OBAFEMI AWOLOWO UNIVERSITY
ILE-IFE, NIGERIA

5-YEAR B.Sc. DEGREE PROGRAMME IN SURVEYING AND GEOINFORMATICS

BY

DEPARTMENT OF ESTATE MANAGEMENT
FACULTY OF ENVIRONMENTAL DESIGN AND MANAGEMENT

5-YEAR B.Sc. DEGREE PROGRAMME IN SURVEYING AND GEOINFORMATICS

1.0 PHILOSOPHY AND OBJECTIVES OF THE PROGRAMME

Surveying and Geoinformatics is a professional programme registrable by Surveyors Council of Nigeria (SURCON) and a multi-disciplinary subject that serves as ally to disciplines in engineering (particularly civil engineering), environmental studies, analysis and planning. Surveying is the science that provides the spatial location of the earth's features and other environmental information, necessary for map production, designing engineering works, planning, location and exploitation of natural resources, as well as land administration. Geoinformatics is an integrated process for map and geoinformation production through the supporting technologies of Global Navigation Satellite System (GNSS), photogrammetry, remote sensing, cartography, geospatial information system and computer science. The programme is designed with a new vision and bias for the digital aspects of the profession. It also ensures adequate related knowledge of mathematics, physics, environmental sciences, law, finance and management studies needed by Surveyors.

Being one of the programmes classified under Environmental Studies by the National Universities Commission (NUC), the general aim of the programme is to produce competent graduates with sufficient contemporary theoretical knowledge and practical skills to deal with planning, design, construction, management and conservation of man-made and natural environment. Specifically, the programme aims at training students to acquire skill and technical know-how in the collection, analysis, storage, distribution, management and application of spatially referenced data. Students would therefore be given comprehensive training in Surveying and Geoinformatics which includes inter alia, traditional areas of surveying, photogrammetry, cartography and hydrography, as well as the comparatively new fields of Global Navigation Satellite System (GNSS) Positioning, remote sensing and other spatial information systems.

Objectives

Upon completion of the course, students should be able to:

i. provide spatial and other environmental information necessary for designing and planning of engineering works, as well as in the location, exploitation and administration of natural resources;
ii. contribute to the design and implementation of geospatial information production systems.
iii. manage geospatial information production systems to:
    - communicate with users
    - plan, direct and control production systems;
    - cost and price products and services
    - report on results.

2.0 JUSTIFICATION FOR THE PROGRAMME

The B. Sc. Programme in Surveying and Geoinformatics is justified at this time considering the fact that only thirteen (13) Universities are offering the programme in Nigeria (see Appendix I) leading to an acute shortage of surveying professionals in the country. As at November 2010, the total number of (registered) surveyors and whether in employment or private practice was 1,998. If we add the 1,245 pupil surveyors (survey graduates that are yet to be registered by Surveyors Council of Nigeria - SURCON) to this number, we have 3,243 graduate surveyors. With an estimated national population of 150 million, this gives a ratio of 1 graduate surveyor to 46,253 Nigerians.

The geographical spread of the Universities listed in the aforementioned Appendix also shows that of the thirteen Universities, six (6) are located in the East, four (4) in the North and three (3) in the entire old Western Region two of which (Federal University of Technology, Akure (FUTA) and Bells University, Ota) were established only in the last one year. Consequently, until January 2011 when FUTA admitted its first set of students, only University of Lagos was offering Surveying and Geoinformatics in the South-Western part of Nigeria at B.Sc. degree level. Experiences in the past six years also indicate that only about 20 percent of qualified UME/UTME, ND and HND candidates are usually able to gain admission to Surveying and Geoinformatics in the University of Lagos, in spite of the significant increase in the undergraduate student enrolment in the programme. Even if the admission quota for the programme is increased to cope with the increasing number of applicants, definitely, there is a limit to the number of students that the Department can cope with given the fact that the human and material resources of the Department are already being over stretched. The situation is the same in the other Universities offering the programme. This has therefore created a scarcity in the number of graduates in this discipline and it has been a source of great urgent concern in the surveying community.

Again, intuitively, less than 20% of land parcels in the country are surveyed and registered due to limited number of surveyors and funding thereby limiting the revenue base of Governments and the economic transactions power of the citizens.

In addition, Obafemi Awolowo University is particularly most suitable for a new degree programme in Surveying and Geoinformatics because of existing supporting facilities and human resources at the UNECA-sponsored Regional Centre for Training in Aerospace Surveys (RECTAS) for photogrammetry, GIS, digital mapping and remote sensing. There are also supporting facilities in the Department of Geography, Faculty of Environmental Design and Management as well as in the UNOOSA-affiliated African Regional Centre for Space Science and Technology Education – English (ARCSSTE-E).

Moreover, the department will provide excellent opportunity for foreign and Nigerian post-graduate diploma students of RECTAS and ARCSSTE-E to continue with their MSc and PhD studies in Geoinformatics and Space Science & Technology in the University thereby increasing the international visibility of the University. It is to be noted that the educational mandates of ARCSSTE-E include MSc degree programme in Space Science and Technology, and this is expected to be run in collaboration with the host University.

The proposed department would therefore be a perfect partner to ARCSSTE-E in the realization of this goal.

Job Opportunities

Nigeria as a Country has not been adequately surveyed and mapped over the years. This has been partly due to the slow processes of the classical methods of surveying but mainly to the dearth of Surveyors. There is also the need to contribute to the international efforts of determining the figure of the earth, studying the dynamics of crust including land masses, and ocean waters, and developing effective methods of data presentation including map making and digital/automated cartography. Modern developments of satellite surveying, remote sensing, geographic information system and land information management provide opportunities in various sectors of the national economy.

Graduates of Surveying and Geoinformatics are needed in several sectors of Nigerian economy such as in:

i. Federal Ministry of Works/Housing
ii. Federal Ministry of Housing/Urban Environments
iii. Office of the Surveyor General of the Federation and the States counterparts
iv. FHA & State Housing Development Corporations
v. FEPA & SEPAS
vi. State Ministry of Works/Housing
vii. Water Corporations & River Basin Development Authorities
viii. Nigerian Port Authority
ix. Oil Companies
x. Universities/Polytechnics & Similar Institutions
xi. Consultancy
xii. Marine Resource Agencies
xiii. Armed Forces
xiv. Federal Capital Development Authority (FCDA)
xv. NEPA
xvi. NITEL
xvii. Private Survey Companies, etc

3.0 DEGREE TO BE OFFERED

The nomenclature for the degree is Bachelor of Science in Surveying and Geoinformatics.

4.0 ADMISSION REQUIREMENTS

There are three modes of entry into the programme subject to the candidate satisfying the University's minimum entry requirements.

4.1 Admission to Part I

Holders of Senior Secondary School Certificate (SSSC) or its equivalent with five credits including English Language, Mathematics, Physics, Chemistry/Geography and any other

subject selected from Economics, Biology, Further Mathematics, and Technical Drawing at not more than two sittings, may gain entry into the programme by taking and passing the Unified Tertiary Matriculation Examination (UTME) organized by the Joint Admission and Matriculation Board (JAMB). Candidates writing the UTME must select English Language, Mathematics, Physics and one of Geography or Chemistry.

4.2 Admission to Part II (Direct Entry)

Candidates who satisfy the requirements specified below may be admitted into a four-year programme, in which case they start from the second year of the five-year standard programme. Candidates admitted by direct entry may be required, where applicable, to take specified courses to make up for the deficiencies found in their academic background. The requirements include:

i. Candidates, who have passes in Mathematics and Physics or Mathematics and Geography at the G.C.E. Advanced Level or its equivalent, and also satisfy the minimum entry requirements stipulated in section 4.1.
ii. Holders of the National Diploma (ND) in Surveying, Civil Engineering, Building and Agricultural Engineering passing at the minimum of Upper Credit level, from an NBTE accredited Institution. They must also satisfy the minimum entry requirements listed in 4.1.

4.3 Admission to Part III

Holders of Higher National Diploma (H.N.D.) in the field of Surveying who have a minimum of upper credit may be considered for admission to Part III in addition to satisfying the basic requirements as in 4.1. They will also be required to offer and pass MTH 201 and MTH 202 when admitted.

5.0 DURATION OF THE PROGRAMME

Students admitted through Senior Secondary School Certificate (SSSC) are expected to spend minimum period of five years to go through the programme. Students admitted through ND shall spend a minimum of four years, while those admitted through HND shall spend a minimum of three years.

6.0 REQUIREMENTS FOR THE AWARD OF DEGREE

To be eligible for the award of B.Sc. Surveying and Geoinformatics degree, the student must satisfactorily complete the minimum number of units prescribed for the degree as follows:

i. pass the normal course examinations including continuous assessment;
ii. satisfactorily complete the Industrial Work Experience Scheme in Part IV;
iii. pass all the special electives totalling 12 units and as prescribed by Senate;
iv. pass the total minimum units required for graduation as follows:
    a. UME candidates – 189
    b. Direct Entry to Part II -- 153
    c. Direct Entry to Part III – 118 (this includes 8 units of MTH 201 and MTH 202)

7.0 SIWES

Students Industrial Work Experience Scheme shall be for the students who passed all core and compulsory courses in Parts I, II and III. Those with outstanding courses can apply for deferment of SIWES.

8.0 EXAMINATIONS

Evaluation of students' performance shall be through normal course examination and continuous assessment of both lectures and practical/laboratory assignments.

8.1 Continuous Assessment

The continuous assessment shall cover 40% of the grade for each course.

8.2 End of Semester Examination

The examination at the end of the semester shall cover 60% of the total grade. The examination would normally take the form of written and/or oral examination as appropriate.

9.0 CATEGORIZATION OF COURSES:

University Special Elective Courses:
Candidates are required to take and pass 12 units of any of the special elective courses offered in Faculties other than theirs. Available special elective courses in the University include the following:

Code	Title	Faculty where offered
SEA 001	Government and the Administration of Public Sector	Administration
SEA 002	Elements of Business Administration	Administration
SEL 001	Introduction to Law	Law
SEL 002	Introduction to Legal Institutions and Processes	Law
SEM 001	Fundamentals of Building Design for Human Habitation	Environmental Design and Management
SEM 002	Issues in Land Management	Environmental Design and Management
SER 001	Use of English	Arts
SER 002	Humanities and the African Experience	Arts
SES 001	Man and the Physical World	Science
SES 002	Man and the Biological World	Science
SEH 001	Man and his Health	Health Sciences
SEH 002	Community Health and Man's Behaviour	Health Sciences

SEP 001	Drug and the Society I	Pharmacy
SEP 002	Drug and the Society II	Pharmacy
SET 001	Technology and Society I	Technology
SET 002	Technology and Society II	Technology
SEG 001	Food Production and the Nation	Agriculture
SEG 002	Agriculture and Human Survival	Agriculture

Courses from other Faculties:

PHY 101	General Physics I
PHY 102	General Physics II
PHY 107	Experimental Physics IA
PHY 108	Experimental Physics IB
MTH 101	Elementary Mathematics I
MTH 102	Elementary Mathematics II
FRN 105	Introduction to French Grammar
MTH 201	Mathematical Methods I
STT 201	Introduction to Statistics
CSC 201	Computer Programming I
MTH 202	Mathematical Methods II
STT 202	Probability Distributions I
CSC 202	Computer Programming II
PHY 311	Introduction to Astrophysics I
ECN 201	Principles of Economics I
MAC 203	Introduction to Financial Accounting I
ECN 202	Principles of Economics II
MAC 204	Introduction to Financial Accounting II
AGP 303	Introductory Exploration Geophysics
CSC 305	Introduction to Database Systems
JPL 401	Land Law I
ECN 301	Microeconomic Theory
ECN 410	Economic Planning
CSC 514	Computer Graphics
CSC 515	Database Design and Management

Faculty Courses:

ARC 103	Graphic Communication
ARC 104	Introduction to Architectural Graphics
ESM 201	Introduction to Valuation I
URP 312	Land Use Planning
ESM 202	Introduction to Valuation II
URP 409	Urban Renewal Techniques
ESM 503	Land Use and Resource Mgt

Surveying and Geoinformatics Core Courses:

SVG 101	Introduction to Surveying
SVG 102	Introduction to Photogrammetry and Remote Sensing
SVG 104	Introduction to Cartography

SVG 201	Fundamental Surveying
SVG 203	Practical Surveying I
SVG 205	Fundamental Photogrammetry
SVG 209	Fundamental Cartography
SVG 202	Large Scale Surveying
SVG 204	Topographic Surveying
SVG 206	Practical Photogrammetry I
SVG 208	Spherical and Field Astronomy
SVG 301	Electronic Surveying
SVG 303	Engineering Surveying
SVG 305	Elements of Geoinformatics
SVG 309	Adjustment Computations I
SVG 311	Cadastral Surveying I
SVG 313	Computer Applications in Surveying
SVG 302	Map Projection
SVG 304	Digital Mapping I
SVG 306	Elements of Geographic Information System
SVG 310	Remote Sensing I
SVG 312	Cadastral Surveying II
SVG 401	Geodetic Surveying
SVG 403	Remote Sensing II
SVG 405	Digital Mapping II
SVG 409	Adjustment Computations II
SVG 411	Hydrographic Surveying I
SVG 501	Survey Laws and Regulation
SVG 503	Digital Photogrammetry
SVG 505	Spatial Data Infrastructures
SVG 507	Physical Geodesy
SVG 511	Hydrographic Surveying II
SVG 513	Geospatial Project Planning & Management
SVG 515	Project Dissertation I
SVG 502	Professional Practice and Ethics
SVG 504	Cadastre and Land Information Management
SVG 506	Marine Surveying
SVG 508	Satellite Geodesy
SVG 510	Geometric Geodesy
SVG 516	Project Dissertation II

Surveying and Geoinformatics Elective Courses:

SVG 307	Analogue Photogrammetry
SVG 315	Hydraulics for Surveyors
SVG 318	Potential Theory and Spherical Harmonics
SVG 407	Technical Foreign Language (French)
SVG 413	Safety and Swimming in Surveying
SVG 509	GIS Tools and Applications
SVG 512	Laws of the Sea

10.0 SCHEDULE OF COURSES

HARMATTAN SEMESTER PART I

Course Code	Course Title	Prerequisite	L	T	P	U
SVG 101	Introduction to Surveying		2	1	1	3
PHY 101	General Physics I		3	1	0	4
PHY 107	Experimental Physics IA		0	0	3	1
MTH 101	Elementary Mathematics I		4	1	0	5
ARC 103	Graphic Communication		0	0	6	2
	Special Electives		2	1	0	2
TOTAL						17

RAIN SEMESTER PART I

Course Code	Course Title	Prerequisite	L	T	P	U
SVG 102	Intro. to Photogrammetry and Remote Sensing		2	1	1	3
SVG 104	Introduction to Cartography		1	0	3	2
PHY 102	General Physics II		3	1	0	4
PHY 108	Experimental Physics IB		0	0	3	1
MTH 102	Elementary Mathematics II		4	1	0	5
ARC 104	Intro. to Architectural Graphics		0	0	6	2
	Special Electives		2	0	0	2
TOTAL						19

HARMATTAN SEMESTER PART II

Course Code	Course Title	Prerequisite	L	T	P	U
SVG 201	Fundamental Surveying		2	1	0	3
SVG 203	Practical Surveying I		0	0	4	1
SVG 205	Fundamental Photogrammetry	SVG 102	2	0	0	2
SVG 209	Fundamental Cartography		1	0	3	2
MTH 201	Mathematical Methods I	MTH 102	3	1	0	4
STT 201	Introduction to Statistics		2	1	0	3
CSC 201	Computer Programming I		2	0	3	3
	Special Electives		2	0	0	2
TOTAL						20

RAIN SEMESTER PART II

Course Code	Course Title	Prerequisite	L	T	P	U
SVG 202	Large Scale Surveying		2	0	0	2
SVG 204	Topographic Surveying		2	0	3	3
SVG 206	Practical Photogrammetry I		0	0	4	1
SVG 208	Spherical and Field Astronomy		2	0	3	3
MTH 202	Mathematical Methods II		3	1	0	4
STT 202	Probability Distributions I		2	1	0	3
CSC 202	Computer Programming II	CSC 201	0	0	6	2
	Special Electives		2	0	0	2
TOTAL						20

HARMATTAN SEMESTER PART III

Course Code	Course Title	Prerequisite	L	T	P	U
SVG 301	Electronic Surveying		2	0	0	2
SVG 303	Engineering Surveying		2	0	0	2

SVG 305	Elements of Geoinformatics		2	0	0	2
CSC 305	Introduction to Database Systems		2	1	0	3
SVG 311	Cadastral Surveying I		2	0	0	2
SVG 313	Computer Applications in Surveying		1	0	3	2
PHY 311	Introduction to Astrophysics I		2	0	0	2
	Special Electives		2	0	0	2
	Sub Total					17
	Restricted Electives (2/3 units from below)					
SVG 307	Analogue Photogrammetry		2	0	2	2
SVG 315	Hydraulics for Surveyors		2	0	0	2
ESM 201	Introduction to Valuation I		1	1	0	2
ECN 201	Principles of Economics I		2	1	0	3
MAC 203	Introduction to Financial Accounting I		2	1	0	3
TOTAL						19/ 20

RAIN SEMESTER PART III

Course Code	Course Title	Prerequisite	L	T	P	U
SVG 302	Map Projection		2	0	0	2
SVG 304	Digital Mapping I		2	0	0	2
SVG 306	Elements of Geographic Information System		1	0	3	2
SVG 310	Remote Sensing I		2	0	3	3
SVG 312	Cadastral Surveying II		2	0	3	3
SVG 316	Adjustment Computations I		2	1	0	3
	Special Electives		2	0	0	2
	Sub Total					17
	Restricted Electives (2/3 units from below)					
SVG 318	Potential Theory and Spherical Harmonics		2	1	0	3
URP 312	Land Use Planning		2	1	0	3
ESM 202	Introduction to Valuation II		2	0	0	2
ECN 202	Principles of Economics II		2	1	0	3
MAC 204	Intro to Financial Accounting II		2	1	0	3
TOTAL						19/ 20

HARMATTAN SEMESTER PART IV

Course Code	Course Title	Prerequisite	L	T	P	U
SVG 401	Geodetic Surveying		2	0	3	3
SVG 403	Remote Sensing II		2	0	3	3
SVG 405	Digital Mapping II		2	0	4	3
SVG 409	Adjustment Computations II		2	1	0	3
SVG 411	Hydrographic Surveying I		1	0	4	2
	Special Electives		2	0	0	2
	Sub Total					16
	Electives (4/5 units from below)					
AGP 303	Introductory Exploration Geophysics		2	1	0	3
URP 409	Urban Renewal Techniques		2	0	3	3
JPL 401	Land Law I		3	1	0	3
FRN 105	Introduction to French Grammar		2	1	0	3

SVG 407	Safety and Swimming in Surveying		1	0	3	2
TOTAL						20/ 21

RAIN SEMESTER PART IV

Course Code	Course Title	Prerequisite	L	T	P	U
SVG 402	Industrial Attachment					15
TOTAL						15

HARMATTAN SEMESTER PART V

Course Code	Course Title	Prerequisite	L	T	P	U
SVG 501	Survey Laws and Regulation		2	0	0	2
SVG 503	Digital Photogrammetry		2	0	3	3
SVG 505	Spatial Data Infrastructures (SDI)		1	0	3	2
SVG 507	Physical Geodesy		2	1	0	3
SVG 511	Hydrographic Surveying II		2	0	3	3
SVG 513	Geospatial Project Planning & Management		2	0	0	2
SVG 515	Project Dissertation I		0	0	8	3
	Sub Total					18
	Electives (2/3 units from below)					
SVG 509	GIS Tools and Applications		2	0	3	3
ESM 503	Land Use and Resource Mgt		1	1	0	2
ECN 301	Microeconomic Theory	ECN 201	2	0	0	2
CSC 515	Database Design and Management		2	0	0	2
TOTAL						20/ 21

RAIN SEMESTER PART V

Course Code	Course Title	Prerequisite	L	T	P	U
SVG 502	Professional Practice and Ethics		2	1	0	3
SVG 504	Cadastre and Land Information Management		2	0	0	2
SVG 506	Marine Surveying		2	0	0	2
SVG 508	Satellite Geodesy		2	1	0	3
SVG 510	Geometric Geodesy		2	1	0	3
SVG 516	Project Dissertation II		0	0	8	3
	Sub Total					16
	Electives (2 units from below)					
SVG 512	Laws of the Sea		2	0	0	2
ECN 410	Economic Planning		2	0	0	2
CSC 514	Computer Graphics		2	0	0	2
TOTAL						18

11.0 SYNOPSES OF COURSE

YEAR	**First Semester**			**Second Semester**			**Requirements for Degree**
	Compulsory	Available Electives	Minimum Electives	Compulsory	Available Electives	Minimum Electives	
I	15	2	2	17	2	2	36

II	18	2	2	18	2	2	40
III	15	14	4	15	16	4	38
IV	14	15	6	15	0	0	35
V	18	07	2	16	6	2	38
Total	80	40	16	81	26	10	**187**

12.0 DESCRIPTION OF COURSES

SVG 101: Introduction to Surveying (3 Units)
History of Surveying; definition of Surveying; principles, classes and uses of Surveying; methods used in Surveying; fields of study in Surveying; practice of Surveying and qualities of a Surveyor; National and International Surveying Organizations; employment opportunities in Surveying and Geoinformatics; uses and care of simple surveying instruments.

SVG 102: Introduction to Photogrammetry and Remote Sensing (3 Units)
Introduction and historical sketch of the developments in the concept, instrumentation and methods of photogrammetry and remote sensing; basic concepts and definitions; parts of an aerial photograph and uses of aerial photographs; use and care of pocket and mirror stereoscopes; monocular and binocular viewing; stereoscopic observations; photographic processes and materials; photo interpretation; basic principles of remote sensing.

SVG 104: Introduction to Cartography (2 Units)
Introduction and historical sketch of the developments in the concept; instrumentation and methods of cartography; definition and objectives of cartography; elements of plan and map construction; drawing surfaces and tools, media of cartographic communication such as lettering, typography, conventional signs; colours, scales and relationships; applications to the plotting of chain surveying, and compass traverse.

SVG 201: Fundamental Surveying (3 Units)
The principles of surveying measurements of magnetic directions or bearing, horizontal lengths or distances, vertical lengths or differences in height or elevation, horizontal angles measured in horizontal planes, and vertical angles measured in vertical planes. Study of the design, adjustment, use and care of surveying instruments such as compasses, steel tapes, theodolites, spirit levels (including tilting and automatic), targets and staves. Compass and theodolite traversing for position and area determination; and longitudinal, cross-sectional and grid levelling for profile determination and contouring.

SVG 202: Large Scale Surveying (2 Units)
Coordinate transformations; open, closed and loop traverses and traverse networks; handling problems created by obstacles to ranging and/or chaining; missing lengths of a traverse; rigorous and semi-rigorous computation, check computation and adjustment; error analysis and obtainable accuracy; principles and instrumentation for subtense traversing and tacheometry. Preparation of large scale maps for engineering, planning,

and cadastral purposes; establishment of layouts; re-establishment of lost boundary beacons; and setting out simple engineering structures such as building foundations, airports and road stretches.

SVG 203: Practical Surveying I (1 Unit)
Demonstration of the adjustment, use and care of the surveying instruments studied in SVG 101 and SVG 201. Practical plane surveying of specified area at a scale of 1: 1000 involving (a) traversing, (b) grid levelling and contouring, (c) fixing of details of natural and man-made features.

SVG 204: Topographical Surveying (2 Units)
Concepts and development of topographic mapping; methods of topographic control survey and mapping process. Methods of establishing horizontal controls – design and construction of signals, beacons and towers; reconnaissance, triangulation, trilateration, traversing, intersection and resection. Topographic heightening – benchmarks, precise spirit levelling, and trigonometric levelling. Methods of detail mapping. Relation of topographic survey to photogrammetric techniques and medium scale mapping methods.

SVG 205: Fundamental Photogrammetry (2 Units)
Photogrammetric use of single and overlapping photos; lenses; design and operation of aerial cameras, camera calibration; Nature and interpretation of aerial photographs; Spatial geometry of vertical and tilted photographs; Procedure and methods of deriving metric data from photographs; Parallax heightening; rectification; orthophoto maps; Preparation and use of mosaics; Flight planning.
Pre-requisite: SVG 102.

SVG 206: Practical Photogrammetry I (1 Units)
Laboratory exercises on the practical application of SVG 205: The uses of the characteristics of photo imagery in interpretation for topographic mapping. Small-scale photo interpretation. Exercise on photo pointing, parallax heightening, map revision, rectification, orthophotography and derivation of metric data from aerial photographs. Care of photogrammetric instruments.

SVG 208: Spherical and Field Astronomy (2 Units)
Nature of the universe and solar system. Celestial sphere. Solution of Astronomical Triangle. Astro coordinates systems. Time Systems. Star Catalogues and Charts. Use of Star Almanac. Solar and Stellar observations. Corrections to observed altitudes and azimuths. Determination of azimuth, latitude and longitude. Position line method. Practical determinations and computations.

SVG 209: Fundamental Cartography (2 Units)
Reading and interpretation of large and small scale maps including hydrographic charts. Methods of referencing map features; the rationale and the methods of choice and change of scales and colours; methods of relief representation; and graphic and mechanical measurement of areas and slopes. Applications to plotting (scale 1: 1000), contouring and fair drawing of the field notes collected in the practical exercise of SVG 203.

SVG 301: Electronic Surveying (2 Units)
History of Electronic Surveying. Review of properties of electromagnetic waves: formation, modulation and propagation. Principles of phase comparison. Group velocity: transmitters, receivers, antenna. Optics, spherical waves, interference and diffraction, thin film, crystal diffraction, holography, dispersion and scattering. Electromagnetic Distance Measuring (EDM) instruments. Errors: instrumental and atmospheric. Interferometric methods of baseline measurements

SVG 302: Map Projection (2 Units)
Introduction: Historical background, definition and purpose of map projections; classification of common projections and theory of cone as a basic developable surface; datum surfaces and coordinate systems; Gaussian fundamental quantities; basic definitions – convergence, scale, torsion, etc. Theory of Distortions: The Tissot Indicatrix; directional, angular, length and area distortions; Orientation of the Tissot Indicatrix. Common projections: characteristics and mapping equations of azimuthal, conic and cylindrical projections – applying distortion theory to normal cases, for the sphere. Transverse Mercator, Universal Transverse Mercator, the Nigerian Projection system (Modified Transverse Mercator) and practical computations. Generalized mapping equations and general theory of projection from ellipsoid to the sphere and to plane.

SVG 303: Engineering Surveying (2 Units)
Review of the methods of preparation of Large scale topographic maps, Orthophoto maps, digital terrain models, and mosaics, for engineering planning and design. Setting out engineering works including ranging circular, transition, and vertical curves. Computation of areas and volumes from field measurement. Mass Hull diagram.

SVG 304: Digital Mapping I (2 Units)
Definitions; Components of digital mapping system: input and output devices; Review of digital mapping software and their capabilities; Execution of digital mapping project; Establishment of digital topographic database.

SVG 305: Elements of Geoinformatics (2 Units)
General knowledge of the concepts in Geoinformatics: Objectives, Tools: hardware and software. Real world environment; Basic model of space: field-based versus object-based concepts of real world; Databases as abstractions of the real world; Metric and topologic dimensions of geospatial databases: 2D, 2.5D, 3D and 4D. Equipment and procedures for the abstractions including Land Surveying, Photogrammetric and Remote Sensing instruments and procedures; Components of terrain object: spatial and non-spatial; Applications of geoinformation technology.

SVG 306: Elements of Geographic Information System (2 Units)
Definitions; GIS and generalized information systems; components of a GIS; GIS subsystems; GIS in relation with other related packages such as CAD, CAC, DBMS and DMS. Components of a spatial database; overview of spatial data models: tessellation data models, vector data models, object-oriented data models; Overview of GIS implementation steps. Equipment and procedures for analogue to digital geospatial data conversion including digitizing and scanning using digitizing tablets and scanners;

Storage of spatial and non-spatial data; Basic operations on a geographic database such as simple query, selection of specified data, data analysis and graphic display of features.

SVG 307: Analogue Photogrammetry (2 Units)
Projective relations in photogrammetry and concept of parallax. Differential formulae. Map compilation using analogue stereo-plotter. Methods of relative and absolute orientations; photogrammetric plotting of stereo models. Model deformation studies. Stereoplotting instruments. Ground controls in photogrammetry. Rectification and Orthophoto.

SVG 308: Geodetic Astronomy (3 Units)
Study of the basic formulae of spherical trigonometry. The definition of the celestial sphere and its coordinate systems. Time element in field astronomy. Star charts, catalogues and ephemerides. Field procedures, instrumentation, and error analysis for the determination of azimuth, latitude, longitude and time. The use of solar ephemeris and the apparent places of fundamental stars. Introduction to star updating, timing systems and instrumentation for higher order determinations of azimuths and positions.

SVG 310: Remote Sensing I (3 Units)
Concepts and basic principles of remote sensing. Electromagnetic radiation and spectrum. Energy sources and interaction with the atmosphere and earth features. Reflectance and spectral signature. Single lens, multiple lens, strip and panoramic cameras. Remote Sensing platforms. Remote sensing systems: photographic, electro-optical and microwave imaging systems.

SVG 311: Cadastral Surveying I (3 Units)
General scope of Cadastral Surveying; Rules and regulations governing demarcation; Cadastral boundary survey; Connection of cadastral survey to controls; Cadastral traverse; computation of co-ordinates and Areas; Production of original plans and their uses. Methods of minesfield Surveys.

SVG 312: Cadastral Surveying II (3 Units)
Cadastral Layout Surveys; Preparation of Cadastral Layout; Basic setting out processes; Survey procedure for cadastral surveying; Compensation survey; Application of EDM and ODM, Digital Theodolite, Total Station and GPS in Cadastral Surveying; Laws and Regulations Governing Cadastral Surveying.

SVG 313: Computer Applications in Surveying (2 Units)
Computer programming in Fortran, Visual BASIC and C/C^{++}. File handling; Programs development for the solution of problems in Land Surveying, Geodesy and Photogrammetry, Remote Sensing, Hydrography and Cartography.

SVG 315: Hydraulics for Surveyors (2 Units)
Properties of fluid – static and dynamics, pressure on immersed surface, force of fluids on walls and columns. Continuity, Bernoullis principles, laminary and turbulent flow; specific energy, river capacity and channel resistance, canals and energy losses, river morphology and regulation.

SVG 316: Adjustment Computations I (3 Units)
Theory of errors with application to surveying measurement and computation. Propagation of systematic and random errors. Statistical analyses of observations and derived parameters. Review of matrix algebra and matrices. Theory of least squares. Linearization of functions; formation of observation and condition equations with surveying and photogrammetry applications.

SVG 318: Potential Theory and Spherical Harmonics (3 Units)
Fundamentals of potential theory; Harmonic functions, Legendre's functions and spherical harmonics, Boundary value problems of potential theory and their applications to the representation of earth's gravity field.

SVG 401: Geodetic Surveying (3 Units)
Horizontal Controls: Design of 1^{st} and 2^{nd} order systems; Higher order instruments – choice, use, care and accuracy; Methods of field data collection; Theory of reducing earth-surface measurements onto the reference ellipsoid; Methods of computations on the reference ellipsoid. Vertical controls; Design of 1^{st} and 2^{nd} order networks; Study of the design, care and use of precise levels including their accuracies. Data collection, reduction and adjustment.

SVG 403: Remote Sensing II (3 Units)
Radar, Earth Orbiting Remote Sensing Satellites. Temperature, depth and aerial estimation by remote sensing. Image processing: Analogue (brief); Digital: radiometric corrections, geometric corrections, image enhancement, image filtering; Manual and automated image interpretation and classification. Classification: supervised, unsupervised and object-based. Accuracy of classification. Presentation of remote sensing data.

SVG 405: Digital Mapping II (2 Units)
Definition; Digital Mapping Input Devices: Digitizers and scanners; Digital Mapping Output Devices: Hard copy output devices (Plotters), VDU, printer, etc; Coordinate transformation for orthogonal and perspective projections; Data structures for computer graphics; computer-assisted cartography; generalization, symbolization, hill shading; Digital mapping production flow line (from photogrammetry, Remote Sensing and Land Surveying to presentation), Digital Mapping software packages; Web mapping; crowd-sourcing for community mapping; cloud computing.

SVG 407: Safety and Swimming in Surveying (2 units)
Definition of safety, Importance of safety, The general rule regarding first aid treatment, Safety of equipment and people at work. Prevention and protection against the effects of fires/ chemical splash, Right attitude to safety methods of reporting accidents:- factual reporting, Road Traffic Accident (RTA), Loss To Injury (LTI). Near-misses, Total man hours road traffic signs and defensive driving,
Rudiments of swimming, buoyancy, arm and leg actions, Safety rules in swimming. Staminar development, Different styles of swimming. The art of suspension in swimming. Maintenance of pool equipment and facilities. Use of swimming floats and pods.

SVG 409: Adjustment Computations II (3 Units)
Observation Equations with functional constraints; combination of Observation Equations and Condition Equations (Mixed Model), Normal equations and solutions: Gauss-Doolitile, Banachiewicz, Choleski and Block matrices partitioning methods. Weight assignment; Estimation of a-priori and a-posteriori variance factor and variance/covariance matrices; error ellipse, statistical tests on residuals and variances, observations and adjusted values; Applications to Surveying and Photogrammetry.

SVG 411: Hydrographic Surveying I (2 Units)
Controls for inland waters and offshore. Position fixing: linear optical and EPF techniques. Introduction to satellite navigator, planning and data analysis of soundings. Fundamentals of under-water acoustics, echo sounders, swathe sounders. Reference levels and mean sea level. Introduction to geophysical survey. Gauges, tide observation, chart datum transfer. Discharge measurements for inland waters and estuaries. Sediment transport. Coastal zone management.

SVG 501: Survey Laws and Regulations (2 Units)
The evolution of the Nigerian Survey Laws and Regulations. Study of the Laws of the Federal Republic of Nigeria Acts of Parliament, Military Decrees and Edicts that relate to the Surveying Professional practice. Comparative study of the survey laws and regulations of other countries. Federal and state departmental instructions as they relate to the execution of surveying jobs. Applications to cadastral surveying. Principles and guidelines for a National Mapping Policy. Study of the National Geoinformation Policy.

SVG 502: Professional Practice and Ethics (3 Units)
Areas of professional practice and essential services rendered. Professional bodies and their functions. Surveyors' Council of Nigeria (SURCON) and the Nigerian Institution of Surveyors (NIS). Control of the profession. Code of Ethics. Costing of Cadastral, Topographical, Engineering and Hydrographical Surveys. Costing of mapping projects. Expert evidence at the court with regard to the practice of the profession of surveying.

SVG 503: Digital Photogrammetry (2 Units)
Basic concepts. Digital Orientation; Aerial triangulation; Digital orthophoto generation from aerial and satellite images. Production of Digital Terrain Models (DTM); Data sources; Interpolation methods; Thiessen polygons, Delaunay Triangulation; DTM structures: Grid, regular and irregular structures; Triangulated Irregular Network (TIN); Contouring; Surface visualization; Perspective views; Application of DTM; Linking DTM and planimetric (2D) data model: DTM packages. LiDAR and Laser Scanning.

SVG 504: Cadastre and Land Information Management (2 Units)
The concept and benefits of cadastre. The historical development and the technical requirements for the development of cadastre. The concept of the multi-purpose cadastre. The concept of land information management. Information storage, maintenance and retrieval. Data storage media. Introduction to computerized data system; data organization; databases and database management systems. Requirements for land information management including referencing framework, detailed surveying and

mapping. Cost benefit analysis of land information system.

SVG 505: Spatial Data Infrastructure (2 Units)
Concept of infrastructure; definition of spatial data infrastructure (SDI); components of SDI: geospatial standards, metadata, clearinghouse; Geo- portals; legal and policy aspects of SDI.

SVG 506: Marine Surveying (2 Units)
Coastal Engineering. Siltation and Erosion. Coastal zone management. Demarcation of harbour limits. Shipping and harbour laws. Position fixing. Large scale surveys, dredging. Effects of wind and wave on seabed. Oceanographic equipment. Tidal Current Measurement.

SVG 507: Physical Geodesy (3 Units)
The earth and its Gravity field; Gravity; history, potential, Laplace and Poisson equations; potential functions: Normal gravity and Stokes' theorem; Gravity anomalies; the geoid, its classical and modern determination, geoidal undulations and deflections of the vertical; Height systems. Measurements of gravity, pendulum, free fall, rise and fall, torsion balance and gravimeters. Gravity reduction methods. Compilation of gravity anomaly maps.

SVG 508: Satellite Geodesy (3 Units)
Variations in the celestial coordinates: precession, nutation, polar motion, aberration, parallax, refraction, proper motion and reduction of star positions. The Astronomical Almanac, the solar and lunar ephemerides. Geometric and dynamic applications of artificial earth's satellites to position, earth's figure and gravity field determinations; the Doppler and Global Navigation Satellite System (GNSS). The principles and applications of Very Long Base Interferometry (VLBI). Principles, implementation and uses of Continuously Operating (GNSS) Reference Station (CORS)

SVG 509: GIS Tools and Applications (3 Units)
GIS hardware & software; Classification of GIS software; Design and implementation of prototypes for various applications e.g. agriculture, water resources management, environmental management, utilities, etc.

SVG 510: Geometric Geodesy (3 Units)
The principal aims of geodesy. Historical sketch and development of the concepts and methods of determining the figure of the earth. The geometry of the ellipsoid including the definitions and derivations of formula for radii of curvature, normal sections, and the geodesics. Coordinates transformation and inter-conversion. Solution of small spherical triangles. Direct and inverse geodetic problems. The concept of datum and datum transformation-Clarke 1880 ellipsoid and the WGS 1967, 1972, 1984 and 1980.

SVG 511: Hydrographic Surveying II (3 Units)
Quality control. Basic theory of tides, tidal constituents and modulation. Harmonic tidal analysis, harmonic and non-harmonic tidal prediction. Observation and analysis of tidal streams. Basic theory of waves, wave refraction and reflection, wave energy. Shore processes. Introduction to oceanography.

SVG 512: Laws of the Sea (2 Units)
Reliability of Charts: Information on charts, navigation aids. Maritime boundaries: Territorial sea and International waters, baselines, continental shelf, Exclusive Economic Zone (EEZ), contiguous zones. Case studies on maritime boundary disputes. Maritime boundary demarcation: Equi-ratio and equi-distant methods, beacon fishing, pollution and Mineral Prospecting/exploitation zones. Nigerian Territorial boundaries Arch pelagic States.

SVG 513: Geospatial Project Planning and Management (2 Units)
Management of Information System; Project Planning and Execution; Data standards; Costing of geospatial projects; Building of GIS; User Requirement studies, feasibility studies, functional requirements; pilot project and bench marking; staff motivation; cost-benefit appraisal.

SVG 515: Project Dissertation I (3 Units)
Study of research principles and techniques. Selection of Project Topics and writing of Research proposal.

SVG 516: Project Dissertation II (3 Units)
Project execution including data collection, processing, analysis and presentation. Preparation of the Project Report.

13.0 EVALUATION

The assessment of students' progress will be done through a combination of the following methods:

- Formal examinations
- Laboratory reports
- Problem solving exercises
- Oral presentation
- Planning, conduct and reporting of individual/group project work.