

ANNUAL REPORT 2013

1. INTRODUCTION

The Department of Geospatial and Space Technology changed its name from the Department of Surveying in 2004. It comprises three main thematic areas namely; Geodetic Science, Remote sensing and Photogrammetry and Hydrographic mapping.

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 both undergraduate and postgraduate degree programs in the field of geospatial technology.

2. PROGRAMS OFFERED

The Department offers the following approved programs:

a) Undergraduate

B. Sc. (Geospatial Engineering)

b) Graduate (Masters)

M.Sc. Geographical Information System

M.Sc. Surveying

The courses offered within the undergraduate programs are

<u>Year</u>	<u>Semester</u>	<u>Course</u>	<u>Hours</u>	<u>CW</u> %	<u>Exam</u> %	<u>Units</u> (Weight)
Year I	<u>Semester 1</u>	FGE 101: Introduction to Engineering	60	40	60	1.25
		FGE 171: Pure Mathematics A	48	30	70	1
		FGE 173: Applied Mathematics A	48	30	70	1
		FGE 175: Physics A	48	30	70	1
		FGE 177: Informatics A	48	30	70	1
		CCS 010: HIV& AIDS	45	20	80	1
		CS 001: Communication Skills	45	20	80	1
	<u>Total</u>		<u>342</u>			<u>7.25</u>
	<u>Semester 2</u>	FGE 102: Introduction to Geospatial Engineering	60	40	60	1.25
		FGE 162: Earth Science	48	30	70	1
		FGE 172: Pure Mathematics B	48	30	70	1
		FGE 174: Applied Mathematics B	48	30	70	1

		FGE 176: Physics B	48	30	70	1
		FGE 178: Informatics B	48	30	70	1
		FGE 182: Elements of Economics	45	20	80	1
		Total	345			7.25
		<i>Total</i>	<i>687</i>			<i>14.5</i>
		Total	687			14.5
Year II	<u>Semester 1</u>	FGE 231: Geospatial Measurement Techniques	60	40	60	1.25
		FGE 241: Cartographics	60	40	60	1.25
		FGE 261: Electrical Technology	48	40	60	1
		FGE 271: Engineering Mathematics IA	48	30	70	1
		FGE 273: Geophysics	48	30	70	1
		FGE 275: Geometry	48	30	70	1
		FGE 277: Computer Programming	48	60	40	1
		Total	360			7.5
	<u>Semester 2</u>	FGE 232: Topometry	60	40	60	1.25
		FGE 242: Cartography	60	40	60	1.25
		FGE 262: Digital Electronics and Microprocessors	48	40	60	1
		FGE 264: Communications and Signal Processing	48	30	70	1
		FGE 272: Engineering Mathematics IB	48	30	70	1
		FGE 276: Geospatial Statistics	48	30	70	1
		FGE 278: Computer Graphics	48	60	40	1
		Total	360			7.5
		<i>Total</i>	<i>720</i>			<i>15</i>
	<u>Semester 3</u>	FGE 299: Practical Project (8 weeks)	288	100	0	3
		Total	288			3
		Total	1008			18
Year III	<u>Semester 1</u>	FGE 311: Introduction to Geodesy	60	40	60	1.25
		FGE 341: Photogrammetry IA	60	40	60	1.25
		FGE 345: Remote Sensing Systems	60	40	60	1.25
		FGE 347: Geoinformation Systems A	60	40	60	1.25
		FGE 349: Geospatial Surface Modelling	48	40	60	1
		FGE 371: Engineering Mathematics IIA	48	30	70	1
		FGE 373: Numerical Methods	48	30	70	1
		Total	384			8
	<u>Semester 2</u>	FGE 302: Adjustment Theory	48	40	60	1
		FGE 322: Geospatial Positioning Techniques	60	40	60	1.25
		FGE 342: Photogrammetry IB	60	40	60	1.25

		FGE 344: Digital Cartography	60	40	60	1.25
		FGE 346: Digital Image Processing	48	40	60	1
		FGE 348: Geoinformation Systems B	60	40	60	1.25
		FGE 372: Engineering Mathematics IIB	48	30	70	1
		<u>Total</u>	<u>384</u>			<u>8</u>
		<i>Total</i>	<u>768</u>			<u>16</u>
	<u>Semester 3</u>	FGE 399: Practical Project (8 weeks)	288	100	0	3
		<i>Total</i>	<u>288</u>			<u>3</u>
		Total	1056			19
Year IV	<u>Semester 1</u>	FGE 421: Geospatial Reference Systems	60	40	60	1.25
		FGE 431: Engineering Surveying A	60	40	60	1.25
		FGE 441: Photogrammetry IIA	60	40	60	1.25
		FGE 447: Remote Sensing Applications	60	40	60	1.25
		FGE 433: Hydrographic Mapping	48	40	60	1
		FGE 461: Geotechnical and Foundation Engineering	48	40	60	1
		FGE 463: Water and Environmental Engineering	48	40	60	1
		<u>Total</u>	<u>384</u>			<u>8</u>
	<u>Semester 2</u>	FGE 432: Engineering Surveying B	60	40	60	1.25
		FGE 442: Photogrammetry IIB	60	40	60	1.25
		FGE 444: Digital Photogrammetry	60	40	60	1.25
		FGE 452: Cadastral Surveying	60	40	60	1.25
		FGE 462: Highway and Transportation Engineering	48	40	60	1
		FGE 464: Structural and Deformation Engineering	48	40	60	1
		FGE 466: Spatial Planning and Design	48	40	60	1
		<u>Total</u>	<u>384</u>			<u>8</u>
		<i>Total</i>	<u>768</u>			<u>16</u>
	<u>Semester 3</u>	FGE 400: Geospatial Engineering Camp (2 weeks)	96	100	0	1
		FGE 434: Hydrographic Mapping Project (1 week)	48	100	0	0.5
		FGE 499: Industrial Attachment (8 weeks)	288	100	0	3
		<i>Total</i>	<u>432</u>			<u>4.5</u>
		Total	1200			20.5
Year V	<u>Semester 1</u>	FGE 541: Land Registration Systems	60	40	60	1.25
		FGE 582: Principles of Management	60	40	60	1.25
		FGE 591: Project	96	100	0	2
		<i>Total (To choose 3 more)</i>	<u>216</u>			<u>4.5</u>
		<u>Electives</u>				

1 Geodesy and Geodynamics

FGE 511: Physical Geodesy	48	40	60	1
FGE 512: Geodynamics	48	40	60	1
FGE 514: Spherical Astronomy	48	40	60	1
FGE 516: Map Projections	48	40	60	1
FGE 517: Time and Timing	48	40	60	1

2 Positioning and Navigation

FGE 521: Satellite Positioning Systems	48	40	60	1
FGE 523: Navigation Systems	48	40	60	1
FGE 524: Vehicle Location and Navigation	48	40	60	1
FGE 525: Telemetry and Data Communication	48	40	60	1
FGE 526: Marine Positioning and Cadastre	48	40	60	1

3 Topometry and Measurement Systems

FGE 531: Medical Imaging and Topometry	48	40	60	1
FGE 532: Precision and Industrial Metrology	48	40	60	1
FGE 533: Mining and Tunnel Surveying	48	40	60	1
FGE 536: Laser Technology	48	40	60	1
FGE 537: Structural Deformation Analysis	48	40	60	1

4 Geoinformatics and Visualisation

FGE 542: Cartographic Animation	48	40	60	1
FGE 543: Close Range Imaging Systems	48	40	60	1
FGE 544: Web-Based Mapping	48	40	60	1
FGE 545: Spatial Data Mining	48	40	60	1
FGE 547: Digital Terrain Modelling	48	40	60	1

5 Land and Infrastructure Management

FGE 551: Land Administration and Management	48	40	60	1
FGE 552: Land Information Systems	48	40	60	1
FGE 553: Land Tenure Systems	48	40	60	1
FGE 554: Facility and Infrastructure Management	48	40	60	1
FGE 561: Environmental Planning and Management	48	40	60	1

Total 144 3

Total 360 7.5

<u>Semester 2</u>	FGE 504: Professional Practice	48	40	60	1
	FGE 544: Geospatial Data Infrastructures	60	40	60	1.25
	FGE 546: Cartographic Map Design and Production	60	40	60	1.25

FGE 556: Land Law	48	30	70	1
FGE 582: Management of Engineering Systems	48	30	70	1
FGE 592: Project	96	100	0	2
<u>Total</u>	<u>360</u>			<u>7.5</u>

3. STUDENT ENROLMENT

A. Undergraduate	
First Year	44
Second Year	48
Third Year	39
Fourth Year	27
Fifth Year	36
B. Postgraduate (M.Sc. GIS)	
First Year	21
Second Year	16
C. Ph.D:	3

4. INTERNATIONAL STUDENTS

There are two international students in the Department. One is in his 3rd Year of study and comes from Uganda while the second is completing his M.Sc. (GIS) studies and comes from Rwanda.

5. RESEARCH ACTIVITIES

A. Research Interest

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

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.

Okumu, B. M. Impact of geo - referencing on demarcated large cooperative society farms

6. INTERNATIONAL LINKS AND COLLABORATIONS

The Department links with the Department of Geography at the University of Helsinki which has seen 2 Ph.D scholarships awarded:

- (i) Samuel Nthuni Mwenje (Staff member) and working on the topic: Identification of Tree Species using Airborne Hyperspectral Data
- (ii) Dickens Odeny and working on the topic: : Assessing forest biodiversity and carbon storage in the East Africa Mountains

7. PUBLICATIONS

Siriba, D. N., Mwenda, J. N. and Dalyot, S. (2014). Time-enabled two-dimensional digital cadastre: Case of the Kenyan cadastre, <<http://www.ingentaconnect.com/content/maney/sre/2011/00000043/00000323/art00003>> South-Eastern European Journal of Earth Observation and Geomatics, vol. 3, no. 1s, pp. 109 -121.

Awange, J. and Kiema, J.B.: Environmental Geoinformatics (Monitoring and management) ISBN 978 -3-642-34084-0

8. CONSULTANCIES

Project: Since June 2013: Stockpile volume determination for quarterly stock taking,
Client: The East African Portland Cement Company
Period: 30th June 2013, 30th September 2013 and 31st Dec. 2013.
Lead consultant: Dr. S.M. Musyoka

Project: Disaster Risk Reduction World Mapping of UNESCOs Point of Interest at Mathare Area in Nairobi County, Kenya;

Client: UNDP

Lead consultant: Dr. F. N. Karanja

9. NUMBER OF STAFF AND THEIR DESIGNATION

Professor	-	2
Associate Professor	-	2
Senior Lecturer	-	3
Lecturer	-	5
Asst. Lecturer	-	0
Graduate assistant	-	1
Tutorial Fellow	-	1

Chief Technologist	-	1
Senior Technologist	-	3
Technologist	-	3
Secretary	-	2
Driver	-	1
Total	-	24

10. NUMEBER OF GRADUANDS

Program	Female	Male	Total
B.Sc. (Geospatial Eng.)	11	18	29
M.Sc. (GIS)	4	8	12
Ph.D	0	1	1

11. PAPERS PRESENTED AT CONFERENCES

Karanja, F. N. and Matara, S.: The Transformation From Green To Concrete Cities; A Remote Sensing Perspective, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XL-1/W1, 163-166, doi:10.5194/isprsarchives-XL-1-W1-163-2013, 2013.

Karanja, F.N. and Ngigi P. N.: The Role Of Remote Sensing In The Sustainable Management Of Wetlands, Africa Leader Conference on Space Science and Technology, October 2013, Accra, Ghana.

Karanja, F.N.: The Spatial Dimension To The Effective Disbursement By Financial Intermediaries Of The Women Enterprise Fund, Regional Conference of the International Network of Women Scientists and Engineers (INWES), “Innovative Programs and Strategies to Increase the number and Career Successes of Women in Science, Technology, Engineering & Mathematics (STEM)” 19-21 November 2013, Nairobi, Kenya.

Nthuni, S. M.; Heiskanen, J.; Karanja, F.N.; Thijs, K. W.; Pellika, P.: Spectral Discrimination Of Indigenous Forest Tree Species Based On Airborne Aisa Eagle Vnir Data In The Taita Hills, Kenya. Poster Presented at the 8th EarSel Imaging Spectropy Workshop in Nantes, France 8th - 10th April 2013