semester Load

i. Semester Load shall be the total number of Courses for a particular Academic Programme offered in a Semester.
ii. The Courses to be Retaken and those to be audited shall be within the Maximum Semester Load of every student.

5.7.2. Normal Semester Load for Undergraduate Academic Programmes

The Normal Semester Load for Undergraduate Academic Programmes shall range from Fifteen (15) Credit Units to Twenty-One (21) Credit Units.

5.7.3. Maximum Semester Load for Undergraduate Academic Programmes

The Maximum Semester Load for Undergraduate Academic Programmes shall be Twenty-eight (28) Credit Units so as to cater for students who have Courses to retake or those who would be able to complete the requirements for their respective Academic Awards in less than the stipulated minimum duration).

5.8. Assessment

Each Course shall be assessed in two (2) parts as follows:
a) The Coursework (Progressive/Continuous Assessment), which shall contribute not less than 30% nor more than 40% of the Total Marks.
b) The Coursework (Progressive/Continuous Assessment) Component shall consist of at least One (1) Test and One (1) Homework/Take-Home Assignment OR Two (2) Tests per Course.
c) The University Examinations, which shall contribute a maximum of 70% of the Total Marks.

5.8.1. Grading of Marks

The overall Marks a candidate obtains in each Course he/she offered shall be graded out of a maximum of One Hundred (100) Marks and assigned appropriate Letter Grades and Grade Points as follows:

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

5.9. Retaking a Course or Courses

i. A student shall retake a Course or Courses 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.
ii. A student who has failed to obtain at least the Pass Mark (50%) during the Second Assessment in the same Course or Courses he/she has retaken shall receive a warning.
iii. A student may retake a Course or Courses when next offered again in order to improve his/her Pass Grade(s) if the Pass Grade(s) got at the first Assessment in the Course or Courses were low.

A student who fails to attain higher marks after retaking to improve, the examination results of the first sitting are recorded on the transcript and should not be recorded as Retake.

iv. Where a student misses to sit examinations for justified reasons; the grades obtained after sitting examination shall not be recorded as a retake because the candidate is sitting the examinations for the first attempt.
v. While retaking a Course or Courses, a student shall:
   a) Attend all the prescribed lectures/ tutorials/Clinicals/Practicals/Fieldwork in the Course or Courses;
   b) Satisfy all the requirements for the Coursework Component in the Course or Courses; and
   c) Sit for the University Examinations in the Course or Courses.
vi. A student shall not be allowed to accumulate more than five (5) Retake Courses at a time. Students are required to register for retakes course(s) first before registering for new courses offered in that semester and the retake courses should fit into the approved normal load to avoid time table clash.
vii. A final year student whose final Examination Results has already been classified by the relevant College/Faculty/School/Institute Board and has qualified for the Award of a Degree/Diploma/Certificate, shall not be permitted to retake any Course or Courses.
viii. When a student has retaken a course the better of the two Grades he/she has obtained in that Courses shall be used in the computation of his/her cumulative Grade Average (CGPA).
ix. Whenever a Course or Courses has/have been retaken, the Academic Transcript shall indicate so accordingly.
x. Students who have a course(s) to retake and these Course(s) fall beyond the set normal semester load for their Academic Programmes shall pay tuition fees for any Course/ Courses to be retaken. Besides, such students also pay the re- examination fees per Course retaken as well as the Registration Fees.

5.10. Progression

5.10.1. Normal Progress

Normal Progress shall occur when a student has passed the Assessments in all the Courses he/ she had registered for in a particular Semester and not when he/she has passed the Assessments in the Core Courses only.

5.10.2. Probationary Progress

A student who has obtained the Cumulative Grade Point Average (CGPA) of less than 2.0 shall be placed on Probation. Such a student shall be allowed to progress to the next Semester/Academic Year but shall still retake the Course(s) he/she had failed the assessments in later on and obtain at least the Pass Mark (50%) in the Course(s).

5.10.3. Certificate of Due Performance

i. A student who fails to honor the deadline set for handing in an assignment without justifiable causes(s) shall receive a score of a zero or fail grade in that assignment.
ii. 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.

5.11. Examinations

5.11.1. Absence from Examination

i. If the Board of a College/Faculty/School/Institute is satisfied 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 count in the calculation of the CGPA.
ii. If the Board of a College/Faculty/School/Institute is satisfied that a student was absent from coursework assessment and or a final examination due to justifiable reason(s) such as sickness or loss of a parent/guardian, then a Course Grade of ABS shall be assigned to that Course(s).

5.11.2. Deferred Examination

i. A student who provides credible reason for failure to complete coursework assessment or to attend an examination based on 27(ii)above may be permitted to 'sit' the deferred examination or coursework assignment when the course(s) is being offered again.

ii. Students needing a deferred exam must submit application to their respective Dean's or Director's Office. The application and supporting documentation pertaining to the absence must be presented as soon as the student is able, having regard to the circumstances underlying the absence but not later than the beginning of the semester in which the examination is scheduled. Where the cause is incapacitating illness, a student must present a University Hospital Medical Statement Form. In other cases, including severe domestic affliction, adequate documentation must be provided to substantiate the reason for an absence.

iii. In case the application for deferred examination has been approved, the Department responsible for the course shall make arrangements for the approved deferred exam.

iv. The grades obtained from a deferred examination shall not be categorized as retake because the assessment(s) is for the first time.

v. A deferred exam shall not be approved if a student has not been in regular attendance where attendance and/or participation are required, and/or, excluding the final exam has completed less than half of the assigned work.

vi. A Student with two or more deferred exams outstanding from a previous semester may be required to reduce the number of courses in which they are registered in order to accommodate deferred courses from previous semester(s) in their semester load. Deferred examination shall be included in a Student's maximum semester load.

vii. A Student shall be required to pay for deferred examination and payment of shall normally be made at the beginning of the semester.

5.11.3. Conceded Pass

a) A "Conceded Pass" is a pass granted for a course in which a final year candidate is within five marks of a pass mark in the course assessment. The pass is conceded on the basis that the student's overall performance in other courses for the programme has been sufficiently strong to counter the deficient percentage in that particular course. .

b) Circumstances Potentially Warranting a Conceded Pass.
The personal circumstances of a student must be taken into account. The student's performance in the course could have been adversely affected by his/her personal circumstances. The circumstances for approval of a Conceded Pass may include but not limited to:
   i. Student illness or Medical condition.
   ii. Family issues (family injury or illness, bereavement etc).
   iii. Commitments to participate in national sport or other activities that warrant favorable consideration.
   iv. Commitments to assist with community service activities.
   v. Unavoidable and unexpected work commitments (e.g. relocation).
   vi. Awarding conceded passes does not compromise the requirements for accreditation of that programme by a professional body.

c) Responsibility and Procedure
   i. The Conceded Passes are granted at the discretion of the Faculty/Institute/ School's Board of Examiners. Students are not automatically entitled to the Conceded Passes and may not request them.
   ii. The Board of Examiners shall during the time of consideration of examination results, identify and grant students eligible for Conceded Passes. A Student will then be formally informed that he/she has been offered a Conceded Pass.

d) Eligibility for a Conceded Pass
A conceded pass shall be granted under the following conditions:
   i. A candidate on Undergraduate Programme shall be eligible for a Conceded pass if the final mark in a Course is in the range of 45 - 49% inclusive and the Cumulative Grade Point Average (CGPA) for the student will be at least 2.0.
   ii. A Conceded Pass may only be awarded if a student has attempted the paper, at least three times. The better of the grades earned will be used for awarding a Conceded pass.
   iii. A Conceded pass shall be discretionary and the Examination Boards shall take into account the following:

a. The results a student has scored each time he/she has attempted the paper.
b. A student's overall Academic record
c. Comments from his/her lecturers, e.g. on their class attendance, participation
d. Whether the course is required for professional accreditation; or it is necessary for a student to demonstrate professional or clinical competence as part of its assessment requirements

iv. A Conceded Pass shall be granted to a whole course, not to a particular piece of assessment.
v. Candidates granted Conceded pass shall earn a credit on the basis of Conceded Pass "CP"
vi. Only candidates in their final year of studies shall be eligible for Conceded pass.
vii. In both undergraduate and postgraduate programmes, the number of conceded pass will be restricted to only one course.
viii. In case a Candidate who does not qualify for conceded pass as stipulated above the existing provision in the semester regulations will guide as the case may be.

e) Recording a Conceded Pass on the Academic Transcript
A granted Conceded Pass will be recorded on the student's academic Transcript by indicating the true percentage /grade achieved, and "CP" as the grading code.

5.12. Discontinuation

i. When a student accumulates three consecutive probations based on CGPA he/she shall be discontinued.
ii. 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.
iii. 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.

5.13. 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.

5.14. *Change of Academic Programme*

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.
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. *Guidelines for Transfer of Credit Units*
Guidelines for the transfer of Credit Units for Undergraduates and Graduate Students who apply to transfer from other recognized Universities or equivalent Institute of Higher Learning to Makerere University. Students should have the following requirements;

a) Must satisfy the admission requirement for the academic program(s) applied for.
b) Must obtain and submit an official academic Transcript (s) Certificate from a recognized University/institution of Higher learning in which he/she was previously enrolled indicating his/her academic status, the courses offered/taken, the credit units completed and the grades obtained in each course.
c) Must have obtained the equivalent of Cumulative Grade Point Average of at least 3.0
d) Will be permitted to transfer to Makerere University Credits earned but the maximum of Credits should not exceeding 60% of the minimum graduation load of the academic programme applied for.
e) If permitted to transfer she/he should not be allowed to transfer the equivalent of credit units in a course in which she/he obtained a Grade point which was lower than 2.0
f) f) An application must be accompanied by recommendations from the Institution or Authority she/he is transferring from.

5.15. *Re-admission after being discontinued due to Weak Academic Performance*

a. A student who has been discontinued from studies because of weak academic performance may be permitted to re-apply to another Programme and compete with other applicants for re- admission into first year.
b. A student who applies and gains re-admission after being discontinued due to weak academic performance will not be permitted to transfer Credits earned from previous Academic Programmes.
c. A student who was discontinued or dismissed from his/her studies because of external irregularities will not be considered for re-admission.

5.16. Withdrawal

a) A student can apply to his/her respective Board of Studies for permission to withdraw from studies at any time of the semester. Reasons for withdrawal should be given in the letter of application.
b) Permission to withdraw shall be granted by the Faculty/School/Institute Board only on compassionate grounds or in cases of illness or financial constraints serious social or domestic difficulties or exceptional professional commitment which can be demonstrated to have adversely affected the candidate.
c) A student will be allowed only a maximum of two withdrawals on an Academic Programme and each withdrawal shall not exceed a period of one academic year.
d) The period of withdrawal(s) shall not count against the period of candidature for the programme a student is registered for.
e) A student who had withdrawn from studies shall apply to his/her respective Faculty/ School/Institute Board to resume studies and shall indicate that the circumstances that made him/her withdraw can no longer affect his/her studies.
f) f) A student who has overstayed on an Academic Programme by more than 2 (two) years beyond the period of candidature stipulated in the Programme shall be discontinued from his/ her studies at the University.
g) Students should take note that the above regulations do not cover the period of sponsorship. The period of sponsorship is governed by the regulations and policy of the sponsor. In the case of Uganda Government sponsorship, the period is that stipulated in a given Academic Programme.

5.17. Approval of Examination Results

i. The Senate has delegated the power to approve all examination result to Boards of Colleges/Faculties/Institutes/Schools. But the results shall not be regarded as final until they are confirmed by Senate on submission of Appropriate Pass Lists to Senate by the relevant Boards. The Appropriate Pass Lists to Senate should be accompanied with Faculty Board Minutes.
ii. Students shall be provided with examination results using the approved testimonial format. *Appeals*

Any student or candidate aggrieved by a decision of the Board of his/ her College/ Faculty/ Institute/ School may appeal to the Senate Examinations for reversal or moderation of the decision of the Board.

Procedure for Considering Appeals from Students

i. The Examinations Irregularities Committees of Faculties/Institutes/ Schools shall handle and communicate their decisions to the concerned students. In their communication to a student who may have been DISMISSED, the Examinations Irregularities Committees of Faculties/Institutes/Schools shall mention the following clause "in case you are not satisfied with the verdict you are free to appeal directly to the Senate Examinations Committee"
ii. The Examinations Irregularities Committees of Faculties/ Institutes/ Schools shall communicate the decisions taken to the Senate Examinations Committee for noting.
iii. A student who is not satisfied with the decisions of the Faculty Examinations Irregularities Committees may appeal to the Senate Examinations Committee.
iv. The appeal shall be in writing addressed to the Academic Registrar and copied to the Faculty/School/Institute Committee stating clearly the grounds of appeal. The Academic Registrar shall acknowledge in writing to the student/candidate and Chairperson of Faculty/School/ Institute Committee receipt of the appeal.
v. The Senate Examinations Committee Secretariat upon receipts of an appeal will request the respective Faculty/Institute/School to comment on the information in the appeal.

vi. The Senate Examinations Committee shall consider the merits of the students' appeals and handle as appropriate.(see also Rule 8 Procedure for Hearing of Malpractice Cases under Rules on Examination Malpractices and Irregularities)

5.18. Publication of Results

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

5.19. Fees *5.19.1.*

Payment of Fees

i. Tuition and other University fees are due on the first day of the academic year. Privately- sponsored students who cannot pay full fees at the beginning of the academic year are required to pay at least 60% of the course load, if they wish by the set deadline.
ii. First year privately-sponsored student who fails to pay the registration fee at the end of the second week of the beginning of an academic year shall forfeit his/her place in the University
iii. A continuing privately-sponsored student who shall not have paid fees by the end of the Sixth week shall be de-registered.
   a. Student should complete paying all the University fees by the sixth week of a semester and be registered then.
   b. In case a student fails to raise enough money to pay for a full semester load a student can chose courses within the next first six weeks and make payment for the course load he/she can afford and get registered.
   c. The minimum course loads to be permitted under this arrangement should be 60% of the total credit units for that semester.
   d. Student will not be allowed to pay University fees and register after the end of the sixth week of a semester.
   e. Only registered students will be allowed to use University facilities, to attend lecturers, do course work and sit for final examinations.

5.19.2. 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 Percentage of Students has withdrawn in the tuition fees a semester already paid to be refunded to the student

By the End of the First Week of a Semester	100%
By the End of the Second Week	80%
By the End of the Third Week of a Semester	60/%
By the End of the Fourth Week of the Semester	40%
By the End of the Fifth Week of a Semester	20%
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. REQUIREMENTS FOR AWARD OF THE BSc DEGREE IN ELECTRICAL ENGINEERING 6.1.

Programme Minimum Graduation Load

The minimum credits required for the award of the Degree of Bachelor of Science in Electrical Engineering shall be ***155*** distributed as shown in the table below.

Year(s)	Classification	Credits
One & Two	Core Courses (including Industrial training and workshop Practice)	90
Three	Core Courses (including Industrial training)	23
	Electives Courses	12
Four	Core Courses (including Project)	**22**
	Electives Courses	**8**
Total		**155**

6.2. Earning of Credits in a Course

a) Each student shall earn Credits for all the Courses specified in the Programme Load for Graduation.
b) A Credit shall be earned when a student has obtained at least the undergraduate Programmes Pass Mark (50%) in each Course he/she had been assessed in. In other words, NO Credit shall be earned in a Course in which a student has failed the Assessment.

6.3. Classification of the Degree

For purposes of the classification of Degrees, Diplomas and Certificates (where applicable) the Cumulative Grade Point Average (CGPA) for the various Classes shall be as indicated below:

Class	CGPA
First Class	4.4 -5.0
Second Class - Upper Division	4.0 - 4.3
Second Class - Lower Division	3.0 - 3.9
Pass	2.0 -2.9

6.4. Awards

The Board of Examiners in a School, Faculty or Academic Institute, upon its satisfaction that the standard required under relevant regulations for the award of a Degree, Diploma, Certificate or other award, as the case may be, has been attained by a candidate in University examinations applicable to him/her, may recommend to the Senate through the relevant Board of a College, School, Faculty, academic Institute that such Degree, Diploma, Certificate or other award be conferred upon or granted to such successful candidate.

6.5. Calculation of the Cumulative Grade Point Average (CGPA)

The Cumulative Grade Point Average at a given time shall be obtained by:
a) 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.
b) Adding together the Weighted Scores for all the Courses taken up to that time.
c) Dividing the Total Weighted Score by the total number of Credit Units taken up to that time.

7. ELECTRICAL ENGINEERING PROGRAMME STRUCTURE

The B.Sc. E. E. Programme shall have the following structure:

- Four Mathematics Courses
- Forty Eight Electrical and Electronic Engineering Courses
- Seven Humanities
- Two Industrial Training Sessions

- One Workshop Practice session

These courses are categorized into core and elective courses as outlined in the below

Table 8: Proposed New Curriculum for the BSc Programme in Electrical Engineering

COURSE CODE	COURSE NAME	LH	PH	TH	CH	CU

YEAR I SEMESTER I							
1	EMT1101	ENGINEERING MATHEMATICS I	60	0	0	60	4
2	ELE1101	CIRCUIT THEORY	45	30	0	60	4
3	ELE1102	PHYSICAL ELECTRONICS	45	30	0	60	4
4	CMP1103	INFORMATION & COMMUNICATION TECHNOLOGY	45	30	0	60	4
5	ELE1112	INTRODUCTION TO ELECTRICAL ENGINEERING	30	0	0	30	2
6	COE1103	BUSINESS COMMUNICATIONS SKILLS	30	30	0	45	3
YEAR I SEMESTER II							
1	EMT1201	ENGINEERING MATHEMATICS II	60	0	0	60	4
2	ELE1201	INTRODUCTION TO DIGITAL ELECTRONICS	45	30	0	60	4
3	ELE1202	ELECTRICAL MATERIALS	45	30	0	60	4
4	CMP1201	COMPUTER PROGRAMMING FUNDAMENTALS	45	30	0	60	4
5	ELE1204	STATICS & DYNAMICS	30	0	0	30	2
6	SOC 1202	INTRODUCTION TO SOCIOLOGY	45	0	0	45	3
YEAR I RECESS TERM							
1	ELE1301	VOCATION WORKSHOP PRACTICE	0	180	0	45	3
2	ELE1302	E LEC ENG DRAWING & INSTALLATION PRACTICE	30	60	0	60	4
YEAR II SEMESTE	**R I**						
1	EMT2101	ENGINEERING MATHEMATICS III	60	0	0	60	4
2	ELE2103	ELECTROMAGNETICS	45	30	0	60	4
3	ELE2102	ELECTRONIC CIRCUITS	45	30	0	60	4
4	ELE2111	NETWORK THEORY	45	30	0	60	4
5	CMP2103	OBJECT ORIENTED PROGRAMMING	45	30	0	60	4
YEAR II SEMESTE	**R II**						
1	EMT2201	ENGINEERING MATHEMATICS IV	60	0	0	60	4
2	ELE2211	ELECTROMAGNETIC FIELDS	45	30	0	60	4
3	ELE2212	ELECTRICAL ENERGY SYSTEMS	45	0	0	45	3
4	ELE2213	INSTRUMENTATION	45	30	0	60	4
5	TEC2202	TECHNOLOGY, ETHICS & HUMAN RIGHTS	45	0	0	45	3
YEAR II RECESS TERM							
	ELE2301	INDUSTRIAL TRAINING	0	180	0	45	3
YEAR III SEMESTER I: AT LEAST 4 COURSES, WITH 2 FROM CHOSEN CONCENTRATION							
	ELECTRONIC ENGINEERING CONCENTRATION						
1	ELE3102	APPLIED ANALOGUE	45	30		60	4
2	ELE3103	APPLIED DIGITAL ELECTRONICS	45	30		60	4
	POWER SYSTEM ENGINEERING CONCENTRATION						
5	ELE3113	POWER SYSTEMS THEORY	45	30		60	4
6	ELE3114	ELECTRICAL MACHINES & DRIVES I	45	30		60	4
	ELECTIVES						
3	TEL3111	COMMUNICATION THEORY	45	30	0	60	4
4	TEL 3112	RADIO WAVE PROPAGATION & ANTENNAS	45	30	0	60	4
7	LAW1104	LAW OF CONTRACTS	30	0	0	30	2
8	COE2105	ENTREPRENEURSHIP	30	0	0	30	2
YEAR	**III SEMESTER II: AT LEAST 4 COURSES, WITH 2 FROM CHOSEN CONCENTRATION**						
	ELECTRONIC ENGINEERING CONCENTRATION						
1	ELE3202	CONTROL ENGINEERING	45	30	0	60	4
2	ELE3211	INDUSTRIAL ELECTRONICS	45	30		60	4
3	ELE3214	COMPUTER COMMUNICATION NETWORKS	45	30	0	60	4
	POWER SYSTEM ENGINEERING CONCENTRATION						
7	ELE3215	POWER SYSTEMS ENGINEERING	45	30		60	4
8	ELE3216	ENERGY CONVERSION AND GENERATION	45	30	0	60	4
9	ELE3205	ELECTRICAL MACHINES & DRIVES II	45	30		60	4

	ELECTIVE						
4	TEL3212	DIGITAL COMMUNICATIONS	45	30	0	60	4
5	TEL3213	MOBILE COMMUNICATIONS SYSTEMS	60	0	0	60	4
6	TEL3214	COMPUTER COMMUNICATION NETWORKS	45	30	0	60	4
10	TEL3217	SYSTEMS ENGINEERING	60	0	0	60	4
11	COE1102	FUNDAMENTAL ACCOUNTS PRINCIPLES	60	0	0	60	4
YEAR	**III RECESS TERM**						
1	ELE3301	INDUSTRIAL TRAINING	0	180	0	45	3
YEAR IV SEMESTER I: AT LEAST 3 COURSES, WITH 2 FROM CHOSEN CONCE				**NTRATION AND PROIECT**			
1	ELE4100	ELECTRICAL ENGINEERING PROJECT	0	180	0	45	3
	ELECTRONIC ENGINEERING CONCENTRATION						
1	TEL4111	DIGITAL SIGNAL PROCESSING	45	30	0	60	4
2	ELE4112	MICROPROCESSOR BASED SYSTEMS	45	30	0	60	4
	POWER SYSTEM ENGINEERING CONCENTRATION						
5	ELE4115	POWER SYSTEM PROTECTION & COORDINATION	45	30	0	60	4
6	ELE4116	ELECTRICAL INSTALLATION DESIGN	30	60	0	60	4
	ELECTIVES						
3	TEL4113	OPTICAL COMMUNICATIONS	45	30	0	60	4
4	TEL4114	TELEVISION AND VIDEO ENGINEERING	45	30	0	60	4
7	ELE4117	ENGINEERING PROJECT MANAGEMENT	60	0	0	60	4
YEAR	**IV SEMESTER II: AT LEAST 3 COURSES, WITH 2 FROM CHOSEN CONCENTRATION AND PROIECT**						
1	ELE4200	ELECTRICAL ENGINEERING PROJECT	0	180	0	45 | 3		
	ELECTRONIC ENGINEERING CONCENTRATION						
1	ELE4211	VLSIC DESIGN & FABRICATION	45	30	0	60	4
2	TEL4213	RADIO FREQUENCY & MICROWAVE ENGINEERING	45	30	0	60	4
	POWER SYSTEM ENGINEERING CONCENTRATION						
4	ELE4209	HIGH VOLTAGE ENGINEERING	45	30	0	60	4
5	ELE4214	POWER ECONOMICS AND MANAGEMENT	60	0	0	60	4
	Electives						
3	TEL4212	SATELLITE COMMUNICATIONS	60	0	0	60	4
6	TEL4215	BROADBAND AND ADVANCED COMMUNICATIONS	45	0	0	45	3
7	ELE4216	ADVANCED TOPICS IN ELECTRONIC ENGINEERING	45	0	0	45	3
8	ELE4217	ADVANCED TOPICS IN POWER ENGINEERING	45	0	0	45	3
9	COE1104	BUSINESS MANAGEMENT	60	0	0	60	4

8.

EMT1101 ENGINEERING MAT

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
60	0	00	60	100	60	40	4

HEMATIC S I

DETAILED COURSE DESCRIPTIONS

Brief Course Description

This is an introductory course giving students the required basic mathematical background and sets foundation for other Engineering courses. It provides an introductory treatment of some mathematical concepts and techniques.

Course Objectives

By the end of this course the students should be able to:

- Have a good understanding of the basic concepts of Engineering Mathematics
- Apply the mathematical principles for solving Engineering problems.

Detailed Course Content:

Functions: [6 Hours]

Elementary, transcendental, Exponential, hyperbolic & logarithmic functions of a real variable

Differential calculus: [15 Hours]

Differential of functions of one and several variables: the derivative (definitions & theorems); Rules of differentiation, the differentiability theorem; Differentiation of functions with exponential functions, logarithmic functions, or hyperbolic functions; Some consequences of differentiability; Maxima and minima; identification of extrema; Indeterminate forms - l'Hopital's rule; Identification of extrema using second derivative; Partial &Total differentiation; Differentiation by chain rule; Change of variables; implicit functions & the derivatives of inverse circular functions. Higher order partial derivatives.

Integral calculus: [15 Hours]

Fundamentals of integration; Definite integrals, area under the curve, Volume of solids, & surfaces of revolution; Integration of a continuous function; Inequalities; The definite integral as a function of its upper limit; Indefinite integrals; Differentiation of an integral containing a parameter; Application of definite integrals; Double integrals & their applications; Systematic integration - by substitution, parts, reduction formulae; integration of rational (partial) functions.

Infinite series: [12 Hours]

Sequences - definition & examples; Convergence; Sequences of real & complex numbers; Limit theorems of sequences; Series - power series, convergence of power series; Maclaurin's and Taylor series; Fourier series; Periodic functions; Trigonometric Fourier series; Exponential Fourier series and Euler's formula; Fourier series of odd and even functions and of function of arbitrary periods; Half range Fourier series expansions; Determination of Fourier series without integration; Some limits theorems of series; Fourier series applications to electric circuits and Mechatronic systems. **Ordinary differential equations (ODE): [12 Hours]**

Definitions; Differential equations of first order and degree; Formation of differential equations of first order and degree - with separate variables, homogeneous, linear; Exact differential equations; Applications of elementary ODE - Cartesian coordinates, orthogonal trajectories, physical applications; Linear ODE of orders

greater than one; Complementary functions (CF) and particular integral (PI); The D-operator; Ordinary rules for finding complementary functions; Cauchy's

homogeneous linear differential equations; Legendre's linear differential equation; Applications of linear ODE in Mechatronic systems (RL,RC, LC, RLC, Springs). **Learning Outcomes**

• Firm grounding in the concepts learned at advanced level **Method of Teaching/Delivery**

The course will be taught by using lectures, tutorials and assignments. **Mode of Assessment**
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

[1] C. Ray Wylie and Louis C. Barrett, *Advanced Engineering Mathematics,* 6th ed., McGraw Hill, New York, 1995.
[2] Erwin Kreyszig, *Advanced Engineering Mathematics,* 8th ed., John Wiley and Sons.
[3] Murray R Spiegel, *Theory and Problems of Vector Analysis,* SI (Metric) ed., McGraw Hill
[4] K. A. Stroud, *Engineering Mathematics,* 5th ed., Palgrave Macmillan, 2005
[5] Bajpai, Calus, Fairley and Walker, *Mathematics for Engineers and Scientists*
[6] Edward & Penney, *Calculus,* International ed., Prentice Hall, 2002
[7] J.L. Smyrl, *Introduction to University Mathematics,* Edward Arnold, 1978

Possible Lecturers:
Dr. E. Lugujjo Dr. T. Togboa Dr. M. K. Musaazi Ms. M. Tumwebaze Mr. P. I. Musasizi

ELE1101 CIRCUIT THEORY

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Brief Course Description
The course introduces concepts, laws and their applications for DC and AC circuits. It presents basic units theory that enables students to understand and analyze circuits.

Course Objectives
By the end of the course students should be able to:

- Have a good understanding of the basics of circuit theory and acquire engineering analytic techniques and skills.
- Apply circuit theorems to simplify and find solutions to electrical circuits.
- Interpret, develop and design electrical engineering circuits

Detailed Course Content:

DC Circuits: 19 **[10 Hours]**

Thevenin's and Nortons theorems, superposition theorem, concept of input and output resistance of network, single-port networks, two-port networks, KCL, KVL, electric power, electric energy/work, energy sources, sources transformations, power transfer, maximum power transfer, current and voltage divider theorems, Mesh and Node analysis; D.C. power supplies and their industrial use. Circuit Elements: **[9 Hours]**
Review of circuit concepts of resistance, capacitance, and inductance; volt-ampere relationships for the basic circuit elements; time-varying and alternating quantities, period, fundamental frequency, concept of harmonics; mean/average, rms, sinusoidal voltages and currents, phase and phase difference.
A.C. Circuits: **[8 Hours]**
Complex numbers, Representation of time-varying/sinusoidal quantities, Phasors, rectangular and polar representation; concept of reactance impedance conductance admittance susceptance; phasor diagrams of resistive, purely inductive and purely capacitive impedances; impedances comprising combinations of R, L, and C; Simple circuit solution using phasor diagrams; Power in a.c. circuits, power factor and power factor correction complex power, real and apparent power, the power triangle.
A.C. Circuit Analysis of Simple Networks: **[8 Hours]**
Circuit theorems under a.c. conditions; Thevenin, Norton, and superposition t heorems; KVL, KCL, loop/mesh and node analysis, maximum power transfer under a.c. conditions. Elementary Transient Signals: Simple functions: step, ramp, impulse, transient analysis of circuits with one energy storage element, impulse response, step response, time constant concept of damping, undamped circuits.
Three Phase Circuits: **[6 Hours]**
Concept of three-phase supply, phase diagrams for 3-phase circuits, balanced 3-phase supply, star and delta circuits, analysis of simple balance 3-phase circuits, power in three-phase circuits power measurement in three phase circuits.
Frequency Response Curves: **[4 Hours]**
Resonance, series and parallel resonance, the concept of Q-factor, tunned circuits frequency selective networks mutually-couple circuits.

Learning Outcomes
On completion of this course the students will:

- Appreciate new concepts in AC and DC Circuit analysis and on completion of this course unit a student will be firmly convinced that the theorems and concepts hold practically;
- Become adept at using various methods of circuit analysis, including simplified methods such as series-parallel reductions, voltage and current dividers, and the node method;
- Appreciate the consequences of linearity, in particular the principle of superposition and Thevenin-Norton equivalent circuits.

Method of Teaching/Delivery

The course will be taught by using lectures, tutorials and assignments. **Mode of Assessment**
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books
[1] Dorf and Svoboda, *Electrical circuits: Introduction*
[2] D. R. Cunningham and S. A. Stuller, *Basic Circuit Analysis,* Jaico, 2005
[3] W. H. Hayt, J. E. Kemmerly and S. M. Durbin, *Engineering Circuit Analysis,* 6th ed., Tata McGraw- Hill, New Delhi, 2006

Possible Lecturers:
Dr. E. Lugujjo Dr.M. K. Musaazi Mr. D. Sebbaale

ELE1102 PHYSICAL ELECTRONICS

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Brief Course Description

The course addresses the physics of basic physical concepts of electronic devices. **Course Objectives**

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

- Understand the behaviour of electrons in electrical and magnetic fields in materials.
- Understand the design and operation of diodes and bipolar junction transistors.

Detailed Course Content:

History of Electronic devices and its impact on society. **[2 Hours]**

Charged Particle Dynamics: [9 Hours]

Electron motion in uniform electric fields and current in external circuit. Electrostatic deflection in Cathode Ray Oscilloscope (CRO). Motion in uniform magnetic fields. Magnetic deflection and focusing. Motion of changed particles in crossed uniform electric and magnetic fields. Cycloidal trajectories in a magnetron. Magnetron cut-off. Electron optics-magnetic lens, electrostatic electron optics. The electron microscope. Electrostatic lens.

Conductors, Semi-conductor and Insulators: [9 Hours]

Electron theory of metals, Classical theory of conduction. Electronic collisions. Dependence of conductivity on temperature. Production of free charge carriers-Band and Band models. Carrier drift and mobility. Mobility variation with temperature. A derivation of ohm's Law. Drift current equations.

Semiconductor materials and processes: [9 Hours]

Intrinsic: band model, effective mass, density states, hole ans electron conduction. Extrinsic: donor acceptor and acceptor states, Fermi level and its variation with temeperature and dopants, Carrier concentration: Carrier diffusion. Flux equation. Fick's laws. The Eistein relation. Total current density. Carrier recombination and diffusion length. Intrinsic semiconductor - Variation of carrier concentration and mobility with temperature. Extrinsic semiconductors-Doping methods. Donors and acceptors. Minority and majority carriers.

The Semiconductor Junction Diode: [8 Hours]

Contact between two materials, metal to semiconductor contacts. Junction diode manufacturer Current/voltage characteristic of a diode. The p-n junction in thermal equilibrium. Junction barrier height. Forward and Reverse bias. The Ideal diode equation. Relative magnitude of hole and electron current. Junction breakdown.

The Bipolar Junction Transistor (BJT): [8 Hours]

The Transistor Action. Carrier density profile. Potential and energy distribution. Band diagram under equilibrium, forward and reverse bias. Current distribution under these conditions. Emitter injection efficiency, transport factor, current gain and collector leakage current, in terms of the device physical conditions. Distribution of excess. Charge in the base and base width modulation. BJT D-C characteristics.

Learning Outcomes

- Identify some contributors to electronics and relate their achievements to the knowledge area; describe a transistor and its functionality; identify some storage elements; articulate the purpose of buses; indicate the importance of designing data conversion circuits; identify two software products used for designing and simulating circuits; and describe how computer engineering uses or benefits from electronics.
- Indicate the properties of materials that lead to be useful for the construction of electronic circuits, giving reasons; and explain the uses of one particular material (as opposed to alternatives) to serve a stated purpose.
- Explain the properties of diodes; and outline the use of diodes in the construction of a range of circuits including rectifiers, ac/dc converters, and common logic functions.

- Explain the differences between the different BJT logic families; and articulate the advantages of each.

Method of Teaching /Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and References Books

[1] Agarwal, Anant, and Jeffrey H. Lang. **Foundations of Analog and Digital Electronic Circuits** San Mateo, CA: Morgan Kaufmann Publishers, Elsevier, July 2005. ISBN: 9781558607354.

[2] Earl D. Gates, *Introduction to Electronics*, 4th ed., Thomson, 2004

[3] D. C. Green, *Electronics4*, 3rd ed., Longman, 1995

Possible Lecturers:

Dr. E. Lugujjo
Dr. T. Togboa
Ms. M. Tumwebaze

CMP1103 INFORMATION & COMMUNICATION TECHNOLOGY

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Brief Course Description

The purpose of the course is to help students to understand the basics of computer software and hardware systems. In addition the course gives basics of programming languages and enables the students to use the applications software. To introduce the use of software applications in problems solving and information storage and retrieval as well as the principles of well-structured programming using C.

Course Objectives

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

- Have an overview of and know computer architecture, computer systems and applications and systems software.
- Familiar with the characteristics and purpose of all the major subunits in a computer system
- Understand the sequence of internal events as a computer executes an instruction.
- Understand the conventions of representing data and instructions within a computer's memory.
- Use Windows and QuickBasic effectively. **Detailed Course Content:**

Introduction to hardware and software: **[5 Hours]**
Computer organization: systems approach to computer architectures;
Programming languages and operating systems: Low-level and high-level programming languages;
Operating systems: Command-line and Graphical User Interfaces; DOS, UNIX, LINUX, WINDOWS, MACINTOSH, etc. Software packages and Utilities;
Computer applications: office, industry, scientific research, etc.
Number systems: binary, decimal, octal, and hexadecimal; **[8 Hours]**
Introduction to computer communications and networks: the physical infrastructure and the logical infrastructure; network topologies and devices;

The Internet: **[7 Hours]**
Requirements for internet connection; internet protocols: http, html; urls;
Internet search engines: Google, Alta-vista, Meta-search engines, etc.
Programming mechanics: **[25 Hours]**
flow-chart and algorithm development; assemblers, interpreters and compilers; Programming language fundamentals: keywords, conditional flow control, iteration, function invocation, recursion, typing, scope, and memory management; Introduction to programming using C and/or MATLAB;

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/Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books
Due to the volatile nature of the pertinent content, the student should be guided by the substantive instructor to access the reference materials.

Possible Lecturers:

ELE1112 INTRODUCTION TO

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
30	0	00	30	100	60	40	2

LECTRICAL ENGINEERING
Dr. D. Okello Mr. S. Mwanje Mr. A. Tumwesigye Mr. P. I. Musasizi

Brief Course Description
The course introduces students to the practice of electrical engineering discussing the different skill sets and occupations expected for electrical engineers.

Course Objectives

To give a historical background, present status and future challenges of the electrical engineering profession

Detailed course content

University studies and engineering: **[8 Hours]**
Introduction, criteria in selecting electrical engineering fields, value of electrical engineering to society
Electrical engineering profession: **[8 Hours]**
Bbackground to the profession, fields (power, telecommunications, electronics, computer systems, management). Interrelation to other engineering disciplines
Development of science and technology in Uganda: evolution of engineering practice in Uganda; standard of engineering, history of electrical engineering.
Analytical methods: scientific methods, experimental methods **[10 Hours]**
Ethics and integrity in engineering: professionalism, ethics, integrity **[4 Hours]**
Professional bodies in Uganda and internationally: UIPE, ERB, development of a professional engineer. IEEE, IEE/IET

Method of Teaching/Delivery

The course will be taught by using lectures, tutorials and assignments**. Mode of Assessment**
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Possible Lecturers:
Dr. D. Okello Mr. S. Mwanje

C0E1103 BUSINESS COMMUN

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	00	45	100	60	40	3

CATIONS
SKILLS

Dr. E. Lugujjo Dr. J. Butime

Brief Course Description

The course helps students to acquire oral and written communication skills.

Course Objectives

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

- Have skills in reading, listening and note-taking
- Effectively express ideas verbally and in writing.
- Have good report writing and presentation skills

Detailed Course Content:

Fundamental skills: **[45 Hours]**

Reading listening, note taking, and note making, speaking and interacting skills. Interpersonal skills will cover conduct and interaction at the work place, conduction of meetings, writing an agenda and a notice of a meeting, deciding on items for discussion, organizing the agenda, inviting people for a meeting and writing of minutes. Academic writing will address report writing, seminars and workshop paper presentation; inter office communication with particular emphasis on business correspondence and memo writing. Technical report writing addressing field data gathering, technical project reports, maintenance reports etc.

Mode of Delivery

The course will be taught by using lectures, tutorials and assignments.

Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

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/Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

[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

Possible Lecturers:

EMT1201 ENGINEERING MAT

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
60	0	00	60	100	60	40	4

Mr. D. Semukuutu

HEMATICS
II

Brief Course Description

The course builds on Engineering Mathematics I and covers differential equations, infinite series, and real vector and numerical analysis. It also prepares the students for engineering mathematics III.

Course Objectives

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

- Enhance their knowledge of engineering mathematics concepts
- Apply engineering mathematics concepts and theorems to electrical engineering

Detailed Course Content:

Complex Number(variable) algebra: [10 Hours]

Definition, properties (algebraic operations) & applications; Cartesian & polar representations; Absolute values; Products, powers and quotients; Extraction of roots; De-Moivre's theorem; exponential & hyperbolic functions of the complex variable.

Vector Algebra: [10 Hours]

Scalars, vectors and their applications; Properties of vectors -addition, multiplication by scalars, dot & cross products; Vector products in terms of components; Application to analytic geometry - equation of lines, planes, spheres, etc; Physical applications -work done, normal flux, moments, force, angular velocity of rigid body;

Coordinate systems and Transformation: Cartesian coordinates, Cylindrical Coordinates, Spherical coordinates. Vector Calculus: Differential length, Area and Volume. Vector Calculus: Line, surface and Volume integrals. Vector Calculus: Gradient, Divergence, Curl and Laplacian. **Linear transformations & matrices: [10 Hours]**

Definitions, equality, sum, product of matrices; types of matrices; the identity matrix, inverse of a matrix, transpose of matrix; Symmetric and skew symmetric matrices; Determinants - definition and properties, minors and cofactors, evaluation of determinants by cofactors; Solution of systems of linear algebraic equations; Consistent and inconsistent equations; Systems of homogeneous equations; Cramer's rule; Gauss -Jordan method.

Vector analysis: [10 Hours]

Scalar and vector fields, vector functions, derivatives of vector functions; divergence and curl of vector functions; application of vector function concepts - line and surface integral, triple integrals and stokes theorems; Physical interpretation of divergence and curl of a vector field; Green's theorem, Line integrals independent of path; exact differential forms.

Real analysis: **[10 Hours]**

Differentiability, the mean value theorem, Generalization of Taylor's series; Integrability, the definite and indefinite integrals, the fundamental theorem of calculus, differentiation and repeated integrals. **[10 Hours]**

Numerical analysis:

Numerical solutions of polynomial algebraic functions; interpolation formulae; numerical differentiation and integration; trapezoidal and Simpson's rules of integration; numerical solutions of ordinary differential equations; further consideration of integral equations by numerical methods.

Mode of Delivery

The course will be taught by using lectures, tutorials and assignments.

Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Learning Outcomes

On completion of this course the student will:

- Be able to formulate Ordinary Differential models associated with Electric Circuits
- Obtain analytical and numerical solutions of Ordinary Differential Equations;
- Have acquired the analytical ability critical to engineering problem solving

Method of Teaching/Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

[1] Martin M. Lipschutz, *Theory and Problems of Differential Geometry,* McGraw-Hill, 1969

[2] C. Ray Wylie and Louis C. Barrett, Advanced *Engineering Mathematics,* 6th ed., McGraw Hill, New York, 1995.

[3] Erwin Kreyszig, Advanced *Engineering Mathematics,* 8th ed., John Wiley and Sons.

[4] Murray R Spiegel, *Theory and Problems of Vector Analysis,* SI (Metric) ed., McGraw Hill

[5] Murray R. Spiegel, 1981. *Applied Differential Equations*. 3rd Edition. Prentice-Hall, Inc., Englewood Cliffs, N.J. 07632

[6] Mary L. Boas, 1983. *Mathematical Methods in the Physical Sciences*. 2nd Edition. John Wiley & Sons, INC. New York

[7] G. Stephenson, 1988. *Mathematical Methods for Science Students*. 2nd Edition. Longman Group UK

[8] Thomas M. Creese and Robert M. Haralick, 1978. *Differential Equations for Engineers.* McGraw-Hill, N. Y. US

[9] Shepley L. Ross, 1966. *Introduction to Ordinary Differential Equations*. Blaisdell Publishing Company, Massachusetts, US.
[10] L. R. Mustoe, 1988. *Worked Examples in Advanced Engineering Mathematics*. John Wiley & Sons Ltd. Great Britain.

Possible Lecturers:

ELE1201 INTRODUCTION TO DIGITAL ELEC

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

RONICS

Dr. E. Lugujjo Dr. T. Togboa Dr. M. K. Musaazi Ms. M. Tumwebaze Mr. P. I. Musasizi

Brief Course Description
The course is intended to provide the basics and necessary theoretical background on digital electronics.

Course Objectives
By the end of the course students should be able to:

- Understand Digital Electronics Techniques and their advantages over analogue techniques.
- Analyse and synthesize logic circuits
- To build and test logic circuits and be able to implement application circuits. **Detailed Course**

Content:
Introduction to electronics: [10 Hours]
Milestones in the development of lectronics; thermionic devices, semiconductor devices, distinction between Analogue and Digital electronics; Analogue and Digital Systems, . Advantages of digital electronics over analogue electronics. Application examples in data acquisition, processing, storage, Access and transmission. Application examples: Instrumentation, Communication, control systems and Computer systems, automobile industry, medicine and consumer electronics. Introudction to analogue and digital conversion
Numbers System: [4 Hours]
Representation of physical quantities by different number systems: Decimal, Octal, Hexadecimal, Binary and conversion between number systems; Digital codes:BCD, ASCII, GRAY, EXCESS-3 **Digital Logic:[9 Hours]**
Introduction to Boolean Algebra and Boolean theorems: Logic gates: AND, OR and NOR operating and truth tables; hierarchy of operations. Logic circuit analysis and synthesis using AND, OR, NOT. NOR and NAND operations and path tables. Single and multivariable Boolean theorems: commutative, associative, and distributive laws; De Morgan's theorem. Universality of NAND and NOR gates. Exclusive OR, exclusive NOR and BUFFER gates.Logic functions: POS/SOP expression, manipulation of logic functions using Boolean algebra. Karnaugh Map.
Introduction to Physical Realisation of logic gates and logic families: [6 Hours]
Logic ICs and logic families: TTL, ECL, CMOS and interfacing. Merit considerations: cast per gate; propagation delay; threshold voltage; noise margin; fan-in and fan-out; power dissipation. Comparison of TTL, ECL and CMOS.

Combinational Logic Circuits: **[8 Hours]**

Design procedure of combinational logic circuits: Half and full adder circuits; encoders, decoders , multiplexers, demultiplexers and other application circuits, minimization of logic circuits by Karnaugh map

Sequential Logic circuits: **[8 Hours]**

Flip-flops, latches, edge triggered flip flops, master slave flip-flops. Multivibrators: one short, A stable : definitions and examples. Flip flop applications; Data storage, Shift registers: SISO, SIPO, PIPO, PISO, other Shift register applications. Counters: Asynchronous and synchronous counters. UP/Down counters. Ring counters. Counter decoding. Waveform/timing diagrams

Mode of Delivery

The course will be taught by using lectures, tutorials, laboratories, and assignments.

Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, laboratories, tests) 40% Final examination	60%
Total	**100%**

Learning Outcomes

- Describe how computer engineering uses or benefits from digital logic.
- Work with binary number systems and arithmetic.
- Derive and manipulate switching functions that form the basis of digital circuits.
- Explain and apply fundamental characteristics of relevant electronic technologies, such as propagation delay, fan-in, fan-out, and power dissipation and noise margin.
- Analyze and design combinational logic networks in a hierarchical, modular approach, using standard and custom logic functions.
- Analyze circuits containing basic memory elements.
- Analyze the behavior of synchronous and asynchronous machines.
- Apply digital system design principles and descriptive techniques

Method of Teaching/Delivery

The course will be taught by using lectures, tutorials and assignments. **Mode**

of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

[1] Stephen Brown, Zvonko Vranesic, 2004. *Fundamentals of Digital Logic with VHDL Design,* McGraw-Hill Professional. ISBN 0072499389, 9780072499384

[2] Douglas A. Pucknell, 1990. Fundamentals of Digital Logic Design with VLSI Circuit Applications, Prentice-Hall

[3] Ronald J. Tocci, 1995. Digital Systems: Principles & Applications, 6th ed., Prentice Hall.

Possible Lecturers:

Dr. J. Butime
Mr. D. Nsubuga Mubiru
Mr. P. Bogere

ELE1202 ELECTRICAL MATERIALS

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

[Pre-requisite: Physical E ectronics].

Brief Course Description

The course exposes students to the basic understanding of atomic theory and spectrum of electrical engineering materials that include dielectrics, semiconductors and their applications.

Course Objectives

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

- Understand the basic principles of atomic theory and wave mechanics.
- Understand the characteristics of dielectrics and semi-conductors materials and their applications.

Detailed Course Content:

Atomic theory: [4 Hours]

Rutherford and Bohr atoms, Emission spectra, wave-particle duality, photoelectric effect. **Dielectric materials and processes: [9 Hours]**

Chemistry and physics of insulating materials, brief review of electrostatic relationships: coulomb's law dielectric displacement, dielectric constant, polarization density, electric susceptibility, Lorentz force field, clausius - Moseti equation. Temperature and frequency dependency of permittivity: dipolar polarization, langevin function, complex dielectric constant, loss tangent. Electric processes in dielectrics:piezoelectric effect, ferroelectricity, ionic conductivity, pyroelectricity,electrostriction and the curie-weiss law. Electric breakdown in dielectrics: thermal, electrolytic, dipole, collision and gas discharge breakdown.

Basic Theorems of Quantum Mechanics: [6 Hours]

The Schroedinger wave equation, the uncertainty principles; Electron orbits; Bohr theorem; energy levels and spectra; the tunnel effect; the harmonic oscillator. Lattice dynamics; laser oscillations; laser systems: pumping and laser efficiency; Ruby laser; He-Ne laser; semiconductor lasers. **Transistor Stuctures: [10 Hours]**

Permeable base Transistors, Planar Doped Barrier Devices, Super lattice Devices, Resonant Tunnelling Devices

Photonic Devices: Optoelectronic Devices: Optical Absorption, Crystalline and Amorphous, Solar Cells, Electroluminescence and Light Emitting Diodes, Photo detectors. Light Emitting Diodes Issues: Material Systems for LED, Light-Current characteristics, Spectral Purity of LEDs, LED Temporal Response, Temperature dependence of LED emission, LED Reliability.

Integrated Circuit Design & Technology: [8 Hours]

Planar Technology, Pattern Generation and Photomask. Photolithography. Epitaxy Oxidation, Diffusion and Ion Implantation. Metallization and Interconnections. Encapsulation; The Integrated Circuit Components-Design Philosophy. Some Basic Building Blocks of Analog Bipolar ICs. **Lasers: [8 Hours]**

Spontaneous and Stimulated emission, semiconductor lasers, Optical Absorption, loss and gain.

Superconductivity: Occurrence of Superconductivity, Critical Field, The Meissner Effect, The Penetration Depth, Quantum Tunnelling, Theory of Superconductivity, Engineering Applications of Superconductivity.

Mode of Delivery

The course will be taught by using lectures, tutorials and assignments.

Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Learning Outcomes

- Indicate the properties of materials that lead to be useful for the construction of electronic circuits, giving reasons; and explain the uses of one particular material (as opposed to alternatives) to serve a stated purpose.
- Explain the properties of diodes; and outline the use of diodes in the construction of a range of circuits including rectifiers, ac/dc converters, and common logic functions.

Method of Teaching/Delivery

The course will be taught by using lectures, tutorials and assignments. **Mode**

of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and References Books

[1] Agarwal, Anant, and Jeffrey H. Lang. **Foundations of Analog and Digital Electronic Circuits** San Mateo, CA: Morgan Kaufmann Publishers, Elsevier, July 2005. ISBN: 9781558607354.

[2] Earl D. Gates, *Introduction to Electronics,* 4th ed., Thomson, 2004

[3] D. C. Green, *Electronics4,* 3rd ed., Longman, 1995

Possible Lecturers:

Dr. E. Lugujjo
Dr. T. Togboa
Ms. M. Tumwebaze

CMP1201 COMPUTER PROGRAMMING FUNDAMENTALS

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
30	60	00	60	100	60	40	4

Brief Course Description

The course provides a thorough understanding of the principles of well-structured and efficient programming in C/C++ fostering a productive and effective programming methodology appropriate for modern day engineering disciplines which require computer programming to carry out simulation, modeling, data gathering and analysis.

Course Objectives

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

- Analyse a problem by decomposing it into distinct inputs, outputs and processes.
- Use stepwise refinement to design an algorithm from the problem analysis.
- Translate a correct algorithm design from pseudo-codes into a C/C++-program-coding
- Use programming environment (e.g. test editor, compilers etc) for development of C/C++- programs.

Detailed Course Content:

Intro to C/C++ : **[10 Hours]**

Basics, Control and Arrays, Pointers, Input / Output

Programming language fundamentals keywords, conditional flow control, iteration, function invocation, parameter passing, recursion, typing, scope, and memory management

Introduction to algorithm and complexity (searching and sorting, e.g., binary search, insertion sort, etc.)

Object-oriented programming (OOP): **[14 Hours]**

Philosophy, principles, and mechanisms (encapsulation, abstraction, inheritance, and polymorphism, OOP with C++: Structures, Classes, and Objects, member function and variables, constructor, destructor, function overloading, virtual functions, standard template library - STL, and very briefly exception handling, templates, operator overloading

Data structures: **[6 Hours]**

Linked list, queue, tree, stack, hash table; Software engineering formalism; advanced topics in data structure and algorithms;

Assignments will be in Numerical Methods Applications:

Least squares line, curve fittings; Fourier series and Trigonometric Polynomials; Iterative methods for linear systems: Newton's method, eigenvectors and eigenvalues. Solution of differential equations: Euler's method, Runge-Kutta and Predictor-Corrector methods,

Mode of Delivery

The course will be taught by using lectures, tutorials and assignments.

Assessment

Assignments, tests, laboratories, and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, laboratories, tests)	40%
Final examination	60%
Total	**100%**

Learning Outcomes

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

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

Method of Teaching/Delivery

The course will be taught by using lectures, tutorials and assignments. **Mode of Assessment**

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

[1] Herbert Schildt, 2003. *C++from the Ground Up,* Third Edition, McGraw-Hill/Osborne, ISBN 0-07-222897-0

[2] Chuck Easttom, 2003. *C++ Programming Fundamentals,* Charles River Media, ISBN 158402371

[3] Bjarne Stroustrup, 2000. *The C++ Programming Language,* Addison-Wesley, ISBN 0-20170073-5

[4] Michael T. Goodrich, Roberto Tamassio, David Mount, 1995. *Data Structures and Algorithms in C++,* John Wiley, ISBN 0-471-20208-8

[5] Robert Sedgewick, 2001. *Algorithms in C++,* Addison - Wesley, ISBN 0201510596

[6] Nell Dale, 2003. *C++ Data Structures,* Jones and Bartlett Publishers

Possible Lecturers:
Dr. D. Okello Mr. S. Mwanje Mr. A. Tumwesigye Mr. P. I. Musasizi Mr. P. Serwanga

ELE1204 STATICS & DYNAMICS

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
30	0	00	60	100	60	40	2

Brief Course Description
Statics and Dynamics course is designed purposely to help Electrical Engineering students to understand mechanical forces and energy in physical structures (structures used in electrical and telecommunication installations).

Course Objectives
By the end of the course students should be able to:

- Understand types of mechanical forces in physical engineering structures
- Apply the concepts of statics and dynamics in the design of engineering structures.

Detailed Course Content:

Statics: [15 Hours]
Fundamental concepts and principles of mechanics; Important vector quantities; Fundamental units; Moments and couples; Resultants of forces and couples; Laws of equilibrium; Free body diagrams; structures, cables, frames and machines;

Dynamics: [15 Hours]
Fundamentals of dynamics; Dynamics of particles and rigid body including kinematics and kinetics; Applications of Newton's second Law of motion; Analysis of motion in two dimensional and three dimensional spaces; Simple harmonic motion; Methods of energy momentum Applications of Dynamics to the engineering concepts; Strength of material, Fluid Mechanics, Pulleys, Chains; Concepts of Flywheel, Bearing, Mechanical Power Transmission.

Mode of Delivery
The course will be taught by using lectures, tutorials and assignments.

Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Learning Outcomes

Having successfully completed the module, you will be able to demonstrate knowledge and understanding of:

- Basic concepts and principles in mechanics of solids
- Applications of mathematics and principles of superposition
- Structural analysis
- Material behaviours under mechanical loadings

- Abilities to identify, describe and analyse the performance of mechanical systems
- Basis for beam design

Method of Teaching/Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

- Benham PP, Crawford RJ, Armstrong CG, Mechanics of Engineering Materials (1996) Pearson/Prentice Hall [Library] [Shops]
- Hibbeler RC, Statics and mechanics of materials (2004) Pearson/Prentice Hall [Library] [Shops]
- Hibbeler RC, Mechanics of Materials (2008) Pearson/Prentice Hall [Library] [Shops]

SOCl0l INTRODUCTION TO SOCIOLOGY

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	00	45	100	60	40	3

Brief Course Description

The course is meant to provide students with knowledge on social aspects of society. Since engineers solve problems faced by the society, it is important for them to understand the characteristics and behaviour of the community.

Course Objectives

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

- Understand cultural, conflict and control, dynamics of social change and the impact of the technology on the environment
- Understand rural and urban sociology in developing countries, basic human rights as understood in today's world and the interrelation of technology and human rights

Detailed Course Content: [45 Hours]

Social structures: Individual, family, and community; Family kinship and neighborhood structure, status and class; Manifest and latent of institutions and groups; social norms, conflict and control; Dynamics of social change with specific reference to E. Africa/Uganda. Reflections of these issues in dwelling, community and development; Introduction to Urban Sociology in developing countries like Uganda; Industrialization and its impact on society; Assessment of impacts of appropriate technology, intermediate technology and high-technology on the development of society. Effects of industrialization on the environment; Impact of land tenure system on industrial development. Principles of human rights: Civil rights and civil liberties, children's, women's rights; Children and family rights; right to education; Regulatory law: public interest law: Gender discrimination issues: employment discrimination; employment law; poverty law; gender issues; importance of gender in social and economic patterns; social welfare.

Method of Teaching/Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**lOO%**

Possible Lecturers:

Mr. D. Semukuutu

ELE1301 VOCATION PRACTICE

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
0	0	180	45	100	60	40	3

Brief Course Description

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

Course Objectives

- To help students acquire practical skills in a workshop environment

Detailed Course Content:

Safety Precautions: [6 Hours]

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

Elementary Machine Shop: [6 Hours]

Detailed study of centre lathe and accessories; Plain and taper turning, simple screw cutting; Cutting tools and their grinding; Introduction of shaper, slotter, planner, pillar and radial drilling machines. **Fitting Shop: [6 Hours]**

Use and care of fitter's tools; Marking out of jobs; Practice in metal filing, sawing, drilling, Die sinking, tapping and reaming; Introduction and use of power jack saw and arbor press **Smithy Shop: [6 Hours]**

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

Electronics and Computer Shop: [9 Hours]

Windows XP, Office automation and use of internet; Software and hardware maintenance **Building Construction: [6 Hours]**

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

Technology Incubation: [6 Hours]

Projects in designing technology based solutions to simple problems.

Learning Outcomes

On completing the course the student should be able to:

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

Method of Teaching/Delivery

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

Mode of Assessment

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

Proposed Staff

Mr. Ivan Rwendeire 36
Mr. John Clifton
Mr. Fred Mukasa
Mr. Yunus Luswa

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

ELE1302 ELEC.ENG DRAWING & INSTALLATION PRACTICE

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Brief Course Description
In this course the students will acquire knowledge and skills about domestic, institutional and industrial electrical installations.

Course Objectives
1. To introduce students to the basics and standards of drawing techniques as a means of communication
2. To introduce students and give them knowledge and skills in the practice of domestic, institutional and industrial electrical installations and train them to inspect and test electrical installations

Detailed Course Content:
Fundamentals Of Engineering Drawing: [6 Hours]
Definitions and Relevancy; Preference of drawings to written and spoken communication in Engineering; Drawing Office; Organisational Structure, Functions, Drawing Reproduction Processes and Techniques. Drawing Materials and Equipment; Standard Abbreviations and Symbols; Types of Lines; Lettering and Numerals; Types of Drawings; Single-Part or Component, Sub-Assembly, General-Assembly. Sketching; Freehand Sketching, Form and Proportion. Pictorial Projection; Perspective, Isometric and Oblique Projections. Orthographic projection; First angle and Third angle Projections, Sectional Views, Views on Drawings, Auxiliary views, and Points, Lines and Plane Surfaces in Space. Dimensioning; Functional and Non-functional, Principles. Transformation of plane figures; Principles of Tangency; Simple Plane Polygons; Special Curves and Loci; Architectural Drawings;
Principles Of Electrical Drawing: [4 Hours]
Charts; Applications, Types. Diagrams; Equivalent Circuits, Circuit Diagrams, Block Diagrams, Line Diagrams, Wiring Diagrams, Location or Lay-out Diagrams, Sankey Diagrams, Schematic Diagrams. BS 3939 electrical standard symbols and convection applied to electrical, power systems (generation, transmission, substation and distribution) telecommunications (transmission and receiver systems), radio, television and electronic equipment (circuits and networks); IEC 61346 Letters; **Drawings And Engineering Design: [4 Hours]**
Definitions; importance and purpose of drawing in design, product development stages and factors considered; Computer Aided Drawing/Design (CAD); Introduction to Simulation; Limitations of Drawings in the Design process, design of components, choice of materials in design and drawings **IEE Wiring Regulations: [16 Hours]**
Scope, objective and fundamental requirements for safety; assessment of general characteristics; protection for safety; selection and installation of ables and equipment; special installations or locations; inspection, testing and certification. Installation of standby and alternative power supply systems.

Method of Teaching /Delivery
The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

EMT2101 ENGINEERING MATHEMATICS III

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
60	0	00	60	100	60	40	4

Brief Course Description

This course builds on Engineering Mathematics II and covers Fourier and Laplace transforms and the special functions.

Course Objectives

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

- Enhance their knowledge of engineering mathematics concepts
- Apply engineering mathematics concepts and theorems to electrical engineering

Detailed Course Content:

Fourier and Laplace transforms: [14 Hours]

Direct and inverse Fourier transforms and their applications; Direct and inverse Laplace transforms; some properties of Fourier and Laplace transforms; solutions of ordinary differential equations by transform techniques; transforms of partial fractions; derivatives, and products of functions; transforms of quadratic factors; the unit step function; the impulse function; translation and periodic functions; Solutions of simultaneous ordinary differential equations; Applications of transform methods to solutions of engineering problems:- oscillatory motion, plane motion, electric circuits; Differentiation and integration of transforms; transforms of periodic functions and convolutions; complex inverse transforms.

Gamma and beta functions: [6 Hours]

Integral definition and Properties of Gamma and Beta functions; Relations between Gamma and Beta functions; Definition of Gamma function for negative values of argument; Generalization of Laplace transforms by means of Gamma functions; Other applications of Gamma functions**. Bessel Functions: [8 Hours]**

Bessel's equation and its solutions; characteristics and graphs of Bessel functions; the generating function of Bessel's functions; Integral representation of Bessel's functions; Integrals involving Bessel's functions; Orthogonally of Bessel's functions; Bessel series; Modified (hyperbolic) Bessel functions; Spherical Bessel functions; Behavior of Bessel functions at large and small value of argument; Applications.

Legendre functions: [6 Hours]

Legendre's equation and its solutions; Legendre's polynomial; The generating function of Legendre's polynomials; Orthogonality of Legendre's polynomials; Legendre's series; Relations between Legendre's polynomials and their derivatives; Legendre's functions of the second kind; The associated Legendre equation and its soluitons; Orthogonality relations for the associated Legendre's functions, characteristics and graphs of Legendre's polynomial and associated Legendre's functions, applications in electrical and telecommunication engineering.

Partial differential equations (PDE): [12 Hours]

Definition, origins and derivations of some PDE of mathematical physics and engineering: heat flow, wave & transmission line equations; classification of PDE; solutions of PDEs by separation of variables, transform, numerical methods; solutions of Laplace's equations in different co-ordinates systems.

Boundary value problems: [8 Hours]

Formal and rigorous solutions, insulated slab, other boundary conditions, another form of the heat equation, the vibrating string, discussion of the solution, prescribed initial velocity, an elastic bar, dirichlet problem, other types of boundary conditions, fourier series in two variables, periodic boundary conditions.

Sturm-liuoville problems and applications: [6 Hours]

Regular sturm-liuoville problems, modifications, orthogonality of eigenftinctions, methods of solution, surface heat transfer, other boundary value problem.

Mode of Delivery: The course will be taught by using lectures, tutorials and assignments.

Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Learning Outcomes

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

- Demonstrate a firm understanding of the solution techniques for Linear Ordinary Differential Equations, Properties of Integral Transforms and Special functions
- Use the Integral Transforms in Circuit Analysis

Method of Teaching/Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

References

[1] C. Ray Wylie and Louis C. Barrett, Advanced *Engineering Mathematics,* 6th ed., McGraw Hill, New York, 1995.

[2] Erwin Kreyszig, Advanced *Engineering Mathematics,* 8th ed., John Wiley and Sons.

[3] Murray R. Spiegel, 1981. *Applied Differential Equations*. 3rd Edition. Prentice-Hall, Inc., Englewood Cliffs, N.J. 07632

[4] Mary L. Boas, 1983. *Mathematical Methods in the Physical Sciences*. 2nd Edition. John Wiley & Sons, INC. New York

[5] Thomas M. Creese and Robert M. Haralick, 1978. *Differential Equations for Engineers.* McGraw-Hill, N. Y. US

[6] L. R. Mustoe, 1988. *Worked Examples in Advanced Engineering Mathematics.* John Wiley & Sons Ltd. Great Britain

Possible Lecturers:

Dr. E. Lugujjo Dr. T. Togboa Dr. M. K. Musaazi Ms. M. Tumwebaze Mr. P. I. Musasizi

ELE2103 ELECTROMAGNETICS

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Brief Course Description

The course builds on Electromagnetics I to provide concepts on electric and magnetic fields in material space.

Course Objectives

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

- Understand the theoretical background of static electromagnetic fields in material space.
- Derive and apply equations related to static electromagnetic fields in material space

Detailed Course Content:

Review of Vector Algebra: **[7 Hours]**

Classification of vector fields. Electrostatic Fields: Coulomb Law & Field Intensity. Electric Field due to Continuous Charge Distribution. Electric flux density, Gauss Law-Maxwell Equation. Electric potential; relationship between E and V-Maxwell Equation.

Electric Field in Material Space: **[16 Hours]**

Properties of materials, Convection and conduction current; Polarization in Dielectric; dielectric constant and strength; Continuity Equation and Relaxation Time; Boundary Conditions; Electrostatic Boundary-Value Problems; Poisson's and Laplace Equations; Electrostatic Boundary-Value Problems: Uniqueness Theorem, Procedure for solving Poisson's and Laplace equations, Resistance and Capacitance, Methods of Images

Magnetostatics: **[22 Hours]**

Biot-Savart's Law; ampere Circuital Law-Maxwell Equation. Application of Ampere's Law Magnetic Flux Density-Maxwell Equation. Maxwell Equation for Static EM Fields; Magnetic Scalar and Vector Potential, Magnetic Forces, Material and Devices: Forces due to Magnetic Fields; Magnetic Torque and Movement. Magnetic Forces, Material and Devices: Magnetization in Materials. Magnetic Forces, Material and Devices: Magnetic Boundary Conditions. Magnetic Forces, Material and Devices: Inductor and Inductance; Magnetic Energy.

Mode of Delivery

The course will be taught by using lectures, tutorials and assignments.

Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Learning Outcomes

The course participant is able to attach quantitative meaning to the basic laws of Electricity and Magnetism, and also able to give daily-life analogies to the concepts studied. The student applies the electricity and magnetism laws studied to explain real situations.

Method of Teaching/Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Reference Material

[1] Matthew N.O. Sadiku, *Elements of Electromagnetics,* 3rd ed.,Oxford University Press, 2001

[2] Sears F., Zemansky M., Young H., *Electricity,Magnetism and Optics.*

[3] Murray R Spiegel, *Theory and Problems of Vector Analysis,* SI (Metric) ed., McGraw Hill

[4] William H. Hayt, Jr., *Engineering Electromagnetics,* 5th ed., Tata McGraw-Hill, New Delhi, 1997

Possible Lecturers:

Dr. E. Lugujjo
Mr. S. Mwanje
Mr. A Wasswa Matovu
Mr. P. Bogere
Mr. I. Kitone

ELE2102 ELECTRONIC CIRCUITS

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Brief Course Description

The course gives basic knowledge on the design and operation of electronic circuits.

Course Objectives

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

- Understand the principles of operation of electronic components and circuits
- Design electronic circuits

Detailed Course Content:

Thermionic Devices; **[6 Hours]**

Review of the vacuum diode; Principles of operation and characteristics of a triode, tetrode, and pentode; Biasing techniques and load lines; small signal parameters and equivalent circuits; Amplifier analysis and design; Cathode ray oscilloscope, Photoelectric tubes; Mercury arc rectifier.

Diodes;**[4 Hours]**

Review of Operation and characteristics of pn junction diodes; Breakdown diodes: Zener and avalanche types; LEDs and tunnel diodes; Single and poly phase rectifier circuits; Ripple factor; smoothing; Voltage regulation; Power supply design and use of regulators; Voltage doubling and multiplying; Clipping; Clamping; Slicer circuits.

Transistors:**[10 Hours]**

Bipolar Junction Transistors: Review of BJT Operation, BJT Fabrication. Heterojunction Bipolar Transistors; Unipolar Devices: Metal-Semi conductor Contacts. Surface charge in MOS Capacitor. The Junction Field Effect Transistor. The MESFET, The MOS Diode. The MOSFET. Heterojunction FETs. JFETs and MOSFETs: Static and dynamic characteristics, biasing and load lines; FET amplifier circuits: CS, CD and CG; Small signal parameters, Equivalent circuits, Amplifier analysis and design; FET as a variable resistor; MOSFETs in digital circuits.

Bipolar Transistors: **[6 Hours]**

Static and dynamic characteristics; Biasing and load lines; Small signal parameters and equivalent circuits; r-parameters, g-parameters, h-parameters and hybrid-pi parameters; Analysis and design of BJT amplifiers: CE, CB, and CC; Comparison of FETs and BJTs.

Frequency Response of Amplifiers: **[6 Hours]**

Inter-electrode capacitances and the Miller effect; High frequency hybrid-pi model of a BJT; FET and pentode high frequency equivalent circuits; Analysis of amplifier performance at low frequency, mid- frequency, Estimation of 3 db frequencies; Bandwidth and gain-bandwidth-product. Feedback Amplifiers; **[6 Hours]**

Negative and positive feedback concepts; Effects of negative feedback on gain, distortion, and bandwidth; Derivation and application of feedback signals; Effect of feedback on input and output impedances; Qualitative discussion of amplifier stability; approximate analysis of single and multistage feedback amplifiers.

Operational Amplifiers; **[7 Hours]**

Ideal and non-ideal characteristics of an Opamp; Practical IC Opamps and their characteristics; Feedback amplifiers based on Opamps; Mathematical operations of addition/ subtraction; multiplication by a constant, integration, and differentiation; The Opamp as a comparator; Non-linear applications on Opamps

Mode of Delivery

The course will be taught by using lectures, tutorials and assignments.

Assessment

Assignments, tests, laboratories, and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, laboratories, tests)	40%
Final examination	60%
Total	**100%**

Learning Outcomes

Apply techniques for the analysis and simulation of linear electric circuits, and measurements of their properties

2. Understand resistive and energy-storage elements, controlled sources and operational amplifiers, and transformers

3. Analyze the transient and AC steady state behavior of a circuit

4. Determine the power supplied and distributed in three-phase systems, perform power factor correction
5. Determine the frequency response of a circuit using the s-plane representation and analysis, Bode Plots, Laplace transforms and computer-aided methods

Method of Teaching /Delivery
The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Reference Material
[1] Thomas and Rosa, The Analysis and Design of Linear Circuits (Laplace Early Edition), Wiley (ISBN 0-471-43299-7)
[2] ***Microelectronic Circuits, 4th edition,*** Adel S. Sedra and Kenneth C. Smith, HRW,1998, ISBN 0-19-511663-1..

Possible Lecturers: Dr. J. Butime Mr. D. Nsubuga Mubiru Mr. P. Bogere

ELE2111 NETWORK THEORY

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale
The course helps the student to understand the principles and methods used to simplify electric networks.

Course Objectives
By the end of the course students should be able to:

- Know various types and components of networks
- Apply network concepts to build, simplify and analyse electric and electronic systems. **Detailed**

Course Content:
Network elements, R,L,M,C: [10 Hours]
Review of the volt-ampere equations for these passive circuit elements. Behavior of C and L at t=0 and t = <x>, Step and impulse responses, Concept of coupling, and coupling co-efficient. Matrix Methods in Network Analysis: Network topology, planar and hinged graphs, KVL and KCL/ Mesh and loop formulations, Cut-sets, coupled Circuits
Two Port Networks: [8 Hours]
Types of two-port networks, *y-*, *z-*, *h-* and *ABCD* parameters, image impedance, insertion loss, attenuation and phase constants.

Network Functions: **[9 Hours]**

Review of Laplace transforms. Simple first and second order circuits, natural responses, natural frequencies. Poles and Zero Frequency response, Bode plots. General s-plane topics. Mathematical models and block diagrams; transient response characteristics: Second-order systems: steady-state characteristics: classification of system, error criteria: analysis by root-locus: Bode and Nyquist plots, constant M-contours, constant-contours: Nichols chart

Fourier Transforms & the Fourier Integral: Convolution integral. Solution of circuits with periodic but non sinusoidal inputs

Network Stability: **[8 Hours]**

Reliability, stable and unstable network function, realising network functions/ polynomials, positive real network functions. Synthesis of LC, RC, RL and RLC networks, Generalised ladder network Stability and design procedures: Stability criteria; type of stability; characteristics frequency response testing; system identification; statistical considerations, time-domain identification, frequency domain identification; design; correlation between root-locus and frequency response.

Electric Filters: **[10 Hours]**

Classification of filters, passive and active filter, Filter transfer functions Butterworth and Chebyshev filter, attenuation function, phase function, propagation constant, Normalized filters. Magnitude and frequency normalization. Frequency time functions. Denormalized filter Computer Aided Network Analysis & Design

Mode of Delivery

The course will be taught by using lectures, tutorials and assignments.

Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Learning Outcomes

The course participant is able to appreciate network and signal theory and their applications to circuit design, filter design and communication theory.

Method of Teaching/Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Reference Material

[1] Alan V. Oppenheim, Alan S. Willsky, S. Nawab Nawab, Syed Hamid Nawab, *Signals and Systems* (2nd Edition), Prentice-Hall, 1997

[2] S.S. Solimon and M.D. Srinath, *Continuous and Discrete Signals and Systems(* 2nd Edition), Prentice Hall, 1998.

[3] S. Haykin and B. Van Veen, *Signals and Systems*, John Wiely & Sons, 1999

[4] L. Balmer, *Signals and Systems: An Introduction* (2nd Edition), Prentice Hall Europe, 1997

[5] B. P. Lathi, *Linear Systems and Signals,* Berkeley Cambridge, 1992.
Possible Lecturers: Dr. E. Lugujjo Dr.M. K. Musaazi Mr. D. Sebbaale

CMP2103 OBJECT ORIENTED PROGRAMMIN

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
30	60	00	60	100	60	40	4

Rationale
The course helps students to acquire more knowledge in object oriented computer programming techniques, and computer graphics.

Course Objectives
The goal of this course is to study key concepts related to computer programming for scientific and engineering applications. through an advanced view of computer programming, mainly using Java, and C++. It includes a study of the differences and similarities between Java and C++; the use of current operating systems (e.g. Linux and Unix) and compilers (e.g. gcc), apply computer graphics to produce engineering drawings and illustrations, Carry out graphical user interface design as well as details of Object Oriented Programming. Hands-on programming should be a key part of the course.

Detailed Course Content:

Brief Introduction to Software Engineering **[4 Hours]**
Programming in Java: **[12 Hours]**
C++ vs. Java; Introduction to Java, Java Applications, Java Applets, Control Structures and Arrays, Methods
Object-Oriented Programming: **[12 Hours]**
Graphics: **[8 Hours]**
Algorithms for 2d and 3d drawing; Picture manipulation and transformation; curve plotting and mouse interaction; Use of standard packages and graphics within a window environment; Graphical User Interfaces: **[16 Hours]**
Introduction to human/computer interaction, models of user knowledge, dialogue design, data display; error control; prototypes and acceptance testing; designing menu systems Exception Handling: **[8 Hours]**
Threads
Files and Streams

Message Passing Interface (MPI and Parallel Computing) **Mode of Delivery**
The course will be taught by using lectures, tutorials and assignments.

Assessment

Assignments, tests, laboratories, and final examination. Their relative contributions to the final grade are :

Requirement **Percentage contribution**

Course work (Assignments, laboratories, tests) 40%
Final examination 60%
Total 100%

Learning Outcomes

- Knowledge and Understanding Upon successful completion of the module, a student will: Understand basic principles of object-oriented program design. Understand the basic and some advanced issues related to writing classes and methods - such as data, visibility, scope, method parameters, object references, and nested classes. Understand the basic ideas behind class hierarchies, polymorphism, and programming to interfaces. Get exposure to exceptions and basic I/O streams. Understand basic principles, main features and operations of abstract data types, in particular of lists, stacks, queues, trees, heaps, hash tables and graphs. Differentiate specifications of abstract data types from particular implementation techniques. Learn about fundamental algorithms associated with the above data types, including tree traversal, treesort, heapsort and graph traversal algorithms.
- Intellectual and Practical skills Upon successful completion of the module, a student will: Be able to solve a given application problem by going through the basic steps of program specifications, analysis, design, implementation and testing --- within the context of the object- oriented paradigm. Be able to competently read 'foreign' Java source code and object diagrams. Have developed solid Java programming skills and the ability to put in practice the acquired knowledge and understanding of the Java language and object-oriented design in relatively simple case studies. Be able to develop Java implementations of abstract data types using different approaches, and evaluate their differences. Be able to use abstract data types and related implementations in designing and implementing efficient solutions to straightforward application problems.

Method of Teaching /Delivery
The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total 100%	

Recommended and Reference Books

[1] Timothy Budd, *Understanding Object-Oriented Programming with Java*, 2nd Edition Addison- Wesley Longman, 1999, ISBN: 0-201-61273-9,

[2] Y. Daniel Liang, *Introduction to Programming with C++*, Prentice Hall, 2007

[3] Schach Stephen, Object-Oriented and Classical Software Engineering, 7th Edition, 2006, McGraw-Hill. ISBN 0-073-19126-4.

[4] Bruce E. Wampler, *The Essence of Object-Oriented Programming,* Addison-Wesley, 2001.

Possible Lecturers:
Dr. D. Okello Mr. S.
Mwanje Mr. A.
Tumwesigye Mr. P. I.
Musasizi Mr. P.

ELE2201 ENGINEERING MATH

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
60	0	00	60	100	60	40	4

Serwanga

EMATICS
IV

Rationale
The course introduces students to probability and statistics and provides advanced engineering mathematics concepts and analysis of complex variables. **Course Objectives**
By the end of the course students should be able to:

- Enhances their knowledge of engineering mathematics concepts
- Apply engineering mathematics concepts and theorems to electrical engineering
- Apply stochastic methods to model engineering systems
- Apply estimation theory to simulate engineering processes and systems

Detailed Course Content:

Complex Variable Analysis: **[15 Hours]**
Limits and derivatives of functions of a complex variable. Analytic functions; Cauchy-Riemann's equations and harmonic functions; rational, exponential, trigonometric and hyperbolic functions of a complex variable, logarithms of functions of a complex variable; mappings and conformal mappings; linear transformations in the complex plane; line integrals in the complex plane, cauchy's integral theorem for evaluation of line integrals; cauchy's integral formula for evaluation of residues at zeros and poles; application of theory of functions of a complex variable to solve boundary value problems and telecommunications engineering.
Dicrete Mathematics: **[7 Hours]**

Probability and statistics: **[20 Hours]**
Discuss the professional responsibilities of statisticians; use/abuse of statistics in science; statistics and scientific method. Basic concepts in statistics sampling, sample quality, unbiased samples, types of samples, data frames; target population, graphical data displays; frequency distributions; measures of central tendency measures of dispersion. Rules of probability; counting techniques- permutations, combinations. The binomial and poison distribution; properties of binomial distribution; the normal distribution; the poison distribution; fitting theoretical distribution to sample frequency distributions; use of standard normal tables; simple regression and correlation analysis; curve fitting and method of least squares; statistical inferences.
Stochastic processes: **[12 Hours]**
Definition of stochastic/random process, qualitative discussion of examples of stochastic processes: poisson process. Markov process Brownian process, digital modulation using phase-shift keying; stationary and ergodic processes; power spectral density(PSD); properties of PSD, PSD applied to base band signals; PSD of white noise; Gaussian random processes and their application in communication theory.
Estimation theory: **[6 Hours]**
Parameter estimation; maximum likelihood parameter estimation; estimation of random variables.

Mode of Delivery
The course will be taught by using lectures, tutorials and assignments.

Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are : 47

Requirement	Percentage contribution
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Method of Teaching/Delivery
The course will be taught by using lectures, tutorials and assignments.
Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are

Requirement	Percentage contribution
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

[1] Hwei Hsu. *Probability, Random Variables & Random Processes*. Schaum's Outlines. ISBN 0-07030644-3
[2] Yannis Viniotis. *Probability & Random Processes for Electrical Engineers,McGraw* Hill.
[3] Papoulis. *Probability, Random Variables & Stochastic Processes*, 3rd Edition., McGraw Hill.
[4] Jorge I Aunon, V. Chandrasekar: *Introduction to Probability & Random Processes*, McGraw Hill
[5] Venkatarama Krishnan, 2006. *Probability and Random Processes* (Wiley Survival Guides in Engineering and Science), Wiley-Interscience; 1 Edition. ISBN-10: 0471703540, ISBN-13: 978-0471703549
[6] Donald G. Childers, 1997. *Probability and Random Processes: Using Matlab with Applications to Continuous and Discrete Time Systems*. Richard D Irwin. ISBN-10: 0256133611, ISBN-13: 978-0256133615
[7] Leon Garcia, 1993. *Probability and Random Processes for Electrical Engineering*. Addison Wesley Publishing Company; 2 Sol Edition. ISBN-10: 020155738X, ISBN-13: 978-0201557381
[8] Roy D. Yates, David J. Goodman, 2004. *Probability and Stochastic Processes: A Friendly Introduction for Electrical and Computer Engineers*. Wiley; 2 Edition. ISBN-10: 0471272140, ISBN-13: 978-0471272144

Possible Lecturers: Dr. E. Lugujjo Dr. T. Togboa Dr. M. K. Musaazi Ms. M. Tumwebaze Mr. P. I. Musasizi

ELE2211 ELECTROMAGNETIC FIELDS

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

[Pre-requisite: Course ELE2103] **Rationale**

The course covers types and propagation of electromagnetic waves and their importance in electrical and telecommunications engineering. **Course Objectives**
By the end of the course students should be able to:

- Derive relevant equations applied in wave guides and propagation of EM waves and understand their importance in the different electrical engineering fields
- Use electromagnetic laws and principles to solve problems in propagation of EM waves.

Detailed Course Content:

Unbounded Wave Propagation: **[17 Hours]**
Definition of wave motion; The wave equation in a perfect dielectric; Helmholtz equation. Uniform plane wave propagation; intrinsic impedance. Distinction between conductors, quasiconductors and dielectrics. Wave equation in a conductive medium; Attenuation and phase constants for good dielectrics and good

conductors; Skin depth and surface impedance. Poynting's vector; Cases of perfect dielectric and conducting media. Reflection of uniform plane waves-normal incidence; Reflection and transmission coefficients; standing waves and VSWR; Energy in standing waves. Polarization: Definition of linear, circular and elliptic polarization.

Guided Waves and Wave Guiding Systems: **[18 Hours]**

Distinction between transmission lines and waveguides; Types of transmission lines and waveguides. Transmission line equation using distributed circuit analysis; Primary and Secondary constants (R, L, G, C, a, p, Zo) a,p,Zo for lossless and low loss lines ; Terminated lines: Expressions for voltage, current and impedance at any point; short circuited, and matched lines; Power flow on transmission lines, Parameters (primary and secondary) for coaxial and parallel wire transmission lines. Standing waves on transmission lines: Relationship between S and p, Standing wave patterns for different terminations. Matching: Necessity of matching; Matching devices-quantative treatment of quarter wave transformer, single stub and double stub tuners; Triple stub turner (qualitative treatment). The Smith Chart: Development and applications (Limited treatment). The infinite plane waveguide: Field expression starting from Maxwell's equations after separating solutions into TE, TM and TEM modes; Field patterns; Concept of cut-off frequency; Definition and inter-relationship between free space wavelength, guide wavelength, cut-off wavelength, space velocity and group velocity; Attenuation and qualitative introduction to perturbation analysis for attenuation; impedance conventions. **Hollow rectangular waveguide:** **[10 Hours]**

Derivation of complete field expressions for TM and TE modes starting with Maxwell's equations and the wave equations; Expressions for a, p, f_c: Field patterns; The dominant mode and its parameters; Circular waveguide: Field solutions for TE and TM modes. Microstrip Transmission lines: characteristics and empirical expressions. Wave propagation in plasmas: Plasmas oscillations; Plasma frequency; Maxwell equations; Concept of plasma cut-off frequency and consequences. Optical fibres: Qualitative discussion of electromagnetic modes in fibres; Discussion from a physical optics point of view; Types of fibres; parameters.

Introduction to numerical Electromagnetics: Overview of the numerical/computational methods applied in electromagnetic problems

Mode of Delivery

The course will be taught by using lectures, tutorials and assignments.

Assessment

Assignments, tests, laboratories and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, laboratories, tests)	40%
Final examination	60%
Total	**100%**

Learning Outcomes

By the end of this course, students should be able to:

- Demonstrate a firm understanding of electromagnetic fields
- Solve realistic electromagnetic-field problems utilizing physical conceptual reasoning and mathematical synthesis of solutions, and not pure formulaic solving.

Method of Teaching/Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

[1] K. Lonngren, S. Savov, & R. Jost, *Fundamentals of Electromagnetics with MATLAB,* 2nd Edition (Scitech Publishing, 2007).

[2] R. Wolfson & J. Pasachoff, *Physics for Scientists and Engineers* (Addison-Wesley).

[3] J. Stewart, *Calculus,* Third Edition (Brooks/Cole Publishing Company, 1995).
[4] N. N. Rao, "*Elements of Engineering Electromagnetics,*" 6th Edition, Prentice Hall, 2004.
[5] *Field and Waves in Communication Electronics,* third edition, Ramo, Whinnery, and Van Duzer, Wiley, 1994
[6] William H. Hayt, Jr. John A. Buck, 2000. *Engineering Electromagnetics.* 6th Edition MC Graw Hill.
[7] Mathew N.O. Sadiku, 2006. *Elements of Electromagnetics,* 4th Edition. ISBN 13: 9780195300482, ISBN 10:0195300483

Possible Lecturers:
Dr. E. Lugujjo
Mr. S. Mwanje
Mr. A Wasswa Matovu
Mr. P. Bogere
Mr. I. Kitone

ELE2212 ELECTRICAL ENERGY SYSTEMS

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	00	45	100	60	40	3

Rationale
The course discusses the different energy sources available in today's society and well their relative merit, demerits and usage implications.

Course Objectives
The course is designed to equip students with a broad training in, and understanding of, energy production, delivery, consumption, efficiency, economics, policy and regulation, considered in the context of the sustainability of energy supply and consumption patterns, both locally and globally. A unique feature of the course is its broad approach to the development of sustainable routes to the generation and supply of energy within which renewable energy is a key theme.

Detailed Course Content:

Energy sources of the current world: sources, conversion and generation principles, challenges of the current energy mix

Technologies for Sustainable Energy: **[15 Hours]**

- Principles of operation of sustainable energy conversion by (i) wind; (ii) wave; (iii) tidal; (iv) solar; (v) biomass; (vi) geothermal; (vii) combined heat and power systems;
- Principal aspects of engineering design underpinning these technologies;
- constraints on each technology, both imposed by physical fundamentals, and by current levels of technology and market, supported by quantitative evidence where possible;
- Fundamentals of grid connection of distributed generators and the problems and constraints associated with this;

Energy Efficiency, Resource and Environment: **[15 Hours]**

- Availability of natural resources and the implications of finite fossil resources;
- The concept of proved reserves and R/P ratios;
- Techniques for energy efficiency in buildings, including passive solar design
- Relationships between energy use and climate change.

Power Systems Engineering and Economics: **[15 Hours]**

- Iterative methods of solution to non-linear nodal network analysis and use a load flow package;
- Effects of AC network on transmission and distribution of electricity

- Principles of power system economics and how market-based solutions can be applied to a previously centrally-controlled industry
- Effects of network on marginal prices at different locations
- Taking human reactions into account when designing engineering solutions

Mode of Delivery
The course will be taught by using lectures, tutorials and assignments.

Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Method of Teaching/Delivery
The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

[1] Peter Gevorkian. *Sustainable Energy Systems Engineering*. - McGraw-Hill (2007) - ISBN 0071473599

[2] Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveranderungen (Germany. *World in Transition: Towards Sustainable Energy Systems.)* - Earthscan (2004)- ISBN 1853838020

[3] Naim Hamdia Afgan, Naim Afgan, Maria da Graca *CarvalhoSustainable Assessment Method for Energy Systems: Indicators, Criteria, and Decision Making Procedure*. Kluwer Academic (2000) - ISBN 0792378768

ELE2213 INSTRUMENTATION

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale
The course enables students to acquire knowledge and skills on electrical instrumentation and measurements.

Course Objectives
By the end of the course students should be able to:
- Understand the construction, operation and characteristic of electrical instruments
- Use electrical instruments to measure various quantities

Detailed Course Content:

Review of Measurement Specifications: **[4 Hours]**
Standards, units. Absolute and relative measurement Instrument specifications range, resolution, accuracy, linearity, etc.
Analogue Instruments: **[8 Hours]**

Moving coil, moving iron instruments. Electrostatic and induction meters. Ballistic galvanometer, Grasso flux meter.
Digital Instruments: Multimeters, data analysers, signal synthesisers. Counters and timers. Transducers: **[6 Hours]**
Transduction methods resistance and reactance change, electromagnetic, semiconductor, digital, thermo-electric. Measurement of displacement, velocity and acceleration, time and frequency, light, temperature, volume, pressure, flow and force.
Analogue Data Processing: **[9 Hours]**
The operational amplifier; characteristics, configurations. Analogue computer hardware, data handling operations and circuits. Simulation of differential equations and transfer functions. Data Acquisition and Conversion: **[10 Hours]**
Sampling theorem, quantisation, multiplexing, filtering sample and hold. ADC circuits dual slope, parallel comparator, successive approximation voltage-to-frequency, etc, ADC specifications. DAC circuits R-2 ladder, weighted resistor, etc. DAC specifications.
Computerized Measurement and Control Systems: **[8 Hours]**
Measurement and control configurations. Instrument control with the GPIB IEEE) bus. Measurement and control algorithms; running averages, deviations, PID.

Mode of Delivery
The course will be taught by using lectures, tutorials and assignments.
Assessment
Assignments, tests, laboratories, and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, laboratories, tests) 40% Final examination	60%
Total	100%

Learning Outcomes

The student will:

- Acquire knowledge of the type of measuring instruments and be able to appreciate why certain instruments are m ore favourable in a particular environment and requirement (accuracy or precision among others);
- Understand the types of errors that occur during measurement and how best they can be minimised during experimental setup.
- Acquire concepts on sensors and their use in design of automated systems.

Method of Teaching/Delivery
The course will be taught by using lectures, tutorials and assignments.
Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended Books and References

[1] Allan S. Morris, *Measurement and Instrumentation Principles,* 3rd ed., Butterworth Heinemann, 2001
[2] *K. Ogata, Discrete- Time Control Systems*

Possible Lecturers:
Dr. J. Butime
Mr. D. Nsubuga Mubiru
Mr. P. Bogere

TEC2211 TECHNOLOGY, ETHICS & HUMAN RIGHTS

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	00	45	100	60	40	3

Rationale

The course is meant to provide students with knowledge on social aspects of society. Since engineers solve problems faced by the society, it is important for them to understand the characteristics and behaviour of the community.

Course Objectives

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

- Understand cultural, conflict and control, dynamics of social change and the impact of the technology on the environment
- Understand rural and urban sociology in developing countries
- Understand of the relation of technology's impacts on society, the ethical background underpinning the decision making and its usage in technology.

Detailed Course Content:

Contemporary Philosophy: **[20 Hours]**

Beginnings: logic and mathematics; Philosophical analysis: Moore and Russell; Alternatives: realism, logical positivism; Postmodernism: critical theory; Feminism: theory, ethics. Engineering ethics: **[25 Hours]** minimum requirements for the practice of engineering; responsibilities of engineering institutions;safety and liability, professional responsibility to clients and employers , whistle blowing, codes of ethics, career choice and legal obligations. General ethical theory, concrete engineering case studies; software liability; bribery, conflict of interest dilemma, protection of intellectual property, privacy of electronic mail, ethics of testifying as a partisan expert witness, the preferential treatment of women in engineering, the morality of pollution in less developed countries with weak environmental standards.

Principles of human rights: Civil rights and civil liberties, children's, women's rights; Children and family rights; right to education; Regulatory law: public interest law: Gender discrimination issues: employment discrimination; employment law; poverty law; gender issues; importance of gender in social and economic patterns; social welfare.

Mode of Delivery

The course will be taught by using lectures, tutorials and assignments.

Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total 100%	

Learning Outcomes

On completing this course the student should be able to:

- Identify some contributors to social and professional issues and relate their achievements to the knowledge area; Contrast between ethical and legal issues; Contrast between a patent and a copyright; Identify some ways of credentialing a person to practice computer engineering; Describe issues that contrast risk issues with safety issues; Identify some issues in computer engineering that address privacy; Describe whistle blowing and the conflicts between ethics and practice that may result from doing so; and Describe how computer engineering uses or benefits from social and professional issues.
- Interpret the social context of a particular implementation; Identify assumptions and values embedded in a particular design; Evaluate a particular implementation using empirical data; Describe positive and

negative ways in which computing altars the modes of interaction between people; and Explain why computing/network access is restricted in some countries

- Analyze an argument to identify premises and conclusion; illustrate the use of example, analogy, and counter-analogy in ethical argument; detect use of basic logical fallacies in an argument; identify stakeholders in an issue and our obligations to them; and articulate the ethical tradeoffs in a technical decision.
- Identify progressive stages in a whistle-blowing incident; Specify the strengths and weaknesses of relevant professional codes as expressions of professionalism and guides to decision-making; Provide arguments for and against licensure in non-engineering professions; Identify ethical issues that arise in software development and determine how to address them technically and ethically; Develop a computer use policy with enforcement measures;
- Explain the limitations of testing as a means to ensure correctness; recognize the importance of product safety when designing computer systems; describe the differences between correctness, reliability, and safety; recognize unwarranted assumptions of statistical independence of errors; discuss the potential for hidden problems in reuse of existing components.
- Distinguish among patent, copyright, and trade secret protection; discuss the legal background of copyright in national and international law; explain how patent and copyright laws may vary internationally; and outline the historical development of software patents.
- Summarize the legal bases for the right to privacy and freedom of expression in one's own nation; discuss how those concepts vary from country to country; describe current computer- based threats to privacy; and explain how the internet may change the historical balance in protecting freedom of expression.
- Outline the technical basis of viruses and denial-of-service attacks; enumerate techniques to combat "cracker" attacks; discuss several different "cracker" approaches and motivations; and identify the professional's role in security and the tradeoffs involved.
- Describe the assessment of total job costs; evaluate the risks of entering one's own business; apply engineering economic principles when considering fiscal arrangements; summarize the rationale for antimonopoly efforts; describe several ways in which shortages in the labor supply affect the information technology industry; and suggest and defend ways to address limitations on access to computing.
- Summarize the basic concepts of relativism, utilitarianism, and deontological theories; recognize the distinction between ethical theory and professional ethics; identify the weaknesses of the "hired agent" approach, strict legalism, naive egoism, and naive relativism as ethical frameworks

Method of Teaching/Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total 100%	

Recommended and Reference Books

[1] Kenneth E. Himma, Herman T. Tavani, 2008. The Handbook of Information and Computer Ethics. Wiley-Interscience. ISBN-10: 0471799599 , ISBN-13: 978-0471799597

[2] J. Fernando Naveda and Stephen B. Seidman, 2006. *IEEE Computer Society Real-World Software Engineering Problems: A Self-Study Guide for Today's Software Professional (Practitioners).* Wiley-IEEE Computer Society Pr. ISBN-10: 0471710512 , ISBN-13: 9780471710516

[3] Winn Schwartau, D. L. Busch, 2001. *Internet & Computer Ethics for Kids: (and Parents & Teachers Who Haven't Got a Clue.).* Interpact Press. ISBN-10: 0962870056, ISBN-13: 9780962870057

[4] Mike W. Martin, Roland Schinzinger, 2004. *Ethics in Engineering*. McGraw-Hill Science/Engineering/Math; 4 Edition. ISBN-10: 0072831154, ISBN-13: 978-0072831153

[5] Caroline Whitbeck, Woodie C. Flowers, 1998. *Ethics in Engineering Practice and Research.* Cambridge University Press ISBN-10: 0521479444, ISBN-13: 978-0521479448
[6] Gail Dawn Baura, 2006.*Engineering Ethics: An Industrial Perspective*. Academic Press; 1 Edition.ISBN-10: 012088531X, ISBN-13: 978-0120885312

Possible Lecturers:
Mr. D. Semukuutu

ELE2301 INDUSTRIAL TRAINING

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
0	0	180	45	100	60	40	3

Rationale
The course enables students to experience what happens in industry by allowing them to work alongside practicing engineers on the design, operation and handling of equipment.

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

Detailed Course Content:

The student is required to participate in the day-to-day activities at the organization's premises as a regular worker. This activity lasts at least eight (8) weeks starting immediately after the end of examination of Semester II of the second year of study. **Learning Outcomes**
At the end of this course, a student should be able to:
- identify and describe the major activities of the sections where he/she was attached
- describe the technical aspects of the training that was undertaken
- identify technical areas of improvement of the sections where he/she was attached
- write a clear and understandable technical report

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

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

Proposed Staff
All Academic staff

ELE3102 APPLIED ANALOGUE ELECTRONICS

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

[Prerequisite: Electronic circuits, Instrumentation]

Rationale
The course treats analogue electronics focusing on applications of analogue electronics in amplifiers, power regulation, oscillation and control.

Course Objectives
By the end of the course students should be able to:
- Understand the operation of the various analogues electronic circuits
- Derive relevant equations and apply them to solve engineering problems, design and analyse analogue electronic circuits
- Build and test analogue electronic circuits

Detailed Course Content:
Power Amplifiers: [12 Hours]
Audio and RF power amplifiers; Class A, B, AB, C, D, E and F. IC Power Amplifiers. Design considerations and applications; Bipolar and FET Differential Amplifiers: DC and AC analysis. Single and Double ended operation. Differential gain, common mode gain common mode rejection ratio. **Operational Amplifiers: [10 Hours]**
Characteristics and parameters. Linear and non-linear operation. Inverting and non-inverting. Op- amp. differential amplifiers,Op-amp application circuits. Other Linear Ics, 555 Timer. **Multistage amplifiers:** dc and ac coupled amplifiers, differential amplifiers, CMRR. **[2 Hours] Feedback amplifiers:** voltage, current, transconductance, transresistance. **[1 Hours]**
Regulated Power supplies: [8 Hours]
Open loop and closed-loop voltage regulation. Current and voltage limiting. Switched mode regulators.
Oscillators: [6 Hours]
Sinusoidal and nonsinusoidal oscillators. RC, RL and Crystal oscillators. Relaxation oscillators. Schmitt Trigger.
Electronic Control Circuits: [6 Hours]
Silicon controlled rectifier. Full wave devices. DC and AC control circuits. Feedback in control circuitry.

Mode of Delivery
The course will be taught by using lectures, tutorials and assignments.

Assessment
Assignments, tests, laboratories, and final examination. Their relative contributions to the final grade are :

Requirement **Percentage contribution**
Course work (Assignments, laboratories, tests) 40% Final examination 60%

Total	**100%**

Learning Outcomes

• Extend knowledge of the theory and applications of transistors, transistor amplifier Design, and operational amplifier integrated circuits
• Introduce students to the concepts and use of feedback and feedback (amplifier) design
• Provide sufficient knowledge and experience so that students will be able to make meaningful design choices when asked to design a (simple) amplifier to meet or exceed design specifications
• Provide sufficient knowledge and experience so that students will be able to make meaningful design choices when asked to design a (simple) analog oscillator to meet or exceed design specifications
• Continue to develop and practice oral and written communications skills specifically directed to the practice of electrical engineering

Method of Teaching/Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

[1] R. C. Jaeger, *Microelectronic Circuit Design*, McGraw-Hill, New York, 1996;
[2] A. S. Sedra and K. C. Smith, *Microelectronic Circuits*, Oxford University Press, New York, 1998
[3] Marc E. Herniter, Schematic Capture with Cadence PSpice, Prentice-Hall, Inc., Upper Saddle River, New Jersey 07458. (Book includes OrCAD Lite Version 9.2 on CD-ROM.)
[4] Kenneth C. Smith, Student Problems Book for Microelectronic Circuits, 3rd. Ed., Saunders College Publishing/Harcourt, Brace, Jovanovich, 1992.

Possible Lecturers:

Dr. J. Butime
Mr. D. Nsubuga Mubiru
Mr. P. Bogere
Mr. G. Bakkabulindi

ELE3103 APPLIED DIGITAL ELECTRONICS

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

[Prerequisite: Introduction to Digital Electronics]

Rationale

The course treats digital electronics focusing on applications of digital electronics in logic circuits and digital storage.

Course Objectives

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

- Understand operations and applications of digital electronic circuits
- Analyse and sysnthesise digital electronic circuits
- To build and test digital electronic circuits

Detailed Course Content:

Digital ICs: **[3 Hours]**

Digital IC technology, Digital ICs and Linear ICs, SSI, MSI, LSI, VLSI, ULSI chips. Digital IC technology and manufacturer's data sheets.

Logic circuits: **[9 Hours]**

Logic families: TTL, ECL, CMOS, I^2L Characteristics; Fall-in; Fall-out; speed; power and noise performance; Interconnection: Interfacing logic families; interfacing with buses, interfacing digital and analogue systems.

Digital storage and Memory Circuits: **[6 Hours]**

Semi conductor memories: ROM; static and dynamic RAM; PROM; EPROM, EEPROM; Special Memories and applications; Memory organization; Memory chips; Magnetic Buble Memories CCDs; PLDs

Clock generation: **[6 Hours]**

Sweep generators; Monostables and Astables; Schmitt triggers; Multiplexers and demultiplexers; coders, decoders and code converters.

Digital Systems Design: **[9 Hours]**

ASM chart, data processor, Control logic subsystems. Synchronous sequential circuits: Analysis and design; staste tables; state diagrams; excitation tables. Asynchronous sequential circuits: analysis and design.

Programmable Logic Controllers: **[6 Hours]**

Basics of PLCs, PLC Hardware Components, Basics of PLC Programming, Counter and Timer Instructions; Wiring Diagrams and Ladder Logic Programs; Programming Timers and Counters; Program Control Instructions; Data Manipulation Instructions; Math Instructions; Sequencer and Shift Register Instructions

Introduction to design and fabrication of Digital ICs: **[6 Hours]**

Digital IC Design, ASICs, FPGAs

Mode of Delivery

The course will be taught by using lectures, tutorials and assignments.

Assessment

Assignments, tests, laboratories, and final examination. Their relative contributions to the final grade are :

Requirement	Percentage contribution
Course work (Assignments, laboratories, tests)	40%
Final examination	60%
Total	**100%**

Learning Outcomes
On completion of this course the student will be able to:

- Represent numerical values in various number systems and perform number conversions between different number systems.
- Demonstrate the knowledge of: operation of logic gates (AND, OR, NAND, NOR, XOR, XNOR) using IEEE/ANSI standard symbols; Boolean algebra including algebraic manipulation/simplification, and application of DeMorgan's theorems; Karnaugh map reduction method.
- Demonstrate the knowledge of operation of basic types of flip-flops, registers, counters, decoders, encoders, multiplexers, and de-multiplexers.
- Analyze and design digital combinational circuits including arithmetic circuits (half adder, full adder, multiplier).
- Analyze sequential digital circuits.
- Demonstrate knowledge of the nomenclature and technology in the area of memory devices: ROM, RAM, PROM, PLD, FPGAs, etc

Method of Teaching/Delivery
The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	Percentage contribution
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

[1] Agarwal, Anant and Jeffrey H. Lang, *Foundations of Analog and Digital Electronic Circuits,* Morgan Kaufmann Publishers, Elsevier, July 2005.

[2] Ronald J. Tocci and Neal S. Widmer, *Digital Systems: Principles and Applications,* Prentice Hall, India, 2004

[4] Douglas A. Pucknell, *Fundamentals of Digital Logic Design with VLSI Circuit Applications,* Prentice-Hall, 1990

[5] Ronald J. Tocci, *Digital Systems: Principles & Applications,* 6th ed., Prentice Hall, 1995.

Possible Lecturers:
Dr. J. Butime
Mr. D. Nsubuga Mubiru
Mr. P. Bogere
Mr. G. Bakkabulindi

TEL3111 COMMUNICATION THEORY

Hours per Semester	Weighted	Weighted	Weighted	Credit
60				

				Total Mark	Exam Mark	Continuous Assessment Mark	Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale

He course introduces the student to the theory of communication systems **Course**

Objectives

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

- understand signals and systems in communication and the analysis of such signals in communication systems.
- Understand principles of principles of information theory, communication theory, signal transmission, filtering and modulation
- Distinguish between different types of noise and transmission systems
- Analyse characteristics of signals and effect of noise in communication systems

Detailed Course Content:

Signal analysis and Signal Models: **[6 Hours]**

Communication systems components and definitions: analog and digital systems; communication channels and their characteristics; bandwidth, distortion, noise and other impairments. Periodic and non-periodic signals; transform theorems and power spectra;

Random Processes and Noise: **[7 Hours]**

Review of Random Processes, Noise sources, noise as a random process, noise figure and noise temperature; noise models.

Modulation/Demodulation: **[12 Hours]**

Analog modulation processes: amplitude modulation, double sideband suppressed carrier, single sideband, vestigial sideband; frequency modulation, phase modulation; frequency discriminator and the envelope detector; AM and FM receiver; pre-emphasis and de-emphasis filtering; FM threshold effect; comparison of angle and linear modulation systems.

Pulse modulation processes: **[10 Hours]**

Amplitude shift keying, phase-shift keying and frequency-shift keying; quadrature AM (QAM) and quaternary PSK (QPSK); M-ary FSK and PSK; Frequency-Division Multiplexing (FDM) and Time- Division Multiplexing (TDM); Acoustic transducers.

Introduction to information transmission theory: **[10 Hours]**

Measure of information; channel capacity; Hartley-Shannon theorem; quantization noise; probability of error in data transmission; S/N performance of a PCM system; multiple access problems

Learning Outcomes

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

- Describe various Amplitude modulation and demodulation systems.
- Describe various Angle modulation and demodulation systems.
- Describe in depth and analyse in noise performance of various receivers.
- Understand some basic information theory with some channel coding theorem

Method of Teaching/Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%

Total100%

Recommended and Reference Books

[1] Simon Haykin, Communication Systems, John Wiley & sons, NY, 4th Edition, 2001.

[2] Roddy and Coolen, Electronic communication, PHI, New Delhi, 4th Edition, 2003.

[3] Taub and Schilling, Principles of communication systems, TMH, New Delhi, 1995.

[4] Bruce Carlson et al, Communication systems, McGraw-Hill Int., 4th Edition, 2002.

Possible Lecturers:

Dr. J. Butime
Dr. D. Okello
Dr. Ing. L. L. Kaluuba
Mr. D. Nsubuga Mubiru
Mr. S. Mwanje
Mr. A Wasswa Matovu
Mr. D. Sebbaale
Mr. I. Kitone

TEL3112 RADIO WAVE PROPAGATION & TENNAS AN

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale

This course builds on the Electromagnetics courses to discuss the conditions and constraints of wave propagation and the design of antennas to be used to achieve radio wave probation. **Course Objectives**

By the end of the course the student should

- Understand the concepts of electromagnetic wave propagation as used in different communication systems
- Understand the principles of design and operation of antennas used in different communication systems.

Detailed Course Content:

Propagation: [9 Hours]

The Earth's Atmosphere: The troposphere: composition and compositional fluctuations; precipitation and rain and their characteristics; effects on propagating signals at different frequencies (scattering/scintillation; absorption).

The Ionosphere: Origins, behaviour and characteristics; effects on ground wave propagation. Sky wave propagation. Terrestrial line of sight propagation; direct, reflected and refracted waves; Fresnel zones. Transionospheric line of site propagation. Propagation in a mobile environment: multipath effects; log-normal and Rayleigh fading; Propagation modelling and propagation models: synthesis and evaluation for low frequencies to Ka- band.

Radiation: [12 Hours]

Retarded potentials; Lorentz gauge conditions. The alternating current element: Fields starting from the retarded vector potential; Radiation, induction and electrostatic fields; Near and far field; Hertzian dipole; Radiated power and radiation resistance. Short antennas: Radiation resistance in

terms of the alternating current element half-wave dipole: Field expressions and radiation patterns starting from the retarded vector potential. Small loop antenna: Radiation pattern in terms of a small dipole; Radiation resistance. Antenna fundamentals: gain, directivity, efficiency and effective area. Antenna arrays: Uniform linear array-field expressions; Principle and Secondary maxima; Broadside and end-fire arrays; Pattern multiplication; Binomial arrays.

Antennas: **[9 Hours]**

Medium wave broadcast antennas: monopole and monopole arrays above perfect ground. Short wave antennas: International radio coverage/communications; Rhombic antennas/arrays: Dipole (curtain) arrays; Local coverage-horizontal dipoles and Vee antennas. TV and FM antennas: Loop- type antennas; Dipoles and Yagi-Ud arrays. Frequency independent antennas: equiangular and log- periodic principles with examples. Microwave antennas: electromagnetic horns; reflector antennas; micro-strip antennas; phased arrays. Micro Strip Antenna

Learning Outcomes

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

- Identify and analyse the purpose and the function of structural elements in radio frequency (RF) links.
- Construct RF systems, i.e. emitter, antennas and measurement tools.
- Assess the performance of a line-of-sight and non-line-of-sight RF links.
- Solve RF link problems.
- Design and evaluate the performance of receiver, transmitter, transceiver systems and RF link.

Method of Teaching/Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

- Freeman, R.L., Radio System Design for Telecommunications, Wiley,
- Rappaport, T.S, Wireless Communications, Prentice Hall,
- Doble, J., Mobile Radio Communications", Steele, S., Pentech Press, 1992. "Introduction to Radio Propagation for Fixed and Mobile Communications, Artech House,

Possible Lecturers:

Dr. J. Butime
Dr. D. Okello
Dr. Ing. L. L. Kaluuba
Mr. D. Nsubuga Mubiru
Mr. S. Mwanje
Mr. A Wasswa Matovu
Mr. D. Sebbaale
Mr. I. Kitone

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

ELE3113 POWER SYSTEMS THEORY **EOR Y**

Rationale

The course introduces the students to power systems engineering and covers basic principles about transmission lines (overhead and underground), transformers and generators in power systems.

Course Objectives

- To introduce the students to fundamental concepts relating to the design and management of modern electrical power systems.
- To develop amongst the students an awareness of technical problems associated with operation of such systems.
- To teach the students basic theory and equip them with necessary analytical, numerical and modeling skills for handling particular problems.

Detailed Course Content:

Basic Concepts: **[7 Hours]**

One line diagram; p.u. System;general description of power network:generation, transmission&distribution; radial and rings systems; brief description of uganda's power network Overhead line parameters:**[10 Hours]** Positive, negative and zero sequence inductances and Electrical characteristics of overhead lines:equivalent circuits for short line, medium line with T or Pi representation, long line with distributed constants, Corona; voltage regulation; power charts; mechanical characteristics of overhead lines: construction of over head lines; poles, towers, insulators, sag and tension. Effect of wind dust abd pollution. Corona.

Underground Cables: **[10 Hours]**

Types and ratings. Continuous, Short time and cyclic current ratings. Grading of Cables;calculation of current inductance and capacitance; insulation resistence, insulation breakdown; thermal characteristscs of cables; fault tolerating techniques and cable joining techniques. Transformers in power systems: **[10 Hours]** Equivalent circuit of 2 or 3 winding 3-phase Transformers. Transformer connections and Groups. Parallel operation of transformers. Inrush currents, losses and cooling; Harmonics in Transformers; power transformers, auto transformers and instrument transformers.

Synchronous generators in power systems: **[8 Hours]**

Cylindrical and salient pole machine parameters. Power delivered to infinite bus. Excitation. Governors. Capability curves V-curves. Synchronism. Parallel operation of Synchronous machines.

Learning Outcomes

Knowledge Skills

Having successfully completed the module, you will be able to demonstrate knowledge and understanding of:

- Fundamental concepts of operation of electrical power systems
- Representation of various components of the system
- Theory of balanced and unbalanced faults
- Basic concepts of stability
- Control of power, frequency, voltage and VAr flows
  Simple methods for modelling and simulation of power systems

Intellectual Skills

Having successfully completed the module, you will be able to:

- Appreciate the complexity of operation of power systems
- Analyse simple cases of power system stability
- Identify some elements of automatic control in power systems
- Benefit from application of per unit system

Practical Skills
Having successfully completed the module, you will be able to:

- Use the concept of symmetrical components in analysis
- Solve typical problems associated with load flow and faults
- Apply the notation of per unit system
- Interpret results from power system analysis
- Formulate admittance matrices and perform nodal analysis

Method of Teaching/Delivery
The course will be taught by using lectures, tutorials and assignments.
Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

- Weedy B M, "Electric Power Systems", 4th Edition, Wiley 1998
- Glover J D & Sarma M, "Power System Analysis and Design", 3rd Edition, Brooks/Cole 2002
- Grainger J J & Stevenson W D, " Power System Analysis", McGraw Hill 1994
- C.L.Wadhwa, "Electrical Power Systems"
- Nagrath & Kothari, "Modern Power System Analysis"
- Y.G.Paithankar & S.R.Bhinde, "Fundamentals of power system protection"
- Badriram & Vishwakarma, "Power System Protection"
- Ravindranath & Chander, "Power System Protection & Switchgear"

Possible Lecturers:
Dr. M. K. Musaazi Dr. P. DaSilva Dr. A. Sendegeya Mr. G. Bakkabulindi Mr. C Wasswa Sebuwufu Mr. A. Muguwa

ELE3114 ELECTRICAL MACHINES & DRIVES I

Hours per Semester	Weighted	Weighted	Weighted	Credit

				Total Mark	Exam Mark	Continuous Assessment Mark	Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale

The course equips students with theories and concepts related to static and dynamic electrical machines and drives.

Course Objectives

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

- To present a comprehensive treatment of transformers and electrical machines.
- To understand, develop and apply physical concepts and principles of circuit model equivalents of both transformers and motors.

Detailed Course Content:

Magnetic Circuits: **[15 Hours]**

Transformers; Construction and Practical Considerations; No-load, on-load operation; Excitation phenomenon; Equivalent Circuts; Determination of parameters; losses; testing; per unit system; Efficiency and voltage Regulations;

Winding: Terminologies: pitches; DC windings: Lap, wave and Multiplex; AC windings: Long pitch, short pitch and fractional slot winding (double/single layer winding); Flux Distribution; MMF and EMF Developed; Winding Factors

D.C Machines; **[15 Hours]**

Circuits Models; EMF and Torque; Commutation; Armature Reaction; Compensating Windings; Methods of Excitation and types of D.C machines; Magnetization characteristics; Induction Machines; Construction; Transformer Concept; Equivalent Circuits; Principle of operation; Power across air gap; Torque and power output; Tests to Determine circuit model parameters; Synchronous Machines: **[15 Hours]**

Construction; Principles of operation; Excitation; Equivalent Circuit; Determination of Armature; Reaction Ampere turns and Leakage reactance of a synchronous machine -Portier method; Special Machines: Construction and principles of operation of a single phase induction machine; series repulsion; shaded pole, universal and step-motors; Schrage motor; applications.

Learning Outcomes

Knowledge and Understanding

Having successfully completed the module, you will be able to demonstrate knowledge and understanding of:

- Theory of electromechanical energy conversion
- Concepts of fundamental torque equation and rotating and oscillating fields
- Principles of operation of electrical generators and motors
- Fundamental characteristics of various types of machines
- The concept of the equivalent circuit
- Construction and design issues associated with electrical machines
- Simple testing of electromechanical devices

Intellectual Skills

Having successfully completed the module, you will be able to: 66

- Appreciate the complexity of design of electromechanical devices
- Identify different types of electrical machines
- Derive equations describing operation of machines

- Formulate relevant equivalent circuits
- Compare and contrast the operation of different types of machines
- Analyse simple problems related to operation of electrical machines

Practical Skills
Having successfully completed the module, you will be able to:
- Tackle problems of analysis of performance
- Explain the shape of characteristics of actual machines
- Apply equivalent circuits to performance prediction
- Interpret results and correlate them with theoretical predictions
- Perform simple tests on machines

Method of Teaching/Delivery
The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

- Sarma M S, Electric Machines, Steady-state Theory and Dynamic Performance Second Edition, Publisher: West Publishing Company, 1994 [Library] [Shops]
- Stephen J Chapman, Electrical Machinery and Power System Fundamentals, Publisher: McGraw-Hill Higher Education, 2001 [Library] [Shops]
- Denis O'Kelly, Performance and Control of Electrical Machines, Publisher: Mc-Graw Hill Book Company, 1991 [Library] [Shops]
- K Karsai, D Kereny, L Kiss, Studies in Electrical and Electronic Engineering 25, Large Power Transformers, Publisher: Elsevier, 1987 [Library] [Shops]
- A E Fitzgerald, Charles Kingsley, Stephen D Umans, Electric Machinery, Sixth Edition, Publisher: Mc-Graw-Hill Higher Education, 2002 [Library] [Shops]
- Charles I Hubert, Electric Machines, Theory, Operation, Application, Adjustment and Control, Publisher: Macmillan Publishing Company, 1991 [Library] [Shops]
- Dino Zorbas, Electric Machines, Principles, Applications, and Control Schematics, Publisher: West Publishing Company, 1989 [Library] [Shops]

Possible Lecturers:
Dr. M. K. Musaazi Dr. P. DaSilva Dr. A. Sendegeya Mr. G. Bakkabulindi Mr. C Wasswa Sebuwufu Mr. A. Muguwa

LAW1104 LAW OF CONTRACTS

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
30	0	00	30	100	60	40	2

Rationale
This course equips students with basics of legal issues affecting the engineering contracts. It covers law of contract and tendering.

Course Objectives

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

- Understand the law of contract and tendering process
- Manage the tendering process and contract

Detailed Course Content:

Law of contract: **[15 Hours]**

Contract management, subcontracting and subcontractor agreements; the roles of the client/customer, the contactor, subcontractor and consultants; the engineer's professional responsibilities and fees, liability and indemnity.

Tendering: **[15 Hours]**

Type of contract and basis of tender; contractual agreements and contract administration; Service Level agreements: requirements and execution.

Learning Outcomes

At the end of the unit students will be able to:

- Understand in outline how laws are made, how the legal system is structured and the context in which legal disputes are resolved.
- Understand some basic principles which govern:
  - formation and terms of contract
  - exclusion and limitation of liability
  - misrepresentation and privity.
  - the remedies available for breach of contract.
  - the duty of care in negligence, especially in the giving of advice.
  - overlaps between contract and tort, including privity.
- Identify and explain some basic commercial policies and values underpinning these rukes.
- Describe and assess certain areas of debate about what the law is and what it ought to be.
- Have some understanding of how the law of contract (and to a lesser extent, tort) will affect the discipline of Engineering.

Method of Teaching/Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

To be determined

COE2105 ENTREPRENEURSHIP

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
30	0	00	30	100	60	40	2

Rationale

The course introduces students to entrepreneurial skills and the process of starting and managing a business.

Course Objectives

To train students on entrepreneurship skills in order to Exercise skills towards job creation and self development and Conduct business profitably

Detailed Course Content:

Introduction to Entrepreneurship: **[10Hours]**

Definitions and concepts; Objectives and historical perspectives; Employment Creation: Self employment; Policies; Viable programmes for Development

Entrepreneurship Process: **[10 Hours]**

Business enterprises and their characteristics; Identification of Business Opportunities; Market surveys; Business plans

Managing Business Enterprises: **[10 Hours]**

Enforcing business plans; Strategic Management; Communication in Business; Managing competition; Finance management - Taxation and cost control; Human resource management Cost accounting systems: Cost analysis; Accounting

Learning Outcomes

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

- Identify and the describe the major steps and requirements for starting a small-scale business
- Develop a business plan
- Explain the role of finance and financial management in the health of a business
- Appreciate the levels and impact of risk and risk taking in a business
- Describe strategies for nurturing or growing a business

Method of Teaching /Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

[1] Peter F. Drucker(2006). *Innovation and Entrepreneurship*. Collins Business. ISBN-10: 0060851139, ISBN-13: 978-0060851132

[2] Bruce Barringer and Duane Ireland (2007). *Entrepreneurship; Successfully Launching New Ventures*. Prentice Hall; 2nd Edition. ISBN-10: 0132240572, ISBN-13: 978-0132240574

[3] Robert Hisrich, Michael Peters and Dean Shepherd, (2006). *Entrepreneurship*. McGraw-Hill/Irwin; 7th Edition. ISBN-10: 0073210560, ISBN-13: 978-0073210568

Possible Lecturers:

Mr. D. Semukuutu

ELE3202 CONTROL ENGINEERING

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale

The course requires a good mathematical background especially in complex, matrix and Laplace algebra. It is an introductory course of control engineering that covers block diagram systems representation, stability and compensation techniques.

Course Objectives

- To understand operation and characteristics of control systems
- To analyze and design control systems using appropriate mathematical tools
- To apply control techniques to advanced engineering situations

Detailed Course Content:

Basic control theory: **[10 Hours]**

The feedback control concept; stability and instability; stability criteria for control systems - Routh's, root -locus, Nyquist, Bode Plots.

Compensation techniques: **[6 Hours]**

Cascade frequency compensation: Lag and lead compensators, bridge-T compensators: cascade root- locus compensation; comparison of techniques. Feedback compensation: time response considerations, transformation of control elements, use of root-locus and polar plots. **State-space Methods:** **[8 Hours]**

Linear algebra: matrix theory; linear vector; spaces, dimension, minor products, Euclidean space, orthonormalisation, change of bases, eigenvalues, eigenvectors, polynomial matrices transfer function matrices, system stability by lyapunov's state-space representation, boundedness of solution, asymptotic stability domain of attraction, linearisation, limit cyles; Poincare-Pendixson theorem, Lienards criteria, point-transformation method.

Discrete Data System: **[8 Hours]**

The sampling process Shannon sampling theorem, impulse sampling; the z-transform; inverse transform, theorems, pulse transfer function, limitations, modified z-transform; inverse; system representation: block diagrams, signal flow graphs; time and frequency response: time response, frequency response, bilinear transform, relative stability, root-locus.

Non-Linear Systems: **[6 Hours]**

General non-linear system description: State and output equations linearization, stability analysis; Liapunov methods; Stability regions; Application of artificial neural networks to non-linear systems; Subharmonic resonance.

Optimal Control and Filtering Theory: **[7 Hours]**

Concept of optimality; Kuhn-Tucker conditions; Dynamic programming; Discrete-time optimal control; Quadratic linear regulator (QLR); Matrix Riccati equation; Stability properties Stochastic systems and their control; Kalman filtering; Noise and its control; Adaptive Control and System Identification: Time series models; Parameter estimation; Prediction-error identification; Method of least squares; Autoregressive Moving-Average (ARMA) Models; Model determination; Self tuning. Special Techniques.

Learning Outcomes

The student will:

- Be able to comfortably check for stability of any system using any criteria.
- Understand the concept of control system engineering, why it is carried out and will appreciate its application in digital control.
- Acquire concepts on sensors and their use in design of automated systems.

Method of Teaching /Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%

Final examination	60%
Total	**100%**

Recommended Books and References

[1] William L. Brogan, *Modern Control Theory*, 2nd ed., Prentice-Hall, 1985
[2] Nise, N. S, *Control Systems Engineering*, 3rd ed., New York, NY: Wiley, 2000.
[3] *K. Ogata, Discrete- Time Control Systems*

Possible Lecturers:
Dr. M. K. Musaazi Dr. P.
DaSilva Dr. A. Sendegeya
Mr. G. Bakkabulindi Mr. C
Wasswa Sebuwufu Mr. A.
Muguwa

ELE3211 INDUSTRIAL ELECTRONICS

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

[Prerequisite: ELE3102, ELE3103] **Rationale**

The course gives students the fundamental concepts of Industrial and power electronics and insight into the present practices and developments in industry where electronics is increasingly being applied for control and automation.

Course Objectives

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

- Understand the operations, characteristics and design of power electronics devices and circuits
- Build and test power electronic circuits

Detailed Course Content:

Industrial control devices: **[4 Hours]**

Mechanical switches, control relays, contactors, solenoids, control values, solid state logic, timing and counting devices

Analogue and Digital Transdicers: **[4 Hours]**

thermo couples, thermistors, resistance temperature detectors, differential transformers, pressure transducers, photoelectric devices, lasers, ultrasonics, optical shaft encoders **Switching Devices:** Diodes, BJT's, FET's; characteristics, ratings, data sheets. **[4 Hours]**

Thyristors: **[6 Hours]**

families, Two transistor analogy of SCR, construction, Turn on & Turn Off characteristics, specifications and parameters, Turn On methods, S.C.R. firing & synchronizing circuits, U.J.T. firing circuits, SCR Protection, Commutation circuits. Gate-trigger requirements & methods, Protection; di/dt, dv/dt, fuse selection, Modern devices.

Converter Circuits: **[6 Hours]**

Diode rectification; single and three phase. Controlled rectification; Inversion, Chopper, and inverter types; commutation, harmonics. Cycloconverters. Controlled rectifiers; 6-pulse rectifiers, distortion, power factor, and regulation; harmonic analysis; radio frequency interference; Pulse width modulation (PWM) and pulse resistance control; Phase Controlled Rectifier : Principle of Phase Control, Single-Phase Mid-Point Converter, Bridge Converter, Full Converter, Semiconverter, Dual converter; DC to DC converters : Principle and types of chopper circuits, set up chopper, Line Regulators.

Inverters: **[6 Hours]**
Pulse width modulated, Single Phase Series and Parallel, Force Commutated Thyristor, Current Source, and Three Phase Bridge inverters; AC Voltage Controllers: Types, Single Phase Voltage Controller with RL Load, Sequence Control of AC Voltage Controllers, Cycloconverters. **Applications:** **[6 Hours]**
Variable frequency induction motor operation: parameters, T-n characteristics equations; D.C motor drives: the free-wheeling diode; Two and four quadrant operation; Machine converter interactions, Traction system; HVDC transmission: control criteria, characteristics; Thyristor valve operation; typical schemes. Industrial application of ultrasonic and its basic principle, optical devices, S.M.P.S., U.P.S.; Advanced control of power electronic circuits using microprocessors, isolation and amplifier circuits, synchronization circuits. Other applications
Industrial process control: **[5 Hours]**
Open & closed loop, modes of control, digital control, fuzzy logic, programmable logic controllers, components ladder logic user program, analog inputs; SCRs and Power control: AC/DC conversion, single & three phase. DIAC, UJT, PVT, TRIACS.
ROBOTS: Robot classification, components and characteristics, Robot sensors. **[4 Hours]**

Learning Outcomes
Having successfully completed the module, you will be able to:

- demonstrate knowledge and understanding of the characteristics of thyristors, bipolar devices, MOSFETs and IGBTs, and select the correct devices for an application.
- demonstrate knowledge and understanding of the basic topography of converters, inverters and power supplies, with an emphasis on application of devices and current industrial practice.
- Perform design calculations for drive and power supply applications, and understand the approximations used.
- Investigate the characteristics and performance of a power converter.

Method of Teaching /Delivery
The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

- Freeman, R.L., Radio System Design for Telecommunications, Wiley,
- Rappaport, T.S, Wireless Communications, Prentice Hall,
- Doble, J., Mobile Radio Communications", Steele, S., Pentech Press, 1992. "Introduction to Radio Propagation for Fixed and Mobile Communications, Artech House,
- Lander C W, *Power Electronics,* 3rd Edition, McGraw-Hill 1993
- Bradley D A, *Power Electronics,* Van Nostrand Reinhold 1987
- Rashid M H, *Power Electronics: Circuits Devices & Applications 2nd Edition,* Prentice Hall 1993

Possible Lecturers:
Dr. J. Butime
Mr. D. Nsubuga Mubiru
Mr. P. Bogere
Mr. G. Bakkabulindi

TEL3212 DIGITAL COMMUNICATIONS

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale

This course discusses the principles of digital communication and they can be applied in different communication systems.

Course Objectives

- To understand the concepts of information theory and digital communications in today's communication systems
- To appreciate the methods used in coding, data compression, digital modulation techniques and other digital communications problems.

Detailed Course Content:

Introduction: **[4 Hours]**

Analog Vs. Digital Communication Systems; A General Communication System; Review of Probability Theory; Probability space, random variables, density functions, independence; Expectation, conditional expectation, Baye's rule; Stochastic processes, autocorrelation function, stationarity, spectral density

Analog-to-digital conversion: Sampling (ideal, natural, sample-and-hold); Quantization, PCM; **[4 Hours]**

Source coding (data compression): **[6 Hours]**

Measuring information, entropy, the source coding theorem; Huffman coding, Run-length coding, Lempel-Ziv;

Communication channels: Band limited channels The AWGN channel, fading channels **[6 Hours]** Receiver design: **[6 Hours]**

General binary and M-ary signaling; Maximum-likelihood receivers; Performance in an AWGN channel; The Chernoff and union/Chernoff bounds; Simulation techniques; Signal spaces Modulation: PAM, QAM, PSK, DPSK, coherent FSK, incoherent FSK **[6 Hours]**

Channel coding: **[6 Hours]**

Block codes, hard and soft-decision decoding, performance; Convolutional codes, the Viterbi algorithm, performance bounds; Trellis-coded modulation (TCM)

Signaling through band limited channels: **[4 Hours]**

ISI, Nyquist pulses, sequence estimation, partial response signaling; Equalization Signaling through fading channels: Rayleigh fading, optimum receiver, performance; Interleaving Synchronization; Symbol synchronization; Frame synchronization; Carrier synchronization **[3 Hours]**

Learning Outcomes

The goal of this course can be divided into three areas:

- Knowledge goal: The students should understand the functions of the various parts of a modern communication system.
- Skill goal: The students should have the ability to analyze theoretically the performance of various parts of a communication system. They should also be able to run Monte Carlo simulations for communication systems in matlab in order to estimate the performance of such systems.
- Attitude goal: The students should be aware of some of the most promising technologies for the future communication systems, such as for example MIMO techniques.

Method of Teaching/Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	Percentage contribution
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended Books and References

- Modern Digital and Analog Communication Systems by BP Lathi
- Digital and Analog Communication by Couch
- Communication Systems by Haykins
- Probability, RV and Stochastic Processes by Popoulis

Possible Lecturers:
Dr. J. Butime
Dr. D. Okello
Dr. Ing. L. L. Kaluuba
Mr. D. Nsubuga Mubiru
Mr. S. Mwanje
Mr. A Wasswa Matovu
Mr. D. Sebbaale
Mr. I. Kitone

TEL3213 MOBILE COMMUNICATIONS SYSTEMS

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale
This course discusses component and system concepts in mobile communications and their applications in different life scenarios.

Course Objectives
- To understand the application of information theory and digital communications concepts in the design of mobile communication systems.
- To appreciate the operational conditions and constraints of today's mobile communication systems and appreciate the requirements of tomorrow's systems.

Detailed Course Content:

Introduction: **[6 Hours]**
Overview of wireless communication systems; Paging and 1st generation cellular services; Transition from analog cellular to digital cellular (US vs. European experience); Features and services of 2G, 2.5G, 2.75G, and 3G systems (i.e. advanced calling services, mobile data, mobile internet, and etc.).
Wireless Communication Concepts: **[6 Hours]**
Propagation models; multiple access methods; Wireless layer protocols; Antennas Cellular System Concepts: **[8 Hours]**
Market and technology overview; Cell splitting; Cellular system economics, cellular design concepts; intersystem operation and roaming
Personal Communications Services: **[10 Hours]**
Overview, PCS philosophy, Advanced calling services and features, Worldwide spectrum allocations and implementations; 2nd Generation FDMA/TDMA Cellular Systems: over-the-air design concepts; Handoff; Roaming; Security; CDMA Cellular Systems: CDMA concepts; IS-95 (CDMAone) - over-the- air design

concepts; IS-95 Handoff; Power Control; Security; CDMA2000 Transition to Third Generation GSM (2.75G): **[8 Hours]**
GSM data service evolution from circuit-switched to packet-switched, packet switching center, Mobile IP; SMS, MMS, E-SMS; GPRS and EDGE (EGPRS); WCDMA - The move to 3rd Generation GSM: Over-the-air concepts; Handoff; Power Control; Security; HSDPA and HSUPA Competitive/Complementary Technologies: Satellite Mobile Systems; WiFi and WiMax **[7 Hours]**

Learning outcomes

This subject, along with other subjects within the study area will provide the foundation for further work within the area of modern wireless communication systems, within Norwegian telecom companies or for further research (Ph.D studies).

Method of Teaching /Delivery
The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended Books and References

- T.S.Rappaport, "Wireless Communications: Principles and Practice, Second Edition, Pearson Education/ Prentice Hall of India, Third Indian Reprint 2003.
- R. Blake, " Wireless Communication Technology", Thomson Delmar, 2003.
- W.C.Y.Lee, "Mobile Communications Engineering: Theory and applications, Second Edition, McGraw-Hill International, 1998.

Possible Lecturers:
Dr. J. Butime
Dr. D. Okello
Dr. Ing. L. L. Kaluuba
Mr. D. Nsubuga Mubiru
Mr. S. Mwanje
Mr. A Wasswa Matovu
Mr. D. Sebbaale
Mr. I. Kitone

TEL3214 COMPUTER COMMUNICATION NETWORKS

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale
The course introduces communication systems and the principles of design, deployments and operation of modern computer and communication networks

Course Objectives

- To understand Principles including basic engineering principles, design algorithms behind building blocks of computer networks as well as Practices describing how things are done in practice (in the case of Internet and the Web)

Detailed Course Content:

Review of Telecommunication networks: **[2 Hours]**
Hardware and software, reference models (Communications Protocol starks): The OSI Model Vs the TCP/IP Model, transmission media, wireless transmission, the telephone system and the new telecommunication systems.
Brief discussion of the Physical Layer: **[5 Hours]**
electromagnetic signals ".on the wire" Transmission: Modulation, Digitization, Synchronization, Transmission Media, Physical Layer Standards : RS-232, CCITT X.21,
Link Layer: **[9 Hours]**
Data transfer between neighboring network elements including encoding, framing, error correction, access control for shared links (MAC protocols) examples to include Ethernet, fast ethernet, satellite etc
Network Layer: host-to-host connectivity, detailed study of routing and addressing. **[9 Hours]**
Transport Layer: **[8 Hours]**
Host-to-host data transport. Detailed study of reliable data transport, congestion control, flow control with examples of TCP and UDP
TCP/IP Application layer: **[6 Hours]**
Detailed study of the Network Applications including HTTP, FTP, electronic mail protocols (SMTP,POP3,IMAP), DNS and distributed file sharing.
Advanced topics in computer networks: **[6 Hours]**
Multimedia networking (quality of service), computer security, wireless networks, overlay networks; **Case studies of emerging network systems /technologies:** HTTP load balancing, Network caching, Content distribution (Akamai), Peer-to-peer systems (Gnutella/BitTorrent).

Learning Outcomes

- Identify some contributors to networks and relate their achievements to the knowledge area; identify some components of a network; name some network devices and describe their purpose; describe advantages of a star topology over a ring topology; describe advantages of a ring topology over a star topology; define the meaning of a protocol; explain the importance of security when dealing with networks; and describe how computer engineering uses or benefits from networks.
- Understand fundamental concepts of networks and their topologies; and understand the concept of network architecture and its hardware components.
- Demonstrate understanding of the elements of a protocol, and the concept of layering; recognize the importance of networking standards, and their regulatory committees; describe the seven layers of the OSI model; compare and contrast the OSI model with the TCP/IP model; and demonstrate understanding of the differences between circuit switching and packet switching.
- Understand the basic concepts of LAN and WAN technologies and topologies; demonstrate understanding of different components and requirements of network protocols; demonstrate understanding of basic concepts of error detection and correction at the data link layer and below; and design and build a simple network by implementing (and designing) a simple network protocol that operates at the physical and data link layers of the OSI model.
- Explain the different roles and responsibilities of clients and servers for a range of possible applications; select a range of tools that will ensure an efficient approach to implementing various client-server possibilities; and design and build a simple interactive web-based application (e.g., a simple web form that collects information from the client and stores it in a file on the server).
- Understand common barriers to network security and the major issues involved in implementing proper security measures; describe the purpose of encryption and the function of public and private keys; compare and contrast the various types of firewalls; generate and distribute a PGP key pair and

use the PGP package to send an encrypted e-mail message; and explain the concept of and necessity for transport layer security.

- Describe the main characteristics of mobile IP and explain how differs from IP with regard to mobility management and location management as well as performance; illustrate (with home agents and foreign agents) how e-mail and other traffic is routed using mobile IP; be aware of the many areas of interest that lie within this area, including networking, multimedia, wireless, and mobile computing, and distributed computing.
- Define performance metric; and describe how each affects a particular network and/or service paradigm.
- Demonstrate understanding of the fundamental concepts of data communications; understand signals and signal encoding methods to communication service methods and data transmission modes.
- Explain the issues for network management arising from a range of security threats, including viruses, worms, Trojan horses, and denial-of-service attack; summarize the strengths and weaknesses associated with different approaches to security; develop a strategy for ensuring appropriate levels of security in a system designed for a particular purpose; and implement a network firewall.
- Summarize the basic characteristics of sampling and quantization for digital representation.
- Select, giving reasons that are sensitive to the specific application and particular circumstances, the most appropriate compression techniques for text, audio, image, and video information; explain the asymmetric property of compression and decompression algorithms; illustrate the concept of run-length encoding; and illustrate how a program like the UNIX *compress* utility, which uses Huffman coding and the Ziv-Lempel algorithm, would compress a typical text file.

Method of Teaching/Delivery
The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total 100%	

Recommended and Reference Books

[1] Andrew S. Tanenbaum1996. *Computer Networks.* Prentice Hall; 3rd Edition. ISBN-10: 0133499456, ISBN-13: 978-0133499452

[2] James F. Kurose and Keith W, 2007.*Computer Networking: A Top-Down.* Addison Wesley; 4 Edition. ISBN-10: 0321497708, ISBN-13: 978-0321497703

[3] Natalia Olifer and Victor Olifer, 2006. *Computer Networks: Principles, Technologies and Protocols for Network Design.* Wiley. ISBN-10: 0470869828, ISBN-13: 978-0470869826

[4] Douglas E. Comer, 2003. *Computer Networks and Internets with Internet Applications.* 4th Edition. Prentice Hall. ISBN-10: 0131433512, ISBN-13: 978-0131433519

[5] Larry L. Peterson, Bruce S. Davie, 2007. *Computer Networks: A Systems Approach, Fourth Edition* (The Morgan Kaufmann Series in Networking). Morgan Kaufmann; 4 Edition. ISBN-10: 0123705487, ISBN-13: 978-0123705488

[6] Nader F. Mir, 2006. *Computer and Communication Networks.* Prentice Hall PTR; 1 Edition . ISBN-10: 0131747991, ISBN-13: *978-0131747999*

Possible Lecturers:
Dr. D. Okello Mr. S. Mwanje Mr. A. Tumwesigye Mr. P. I. Musasizi Mr. P. Serwanga

ELE3215 POWER SYSTEMS ENGINEERING

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale
This introduces students to power systems components and analysis

Course Objectives
- To introduce students to power systems components and analysis
- To ensure students are able to investigate and work on large power system networks

Detailed Course Content:

Fault Analysis: **[10 Hours]**
Symmetrical components; Short circuit studies in small & large Systems. Fault levels. Sequence impedance of equipment; Symmetrical components, balanced & Unbalanced fault conditions & Calculations, solution of networks; Fault detection.
Load flow analysis: **[12 Hours]**
Solutions for simple systems (2 or 3-bus systems) methods of solutions for large systems. Gauss. Gauss-Seidel, Newton-Raphson, fast decoupled.
Power System Stability: **[15 Hours]**
Rotor Angle stability: Transients and Traveling waves. Steady, Dynamic, Transient stability. Modelling of single machine infinite-bus systems; Equal area criterion and swing equation; Swing curves, use of computers in transient calculations. control of frequency; Voltage stability: control of voltage and reactive power control; Improvement of system stability. Harmonics: Voltage and current harmonics, resonance.
HVDC Transmission: **[10 Hours]**
Introduction and classification of HVDC transmission, limitation of AC interconnection and advantages of DC interconnection. Components of HVDC transmission. Converting and inverting station review of current technologies.

Learning Outcomes

Knowledge and Understanding
Having successfully completed the module, you will be able to demonstrate knowledge and understanding of:
- Fundamental concepts of power system stability
- Factors that influence system stability
- Methods to improve and maintain stability
- Components of protection systems
- The concept of protection zones
- Components used in earthing systems
- Basic structure of different lines and cables
- Types of HVDC links and their control

Intellectual Skills
Having successfully completed the module, you will be able to:
- Analyse simple problems related to system stability
- Appreciate the conflicting nature of the design requirements of a protection system
- Explain the reasons for system earthing
- Appreciate the features of power simulation packages

- Discuss the principles of operation of FACTS
- Appreciate the advantages and disadvantages of HVDC transmission

Practical Skills
Having successfully completed the module, you will be able to:
- Apply equal area stability criteria to simple systems
- Explain principles of operation of protection systems
- Design simple protection systems for transmission lines and transformers
- Comply with power system earthing practices
- Determine temperature rise and ratings of cables and lines

Method of Teaching/Delivery
The course will be taught by using lectures, tutorials and assignments.
Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

- Weedy B M, "Electric Power Systems", 4th Edition, Wiley 1998
- Glover J D & Sarma M, "Power System Analysis and Design", 3rd Edition, Brooks/Cole 2002
- Grainger J J & Stevenson W D, " Power System Analysis", McGraw Hill 1994
- C.L.Wadhwa, "Electrical Power Systems"
- Nagrath & Kothari, "Modern Power System Analysis"
- Y.G.Paithankar & S.R.Bhinde, "Fundamentals of power system protection"
- Badriram & Vishwakarma, "Power System Protection"
- Ravindranath & Chander, "Power System Protection & Switchgear"

Possible Lecturers:
Dr. M. K. Musaazi Dr. P. DaSilva
Dr. A. Sendegeya Mr. G. Bakkabulindi Mr. C Wasswa Sebuwufu Mr. A. Muguwa

ELE3216 ENERGY CONVERSION AND GENERATION

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale
This course helps the students to understand different energy sources and conversion technologies for generating electric power and heat.

Course Objectives
By the end of the course students should be able to:
- Understand the energy conversion principles
- Distinguish between various energy sources and conversion technologies

Detailed Course Content:

Energy Resources and Conversion: **[8 Hours]**
Resources: Solar, Hydro, Biomass, Biogas, Geothermal, Renewable energy sources; Energy Conversion: Thermo and Photoelectric, Electrothermal; Induction heating, Dielectric Heating, and principles of arc welding; Electromechanical and Electromagnetic conversion. Principles of operation of rotating, machines. Heat Transfer. Energy Conversion Efficiency. Distributed (or embedded) generation
Power Plants: **[37 Hours]**
Thermal Power Plants: Sources of conventional energy and method of harnessing, special features and cycles used in steam, gas and diesel power plants, combine cycle systems and c0generation. Location of the above plants and selection of units, prime movers and associated equipment. *Hydroelectric Power Plants:* The plant and their equipment, layout, run of the river and accumulation type station, types of hydroelectric turbine and their station.
Nuclear Power Plants: Nuclear reaction, fission and fusion reaction, critical mass chain reaction, moderators, reactor control and cooling, classification of reactors, different types of reactors, radiation damages, shielding of grays neutrons, materials for construction.
Thermoelectric Generators: Thermoelectric effect, solid state description of thermoelectric effect, analysis and design of thermoelectric generator, figure of merit, device configuration, solar and radioisotope powered generators, applications.
MHD Generators: Gaseous conductors, analysis and design of MHD generator, problems associated with MHD generation, possible configuration. Combined Heat and Power (CHP).
Photovoltaic Generators: Radiation principles, optical effects in semiconductors & p.n-junction, analysis and design of converter, fabrication of cells, solar cells in space.
Fuel Cells: Thermodynamic principles, efficiency of fuel cell factors limiting the performance, design, new development in fuel cells, possibility of future use in Electric vehicles.

Learning Outcomes
Having successfully completed the module, you will be able to demonstrate knowledge and understanding of:

- Theory of electromechanical energy conversion
- Concepts of fundamental torque equation and rotating and oscillating fields
- Describe power generation principles for different sources
- Tackle problems of analysis of performance
- Apply equivalent circuits to performance prediction
- Interpret results and correlate them with theoretical predictions

Method of Teaching/Delivery
The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

- Sarma M S, Electric Machines, Steady-state Theory and Dynamic Performance Second Edition, Publisher: West Publishing Company, 1994 [Library] [Shops]
- Stephen J Chapman, Electrical Machinery and Power System Fundamentals, Publisher: McGraw-Hill Higher Education, 2001 [Library] [Shops]
- K Karsai, D Kereny, L Kiss, Studies in Electrical and Electronic Engineering 25, Large Power Transformers, Publisher: Elsevier, 1987 [Library] [Shops]
- P. Breeze, Power generation technologies, Elsevier 2005 [Library] [Shops] **Possible Lecturers:**

Dr. M. K. Musaazi Dr. P. DaSilva Dr. A. Sendegeya Mr. G. Bakkabulindi Mr. C Wasswa Sebuwufu Mr. A. Muguwa

ELE3205 ELECTRICAL MACHINES & DRIVES I

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale

The course builds on the first course in machines and drives to equip students with theories and concepts related to static and dynamic electrical machines and drives.

Course Objectives

- To analyze the characteristics of the electrical machines and their behavior in electrical systems.
- To understand the applications of various electrical machines in an electrical system
- To operate and test these machines

Detailed Course Content:

Transformers: **[9 Hours]**

Three phase transformers, connection diagrams and vector symbols, parallel operation; instrument transformer; welding machine transformer phase convention, transformer transients. D.C Machines: **[10 Hours]**

Characteristics of D.C generators and motors, mode of operation, starting, braking and speed control, losses, efficiency and testing, Applications.

Induction Motors: **[10 Hours]**

Modes and Crowling: speed control; Deep bar double cage Rotor; induction machine dynamics. Analysis of induction machine equations, speed/torque curves, testing and efficiency: Applications Synchronous Machines: **[10 Hours]**

Synchronizing to infinite bus-bars, operating characteristics, losses and efficiency; power flow equations, capability curve, salient pole machine-Two reaction model, parallel operation; machine performance, Heating in synchronous machines, short circuits in synchronous machines, other mode of operation; the compensation and power factor correction. V-curve.

Special Machines: **[6 Hours]**

Construction and principles of operation of a single phase induction machine, series repulsion, shaded pole universal and step-motors, schrage motor, Applications.

Learning Outcomes

Knowledge and Understanding

Having successfully completed the module, you will be able to demonstrate knowledge and understanding of:

- Concepts of fundamental torque equation and rotating and oscillating fields
- Principles of operation of electrical generators and motors
- Fundamental characteristics of various types of machines
- The concept of the equivalent circuit
- Construction and design issues associated with electrical machines
- Simple testing of electromechanical devices

Intellectual Skills

Having successfully completed the module, you will be able to:

- Identify different types of electrical machines
- Derive equations describing operation of machines
- Formulate relevant equivalent circuits

- Compare and contrast the operation of different types of machines
- Analyse simple problems related to operation of electrical machines

Practical Skills

Having successfully completed the module, you will be able to:

- Tackle problems of analysis of performance
- Explain the shape of characteristics of actual machines
- Apply equivalent circuits to performance prediction
- Interpret results and correlate them with theoretical predictions
- Perform simple tests on machines

Method of Teaching /Delivery

The course will be taught by using lectures, tutorials and assignments**. Mode of Assessment**

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

- Sarma M S, Electric Machines, Steady-state Theory and Dynamic Performance Second Edition, Publisher: West Publishing Company, 1994 [Library] [Shops]
- Stephen J Chapman, Electrical Machinery and Power System Fundamentals, Publisher: McGraw-Hill Higher Education, 2001 [Library] [Shops]
- Denis O'Kelly, Performance and Control of Electrical Machines, Publisher: Mc-Graw Hill Book Company, 1991 [Library] [Shops]
- K Karsai, D Kereny, L Kiss, Studies in Electrical and Electronic Engineering 25, Large Power Transformers, Publisher: Elsevier, 1987 [Library] [Shops]
- A E Fitzgerald, Charles Kingsley, Stephen D Umans, Electric Machinery, Sixth Edition, Publisher: Mc-Graw-Hill Higher Education, 2002 [Library] [Shops]
- Charles I Hubert, Electric Machines, Theory, Operation, Application, Adjustment and Control, Publisher: Macmillan Publishing Company, 1991 [Library] [Shops]
- Dino Zorbas, Electric Machines, Principles, Applications, and Control Schematics, Publisher: West Publishing Company, 1989 [Library] [Shops]

Possible Lecturers:

Dr. M. K. Musaazi Dr. P. DaSilva Dr. A. Sendegeya Mr. G. Bakkabulindi Mr. C Wasswa Sebuwufu Mr. A. Muguwa

TEL3217 SYSTEMS ENGINEER

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
60	0	00	60	100	60	40	4

N
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Rationale

This course imparts the skills required to build, manage and decommission large scale engineering systems.

Course Objectives

- To give a comprehensive coverage of *system* analysis, design, development and decommissioning.
- To study the principles that make a *remarkable* difference in System development performance, Organizational performance and Level of personal frustrations in coping with complex tasks
- To study the system, product, or service problem-solving/solution development techniques

Detailed Course Content:

SYSTEM ANALYSIS CONCEPTS **[20 Hours]**

Definition of Terms: Concept, Principle, Process, Operation, Task, Practice, Best or Preferred Practice. **System Entity Concepts:** What Is a System; System Attributes, Properties, and Characteristics; System Roles and Stakeholders; System Acceptability; The System/Product Life Cycle. **System Architecture Concepts:** The Architecture of Systems; System Levels of Abstraction and Semantics; The System of Interest Architecture; The Operating Environment Architecture; System Interfaces. **System Mission Concepts:** Organizational Roles, Missions, and System Applications; Understanding the Problem, Opportunity, and Solution Spaces; System Interactions with its Operating Environment; System Mission Analysis; System Use Cases and Scenarios. **System Operations Concepts:** System Operations Model; System Phases, Modes, and States of Operation; Modelling System and Support Operations.

System Capability Concepts: System Operational Capability Derivation and Allocation; The Anatomy of a System Capability. **System Concept Synthesis:** System Analysis Synthesis SYSTEM DESIGN AND DEVELOPMENT PRACTICES **[25 Hours]**

Design Principles: Detailed study of design principles and system requirements analysis. **System Development Strategies:** The System Development Workflow Strategy; System Design, Integration, and Verification Strategy; The SE Process Model; System Development Models. **System Specification:** System Specification Practices; Understanding Specification Requirements; Specification Analysis; Specification Development; Requirements Derivation, Allocation, Flow Down, and Traceability; Requirements Statement Development. **System Development:** Operational Utility, Suitability, and Effectiveness; System Design To/For Objectives; System Architecture Development; Developing an Entity's Requirements, Operations, Behavioural and Physical Domain Solutions; Component Selection and Development; System Configuration Identification; System Interface Analysis, Design, and Control; Human-System Integration; Engineering Standards, Frames of Reference, and Conventions; System Design and Development Documentation. **Decision Support .** Analytical Decision Support; Statistical Influences on System Design; System Performance Analysis, Budgets, and Safety Margins; System Reliability, Availability, and Maintainability (RAM); System Modeling and Simulation; Trade Study Analysis of Alternatives. **Verification and Validation:** System Verification and Validation; Technical Reviews; System Integration, Test, and Evaluation. **System Deployment, Operations, and Support:** System Deployment; System Operations and Support (O&S).

PRINCIPLES MAINTENANCE ENG: **[15 Hours]**

Detailed study of the principles of maintenance engineering applied to electrical engineering systems.

Learning Outcomes

This course will enable the student to productively contribute as a systems engineer in the planning, design or analysis of facilities, equipment, or processes. The student will gain an in-depth understanding of the Scientific Method, DOD Systems Engineering Practice, and the principles of project management, excluding emphasis of cost and schedule control. The student will understand the meaning and practice of: requirements and functional analysis, alternatives development, synthesis, trade studies, decision methodology, life-cycle cost analysis, interface control, and system integration. The student will develop the skills necessary to analyze a system and define requirements. Practical applications will be oriented towards the design and operation of waste management and environmental restoration facilities within the DOE complex

Method of Teaching /Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment 85

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

[1] Scientific Systems Engineering and Analysis, by B.S. Blanchard and W.J. Fabrycky, Prentice hall. Third Edition ISBN 0-13-135047-1; and Engineering of Complex Systems, University of Washington Monograph, Brian Mar, 1996.

Possible Lecturers:

Mr. P. I. Musasizi Mr. S. Mwanje

COE1102 FUNDAMENTAL ACCOUNTS PRINCIPLES

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale

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

Course Objectives

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

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

Detailed Course Content:

ECONOMICS: [23 Hours]

The social framework: Population, prices, markets, and the allocation of economic resources; Demand and supply concepts; The structure, organization and ownership of the means of production; National Income, GDP, GNP;

Accounting, its components and determinants; Money, finance, financial institutions and international trade; Tasks and limitation of economic policy; Introduction to methods of estimating costs: single price methods, unit methods, superficial area methods, elemental cost methods, etc., and approximate estimate methods. Introduction to cost planning and cost control techniques **ACCOUNTS: [22 Hours]**

Basic accounting concepts and accounting applications in business; Recording of transactions; The double-entry system, the measurement of income, assets and liabilities, the preparation of income statement and balance sheet and accounting conventions; The general Journal and other journals, Cash Book, The ledger, Cheques; Sources and uses of funds statements; Interpretation of accounts. Ratio analysis, incomplete records, non-trading accounts, accounts for sole-trader, partnership and limited companies. Cost and management accounting: including budgeting, relevant costing, transfer pricing and budgetary control of decentralized operations; Principles of taxation: the Uganda taxation system and how it is applied to companies, businesses, trusts, non-profit organizations,

partnerships, sole proprietorship and individuals. Value Added Tax (VAT) computation and other tax regimes;

Method of Teaching/Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

ELE3301 INDUSTRIAL TRAINING

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
0	0	180	60	100	60	40	3

Rationale

The course enables students to experience what happens in industry by allowing them to work alongside practicing engineers on the design, operation and handling of equipment.

Course Objectives

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

Detailed Course Content:

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

At the end of this course, a student should be able to:

- identify and describe the major activities of the sections where he/she was attached
- describe the technical aspects of the training that was undertaken
- identify technical areas of improvement of the sections where he/she was attached
- write a clear and understandable technical report

Mode of teaching/delivery

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

Mode of Assessment

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

Proposed Staff

All Academic staff

TEL4111 DIGITAL SIGNAL PROCESSING

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale

This course discusses the concepts of dicrete signal processing and their applications in communications, control and instrumentation.

Course Objectives

To give students an understanding of the analysis of discrete signals and systems, and their application in the design of filters and signal processors used in control, communications and instrumentation.

Detailed Course Content:

Discrete-Time Signals, Systems, & Transforms: [11 Hours]

Basic Sampling Theory and D/A Conversion; Discrete-Time Linear Systems; Autocorrelation; Cross-Correlation (VIP); Z Transform; Discrete-Time Fourier Transform; Frequency Selective Linear Filtering; Sampling and Reconstruction; Multirate DSP: Efficient Up-sampling/Down-sampling, MultiStage Interpolation, Digital Subbanding; Applications: CD Players, Cell Phones, wireless networks. **Digital Filter Design: [8 Hours]**

FIR Filters - Equiripple Designs; IIR Filters: Common analog filters, Bilinear transformation, Frequency transformations.

Discrete Fourier Transform: [8 Hours]

Definition and Properties; Fast Fourier Transform Algorithms: Divide and Conquer Approach, Radix- 2 FFT; Sectioned Convolution

Nonparametric methods of power spectrum estimation: [6 Hours]

Discrete random processes; Estimation of autocorrelation sequence; Periodogram; Smoothed periodograms.

Model-Based Spectrum Estimation: [6 Hours]

Autoregressive (AR) Modelling; Forward/Backward Linear Prediction; Levinson-Durbin Algorithm; Minimum Variance Method; Eigenstructure Methods I: MUSIC; Eigenstructure Methods II: ESPRIT; Applications in Speech Processing, Communications, and Acoustics.

Adaptive Signal Processing: [6 Hours]

Applications: Equalization, etc ; Adaptive Direct-Form FIR Filters - LMS; Adaptive Direct-Form FIR Filters - RLS

Learning Outcomes

- Identify some contributors to digital signal processing and multimedia and relate their achievements to the knowledge area.
- Know the difference between analog and discrete signals.
- Describe how computer engineering uses or benefits from digital signal processing and multimedia.
- Explain the purpose of a Fourier transform in signal processing.
- Describe the advantage of the FFT.
- Contrast how group size affects signal spectra.
- Understand the concept, properties and uses of the z-transform.
- Understand the relationship between z-transform and the conformal map
- Understand the Discrete Fourier transform and its significance.
- Understand frequency selective filters in the z-transform domain.
- Understand the definition of a window function.
- Understand the discrete-time representation of signals.
- Use the convolution technique to analyze circuits.

Method of Teaching /Delivery
The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

[1] Emmanuel C. Ifeachor, Barrie W. Jervis, *Digital Signal Processing; A practical Approach,* 2nd Edition, Prentice Hall, 2002.

[2] Richard G. Lyons, *Understanding Digital Signal Processing,* 2nd Edition, Pearson Education, 2004.

[3] John G. Proakis, Dimitris G. Manolakis, *Digital Signal Processing; Principles, Algorithms and Applications,* 4th ed., Prentice Hall, 2006.

[4] S. Salivahanan, A. Vallararaj, C. Gnanapriya, *Digital Signal Processing,* Tata McGraw-Hill Publishing Company Limited, 2006.

[5] A.V. Oppenheim and R.W. Schafer, *Digital Signal Processing,* Prentice Hall, Englewood Cliffs NJ, 1975.

[6] Sanjit K. Mitra, *Digital Signal Processing,* 3rd ed., 2006

[7] Boaz Porat, *A course in digital signal processing,* John Wiley & Sons Inc., 1997.

[8] Alan V. Oppenheim, Ronald W. Schafer, *Discrete-time Signal Processing,* Prentice-Hall, International ed., 1989.

[9] Lawrence R. Rabiner, Bernard Gold, *Theory and application of digital signal processing,* Prentice-Hall Inc., 1975.

Possible Lecturers:
Dr. J. Butime
Dr. D. Okello
Dr. Ing. L. L. Kaluuba
Mr. D. Nsubuga Mubiru
Mr. S. Mwanje
Mr. A Wasswa Matovu
Mr. D. Sebbaale
Mr. I. Kitone

ELE4112 MICROPROCESSOR BASED SYSTEMS

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale
This course introduces microprocessor architecture and discusses the design of systems based on micrporocessors and microcontrollers.

Course Objectives
- To provide students with an understanding of microprocessor-based systems and their use in instrumentation, control and communication systems
- To Investigate microprocessor-based systems, produce software for a microprocessor-based system, interface microprocessor-based systems and understand usage of programmable logic controllers

Detailed Course Content:

Microprocessor-based systems: **[16 Hours]**

Historical and technological background, Types of microprocessor: speed of processing and data transfer, cost, i/o facilities, physical size; types drawn from 8,16,32 bit systems, single chip/microcontroller and multi-chip systems, dedicated/embedded and PC/workstation systems, CISC and RISC processors, Intel and Motorola types. Applications: control systems (e.g. car engine management, robotics, distributed control systems, printers); instrumentation systems (e.g. data acquisition and logging systems, indicator display systems, 'intelligent' panel instruments); communication systems (e.g. facsimile machines, modems, radio transmitters, radar systems); commercial systems (e.g. eftpos systems, electronic bank teller machines, hand-held stock loggers, PCs)

Software for a microprocessor-based systems (micro programming): **[18 Hours]**

Design software: algorithms in the form of a structure chart showing actions and conditions or in pseudo code (structured English), in sufficient detail to allow coding to proceed. Specification: the specifications should be sufficiently demanding to require modularization and the passing of data between modules. Specifications should focus on the use of microprocessor-based system in applications requiring interfacing to devices such as lights, switches, motors, heaters, dumb terminals, keypads, LCD and LED displays, printers, ADCs and DACs and other computer systems. **Interfacing:** **[11 Hours]**

Interfacing techniques; Timing and synchronization interfaces; IC peripheral chips; Programmable parallel interface: devices in this category include M68230 PIT, 8255 PPI, 6522 VIA and Z80PI0. Interrupts should also be considered. Programmable serial interface: devices in this category include M68681 DUART, 8250 UART, M6850 ACIA. Serial interface standards (RS-232 and RS-422/RS-423);

Memories and interface circuits; Direct Memory Access; Sliced processors. Instructions and addressing modes.; Operating Systems Compilers, and programming considerations.

Learning Outcomes

Having successfully completed the module, you will be able to:

- demonstrate knowledge and understanding of digital techniques and hardware design principles necessary to underpin your education in your chosen engineering discipline and apply them to the design of modern electronic systems.
- analyse and design logic circuits using programmable logic and will develop a basic understanding of hardware descriptions in software.
- design, understand and implement combinational and sequential logic designs using programmable logic devices,
- develop hardware descriptions in SystemVerilog and use them in digital design applications.
- combine theory and experience in developing new concepts and creatively apply them in new designs.

Method of Teaching/Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

- T J Kazmierski, Digital Techniques and Microprocessors - Lecture Notes , 2009.
- M M Mano, M D Ciletti, Digital Design, 4th Edition,P earson Prentice Hall, 2007.
- J F Wakerly, Digital Design - Principles and Practices, 4th Edition, Pearson Prentice Hall, 2006.
- R J Tocci, N S Widmer, G L Moss, Digital Systems - Principles and Applications, 10th Edition, Pearson Prentica Hall, 2007.

Possible Lecturers:

Dr. J. Butime

Mr. D. Nsubuga Mubiru
Mr. P. Bogere
Mr. G. Bakkabulindi
Dr. Ing. L. L. Kaluuba

TEL4113 OPTICAL COMMUNICATIONS

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale
This course discussed component and system concepts in optical communications and its application.

Course Objectives
To give students and understanding of the theory of optical devices and systems and their application in optical communication networks.

Detailed Course Content:
Theory and Devices: [12 Hours]
Optical Fibre: The Nature of Light , Transmitting Light on a Fibre , Light Propagation in Multimode and Single-Mode fibres, Plastic Optical Fibre (POF), Hard Polymer (plastic) Clad (silica) Fibre (HPCF) Optical Sources: Light Emitting Diodes (LEDs), Lasers.
Optical Detectors: Photoconductors; Photodiodes including Schottky-Barrier and Avalanche Photodiodes (APDs); Hetero-Interface Photo detectors, Travelling-Wave, Resonant-Cavity, Phototransistors.
Optical Devices: Optical Component Technologies, Optical Amplifiers, Second Harmonic Generation (SHG), Splitters and, Polarization Control, Lenses and Diffraction, Filters, Modulators and Switches, Repeaters
Fibre Manufacture, Cables & Connectors: The Technology of Fiber, Fibre Cables, Joining Fibres (splicing).
Systems: [9 Hours]
Brief Discussion of Point-to-Point Transmission Systems including Modulation, System Engineering, and Control of Dispersion
Optical Link Connections in Electronic Networks: Brief discussion of Fibre Distributed Data Interface (FDDI),Ethernet (IEEE 802.3) , Fibre Channel, Synchronous Optical Network (SONET) and SDH, Asynchronous Transfer Mode (ATM)
Wavelength Division Multiplexing: Components for WDM Systems, Standards for WDM
Operations: [9 Hours]
Optical connectors and multiplexors:
Measuring instruments and techniques: power meter, optical spectrum analyzer, OTDR, BER meter. Link Budget and loses: Measuring optical fiber cable loses; optical network simulation packages (PTDS); safe working practices.

Learning Outcomes
On successful completion of this module the learner will be able to...

- Identify the main parameters of laser diodes, optical fibre, and optical receivers that effect the performance of optical communications systems
- Analyse the equations that explain the modulation of an optical carrier with electrical data signals and
  apply these equations to determine the maximum modulation rate that can be attained
- Derive solutions for how non-linearity and dispersion affect the propagation of data signals in optical fibre, and apply these solutions to analyse the maximum data rate and transmission distance of optical transmission links

- Determine the various parameters of an optical receiver that affect Bit-Error-Rate and eye diagrams,
  and identify how an eye-diagram may be used in quantifying system performance
- Identify the different type of networking configurations that may be used in an optical network and
  analyse how component selection effects network design
- Design a basic optical communication systems and analyse how it performance would be effected by the
  various components used in the system design
- Implement a wavelength division multiplexed systems and formulate how altering the parameters of
  the components used would change system capacity
- Operate all the main components required to develop a basic optical communication systems, and

  conduct experiments to develop and analyse an optical transmission system

Method of Teaching /Delivery
The course will be taught by using lectures, tutorials and assignments.
Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books
- Fiber-Optic Communication Systems, 3rd Edition, by Govind P. Agrawal (Wiley) (ISBN: 0-471-21571-6)
- Optics, 4th Edition, by Eugene Hecht (Addison-Wesley) (ISBN: 0-8053-8566-5)
- Fiber-Optic Communications Technology, by Djafar K. Mynbaev and Lowell L. Scheiner (Prentice-Hall) (ISBN: 0-13-962069-9)
- Fiber Optic Commmunications, 4th Edition, by Joseph C. Palais (Prentice Hall) (ISBN: 0-13-895442-9). This is a standard undergraduate text on optical communication systems. As such, it's not at the level needed for this course, but it may be useful as a supplement to Agrawal's book.

Possible Lecturers:
Dr. J. Butime
Dr. D. Okello
Dr. Ing. L. L. Kaluuba
Mr. D. Nsubuga Mubiru
Mr. S. Mwanje
Mr. A Wasswa Matovu
Mr. D. Sebbaale
Mr. I. Kitone

TEL4114 TELEVISION AND VIDEO ENGINEERING

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale
This course discussed component and system concepts in television systems and video engineering.
Course Objectives
To give a comprehensive coverage of TV Systems with all the new developments in Television and Video Engineering.

[9 Hours]

Detailed Course Content:

Fundamentals of Television:

Geometry form and Aspect Ratio, Image Continuity, Number of scanning Tubes, Interlaced scanning, Picture resolution, Camera tubes, Image orthicon, Vidicon, Plubicon, silicon diode array vidicon, solid state signal, video signal dimension, horizontal sync, Composition, vertical sync, functions of vertical pulse train, scanning sequence, Picture signal transmission, sound signal transmission, standard channel bandwidth. Setting up, Operation and Maintenance of a TV Station. ***Monochrome Television Transmitter and Receiver:*** **[10 Hours]**

TV transmitter, signal propagation, Interface, TV transmission Antennas, Monochrome TV receiver, RF tuner, UHF VHF tuner, Digital tuning techniques, AFT, IF subsystems, AGC, Noise cancellation, Video and sound inter carrier detection, Vision IF subsystem, video amplifiers requirements and configurations, DC re-insertion, Video amplifier circuits, Sync separation typical sync processing circuits, deflection current waveform, Deflection Oscillators, Frame deflection circuits, requirements, Line Deflection Circuits, EHT generation, Receiver antennas.

Essentials Of Colour Television; **[10 Hours]**

Compatibility, colour perception, three colour theory, luminance, hue and saturation, colour television cameras, value of luminance and colour difference signals, colour television, display tubes, delta, gun precision, inline and Trinitron colour picture tubes, purity and convergence, purity and static and dynamic convergence adjustments, pincushion correction techniques, automatic degaussing circuit, grey scale tracking, colour signal transmission, bandwidth, modulation of colour difference signals, weighting factors, Formation of chrominance signal.

Colour Television Systems; **[9 Hours]**

NTSC colour TV system NTSC colour receiver, limitations of NTSC system, PAL colour TV system, cancellation of phase errors, PAL-D colour system, PAL coder, PAL Decoder receiver, chromo signal amplifier, separation of U and V signals, colour burst separation, Burst phase Discriminator, ACC Amplifier, Reference oscillator, Ident and colour killer circuits, U and V demodulators, Colour signal matrixing, SECAM system, merits and demerits of the PAL and SECAM systems. ***Advanced Television Systems:*** **[7 Hours]**

Satellite TV technology and standards (DVB, etc); HDTV, CCTV; IPTV; Multifunctional Control: OnBoard, Remote and Touch Screen; Cable TV, VCR, Digital Video Disc recording and playback; Teletext broadcast receiver, Digital Television Broadcasting, Projection Television, Flat Panel Display TV Receiver, stereo sound in TV, 3D TV, EDTV, Digital equipments for TV studios

Learning Outcomes

On successful completion of this module the learner will be able to...

- Understand video display principles.
- Describe the operations in modern audio coding.
- Describe the traditional video formats and some of the more common modern digital formats.
- Understand the advantages of digital broadcast as compared to analogue format broadcast.
- Understand the types of internet video and streaming principles.

Method of Teaching/Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

- R.R.Gulati, " Monochrome Television Practice, Principles, Technology and servcing , Second edition, New age International Publishes, 2004 (Unit I,II,IV and V)
- R.R.Gulati "Monochrome and colour television ", New age Internationl Publisher, 2003 (Unit I,III and IV)
- A.M Dhake, "Television and Video Engineerign", Second edition, TMH, 2003.
- S.P.Bali, " Colour Television, Theory and Practice", TMH, 1994 **Possible Lecturers:**

Dr. J. Butime
Mr. D. Nsubuga Mubiru
Mr. P. Bogere
Mr. G. Bakkabulindi

ELE4115 POWER SYSTEM PROTECTION

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale

The course provides information on issues related to power systems control mechanisms and coordination of power systems.

Course Objectives

- To help students understand the concept of protection and coordination in power systems **Detailed**

Course Content:

Protection Principles and Components: **[7 Hours]**
Methodology discrimination, derivation of relaying quantities, combined over-current and earth fault relays. Relays, current transformers, voltage transforming devices, H.F capacitors couplers, line traps, circuit breakers, tripping and other auxiliary supplies; Fuses, terminals, and test links. Fault Calculations: **[8 Hours]**
Purpose of faults, factors affecting seventy of faults, methods of fault calculation. Calculation of balanced fault conditions, calculation of unbalanced fault conditions
Over current Protection: **[8 Hours]**
Over-current and earth-fault protection systems; Grading of current settings, Grading of time settings, inverse-time over-current systems. Selection of settings, system analysis grading of relay settings, current transformer requirements, sensitive earth-fault protection. Directional control Feeder Protection: distance system: **[8 Hours]**
Operating principles, impedance measuring elements and their characteristics, development of comparators Systems, complex relaying characteristics, switched and polyphase distance protection, Distance protection schemes, practical considerations in the application of distance protection. Feeder Protection: Pilot Wire and Carrier-Current Systems: **[8 Hours]**
Basic concepts of unit protection of feeders, types of protection information channels, starting relays longitudinal differentiation protection, pilot wire protection, power line carrier phase-comparison protection, and directional comparison protection.
Over-voltage Protection: **[6 Hours]**
Over-voltage phenomena in power systems; traveling waves, insulation coordination, protection against internal and external over voltages, surge protection, 95
Protection by SCADA systems

Learning Outcomes

Knowledge and Understanding
Having successfully completed the module, you will be able to demonstrate knowledge and understanding of:

- Fundamental concepts of power system stability
- Factors that influence system stability
- Methods to improve and maintain stability
- Components of protection systems
- The concept of protection zones
- Components used in earthing systems
- Basic structure of different lines and cables
- Types of HVDC links and their control

Intellectual Skills
Having successfully completed the module, you will be able to:

- Analyse simple problems related to system stability
- Appreciate the conflicting nature of the design requirements of a protection system
- Explain the reasons for system earthing
- Appreciate the features of power simulation packages
- Discuss the principles of operation of FACTS
- Appreciate the advantages and disadvantages of HVDC transmission

Practical Skills
Having successfully completed the module, you will be able to:

- Apply equal area stability criteria to simple systems
- Explain principles of operation of protection systems
- Design simple protection systems for transmission lines and transformers
- Comply with power system earthing practices
- Determine temperature rise and ratings of cables and lines

Method of Teaching/Delivery
The course will be taught by using lectures, tutorials and assignments.
Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

- Weedy B M, "Electric Power Systems", 4th Edition, Wiley 1998
- Glover J D & Sarma M, "Power System Analysis and Design", 3rd Edition, Brooks/Cole 2002
- Grainger J J & Stevenson W D, " Power System Analysis", McGraw Hill 1994
- C.L.Wadhwa, "Electrical Power Systems"
- Nagrath & Kothari, "Modern Power System Analysis"
- Y.G.Paithankar & S.R.Bhinde, "Fundamentals of power system protection"
- Badriram & Vishwakarma, "Power System Protection"
- Ravindranath & Chander, "Power System Protection & Switchgear"

Possible Lecturers:
Dr. M. K. Musaazi Dr. P. DaSilva Dr. A. Sendegeya Mr. G. Bakkabulindi Mr. C Wasswa Sebuwufu Mr. A. Muguwa

ELE4116 ELECTRICAL INSTALLATION DESIGN

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale
In this course the students will acquire knowledge about the design and implementation of domestic and industrial electrical installations.

Course Objectives
By the end of the course students should be able to:

- Design and implement electrical installation and know the installation standards.
- Design large scale domestic, institutional and industrial electrical installations.

Detailed Course Content:

Electrical Systems: **[16 Hours]**
Students gain knowledge and hands-on experience in design, installation, testing, commissioning, and maintenance of electrical installations in buildings. Students learn the fundamentals in operation, selection and maintenance of vertical transport systems, viz the passenger lifts and escalators, telelifts, etc.
Alternative energy : **[13 Hours]**
Design, Installation and maintenance of standby and alternative energy supply e.g. solar systems and diesel generators.
Design of air-conditioning and ventilation systems: **[16 Hours]**
covers the principles pertaining to human comfort, load estimation, design concepts, installation, operation and maintenance of air-conditioning systems in buildings.

Learning Outcomes
The student will:

- Be able to comfortably check for stability of any system using any criteria.
- Understand the concept of control system engineering, why it is carried out and will appreciate its application in digital control.
- Acquire knowledge of the type of measuring instruments and be able to appreciate why certain instruments are m ore favourable in a particular environment and requirement (accuracy or precision among others);
- Understand the types of errors that occur during measurement and how best they can be minimised during experimental setup.
- Acquire concepts on sensors and their use in design of automated systems.

Method of Teaching /Delivery
The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended Books and References

[1] William L. Brogan, Modern Control Theory, 2nd ed., Prentice-Hall, 1985

[2] Nise, N. S, Control Systems Engineering, 3rd ed., New York, NY: Wiley, 2000.

[3] Allan S. Morris, Measurement and Instrumentation Principles, 3 rd ed., Butterworth Heinemann, 2001

[4] K. Ogata, Discrete- Time Control Systems

ELE4117 ENGINEERING PROJECT MANAGEMENT

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
60	0	00	60	100	60	40	4

Rationale

This course discussed advanced concepts in power systems engineering including the recent research topics

Course Objectives

The course examines project management roles and environments, the project life cycle and various work planning, control & evaluation techniques used to achieve project objectives. The tools currently available to project managers should be discussed throughout the course.

Detailed Course Content:

Project Management Concepts: **[6 Hours]**

Characteristics of a project, the need for project management; roles of project managers in organizational environments; Systems development cycle; roles of systems analysis & systems management in project life cycle.

Project Organizational Structures: **[6 Hours]**

Describe the ways groups are organized into projects; the roles & responsibilities of project team members; relationship between project managers & line managers, especially in division of responsibility and authority.

Project Organizational Behaviors: **[6 Hours]**

Identify leadership styles of project managers; Techniques used to manage groups and individuals to increase project team effectiveness; sources of ethnic/corporate diversity that impact project team effectiveness.

Applied Project Planning: **[8 Hours]**

Statement of work (SOW) & decomposition of overall project goals; Using established tools and techniques, develop a work breakdown structure (WBS) required to achieve stated project objectives; produce a task-flow network and analyze the contingencies, interrelationships, and critical path(s) of the work elements; and produce a Gantt chart required to schedule completion of all work elements.

Resource Allocation: **[6 Hours]**

Analyze optimal labor utilization for cost effectiveness; schedule efficiency using a resource-loading chart.

Cost Estimating & Budgeting: Develop cost estimates & budgets with cost accounts to plan project expenditures; cost summaries for tracking project expenditures to budgeted costs; cost forecasts to proactively control future planned expenditures.

Project Performance Measurement & Control: **[6 Hours]**

Concept of earned value performance measurement; Describe how project management information systems (PMIS) are used to monitor, evaluate, and control planned cost and schedule performance. **Project Evaluation and Termination:** **[7 Hours]**

Describe the procedure for conducting periodic project performance evaluation audits; Explain how project managers must communicate audit results to customers and management in order to manage expectations; Describe how, as a result of project audits, project managers conduct trade-off analyses of project performances versus cost and schedule constraints; Identify causes associated with project success and failure; Specify ways in which a project can be terminated upon completion

Method of Teaching /Delivery
The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

ELE4211 VLSIC DESIGN & FABRICATION

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale
The course introduces the concepts and physical procedures involved in the design, integration and manufacture of semiconductor devices and circuits. The course teaches fundamental design principles and simulations of hands-on experience in fabricating integrated circuits based on silicon technology but extendable to other materials. By the end of the course, the students should understand the broad aspects of semiconductor processing for integrated circuits and various junction devices, including testing and evaluation, concepts of yield, lab procedures including safety, assembly and packaging.

Course Objectives
By the end of the course students should be able to:

- Be conversant with the terminology and theory involved in the design and fabrication of semiconductor devices.
- Know the processes for the design, large scale integration and manufacture of semiconductor devices.

Detailed Course Content:

Terminology: **[12 Hours]**
wafers, masks and photolithography; Diffusion; Dopants, and metals. Integrated n-channel, silicon- gate MOSFET; A CMOS transistor pair design; Bipolar technologies: npn epitaxial silicon bipolar transistor; Schottky diodes; resistors;
Large-scale integration (LSI): **[33 Hours]**
MOSFET gate-array USIC; Fabrication processes: silicon diode growth by dry oxidation; ion implantation; forming the poly-silicon gates; insulation; and contact windows; metal removal by reactive ion itching (RIE); and wire bonding. Very large-scale Integration: Advantages of integration and problems associated with integrated circuits.

Learning Outcomes

- Identify some contributors to VLSI and ASIC design and relate their achievements to the knowledge area.
- Define a semiconductor.
- Explain the difference between MOS and CMOS transistors.
- Define a sequential circuit.
- Identify some memory devices related to VLSI circuits.
- Define the meaning of a chip.
- Give an example of an ASIC chip design.
- Describe how computer engineering uses or benefits from VLSI and ASIC design.

- Understand the current carrying mechanism and the I/V characteristics of intrinsic and doped semiconductor materials.
- Understand how these quantities reflect the ability of the inverter to operate in the presence of noise.
- Understand how changing the configuration of the inverter and the MOSFETS that make it up changes the VTC and thus the inverter's operation.
- Understand the method to perform circuit design for CMOS logic gates.
- Understand the techniques, such as Euler paths and stick diagrams, used to optimize the layout of CMOS logic circuits.
- Understand how the size for each transistor in a CMOS logic gate can be determined.
- Understand how to use charge storage (capacitance) and feedback to store values in CMOS logic.
- Understand the circuit design, functionality, advantages, and disadvantages of dynamic latches in CMOS.
- Understand how we organize memory systems and why we do not typically organize them in the most simplistic arrangement such as in a one-dimensional word array.
- Understand the basic steps of photolithography, its limitations, and how that determines minimum line width and device sizes.
- Understand the processing steps required for fabrication of CMOS devises and the general results of each step.

Method of Teaching/Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended Books and References

[1] David A. Hodges, Horace G. Jackson, and Resve A. Saleh, *Analysis and Design of Digital Integrated Circuits*, Third Edition, , McGraw-Hill, 2004.

[2] Jan M. Rabaey, Anantha P. Chandrakasan, and Borivoje Nikolic, *Digital Integrated Circuits*, Second Edition, Prentice-Hall, 2002.

[3] Neil H. E. Weste and Kamran Eshraghian, *Principles of CMOS VLSI Design*, Second Edition, Addison Wesley, 1993.

[4] Neil H. E. Weste and David Harris, *Principles of CMOS VLSI Design*, Third Edition, Addison Wesley, 2004.

[5] Sung-Mo (Steve) Kang and Yusuf Leblebici *CMOS Digital Integrated Circuits Analysis and Design*, Third Edition, , McGraw-Hill, 2002.

[6] David A. Johns and Ken Martin, *Analog Integrated Circuit Design*, Wiley, 1997.

[7] Roubik Gregorian, *Introduction to CMOS Op-Amps and Comparators*, Wiley, 1999.

[8] R. Jacob Baker,CMOS; *Circuit Design, Layout, and Simulation*, Revised Second Edition, Wiley- IEEE Press, 2008.

[9] R. Jacob Baker, *CMOS Mixed-Signal Circuit Design*, Second EditionWiley-IEEE Press, 2009.

[10] Adel S. Sedra, Kenneth C. Smith, *Microelectronic Circuits*, Fifth Edition, Oxford University Press, 2003.

[11] R. L. Geiger, P. E. Allen, and N. R. Strader, *VLSI Design Techniques for Analog and Digital Circuits*, McGraw-Hill, 1990.

[12] John P. Uyemura, Brooks/Cole, *Physical Design of CMOS Integrated Circuits Using L-Edit*, 1995.

[13] Clein, Newnes, *CMOS IC Layout*, Dan, 2000.

[14] Ron Kielkowski, Inside *SPICE: Overcoming the Obstacles of Circuit Simulation*, Second Edition, McGraw-Hill, Inc., 1998. ISBN 0-07-913712-1

[15] Daniel Foty, *MOSFET Modeling with SPICE*, Prentice Hall, 1997.

[16] Yannis P. Tsividis, *Operation and Modeling of the MOS Transistor*, McGraw-Hill, 1987.

[17] Ben Streetman, Sanyay Banerjee, *Solid State Electronic Devices*, Fifth Edition, Prentice Hall, 2000.
[18] James D. Plummer, Michael D. Deal, Peter B. Griffin, *Silicon VLSI Technology*, Prentice Hall, 2000.

TEL4212 SATELLITE COMMUNICATIONS

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale
This course discussed component and system concepts in satellite communications ad its application in different life scenarios.

Course Objectives
The course will cover the most relevant aspects of satellite communications, with emphasis on the most recent applications and developments.

Detailed Course Content:

Basics: **[6 Hours]**
Review of the background and basic concepts of satellite communications including discussion of the different satellite systems e.g. Intelsat, sitcom etc
Orbital aspects, with emphasis on the geostationary orbit **[6 Hours]**
Satellite subsystems, launching methods, and on-board processing. **[5 Hours]**
Design of a digital satellite link, link budgets, modulation, error control coding, baseband signaling theory, and multiple access methods. **[6 Hours]**
Frequency assignments and propagation.
Antennas and earth station technology, including the design of very small aperture terminals (VSATs). **[6 Hours]**
Applications of satellite networks in connectivity, point to point and point to multipoint systems. **[6 Hours]**
Specific applications of satellites: global positioning system (GPS), satellites for mobile communication, and satellites for internet. **[6 Hours]**
Non-geosynchronous orbits and their applications. **[4 Hours]**

Learning Outcomes

The course gives the basic principles in the most important parts within satellite communication and broadcast services. This includes radio transmission, modulation and access methods, satellite and earth station technology and finally system performance. The students will get insight in satellite systems and the dimensioning of such systems.

Method of Teaching/Delivery
The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

- M. Richharia, "Satellite Communication Systems", Second edition, McGraw-Hill, 1999 ISBN: 0071342087
- Donald C. Mead, "Direct Broadcast Satellite Communications: An MPEG Enabled Service"

Possible Lecturers:
Dr. J. Butime Dr. D. Okello Dr. Ing. L. L. Kaluuba Mr. D. Nsubuga Mubiru Mr. S. Mwanje

TEL4213 RADIO FREQUENCY & MICROWAV ENGINEERIN G

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Mr. A Wasswa Matovu Mr. D. Sebbaale Mr. I. Kitone

Rationale
This course introduces the principles and RF & Microwave engineering and their application in radar and broadcast radio communication systems. **Course Objectives**
By the end of the course the student should understand the

- Operation of components and devices used in RF & Microwave systems
- Principles of design and operation of devices for generation & processing of RF signals at different power levels.
- Applications of RF & microwave systems in communication, control & instrumentation. **Detailed Course**

Content:
Transmission lines and waveguides for RF: **[8 Hours]**
Evaluation of attenuation constant for the rectangular waveguide (perturbation analysis). Physical and electrical parameters of common coaxial lines and waveguides. Matching: physical realization of reactive elements; Sliding screw, triple screw and E-H tuners; Quarter-wave transformers. Energy coupling into and out of waveguides: probe, loop and aperture coupling. **Passive devices:** **[6 Hours]**
Attenuators, couplers, terminators, phase shifters, slotted lines, hybrid junctions, tuners, switches, bends, twists, flanges and hybrid rings. Surface acoustic waves and SAW devices. Ferrite devices; Faraday rotation; Isolators and circulators. Microwave resonators; Frequency meters. Scattering parameters.
Generation and processing: **[8 Hours]**
Tube devices: Klystron; Magnetron; Traveling wave tube; Backward wave oscillator. Solid state devices: Bi-polar transistors; Field effect transistors; Tunnel diode; Transferred electron devices- Gunn diodes; Avalanche transit time devices-READ, IMPATT, TRAPATT, BARITT, PIN and SCHOTTKY diodes. Microwave integrated circuits and monolithic microwave integrated circuits. Parametric amplifiers; Masers; Lasers. **Active components:** Microwave filters, Microwave amplifiers, Oscillators and Mixers
Measurements: **[4 Hours]**
Frequency, wavelength, VSWR, reflection coefficient, attenuation and impedance; scattering parameters. Power measurements

Radio frequency power applications: **[8 Hours]**
Industrial, scientific and medical applications; Advantages of radio frequency heating. Interaction of radio frequency energy with materials: Mechanisms; Expression for energy conversion in a dielectric; Factors which affect dielectric heating. **Applicators:** Parallel plate, resonant and traveling wave. Biological effects ofnon-ionising radiation; Leakage standards and leakage control. **Radar systems:** **[4 Hours]**
Radar equation and applications. Antenna types and scanning systems. Radar performance; pulse duration and pulse repetition frequency; Range and resolution; noise performance; Types of radar: Pulsed, MTI, CW,FM and mapping
Broadcast radio Communications: **[7 Hours]**

Learning Outcomes
On completion of this module, the learner will be able to:

- Demonstrate familiarity with the technical terms which are specific to microwave engineering, including the usages, styles and practices that are appropriate to this branch of electronics.
- Use software specific to microwave engineering to design matching networks, including conjugate matching and the use of quarter-wave transformers.
- Illustrate their solutions to matching problems on a Smith chart.
- Apply the S-parameters to characterize and to design microwave circuits.
- Demonstrate familiarity with the specialist instrumentation used in microwave engineering and calibrate and use such instrumentation to make basic measurements.
- Enumerate a variety of microwave antennas, their construction applications and the methodology used in making measurements on them.
- Recall the methods by which fixed terrestrial microwave radio systems are designed and use "noise calculations" to design radio systems.
- write an engineering report and comment critically on one of their laboratory exercises
- Make a presentation on an assigned aspect of microwave engineering (technology or the history of microwave engineering), working as part of a team and using appropriate media.

Method of Teaching/Delivery
The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended Books and References

1) Samuel Y Liao, "Microwave Devices & Circuits" , Prentice Hall of India, 2006.
2) Reinhold.Ludwig and Pavel Bretshko 'RF Circuit Design", Pearson Education, Inc., 2006
3) Robert. E.Collin-Foundation of Microwave Engg -Mc Graw Hill.
4) Annapurna Das and Sisir K Das, "Microwave Engineering", Tata Mc Graw Hill Inc., 2004.
5) M.M.Radmanesh , RF & Microwave Electronics Illustrated, Pearson Education, 2007.
6) Robert E.Colin, 2ed "Foundations for Microwave Engineering", McGraw Hill, 2001
7) D.M.Pozar, "Microwave Engineering.", John Wiley & sons, Inc., 2006.

Possible Lecturers:
Dr. J. Butime
Dr. D. Okello
Dr. Ing. L. L. Kaluuba
Mr. D. Nsubuga Mubiru
Mr. S. Mwanje

Mr. A Wasswa Matovu
Mr. D. Sebbaale

ELE4209 HIGH VOLTAGE ENG NEERING

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Mr. I. Kitone

Rationale
The course provides students with knowledge on the fundamentals governing generation and control in high voltage power systems.

Course Objectives
By the end of the course students should be able to:

- Understand the generation and measurement of high voltages
- Understand electric fields and field stress control around high voltage systems
- Understand the phenomena involved in non-destructive insulation and testing as well as over voltages in power systems.

Detailed Course Content:

Introduction: **[16 Hours]**
Generation and transmission of electrical energy, voltage stresses testing voltages ac and dc voltages. Generation of High Voltages: DC and AC voltage generation electrostatic generators, testing transforms, impulse voltages, and their generation, and operation.
Measurement of High Voltages: Peak voltage measurement by sparke gaps, electrostatic voltmeters, ammeters in series with high impedance and high ohmic resistor voltage dividers, generating voltmeter, measurement if peak voltages, impulse voltage measurement.
Electrostatic Fields & Field Stress Control: **[16 Hours]**
Electric field distribution and breakdown strength of insulating materials; fields in homogeneous isotropic materials, fields in multi dielectric isotropic materials experimental field analysis techniques.
Electric Breakdown in Gases liquids & solids: Review of classic gas laws, ionization and decay processes, cathode processes, secondary effects, sparking voltages, breakdown field strength, corona discharge, surge breakdown, breakdown in solid and liquid dielectrics.
Non-destructive Insulation and Testing: **[13 Hours]**
HV dielectric loss and capacitance measurement, Partial discharge measurement, calibration of partial discharge dielectric.Phenomenon of over voltages in power systems, and wave propagation over lines and equipment
Protection of lines equipment against system over voltages

Learning Outcomes

Knowledge and Understanding
Having successfully completed the module, you will be able to demonstrate knowledge and understanding of:

- Breakdown mechanisms of solids, liquids and gases.
- Partial discharges and their measurement techniques.
- Generation of impulse, dc and ac high voltages.
  Range of techniques to measure different types of high voltages.
  Transient voltages and their propogation characteristics. Insulation
  life and accelarated tests.

Intellectual Skills
Having successfully completed the module, you will be able to:

- Apply solid, liquid and gas insulation for a arnge of high voltage apparatus.
- Understand the concept of insulation coordination.
- Use the Bewley Lattice Diagram to calculate surge voltage experienced by high voltage apparatus.
- Assess the lifetime of insulation based on accelarated ageing tests.

Practical Skills
Having successfully completed the module, you will be able to:

- Design high voltage generator.
- Select the right technique to measure different types of high voltages.
- Choose the right surge device to eliminate overvoltages of high voltage apparatus.
- Demonstrate general skills in high voltage engineering.

Method of Teaching/Delivery
The course will be taught by using lectures, tutorials and assignments.
Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

- Weedy B M, "Electric Power Systems", 4th Edition, Wiley 1998
- Glover J D & Sarma M, "Power System Analysis and Design", 3rd Edition, Brooks/Cole 2002
- Diesendorf W, Insulation Co-ordination in High-Voltage Electric Power Systems, Butterworths 1974
- Gallagher T J and Pearmain A J, High Voltage Measurement, Testing and Design, Wiley 1983
- Kuffel E, High Voltage Engineering, 2nd Edition, Newnes 2000

Possible Lecturers:
Dr. M. K. Musaazi Dr. P. DaSilva Dr. A. Sendegeya Mr. G. Bakkabulindi Mr. C Wasswa Sebuwufu Mr. A. Muguwa

ELE4214 POWER ECONOMICS AND MANAGEMENT

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

LH	PH	TH	CH	WTM	WEM	WCM	CU
60	0	00	60	100	60	40	4

Rationale
This course discussed concepts in the economics and management of power systems

Course Objectives
To understand the economics of power systems and the theories behind power systems charging as well the concepts and parameters that affect the cost of power to a given installation

Detailed Course Content:

Introduction of Economics: **[6 Hours]**
History of economic thought. Definition of economics. Macro and Micro economic. Economics laws and applications. Assumptions and methods of economics. Cost benefit analysis. Prices, wages, rent, interest and profit. Economic planning and development.

Network Planning: **[10 Hours]**
Energy and power resources of all forms on a national, continental and world scale. Load forecasting, planned development of generation, transmission and loads. A.C. systems and economic choice of transmission and distribution voltage levels. Effect of load factor, power factor, and diversity factor on generating cost.

Load Analysis and Management: **[10 Hours]**
Types of loads. Estimation of load. Load growth and load forecasting. Load duration curves. Maximum demand, Diversity and Diversity Factor, Load, Demand and Demand and Demand Factor, Capacity and Utilization factors and their importance in load estimation and analysis. Load management.

Financial Management and Cost Analysis: **[10 Hours]**
Cost of power plant. Financial mathematics. Depreciaiton and Amortisation. Maintenance and operating costs. Economic selection of number of units in the power station. Relative costs of various power plants. Financial Management.

Economics of power plants: **[8 Hours]**
Kelvin's law of Transmission, Choice of transmission, and distribution voltages. Effect of load factor, power factor, and diversity factor on generating costs.

Tariffs: **[6 Hours]**
Energy Tariff objectives. General Tariff forms. Different types of tariffs, their origin and justification. Optimum tariff design. WAPDA tariff system. Private power policy

Feasibility Studies: **[6 Hours]**
Feasibility study of power generation, transmission and distribution, and electrification of Houses, Multi-story building and industries. Project documentation.

Management of Power System: **[4 Hours]**
Reliability and optimization. Theory of management. Project management. Management of large power plants. Personnel management information systems.

Learning Outcomes
Having successfully completed the module, you will be able to:

- Demonstrate knowledge and understanding of Advanced concepts of operation of electrical power systems.
- demonstrate knowledge and understanding of Elements of control of power systems
- Demonstrate knowledge and understanding of Economic and management aspect.
- Appreciate the complexity of power systems.
- analyse the performance of power systems.
- Apply A range of analytical and numerical methods of analysis of power systems.

- use commercial software for simulation.
- Apply modern modelling techniques.

Method of Teaching/Delivery
The course will be taught by using lectures, tutorials and assignments.
Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended Books and References

- Weedy B.M., B.J. Cory, Electric Power Systems, 4th Edition, Wiley 1998 [Library] [Shops]
- Y.H. Song, A.T. Johns, Flexible ac transmission systems (FACTS), IEE 1999 [Library] [Shops]

Possible Lecturers:
Dr. M. K. Musaazi Dr. P. DaSilva Dr. A. Sendegeya Mr. G. Bakkabulindi Mr. C Wasswa Sebuwufu Mr. A. Muguwa

TEL4215 BROADBAND AND ADVANCED COMMUNICATION

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	00	45	100	60	40	3

Rationale
This course discussed advanced concepts in communication systems engineering including the recent research topics

Course Objectives
To address the most recent developments in broadband communications for voice, data and video communication requirements as well as address other promising research and commercial communication technologies

Detailed Course Content:

Wireless broadband systems: Detailed discussion of 3G, HSDPA, LTE, Wimax, 4G, NGN, UWB, etc Wire line broadband communications: the whole range of xDSL technologies, DWDM, etc Broadband broadcast systems: Detailed discussion of broadband television and radio systems including DVB, DAB, EDTV etc Other New technologies that may not have been known at the time of publication of this syllabus
Method of Teaching/Delivery

The course will be taught by using lectures, tutorials and assignments. **Mode of Assessment**
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Possible Lecturers:
Dr. J. Butime
Dr. D. Okello

Dr. Ing. L. L. Kaluuba
Mr. D. Nsubuga Mubiru
Mr. S. Mwanje
Mr. A Wasswa Matovu
Mr. D. Sebbaale

ELE4216 ADVANCED TOPICS IN ELECTRONICS ENGINEERING

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	00	45	100	60	40	3

Rationale
This course discussed advanced concepts in electronics and electronic systems engineering including the recent research topics

Course Objectives
To address the most recent developments in electronics engineering as well as address other promising research and commercial electronics engineering technologies

Detailed Course Content:

Any new technologies that may not have been known at the time of publication of this syllabus **Method of**

Teaching/Delivery
The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Possible Lecturers:
Dr. J. Butime
Mr. D. Nsubuga Mubiru

Mr. P. Bogere Mr. G. Bakkabulindi

ELE4217 ADVANCED TOPICS IN POWER ENGINEERING

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	00	60	100	60	40	3

Rationale
This course discussed advanced concepts in power systems engineering including the recent research topics

Course Objectives
To address the most recent developments in power systems engineering as well as address other promising research and commercial power systems technologies and energy challenges

Detailed Course Content:

Any new technologies that may not have been known at the time of publication of this syllabus **Method of**

Teaching/Delivery
The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Possible Lecturers:
Dr. M. K. Musaazi Dr. P. DaSilva Dr. A. Sendegeya Mr. G. Bakkabulindi Mr. C Wasswa Sebuwufu Mr. A. Muguwa

COE1104 BUSINESS MANAGEMENT

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
60	0	00	60	100	60	40	4

Rationale
This course introduces students to principles of managing engineering businesses and projects/contracts. It covers organizational structures and characteristics, management functions and marketing principles. 110

Course Objectives
By the end of the course students should be able to:

- Understand organizational operations, management function and marketing principles
- Manage an organization, business and project/contract.

Detailed Course Content:

Organizations: **[10 Hours]**
Definitions and reasons for their existence; Classification of Organizations: Objectives, structures, ownership; Evolution of management theory;
Management functions: **[10 Hours]**
Planning, organizing, human resource management, leadership motivation, monitoring and control; The roles and responsibilities of managers and the challenges managers face today; Management of organizational change, conflict resolution and creativity Industrial relations. **Management and Development of enterprise:** **[8 Hours]**
Identification and Selection of a viable project, preliminary and detailed studies; preparation of business plans and presentation for evaluation.
Production planning & control: **[12 Hours]**
Product design, plant location, plant layout; Forecasting, planning routing, loading, scheduling, dispatching, follow-up actions, capacity planning and production smoothing; Inventory planning and control; Materials requirements planning; Manufacturing resources planning; Productivity and service quality; Quality assurance and statistical quality control methods; **Marketing:** **[10 Hours]**
Environmental forces which affect the marketing process: tools used by modern marketers and the four Ps of marketing: product, place, price and promotion.
Production Management: **[10 Hours]**
Emphasis on pricing, marketing planning, competitor and customer analysis; market forecasting, product strategy and marketing mix decisions; customer service and financial analysis for product management. Service and industrial marketing including the standard industrial classification (SIC) system, derived demand, industrial buying behavior and market segmentation, Business ethics: introduction to basic ethical theory, ethics of markets and prices, environmental and customer issues and employee issues.

Learning Outcomes

Knowledge and Understanding
Having successfully completed the module, you will be able to demonstrate knowledge and understanding of:

- effective business organisation and business functions;
- managerial roles and skills;
- finance as the language of business;
- the interface between management and engineering.

Intellectual Skills
Having successfully completed the module, you will be able to:

- explain the contribution of effective and efficient management to the attainment of organisational objectives;
- evaluate alternative forms of business organisation;
  evaluate the contribution of a combination of business functions to organisational outcomes;
  conduct and interpret managerial analyses of a range of financial data.

Practical Skills
Having successfully completed the module, you will be able to:

- organise business activities effectively and efficiently;
- understand and interpret financial information;
- prepare budgets and manage activities within budgetary targets;

- liaise with appropriate professional support agencies such as lawyers, advertising agencies, local authorities and so on.
- appreciate the legal and ethical dilemmas faced by engineers in their working environment.

General Transferable (key) Skills

Having successfully completed the module, you will be able to:

- demonstrate personal effectiveness in achieving personal goals;
- contribute to effective and efficient organisational decision-making;
- demonstrate personal motivation and be able to motivate others;
- utilise generic managerial skills effectively and efficiently.

Method of Teaching /Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

- W Nel, Management for Engineers, Technologists and Scientists, John Wiley & Sons, 1987.
- AC Payne, JV Chelson and LRP Reavill, Management for Engineers, Wiley and Sons 1996.

Possible Lecturers:

Mr. D. Semukuutu

Appendix A List of Academic Staff

	Name	Designation	Highest Qualification
1	Tickodri -Togboa Stevens Sunday	Associate Professor	PhD
2	Lugujjo Eriabu	Associate Professor	PhD
3	Da Silva Izael Pereira	Senior Lecturer	PhD
4	Musaasi Kizza Moses	Senior Lecturer	PhD
5	Mugisha Patrick	Senior Lecturer	Master of Science
6	Kaluuba Livingstone	Senior Lecturer (contract)	PhD
7	Butime Julius	Lecturer	PhD
8	Nyongarwizi Akol	Lecturer	PhD
9	Okau Richard	Lecturer	PhD
10	Okello Dorothy Kabagaju	Lecturer	PhD
11	Nsubuga Mubiru Dan	Lecturer	Master of Science
12	Ariho Gordon	Assistant Lecturer	Master of Science
13	Musasizi Paul Isaac	Assistant Lecturer	Master of Science
14	Sebbale Derrick	Assistant Lecturer	Master of Science
15	Serugunda Jonathan	Assistant Lecturer (study leave)	Master of Science
16	Mwanje Stephern Ssekiranda	Assistant Lecturer	BSc in Electrical Engineering
17	Kitone Isaac	Assistant Lecturer (temporary staff)	MSc. Electrical Engineering
18	Muguwa Andrew	Assistant Lecturer (temporary staff)	Master of Science
19	Wasswa Abubaker Matovu	Assistant Lecturer (temporary staff)	Bachelor of Science
20	Bogere Paul	Teaching Assistant	Masters of Engineering - Mechanical
21	Bakabulindi Geofrey	Teaching Assistant	Master of Engineering - Electrical
22	Ssemukutu Dominic	Teaching Assistant	Master of Science
23	Asiimwe Tumusiime Arthur	Teaching Assistant	BSc in Electrical Engineering
24	Kagarura Geofrey Mark	Teaching Assistant	BSc in Telecommunication Engineering
25	Kakande Josephine Nakato	Teaching Assistant	BSc in Electrical Engineering
26	Nantagya Sara	Teaching Assistant	BSc in Civil Engineering
27	Miyingo Mokulira Emmanuel	Teaching Assistant	BSc in Electrical Engineering
28	Mwikirize Cosmas	Teaching Assistant	BSc in Electrical Engineering
29	Naggaga William Lubega	Teaching Assistant	BSc in Electrical Engineering
30	Namujju Dona	Teaching Assistant	Bachelor of Science
31	Tumwebaze Maureen	Teaching Assistant	Bachelor of Science
32	Gitta Robert	Teaching Assistant	Bachelor of Science
33	Lating Peter Okidi	Lecturer (contract)	PhD
34	Katumba Andrew	Teaching Assistant (temporary staff)	BSc in Electrical Engineering
35	Wakyiku David	Teaching Assistant (temporary staff)	BSc in Electrical Engineering
	TECHNICAL STAFF		
36	Muzuula Daniel Kiguba	Technician I	Diploma
37	Ntege Robinson Luwero	Technician I	Diploma