

UNIVERSITY OF NAIROBI
DEPARTMENT OF ELECTRICAL AND INFORMATION ENGINEERING
ANNUAL REPORT 2012

1. INTRODUCTION:

The department runs B.Sc., M.Sc. and Ph.D. programs in Electrical & Electronic Engineering. The undergraduate B.Sc. program consists of five years of study, and contributes to knowledge in both fundamental and applied areas of Electrical Engineering. It provides a diverse curriculum that instills in our students the skills, talents and creativity necessary for the varied and rapidly changing requirements. This enables them to serve a wide variety of other fields that require leadership, teamwork, decision making and problem solving abilities.

2. COURSES

2.1 BSC COURSE

2.1.1 GENERAL

The undergraduate students complete a total of 76 course units distributed as follows (including laboratories):

First Year	14
Second Year	16
Third Year	16
Fourth Year	16
Fifth Year	14
TOTAL	76

Each semester course unit has a total of 45 contact hours including lecturers and tutorials, while a laboratories course unit has 60 hours per semester. The program incorporates a practical “fourth term” assignment of eight weeks at the end of the second year of study. For the third and fourth years of study, there is industrial attachment during the long vacations.

In the course codes, the first integer after FEE denotes the year study. The second integer denotes as far as is possible, the subject area while the last integer denotes the semester in which the course is taught; 1 for the first and 2 for the second semester. Where the last integer is 0 it means that this is a course which is done throughout the two semesters such as the Engineering Project in the fifth year of study.

In order to cover this syllabus, service courses shall be provided by the following Departments.

- | | |
|---|---|
| 1. Civil Engineering and Construction Engineering | FEE 252 |
| 2. Mechanical and Manufacturing Engineering | FEE 241/2, FEE 251, FEE 261/2, FEE 121/2. |
| 3. School of Mathematics | FEE 111/2, FEE 121/2, FEE 271/2, FEE 471/2, FEE 571 |
| 4. Department of Physics | FEE 101/2 |

5. Board of Common Undergraduate Courses (BCUC). CCS 001, CCS 008, CCS 010

2.1.2 BSC COURSE UNITS

FIRST YEAR

FEE 101 Physics A
FEE 111 Applied Mathematics A
FEE 121 Pure Mathematics A
FEE 131 Computer Science I
FEE 141 CCS 001: Communication Skills
FEE 151 CCS008:Elements of Philosophy
FEE 161 Mechanical Workshop Technology
FEE 102 Physics B
FEE 112 Applied Mathematics B
FEE 122 Pure Mathematics B
FEE 132 Computer Science II
FEE 142 Electrical Measurements
FEE 152 CCS010: HIV/AIDS
FEE 162 Electrical Workshop Technology

SECOND YEAR

FEE 201 Physical Electronics A
FEE 221 Electrical Circuit Theory I A
FEE 231 Computer science III
FEE 241 Engineering Drawing A
FEE 251 Thermodynamics for EE
FEE 261 Mech. of Mach. & Str. of Mat. A
FEE 271 Mathematics II A
FEE 281 Laboratory IIA
FEE 202 Physical Electronics B
FEE 222 Electric Circuit Theory I
FEE 232 Computer Science IV
FEE 242 Engineering Drawing B
FEE 252 Fluid Mechanics for EE
FEE 262 Mech. of Mach. & Str. of Mat. B
FEE 272 Mathematics II B
FEE 282 Laboratory II B

THIRD YEAR

FEE 301 Analogue Electronics A
FEE 321 Electrical Circuit Theory IIA
FEE 331 Digital Electronics A
FEE 341 Electrical Machines I A
FEE 351 Electromagnetic Fields A
FEE 361 Mechanical Engineering for EE
FEE 371 Mathematics III A
FEE 381 Laboratory III A
FEE 302 Analogue Electronics B
FEE 322 Electric Circuit Theory II B
FEE 332 Digital Electronics B
FEE 342 Electrical Machines I B
FEE 352 Electromagnetics Fields B

FEE 362 Instrumentation
FEE 372 Mathematics III B
FEE 382 Laboratory III B

FOURTH YEAR

FEE 401 Electronics A
FEE 411 Control System A
FEE 421 Telecomms. &Electroacoustics A
FEE 431 Electrical Power Systems I A
FEE 441 Electrical Machines II A
FEE 451 Electrodynamics& Ins. Mat. A
FEE 471 Statistics
FEE 481 Laboratory IV A
FEE 402 Electronics B
FEE 412 Control System B
FEE 422 Telecomms. &Electronacoustics B
FEE 432 Electrical Power Systems I B
FEE 442 Electrical Machines II B
FEE 452 Electrodynamics& Ins. Mat. B
FEE 472 Numerical Methods
FEE 482 Laboratory IV B

FIFTH YEAR

FEE 501 Applied Electronics A
FEE 511 Control Engineering A
FEE 560 Engineering Project
FEE 571 Mathematical Methods
FEE 591 Laboratory V A
FEE 502 Applied Electronics B
FEE 512 Control Engineering B
FEE 560 Engineering Project
FEE 582 Management for Engineers
FEE 592 Laboratory V B

Elective Courses in Fifth Year (two per Semester)

Light Current

FEE 521 Telecommunications A
FEE 551 Microwaves and Antennas A
FEE 522 Telecommunications B
FEE 552 Microwaves and Antennas B

Heavy Current

FEE 531 Electrical Power Systems II A
FEE 541 Power Electronics & VariableMachine Drives A
FEE 532 Electrical Power Systems II B
FEE 542 Power Electronics & VariableMachine Drives B

2.2 MSC. COURSE

2.2.1 GENERAL

The MSc students complete a total of 9 course units in Part I of the program, distributed as follows:

	common	option	total
First Semester	2	3	5
Second Semester	1	3	4
TOTAL	6	3	9

Each semester course unit has a total of 60 contact hours including lecturers and tutorials. The students proceed to Part II (Thesis phase) after successfully completing Part I by passing all the course units for their option.

Course codes have the first integer after FEE as 6 denoting Masters. The other digits are applied as shown in the next section.

2.2.2 MSC. COURSE UNITS

- a. Core courses FEE 600-607,650
- b. Electronic Engineering Option FEE 610-618
- c. Electrical Engineering Option FEE 620-629
- d. Control Engineering Option FEE 630-635

Common Core Courses

FEE 600 Engineering Mathematics
 FEE 601 Software Engineering
 FEE 650 Research Methodology

Core Courses in Electronic Engineering

FEE 602 Analogue Electronics
 FEE 603 Digital Electronics
 FEE 604 Signal Analysis

Core Courses in Electrical Engineering

FEE 605 Electrical Power Systems
 FEE 606 Electrical Machines
 FEE 607 Power Electronics

Options in Electronic Engineering

Option 1: Optics, Fields and Waves

FEE 610 Optical Electronics and Lasers
 FEE 611 Antennas and Wave propagation
 FEE 612 E/M Theory and High Frequency Devices

Option 2: Telecommunications

FEE 613 Communication Systems
 FEE 614 Digital Transmission
 FEE 615 Computer Communication Network

Option 3: Electronics

FEE 616 Digital Signal Processing
 FEE 617 Computer Architecture

FEE 618 Electronic Instrumentation

Options in Electrical Engineering

Option 1: High Voltage, Switchgear & Insulation

FEE 620 High Voltage Engineering
 FEE 621 Switchgear and Protection
 FEE 622 Insulating Materials

Option 2: Electrical Power Systems Operations & Planning

FEE 623 Electrical Power Systems, Operation and Control
 FEE 624 Electrical Power Transmission and Distribution Systems

FEE 625 Electrical Power Systems Planning and Management

Option 3: Electronic Machine Design, Control and Power Plants

FEE 626 Electrical Machine Design
 FEE 627 Electrical Machine Drives and Control
 FEE 628 Electrical Power Plant Equipment and Auxiliaries

Options in Control Engineering

Option 1: Optimal, Linear and Non-linear Control

FEE 630 Linear Control Systems
 FEE 631 Optimal Control
 FEE 632 Non-Linear Control and Stability

Option 2: Automation, Digital and Adaptive Control

FEE 633 Digital Control
 FEE 634 Adaptive Control, Learning Systems and Estimation
 FEE 635 Robotics and Automation

3. STUDENT ENROLMENT

3.1 UNDERGRADUATE

	Male	Female	Total
First Year	135	30	165
Second Year	127	14	141
Third Year	126	21	147
Fourth Year	129	22	151
Fifth Year	79	17	96
TOTAL	596	104	700

3.2 MSC

	Male	Female	Total
First Year	7	1	8
Second Year	19	1	20
TOTAL	26	2	28

3.3 Ph.D

	Male	Female	Total
Enrolled	0	0	0
TOTAL	0	0	0

4. INTERNATIONAL STUDENTS

	Male	Female	Total
Undergraduate	3	0	3
MSc	2	0	2
Ph.D	0	0	0
TOTAL	5	1	6

5. NUMBERS OF GRADUANDS

5.1 Undergraduate

	Male	Female	Total
Graduated	80	16	96

5.2 Masters

	Male	Female	Total
Graduated	1	0	1

5.3 Ph.D

	Male	Female	Total
Graduated	1	0	1

6. RESEARCH

Some of the reported publications and conference presentations are listed below

	Title	Authors	Journal	Conference
1.	A Robust Image Watermarking Scheme, Invariant to Rotation Scaling and Translation Attacks	Felix O Owalla, Elijah Mwangi		16 th IEEE Mediterranean Electrotechnical Conference, Tunisia, 25 th March 2012 – 28 th March 2012 pp 379-382
2.	Parameter Optimization In Design Of A Rectangular Microstrip Patch Antenna Using Adaptive Neuro-Fuzzy Inference System Technique	K.V. Rop, D.B.O. Konditi, H.A. Ouma , S. Musyoki	<i>International Journal of Technical and Physical Problems of Engineering (IJTPE) Issue 12, September 2012, No.3 Vol 4 pp16~23, Serial No: 0012-0403-0912</i>	1st Annual International Interdisciplinary Conference, Catholic University of Eastern Africa (CUEA), June 26-30, 2012
3.	An Improved Enhanced of Degraded Binary Text Document Images Using Morphological and Single Scale Retinex Operations	Kiragu Henry, Mwangi Elijah		IET Image Processing Conference (IPR 2012), London 2-4 th July 2012 10.1049/cp 2012.040, pp 1-6
4.	Distribution of Electromagnetic Field Radiation from a Rectangular Cavity-Backed Slot Antenna, ADI-FDTD Perspective,	G M. Nyaory D. B.O. K'Onditi, H. A. Ouma , S. Musyoki		Proc. of KSEEEE-JSAEM 2012 International Engineering Conference, AICAD, Juja, Nairobi, August 2012
5.	Analysis of Electromagnetic Field Radiation from a Rectangular Cavity-Backed Slot Antenna Using ADI-FDTD Method	George M. Nyaory Dominic B.O. K'Onditi, Heywood A. Ouma , Stephen Musyoki	<i>Journal Of Information Engineering and Applications (JIEA@iiste.org), Vol 2, No. 8, September 2012, pp1~8. ISSN 2224-5782(print) ISSN 2225-0506 (online).</i>	September 2012
6.	Aircrafts identification using moments invariants feature extraction and Bayesian Decision theory classification.	Dickson Wambaa Elijah Mwangi		<i>IEEE-CS, South Africa</i> October 2012
7.	Distributed Slack Bus Model for a Wind-Based Distribution Generation using Combined Participation Factors	Musau, P.M, Abungu, N.O	<i>International Journal of Emerging Technology and Advanced Engineering</i>	October 2012

8.	An Experimental Prototype for Low Head Small Hydro Power Generation using Hydram	Nganga, Obadiah Burugu G. N. Nyakoe Dr. Nicodemus Abungu, WanjauKabecha		The Seventh JKUAT Scientific, Technological and Industrialisation Conference November, 2012
9.	Combined Economic and Emission Dispatch Solution Using ABC_PSO Hybrid Algorithm with Valve Point Loading Effect	Emmanuel DarteyManteaw, Dr. Nicodemus AbunguOdero	<i>International Journal of Scientific and Research Publications, Volume 2, Issue 12 ISSN 2250-3153</i>	December 2012
10.	Multi-objective environmental/economic dispatch solution using hybrid ABC_PSO algorithm	Manteaw, E.D, Abungu, N.O	<i>International Journal of Scientific and Research Publications</i>	December 2012

7. DEPARTMENTAL FULL-TIME STAFF

1.	Associate Professor	4
2.	Senior Lecturer	8
3.	Lecturer	4
4.	Graduate Assistant	6
5.	Technologist	16
6.	Secretary	2
7.	Cleaner	2
TOTAL		42

8. OTHER NOTABLE ACTIVITIES

- (i). **Change of Head of Department:** In March 2012 Prof. Vitalice K Oduol was succeeded by Dr. H OumaAbsaloms, after successfully completing two terms as the department head.
- (ii). **Curriculum Development:** Department was involved into exploration of starting programs in Biomedical Engineering, Petroleum and Mining Engineering and Instrumentation and Control.
- (iii). **Curriculum Review:** The review of the BSc and MSc programs was taken a further notch with the initial draft being put together for discussion in the first quarter of 2013
- (iv). **Collaborations:** Initial discussions for collaborations with several institutions were carried out. The institutions included: Centurion Systems, Siemens, African Cotton & Textile Industries Federation (ACTIF) Centre of Excellence, Johns Hopkins University- Centre for Bioengineering Innovation and Design,