

UNIVERSITY OF NAIROBI

SCHOOL OF ENGINEERING

ANNUAL REPORT – 2011/2012

Introduction

The School of Engineering is located on the main campus, along Harry Thuku Road, directly opposite the main administration building of the University. Nearby landmarks include the Central Police Station, the Norfolk Hotel, and the Kenya National Theatre.

The School has five departments namely:

- Department of Civil and Construction Engineering
- Department of Electrical and Information Engineering
- Department of Mechanical and Manufacturing Engineering
- Department of Environmental and Biosystems Engineering
- Department of Geospatial and Space Technology

The School is the oldest in the University, having started way back in April 1956 as the then Royal Technical College, which evolved into the University of Nairobi by 1970. To date approximately 8,000 graduates have been awarded the BSc Engineering degree as well as numerous Master of Science and PhD degrees.

Academic Programmes

All the five departments offer a five-year undergraduate study program leading to a Bachelor of Science degree in the respective fields of study. They also offer a Master of Science degree running for two years, as well as PhD programmes. The School has been running a self-sponsored programme since 1998 which runs concurrently with the government sponsored programme.

The academic year runs from October to July with the graduation ceremony taking place every September.

Admission Requirements into undergraduate program

The following will be eligible to apply for a course in any of the five departments:

- i) K.C.S.E. Applicants or Equivalent: For KCSE holders a minimum aggregate of C+ (plus). Additionally a grade of C+ in each of the cluster subjects, as follows:

Physics

Chemistry

Mathematics

Biology/Geography/any group IV Subject*

Group IV Subjects

Home Science Building Construction

Art and Design Power Mechanics

Agriculture Electricity

Woodwork Drawing and Design

Metalwork Aviation Technology

Computer Studies

* Home Science is no longer acceptable for admission

- ii) Advanced Level Certificate Holders: A minimum of 2 principal passes in mathematics and physics and a subsidiary level pass in Chemistry
- iii) Higher National Diploma (HND) or Equivalent: Candidates with Higher National Diploma in the following broad areas of study;

Environmental and Biosystems Eng. Civil Engineering, Electrical Engineering, Mechanical Engineering, Surveying, Geospatial Engineering etc.
- iv) Ordinary Diploma or Equivalent: Candidates with a credit pass in the areas indicated in ©.
- v) Diploma from Science/Technical Teacher Training Colleges

Candidates from Teacher Training Colleges with a Science Diploma in Mathematics and Physics.
- vi) BSc/B.Ed. (Science) degrees or any other relevant degrees

Candidates with Bachelor of Science or Education degrees (in Physics and Mathematics) from recognized institutions or any other relevant degree from a recognized institution.

The following are the Annual Reports from four departments of the five departments in the School.

Department of Civil & Construction Engineering

Teaching and Learning

The Department of Civil and Construction Engineering offers a range of programs at both graduate and undergraduate levels.

At the undergraduate level, after completing their first year courses, students are offered courses in applied mechanics, hydraulics, surveying, materials, structures, engineering management, geotechnical engineering, transportation engineering, environmental health engineering and water resources engineering. Courses in mathematics, computer programming and non-technical subjects are also obligatory in the programme.

At the graduate level, the course is intended for engineers with suitable qualifications and/or professional experience who wish to study further or expand their range of expertise in specified field of civil engineering. The specialized options offered are:

Geotechnical Engineering

Dealing with properties and behavior of the ground, interactions between structures and their foundations.

Structural Engineering

Focusing on the built environment, including structural design, materials, reliability, construction and the management of ageing infrastructure.

Transportation Engineering

Focusing on transportation planning, pavement design, traffic design and control operations, transportation safety and pollution control.

Environmental Health Engineering

This deals with supply of safe water through treatment and the disposal of such liquid or solid wastes as may be generated from activities in the living environment.

Water Resources Engineering

Focuses on water supply and distribution as well as other fluids like oil and their required structures. It also includes water resources management and administration.

- Course offered: Bachelor of Science in Civil Engineering
Master of Science in Civil Engineering

- Enrolled students
 - o BSc. level: 656
 - o Master level: 34
 - o PhD. Level: 3

- Number of graduands:
 - o BSc. Level: 90
 - o Master level: 2
 - o PhD level 1

- International student component: 6

Service Delivery

Metrocount pneumatic vehicle classifier system training for the following technical staff by KURA on 23rd – 27th July, 2012 at Sports View Hotel-Kasarani.

1. Martin Mburu
2. Kenneth Kaunda
3. Sammy Gatimu
4. Charles Kirui
5. Stephen Ochieng'
6. Roselyn Masoni

Fire marshalls and fire drills skills at the St. John House.

1. Maxwell Odira
2. Stephen Ochieng'
3. Wairimu Njuguna –trained on HIV/AIDS and breast cancer

- Mr. S. Osano Mr. J. Kanyugo has been trained on Research and Project Grant writing.

- W. Njuguna has been trained on Customer Care.

Research, Innovation and Consultancy

Research /Publications activities undertaking:

Research papers by Prof. S. K. Mwea, S. Osano

Title: **Root tensile strength of 3 typical plants and their contribution to soil shear strength - Journal of Civil Engineering Research and Practice Vol. 8 No. 1 pp 57 - 73**

Authors: **Osano Simpson Nyambane, Sixtus Kinyua Mwea**

Title: **A Study on the Engineering Behaviour of Nairobi Subsoil Journal – Vol 6 No. 7 July 2011 ISSN 1819 - 6608**

Authors :- **Onyanchara M., C., Mathu, E., Mwea, S., & Ngecu, W.**

Title: **“Pull-Out Resistance Of 3 Different Plant Species And Their Application In Slope Stabilization Works Journal Of Engineering Indian Centre For Advanced Scientific And Technological Research ” (Icastor) Volume 5, No. 1 January 2012**

Authors: **Osano S, Mwea S.K and Gichaga F .J**

By Dr. Simeon Dulo-Assessment of urban water supply: case study of Athi River Town.

Dr. Ezekiel Nyangeri-Visionary and knowledge management in strategic development of water services

- International links and collaborations

Consultancies

Prof. Mwea: Civil & Mr. S. K. Mutua Structural services to

- Agriculture Building – Upper Kabete
- Appointed External Examiner at Jomo Kenyatta University of Agriculture and Engineering
- Appointed External Examiner at Mombasa Polytechnic University College.
- Extension to Kenyatta National Hospital Library
- Extension to teaching facilities at Dental School
- Investigation of Top Plaza for the Pensions Department – University of Nairobi

Prof. Mwea: Consultant for Howard Humphreys East Africa Limited

Papers presented at conferences

Proposed project proposal by Dr. Mumenya

S/N	TITLE/NAME OF THE ARTICLE	AUTHOR/S	NAME OF JOURNAL/PUBLICATION	DATE OF PUBLICATION
1.	Clean Industrial Concept of recycling waste plastics for infrastructure development and wealth creation	Dr. S. Mumenya	Proposed project proposal in response to:NCST call	30 th August, 2012
2.	Direct shear box and ring shear test comparison: why does internal angle of friction vary	Dr. S. Osano	ICASTOR Journal of Engineering	

Any other Activities

Community Service

Prof. S.K. Mwea and Eng. D. Koteng’ attended a workshop on Eurocodes in Kenya.

Prof. F. J. Gichaga – Chairman of National Council for Science and Technology

- Appointment as Fellow of the Kenya National Academy of Sciences
- Appointed as a BOG member – Kagumo High School

Prof. S.K. Mwea attended a stakeholders’ workshop to provide comments on the developed policy guidelines for an internship programme for graduate engineers.

Eng. D. Koteng’ attended a conference on Regional Infrastructure.

Eng. J. Mwero attended a workshop on Material Scientists.

Prof. S. K. Mwea: Guest of Honor at St. Benedict's Kithimu

Prof. F. Gichaga Speech during 19th Graduation Ceremony at Jomo Kenyatta University of Agriculture & Technology

Prof. F. J. Gichaga - Speech during inauguration of JKUAT Arusha Campus.
- Speech during county governance certificates award ceremony- Safari park hotel.

Prof. F. J. Gichaga - Speech during the inauguration of Multi Media University College
On 28th November, 2012
- Speech on 20th graduation ceremony at JKUAT on 30th November, 2012

Prof. S. K. Mwea - Moderation of 1st semester examinations results for 2012/2013 academic year.
- Invitation to E.S.A- Huawei technologies ltd sports day
- Awarded a certificate for presenting paper titled "Variation of Groundwater static levels in Nairobi City since 1927".

Dr. S. W. Mumenya - Attended a workshop at Institute of Trade Development on Training courses on the design of low cost technologies for water and wastewater on 29th October – 2nd November, 2012.

Seminars & Graduation by MSc. & PhD Students

Seminar by Barrack Okoya – MSc. Student & Graduate Assistant

Seminar by James Odongo - MSc. Student

Seminar by Clive Kiage Temu - MSc. Student

Seminar by Meshack Onyango - PhD. Student

Seminar by Kipyator Franklin- MSc. student

Seminar by Richard Manjanja - MSc. student

Graduation for a PhD student – Osano Simpsons

Graduation for MSc. students – Clive Temu Kiage, Adoyo Felix Otieno & Agwaro Paul Ogutu

DEPARTMENT OF ELECTRICAL AND INFORMATION ENGINEERING

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.

COURSES

BSC COURSE

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 |

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

MSC. COURSE

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.

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

STUDENT ENROLMENT

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

MSC

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

Ph.D

	Male	Female	Total
Enrolled	0	0	0
TOTAL	0	0	0

INTERNATIONAL STUDENTS

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

NUMBERS OF GRADUANDS

Undergraduate

	Male	Female	Total
Graduated	80	16	96

Masters

	Male	Female	Total
Graduated	1	0	1

Ph.D

	Male	Female	Total
Graduated	1	0	1

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 KSEEE-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	<i>Journal Of Information Engineering and Applications (JIEA@iiste.org), Vol 2, No. 8, September 2012, pp1~8.</i>	September 2012

		Musyoki	<i>ISSN 2224-5782(print) ISSN 2225-0506 (online).</i>	
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

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

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,

DEPARTMENT OF ENVIRONMENTAL AND BIOSYSTEMS ENGINEERING

1. Introduction.

The Department of Environmental and Biosystems Engineering programme prepares its graduates for careers requiring application of physical, biological, and engineering sciences to problems that involve environment and living systems. The scope of Environmental and Biosystems Engineering is broader and encompasses agriculture, the environment, food, forestry, aquaculture and bio-based production and processing systems in industries and rural development.

Our Curriculum is student centered and balances theory and practice. Unlike the traditional engineering courses that provide linear intervention, our curriculum prepares our graduates to provide evolving solutions in a closed loop and thus continual improvement and sustainability.

2. Courses offered.

The Department offers B.Sc., MSc. and PhD in Environmental and Biosystems Engineering

3. Enrollment of undergraduates and postgraduates

UNDERGRADUATES				
NO	LEVEL OF STUDY	MALE	FEMALE	TOTAL
1.	First Year	37	18	55
2.	Second Year*	36*	10	46
3.	Third Year	41	17	58
4.	Fourth Year	36	10	46
5.	Fifth Year	29	7	36
TOTAL		179	62	241

* One International student (Male)

POSTGRADUATES (MSc.)				
NO	LEVEL OF STUDY	MALE	FEMALE	TOTAL
1.	Part I *	11*	1	12
2.	Part II	43	7	50
TOTAL		54	8	62

* One International student (Male)

POSTGRADUATES (PhD)				
NO	LEVEL OF STUDY	MALE	FEMALE	TOTAL
1.	First Year	7	-	7
TOTAL		7	-	7

4. Research Interests

- Agricultural /Aquatic Machinery
- Agricultural Process /Food Engineering
- Concrete and Fibre Reinforced Concrete
- Conservation Agriculture
- Egg Incubation
- Environmental Control and Simulation
- Environmental Impact Assessment and Environmental Audit
- GIS and GPS Mapping
- Granular mechanics
- Industrial Safety
- Land Husbandry and Landscape Engineering
- Landscape and Biomass mapping using remote sensing and GIS
- Occupational Health and Safety
- Produce Drying
- Rain Water Harvesting
- Reinforced Concrete
- Renewable Energy
- Rural Power, Transport and Access
- Soil and Water Engineering
- Soil Tillage and Fertility Management
- Timber and, Animal Housing
- Waste water management
- Water Resources Engineering
- Water Systems Engineering

5. Research activities

TITLE OF RESEARCH PROJECT	YEAR	RESEARCHERS
<ul style="list-style-type: none"> Water harvesting, Environment, Health and nutritional sustainability I Kitui west (NCST). (In progress) 	2012	A.N. Gitau
<ul style="list-style-type: none"> Post-harvest control of aflatoxin contamination in stored maize using super absorbent polymers (STTPs) in improved and affordable design of storage structures. (funds from NCST) (In progress) 	2012	Dr. D. O. Mbuge
<ul style="list-style-type: none"> A Three Dimensional Environmental Simulation Model of a Greenhouse System 	2012	J. O. Agullo

6. International Links and Collaborations:

- Department of Environmental Health, safety and Emergency management (EHSEM) -Harvard University & Department of Environmental and Biosystems Engineering -UoN
- Africa Biofuel and Emission Reduction (East Africa) Ltd. & Department of Environmental and Biosystems Engineering -UoN
- Department of Environmental and Biosystems Engineering -University of Nairobi/EURA Innovation GmbH (2012)
- Food and soft laboratory, ETH Zurich, Department of health science SWITZERLAND, and University of Nairobi(ICIPE) (2011 to date)
- Biofuel Africa & Department of Environmental and Biosystems Engineering -UoN The Department also has a consultancy unit. (2011 to date)
- Department of Environmental and Biosystems Engineering -University of Nairobi / University of Siegen - Germany
- Department of Environmental and Biosystems Engineering -University of Nairobi / EurA Innovation GmbH
- Department of Environmental and Biosystems Engineering -University of Nairobi / Department of Agri-Food Science and Technology - University Of Bologna (EDULINK II) on Energy-agro food synergies in Africa: New Educational Models for Universities.

Publications (Books/Journals)

TITLE	YEAR	AUTHOR
<ul style="list-style-type: none"> Optimizing the Performance of a Manually Operated Groundnut (Arachis hypogaea) Decorticator 	2012	A.N. Gitau
<ul style="list-style-type: none"> Mechanical properties of groundnuts- Maxwell publishers 	2012	V. K. Too, E.B. K. Mutai, J. M. Mutua, D. A. Mutuli, D. .O Mbuge
<ul style="list-style-type: none"> Use of UASB reactor in treatment of Dairy industry waste water in New KCC Kitale factory - IJE (ISSN-0974-407X) 	2012	P.K Kimani, B. N.K. Njoroge, A.N. Gitau Volume 5 May 2012
<ul style="list-style-type: none"> Viscoelastic Properties of Bulk Groundnuts 	2012	K.V. Too, E.B.K. Mutai, J.M. Mutua, D.A. Mutuli and D.O. Mbuge
<ul style="list-style-type: none"> Revision of Farm structures Text book Completed (Funded by FAO) 	2012	L. O. Gumbe & J. Agullo.
<ul style="list-style-type: none"> State of the Art Report on Global and Regional Soil Information: Where are we? Where to go? FAO, Rome http://www.fao.org/docrep/017/i3152e/i3152e.pdf 	2012	Omuto CT, Nachtergaele FO, Vargas-Rojas R. 2012

7. Staff and their designation

DESIGNATION	NO
Professor	-
Associate Professor	2
Senior Lecturer	6
Lecturer	4
Assistant Lecturer	2
Part Time Lecturer	8
Chief technologist	2
Senior Technologist	-
Technologist	4
Technical Assistant Grade IV	3

Secretary	3
Driver	1
Subordinate staff	2

8. Number of granduands (diploma, bachelors, postgraduate diploma, masters, and PhD

UNDERGRADUATES				
NO	LEVEL OF STUDY	MALE	FEMALE	TOTAL
1.	Bachelors	26	4	30
2.	Masters	-	1	1
3.	PhD	1	-	1
TOTAL		27	5	32

9. Number of papers presented in conferences

- *Illustration of the process involved in data preparation for a watershed hydrologic model -J. P. O. Obiero*, M. A. Hassan* and J. Sang. At the Department of Biomechanical and Environmental Engineering, Jomo Kenyatta University of Agriculture and Technology.*
- **Eng. Gichuki Muchiri** delivered a talk on “The Role of Mechanization in Agriculture” at Jomo Kenyatta University of Agriculture and Technology (JKUAT) on Friday 24th February, 2012 from 9.30. am to 1100.am.

10. Corporate social responsibility activities

- *Environmental and Biosystems Engineering Students open day held on 21st April 2012 at upper Kabete Campus. (photos attached)*
- *Represented the School of Engineering at the Annual Tree Planting Event at the University Farm Kanyariri on 2nd November 2012*
- *Ploughing contests for seedbed preparation for improved agricultural production through the Kenya Ploughing Organization (KPO) e.g. participated at the National Ploughing contest on 5th Nov 2012 at UoN Farm Kanyariri*
- *Environmental And Biosystems Engineering Students Association EBESA visited Nairobi Children's Home On 8th December 2012*

11. Other activities

- **Dr. A. N. Gitau** participated in evaluation of consultants for GEF SGP Baseline Assessment in Laikipia County.
- Mr. Januarius Ondiek Agullo- recruited by Training Centre in Communication (TCC) to train participants on the use of R statistical package for data analysis. (12th -16th March 2012)
- **J. P. Obiero** Invited to participate as a consultant (Resource person) in the training of international students in a 6 month postgraduate diploma course on integrated water resources management at Egerton University, An initiative between Egerton University and ITC Netherlands. I was resource person to handle module on GIS-based catchment modeling-**12-16th March 2012**
- **J. P. Obiero** Convened an annual general meeting (AGM) for the Nairobi Branch of the Kenya Ploughing Organization, a subcommittee of the Agricultural Society of Kenya (ASK) on 9th January 2012 To review 2011 activities, and plan for the 2012 activities that include ploughing competitions, etc. He is the current Chairman of KPO (Nairobi Branch).
- **J. P. Obiero** participated at the AGM for the National office of the Kenya Ploughing Organization (KPO) on 23rd March 2012 at the Show Ground, Nairobi.
- **J. P. Obiero** Participated at the executive committee meeting of the ASK held on 16th February 2012 to discuss planned construction projects proposed for the show ground that include wall fence, rehabilitation of water infrastructure etc.
- Training on seed drying, processing and storage for professionals working in seed production in Sub- Saharan Africa in collaboration with the Faculty of Agriculture - **Dr. A. N. Gitau, Dr. D. O. Mbuge, Eng. J. M. Mutua, E. M. Mwachoni, R. M. Mathenge - May 2012 (photos attached)**
- Environmental and Biosystems Engineering 5th year Students dinner held on **31st May 2012** at Kabete Vet golf Club. **(photos attached)**
- IEK exhibition at KICC on **May 11, 2012 - E. B. K. Mutai (photos attached)**
- **J. P. O. Obiero** Organized Nairobi Branch Ploughing contest coordinated by the Agricultural Society of Kenya (ASK- Nairobi branch) in which the department was a participant.
- **J. P. O. Obiero** Participated in the planning of the 2012 Nairobi International Trade Fair (NITF) as an executive committee member. (27th October 2012)
- **Prof. G. R. A MCHAU** Dean, School of Agriculture from the University of Venda (South Africa) visited SoE and the department on a Benchmarking tour.
- Visitors from Reckoning International visited our department on 31st July 2012 for possible cooperation on the use of conservation tillage equipment.
- Keller Joegen from University of Siegen - Germany visited our department on 18th Dec 2012 seeking possible cooperation.



Visitors from Reckoning International (Daniel and James) in a discussion Chweya, Wamutitu & Mathenge during their tour to our workshops on 31st July 2012



EBE students on a visit to African Diatomite Company Kariandusi on 20th July 2012

Department of Geospatial and Space Technology

0 1. INTRODUCTION

The Department of Geospatial and Space Technology changed its name from Department of Surveying in 2004. Several name changes have occurred since the Department was started in early 1960's. The new name was necessitated by the emergence of modern technology and tools, especially satellite positioning techniques and computer applications including geographical information systems (GIS).

Geospatial Engineering is a professional discipline concerned with the measurement, analysis and graphic representation of dimensional geo-spatial relationships, as well as with design, construction, maintenance, and the use of geospatial databases. It has its roots in surveying and mapping and encompasses the specialized areas of geodesy, surveying, topometry, hydrography, geoinformatics and navigation.

The Department continues to offer the 5-year curriculum leading to award of the degree, B.Sc. in Geospatial Engineering. The 3rd batch of students under this program graduated in September 2011. They were 37 students of whom 7 were female students. The Department is also offering a masters degree program – MSc. (GIS) and in the year under review, students graduated. The degree program – MSc. (Surveying) graduated 1 (one) candidate. There were a total of 3 Ph.D registered candidates in the year under review. Two are expected to graduate in the following year.

3. STUDENT ENROLMENT

A. UNDERGRADUATE	
First Year	35
Second Year	39
Third Year	37
Fourth Year	34
Fifth Year	30
B. POSTGRADUATE (M.Sc. GIS)	
First Year	9
Second Year	8
C. POSTGRADUATE (M.Sc. Surveying)	

5. RESEARCH INTERESTS, INTERNATIONAL LINKS & COLLABORATIONS

A. Research Interest

Our members continued carrying out research in various fields as outlined below:

Geodetic Science

Mulaku, G.C.; The Kenyan Cadastre and Spatial Data Infrastructure.

Musyoka, S.M.; Modernization of the Kenyan Geodetic Network.

Rostom, S.R.; Aerial Triangulation by Digital Photogrammetry

Macoco, D.K.; Challenges in Indoor Positioning

Karanja, F.N.; Earth Observations for Natural Resource Management,

Gender –Disaggregate Spatial databases and Applications,

Application of GIS in Poverty Reduction.

Wakoli, P.C.; Application of Photogrammetry to Detection & Monitoring of Structural Deformations.

Kiema, J.B.K.; Use of GIS in Business Decision Planning

Governance and Partial Information Management

Use of Space Technology in Water Management.

B. International Links and collaborations

The Department formalized its links with the Department of Geography at the University of Helsinki which has seen 1 Ph.D partial scholarship awarded to one potential member of staff.

6. PUBLICATIONS/ CONSULTANCIES

A. Publications

GIS in Education Planning: The Kenya School Mapping Project. G.C. Mulaku: African Survey Review, Vol.43. No.323, pp567-578, October, 2011.

7. NUMBER OF GRADUANDS

A: Masters

Course	Male	Female	Total
MSc. (GIS)	4	3	7
MSc. Surveying	1	0	1

B: Undergraduates

Course	Male	Female	Total
BSc. (Geospatial Engineering)	30	7	37

Department of Mechanical and Manufacturing Engineering

The Department of Mechanical and Manufacturing Engineering is one of the five departments in the School of Engineering and its history dates back to 1956 when the Royal Technical College was started. In 2003, the University of Nairobi Senate ratified the change of name of the department from the initial name of Department of Mechanical Engineering to the present name of the Department of Mechanical & Manufacturing Engineering offering the same undergraduate BSc. degree in Mechanical Engineering. The department also offers 5 MSc. degree programs as well as PhD programs

The department has an undergraduate student enrollment of about 564 and postgraduate student enrolment of 23 with an Academic Staff establishment of 23 and Technical Staff Establishment of 20.

2. COURSES OFFERED

(a) BSc. degree Mechanical Engineering

- Basic Applied Sciences (Physics, Chemistry & Mathematics) in the 1st year of study
 - Mathematics (in 2nd, 3rd and 4th year)
 - Courses in Humanity (Philosophy, Communication Skills, HIV/AIDS) in the 1st year of study)
 - Thermodynamics
 - Solid Mechanical
 - Fluid Mechanics
 - Mechanics of Machines
 - Computing
 - Production Engineering & Industrial Management
 - Engineering Drawing
 - Engineering Design
 - Materials Science & Metallurgical Engineering
 - Engineering Project (in the 5th and Final Year)
- (b) MSc. degrees in Mechanical Engineering

(i) Advanced Thermo-Fluids Engineering

First Year

Compulsory course units – Thermal Engineering

FME 660 – Advanced Thermodynamics I

FME 661 – Advanced Heat Transfer

FME 662 - Advanced Fluid Mechanics

FME 663 – Mass Transfer

FME 690 – Mathematics Methods

FME 692 – Research Methodology

Plus from course units chosen from the following:

FME 665 – Advanced Thermodynamics II

FME 666 - Advanced Refrigeration

FME 667 – Combustion Theory

FME 668 – Renewable Energy Technology

FME 669 - Direct Energy conversation

FME 670 – Drying Processes

FME 671 – Advanced Conductive Heat Transfer

FME 672 – Two –phase Flow

FME 673 – Theory of Turbulence

FME 674 – Environmental Fluid Mechanics and Pollution

FME 691 – Numerical Methods

Compulsory Course Units – Fluids Engineering (options)

FME 660 – Advanced Thermodynamics I

FME 661 – Advanced Heat Transfer

FME 662 - Advanced Fluid Mechanics

FME 664 – Boundary Layer Theory

FME 690 – Mathematics Methods

FME 692 – Research Methodology

Plus from course units chosen from the following:

FME 671 – Advanced Conductive Heat Transfer

FME 672 – Two –phase Flow

FME 673 – Theory of Turbulence

FME 674 – Environmental Fluid Mechanics and Pollution

FME 675 – Advanced Gas Dynamics

FME 676 – Hydrodynamic Lubrication

FME 677 – Experimental Fluid Mechanics

FME 678 – Computational Fluid Mechanics

FME 691 – Numerical Methods

Second Year for both of the above options

A suitable research project supervised by at least one member of staff and submitted as a thesis written in accordance with University regulations.

(ii) Advanced Applied Mechanics

First Year

Compulsory course units

FME 640 – Continuum Mechanics I

FME 641 – Continuum Mechanics II

FME 642 – Vibration Engineering

FME 643 – Experimental Stress Analysis

FME 690 – Mathematics Methods

FME 692 – Research Methodology

Plus from course units chosen from the following:

FME 644– Engineering Plasticity

FME 645 – High Pressure Engineering

FME 646 – Theory of Elasticity

FME 647- Control Engineering

FME 648 – Properties and Testing of Materials

FME 649 – Finite Elements Methods

FME 626 – Chemical Metallurgy

FME 691 – Numerical Methods

Second Year

A suitable research project supervised by at least one member of staff and submitted as a thesis written in accordance with University regulations.

(iii) Industrial Engineering

First Year

Compulsory course units

FME 600 – Operation Research

FME 601 – Management Information Systems

FME 603 –Engineering Vibration

FME 604– Work Systems Design and Measurement

FME 690 – Mathematics Methods

FME 692 – Research Methodology

Plus from course units chosen from the following:

FME 604– Human Performance Mechanisms

FME 605 – Industrial Psychology

FME 606 – Work Incentives and Organization

FME 607- Healthy and Safety

FME 608 – Ergonomics and Man-Machine Systems

FME 609 – CAD/CAM

FME 610 – Industrial Data Processing Systems

FME 611 – Production Systems Design and Analysis

FME 612 – Decision Theory

FME 613 – Risk Theory

FME 614 – Mathematical Programming

FME 615 – Mathematical Optimizations

FME 616 – Energy Utilizations

FME 617 – Quality Control and Reliability

FME 618 – Maintenance Management

FME 619 – Production Planning, Scheduling and Control

FME 691 – Numerical Methods

(iv) Materials Science and Metallurgical Engineering

First Year

Compulsory course units

FME 620 – Structure, Properties and Behavior of Materials

FME 621 – Iron and steel Metallurgy

FME 622 – Process Metallurgy

FME 623 – Corrosion and Deterioration of Materials

FME 690 – Mathematics Methods

FME 691 – Research Methodology

Plus from course units chosen from the following:

FME 624 – Non-Destructive Testing and Evaluation

FME 625 – Structure and Properties of Ceramics and glasses

FME 626 – Polymer Science and Engineering I

FME 627 – Polymer Science and Engineering II

FME 628 – Phase diagrams in Materials

FME 629 – Chemical Metallurgy

FME 630 – Composite Materials

FME 631 – Nuclear Materials

FME 632 – Engineering Non-Ferrous Metals

FME 633 – Foundry Technology

FME 634 – Modern Analytical Techniques

FME 691 – Numerical Methods

Second Year

A suitable research project supervised by at least one member of staff and submitted as a thesis written in accordance with University regulations.

Year III – (3) Chol Dhieu Gabriel

F18/3474/2010 (Sudanese)

Udouchukwu Christian Kelechi F18/35484/2010 (Nigerian)

Year IV – (4) Samenjo Karl Heinz Tondo F18/29353/2009 (Camerron)

5. International Links & Collaboration

- Through the collaboration established between the Department of Mechanical & Manufacturing Engineering of the University of Nairobi and the National Taiwan University of Science & Technology (NTUST), seven students from the department who got 1st class honours degree are applying for postgraduate MSc. studies and scholarships to NTUST. These are King'ora Kamau, Cherono Sheillah, Odongo Philip, Ochieng David, Mosiria Bwana, Omondi Anthony and Mogaka Davidson Onchana. Two academic members of staff Mr. Kimilu and Mr. Kivindu are finalizing their applications for admission and scholarships for PhD studies in the same institution.

6. Publication for the year

- Book – S.M. MUTULI – Fundamentals of Solid And Structural Mechanics “Accepted for publication at the University of Nairobi Press.
- NJOROGE, K.D., MUTLU S.M., KIHU J.M. “An Intrinsic Dislocation Density – Finite Element Formulation of Metal Plasticity” International Journal of Computation Engineering Research ISSN: 2250-3005, 201 (on-line).

7. Consultations

- Conducting laboratory experiments for Multimedia University (Faculty of Engineering
- Prof. Oduori is carrying out investigations of aircraft docking system for Kenya Airways aircrafts.
- Conducting laboratory experiments for Moi University.

8. Numbers of graduands

- Diploma – None
- BSc. degree in Mechanical Engineering – 55
- MSc. degree - 1

9. Papers presented at conferences –

- Mr. Bernard Odera attended the International Seminar on Heterogeneous Multicomponent Equilibria in Germany 9th – 17th February 2013.

10. Any other Activity

Objectives - Research and Innovation and Consultancy

The department participated in the initiation of a project on the establish establishment of an NDT Centre for research and training at the Institute of Nuclear Science & Technology of University of Nairobi. An initial support grant of Ksh. 40 Millions has been approved. This project is supporting one student by the name Mr. Birir who is supervised by Prof. Mutuli from Mechanical Engineering and Dr. Gatari from Nuclear Science.

Community Service

- On Saturday 6th October 2012, students from the department participated in the commissioning of a water pump for a borehole at St. Ebrahim School in Kamulu sponsored by Davis & Shirtliff Co. Ltd.

4. RESEARCH ACTIVITIES UNDERTAKEN

- Charles Omondi Ogingo – F18/1437/2010 a 1st year student in the Dept. of Mechanical And Manufacturing Engineering has been awarded a Science, Technology And Innovation (ST & I) Grant of Kshs. 400,000/= by the National Council of Science and Technology to carry out more work on his innovation entitled “The Cell phone and Remote – Controlled Lock”.
- Eng. David Masinde Munyasi, Lecturer in the Department of Mechanical and Manufacturing Engineering has been given a grant of KES 250,000 by the Deans Committee to carry out a research on “Assessment of Stone Crushing Characteristics and Optimum Dynamical and Structural Design of a Stone Crusher for Small Scale Entrepreneurs” being his PhD Research Work.
- Prof. Oduori has been awarded a grant from National Council of Science And Technology of Ksh. 800,000/= for commercialization of social Decorticator.
- Mr. Mwaka has been awarded a grant of Ksh. 3.985 million by the National Council of Science And Technology for a project entitled “Small Scale Water Extraction in arid and semi-arid areas by wind power.
- Dr. Hussein Jama was awarded a grant of Kshs. 250,000/- from the Dean’s Committee Research Grant to carry out research entitled “Behaviour of Steel Plates Strengthened with CFRP subjected to Blast and Impact Loads”.

- Prof. S.M. Mutuli was awarded a grant of Kshs. 250,000/- from the Dean's Committee Research Grant to carry out research entitled "Design and Fabrication of a Universal Testing Rig for Laboratory Experiments on Beam Deflections - Cases of Simply Supported Beams, Cantilever Beams and Fixed Beams subjected to point loads, distributed loads and couples"
- Dr. Thomas Ochuku Mbuya was awarded a grant of Kshs.250,000/- to carry out research entitled "Development of Recycle Friendly Aluminum Alloys for Automotive and Structural Applications."