NATIONAL BOARD FOR TECHNICAL EDUCATION

NATIONAL DIPLOMA (ND)

IN

SURVEYING AND GEOINFORMATICS

CURRICULUM AND COURSE SPECIFICATIONS

2006

PLOT 'B' BIDA ROAD, PM.B. 2239, KADUNA - NIGERIA

1.0 CERTIFICATE AND TITLE OF THE PROGRAMME:

The Certificate to be awarded and the programme title shall read: "NATIONAL DIPLOMA (ND) IN SURVEYING AND GEO-INFORMATICS" and "HIGHER NATIONAL DIPLOMA (HND) SURVEYING AND GEO-INFORMATICS" respectively. A transcript showing all the courses taken and grades obtained shall be issued together with the certificate.

2.0 GOALS AND OBJECTIVES:

2.1 National Diploma Programmes:

The National Diploma Programme in Surveying and Geo-Informatics is aimed at producing diplomates that can demonstrate sound understanding of the methods and instruments used in Geo-Informatics. On the completion of this programme, the diplomate should be able to:

1. Interpret spatial measurements from various sources;
2. Operate Geo-Informatics instruments;
3. Carry out cadastral survey to define boundaries of land;
4. Apply the basic principles of surveying and method in Geo-Informatics;
5. Interpret imageries;
6. Compile maps at various scales from imageries; and
7. Carry out cartographic processes for presentation of Geo-Informatics.

2.2 Higher National Diploma Programme:

The Higher National Diploma Programme in Surveying and Geo-Informatics is aimed at producing diplomates with a good mastery of the methods and instrumentation used in Geo-Informatics. On completion of this programme, the student should be able to:

(i) Operate various Geo-Informatics equipment;
(ii) Use land administration procedures in various cadastral system
(iii) Carry out engineering surveys for physical developments such as roads, railways, dams, pipelines, large industrial sites, utilities, etc.
(iv) Carry out geodetic and topographical surveys for controlling all survey works and for geo-informatics production;
(v) To acquire spatial data using photogrammetric and remote-sensing techniques.
(vi) Carry out Cartographic process for Geo-Information production;

(vii) Carry out hydrographic survey;
(viii) Apply the basic principles of management in solving, at appropriate level, management and supervisory problems related to Geo-Informatics environment.
(ix) Apply geo-information technology in environmental mapping, monitoring and protection; and
(x) Manipulate a geographic information system for geo-information production.

3.0 ENTRY REQUIREMENTS:

3.1 National Diploma Programme:

Applicants with the following qualifications may be considered for admission into the National Diploma Programme by direct entry:

(i) SSCE or its equivalents with credit passes in Mathematics and Physics and any other two subjects from the following: Statistics, Further Mathematics, Chemistry, Technical Drawing, Basic Surveying, Geography, Economics, Biology/Agricultural Science and at least a pass in English Language at not more than two sittings.

(ii) Four credit passes in relevant subjects as stated in (i) above obtained at the final examination of an NBTE recognised preliminary ND Programme offered in Polytechnic or similar post-secondary technical institution.

OR

(iii) NTC in Building Trades in relevant subjects as stated in (i) above

3.2 Higher National Diploma Programme:

Applicants with all the following qualifications may be considered for admission in the Higher National Diploma Programme by direct entry:

(i) The entry requirements or the National Diploma Programme in 3.1 above.
(ii) National Diploma in Surveying and Geo-Informatics with a minimum of lower credit pass; and
(iii) A minimum of one year Post-National Diploma cognate work experience in the field of Surveying and Geo-Informatics.

4.0 **CURRICULUM:**

4.1 **The curriculum of all ND and HND programmes consists of four components These are:**

(i) General Studies/Education
(ii) Foundation Courses
(iii) Professional Courses
(iv) Supervised Industrial Work Experience Scheme (SIWES)

4.2 **The General Education component shall include courses in Art and Humanities** English Language, Communication, History.

These are compulsory. **Mathematics and Science** (for non-science based programmes) **Social Studies** - Citizenship (the Nigerian Constitution) Political Science, Sociology, Philosophy, Geography, Entrepreneurship, Philosophy of Science and Sociology are compulsory. The General Education component shall account for not more than 15% of total contact hours for the programmes

4.3 **Physical and Health Education** (one semester credit only).

4.4 **Foundation Courses** include courses in Economics, Mathematics, Pure Sciences technical drawing, descriptive geometry, statistics, etc.

The number of hours will vary with the programme and may account for about 10 -15% of the total contact hours.

4.5 **Professional Courses** are courses which give the student the theory and practical skills he needs to practice his field of calling at the technician/technologist level. These may account for between 60 - 70% of the contact hours depending on programme.

4.6 **Supervised Industrial Work Experience Scheme (SIWES)** shall be taken during the long vacation following the end of the second semester of the first year. See details

5.0 **CURRICULUM STRUCTURE:**

5.1 **ND Programme:**

The structure of the ND programme consists of four semesters of classroom, laboratory and workshop activities in the college - and a semester (3-4 months) of supervised industrial work experience scheme (SIWES). Each semester shall be of 17 weeks duration made up

as follows: 15 contact weeks of teaching, i.e. lecture, recitation, and practical exercises, etc.; and 2 weeks for tests, quizzes, examinations and registration. SIWES shall take place at the end of the second semester of the first year.

5.2 **HND Programme**:

The structure of the programme is similar to that of the ND save that the SIWES at the end of the first year is not compulsory.

6.0 ACCREDITATION:

Each programme offered either at the ND or HND level shall be accredited by the NBTE before the diplomates can be awarded either of the diploma certificates. Details about the process of accreditating a programme for the award of the ND or HND are available from the Executive Secretary, Programme Department, National Board for Technical Education, Plot B, Bida Road, P.M.B. 2239, Kaduna, Nigeria.

7.0 CONDITIONS FOR THE AWARD OF THE ND/HND:

Institutions offering accredited programmes will award the National Diploma to candidates who successfully completed the programme after passing prescribed coursework, examinations, diploma project and the supervised industrial work experience. Such candidates should have completed a minimum of between 72 - 80 semester credit units depending on the programme.

8.0 GUIDANCE NOTES FOR TEACHERS TEACHING THE PROGRAMME:

8.1 The new curriculum is drawn in unit courses. This is in keeping with the provisions of the National Policy on Education which stress the need to introduce the semester credit units which will enable a student who so wish to transfer the units already completed in an institution of similar standard from which he is transferring.

8.2 Undesigning the units, the principle of the modular system by product has been adopted; thus making each of the professional modules, when completed provides the student with technician operative skills, which can be used for employment our poses.

8.3 As the success of the credit unit system depends on the articulation of programmes between the institutions and industry, the curriculum content has been written in behavioural objectives, so that it is clear to all, the expected performance of the student who successfully completed some of the courses or the diplomates of the programme. There is a slight departure in the presentation of the performance based curriculum which requires the conditions under which the performance expected to be carried out and the criteria for the acceptable levels of performance.

It is a deliberate attempt to further involve the staff of the department teaching the programme to write their own curriculum stating the conditions existing in their institution under which the performance can take place and to follow that with the criteria for determining an acceptable level of performance. Departmental submission on the final curriculum may be vetted by the Academic Board of the institution. Our aim is to continue to see to it that a solid internal evaluation system exists in each institution for ensuring minimum standard and quality of education in the programmes offered throughout the polytechnic system.

8.4 The teaching of the theory and practical work should, as much as possible, be integrated. Practical exercises, especially those in professional courses and laboratory work should not be taught in isolation from the theory. For each courses, there should be a balance of theory to practice in the ratio of 50:50 or 60:40 or the reverse.

9.0 GUIDELINES ON SIWES PROGRAMME:

For the smooth operation of the SIWES the following guidelines shall apply:

9.1 Responsibility for Placement of Students

(a) Institutions offering the ND programme shall arrange to place the students in industry. By April 30th of each year, six copies of the master list showing where each student has been placed shall be submitted to the Executive Secretary, NBTE which shall, in turn, authenticate the list and forward it to the Industrial Training Fund, Jos.

(b) The Placement Officer discuss and agree with industry on the following:

(i) A task inventory of what the students should be expected to experience during the period of attachment. It may be wise to adopt the one already approved for each field.

(ii) The industry-based supervisor of the students during the period, likewise the institution based supervisor.

(iii) The evaluation of the student during the period. It should be noted that the final grading of the student during the period of attachment should be weighted more on the evaluation by his industry-based supervisor.

9.2 Evaluation of Students During the SIWES

In the evaluation of the student, congnisance should be taken of the following items:

(a) Punctuality
(b) Attendance
(c) General Attitude to Work
(d) Respect for Authority
(e) Interest in the field/technical area
(f) Technical competence as a potential technician in his field.

9.3 Grading of SIWES

To ensure uniformity of grading scales, the institution should ensure that the uniform grading of students' work which has been agreed to by all Polytechnics is adopted.

9.4 The Institution Based Supervisor

The Institution-based supervisor should initial the log book during each visit. This will enable him to check and determine to what extent the objectives of the scheme are being met and to assist students having any problems regarding the specific assignments given to them by their industry-based supervisor.

9.5 Frequency of Visit

Institution should ensure that students placed on attachment are visited within one month of their placement. Other visits shall be arranged so that:

(1) There is another visit six weeks after the first visit, and
(2) A final visit in the last month of the attachment.

9.6 **Stipend for Students in SIWES**

The rate of stipend payable shall be determined from time to time by the Federal Government after due consultation with the Federal Ministry of Education, the Industrial Training Fund and the NBTE'

9.7 **SIWES As a Component of the Curriculum**

The completion of SIWES is important in the final determination of whether the student is successful in the programme or not. Failure in the SIWES is an indication that the student has not shown sufficient interest in the field or has no potential to become a skilled technician in his field. The SIWES should be graded on a fail or pass basis. Where a student has satisfied all other requirements but failed SIWES, he may only be allowed to repeat another four months SIWES at his own expense.

National Board for Technical Education,
Kaduna.

NATIONAL DIPLOMA IN SURVEYING AND GEO-INFORMATICS

YEAR ONE:

Semester One

Code No	Course	L	T	P	CU	CH	Pre-requisite
SUG 101	Basic Principles in Surveying I	2	0	3	3	5	
SUG 103	Introduction to Photo-grammetry & Remote Sensing I	2	0	2	3	4	
SUG 105	Basic Principles in Cartography I	1	0	2	2	3	
SUG 109	Introduction to Computer	2	0	3	3	5	
STA 111	Introduction to Statistics	2	0	0	2	2	
MTH 111	Logic & Linear Algebra	2	0	0	2	4	
BPH 111	Physics I (Mechanics & Properties of Matter & Heat)	2	0	3	3	5	
GNS 101	Use of English I	2	0	0	2	4	
GNS 127	Citizenship Education I	2	0	0	2	4	
	Total	17	0	13	22	36	

Semester Two

Code No	Course	L	T	P	CU	CH	Pre-requisite
SUG 102	Basic Principles in Surveying II	2	0	3	3	5	SUG 101
SUG 104	Introduction to Photo-grammetry & Remote Sensing II	2	0	2	3	4	SUG 103
SUG 106	Basic Principles in Cartography II	1	0	2	2	3	SUG 105
SUG 108	Cadastral Surveying I	2	0	3	3	5	-
SUG 110	Computer Application I	2	0	3	3	5	SUG 109
MTH 112	Algebra & Elementary Trig	2	0	0	2	2	MTH 111
GNS 102	Communications in English I	2	0	0	2	2	GNS 101
GNS 128	Citizenship Education II	2	0	0	2	2	-
	Total	15	0	13	20	28	

YEAR TWO:

Semester One.

Code No	Course	L	T	P	CU	CH	Pre-requisite
SUG 201	Cadastral Surveying II	2	0	2	3	4	SUG 108
SUG 203	Field Astronomy I	1	0	2	2	3	
SUG 207	Surveying Instrument I	1	0	2	2	3	
SUG 209	Control Surveys	1	0	2	2	3	
BPH 121	Physics II (Optics, Waves, Electricity & Magnetism)	2	0	3	3	5	BPH 111
MTH 211	Calculus	2	0	0	2	2	
GIT 201	Elements of Geo-Informatics	1	0	3	2	4	
GIT 203	Database Creation and Use	1	0	3	2	4	
GNS 121	Introduction to Sociology	2	0	0	2	2	
	Total	15	0	17	22	30	

Semester Two

Code No	Course	L	T	P	CU	CH	Pre-requisite
SUG 202	Cadastral Surveying III	2	0	2	3	4	SUG 201
SUG 204	Field Astronomy II	1	0	2	2	3	SUG 203
SUG 208	Engineering Surveying I	2	0	3	3	5	
SUG 210	Topographical Surveying I	1	0	3	2	4	
MTH 122	Trigonometry & Analytical Geometry	2	0	0	2	2	MTH 211
SUG 214	Final Projects	0	2	6	4	8	
	Total	8	2	16	16	26	

BASIC PRINCIPLES IN SURVEYING AND GEOINFORMATICS COURSES (SUG 101 AND 102)

BASIC PRINCIPLES IN SURVEYING I

PROGRAMME: NATIONAL DIPLOMA (ND) SURVEYING AND GEOINFORMATICS						
COURSE: Basic Principles in Surveying I			**COURSE CODE: SUG 101**			**CONTACT HOURS: 75HRS**
Course Specification: Theoretical Contents				**Practical Content**		
	General Objective: 1.0 Understand the basic principles and scope of Surveying and Geoinformatics.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Basic Principle and Scope of Surveying Geoinformatics 1.1 Explain the principles of working from 'whole to part' in Surveying and Geo-data works. 1.2 State the importance of "Scientific honesty" made on observations. 1.3 Explain with examples the various "checks" made on field observation and during computation. 1.4 Define errors of misclosure in surveys and describe methods of "balancing" these. 1.5 Explain the need and procedure for "examination" of Surveys and Geo-data. 1.6 Describe the various classes of Survey/ Geoinformatics and their order of accuracy. 1.7 Explain the Principles of 'Economy of accuracy" and its influence on choice of equipment and methods.			1.1 Carryout a measurement of linear distance of about 200m using linen tape: ! Surface Measurement ! Step Measurement. 1.2 Carryout a measurement of horizontal and vertical angles with theodolite and compass. 1.3 Carryout a map reading exercises – slope determination and direction, cross sections, contours, bearings, direction of river flows, and classification of features such as settlement, roads and rail lines. 1.4 Carryout compass survey and plot. 1.5 Carryout a demonstration of the use of a hand held GPS. .		

	1.8 Explain the principles of 'consistency' in Surveys/Geo-data. 1.9 Distinguish between accuracy and precision. 1.10 Describe the procedure of entrusting 'custody' of Survey/Geo-data monuments to local officials and the instructions for their 'preservation'. 1.11 Name the different branches of Surveying and Geoinformatics stating their aims e.g. geodetic survey, topographic survey, cadastral survey, hydrographic survey, engineering and large scale surveys.					
	General Objective: 2.0 Understand the use and methods of using linen and steel tapes in making linear measurements.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Linear Measurement and Chain Surveying 2.1 Explain the effect of a. Misalignment b. Slope of using Linen c. Temperature d. Tension and e. Standardization error on measured distances in making linear. 2.2 Apply the corrections in making linear listed in 2.1 above measurement.					

	2.3 Identify chain surveying instruments e.g. Linen tapes, steel tapes, ranging rods. 2.4 State the necessary precaution in the use of above instruments. 2.5 State the criteria for selection in survey lines and offsets and the limitation lengths. 2.6 Describe the methods of making linear measurements in chain surveys – both limiting conditions on measurement accuracy. 2.7 Explain common errors of building corners, wrong booking values. 2.8 Explain with sketches the basic .methods of check or proof lines, and the use of control frame work for position and orientation. 2.9 Describe the general procedure for carrying out a chain survey. 2.10 Illustrate the method of booking field measurements in chain surveys. 2.11 Enumerate field problems and methods of overcoming them. 2.12 Identify errors in simple chain surveys. 2.13 Carryout survey of an area of at least one hectare. 2.14 Book all field					

	measurements. 2.15 Plot surveying at a suitable scale. 2.16 Draw to field standards using conventional signs and hand lettering.					
	General Objective: 3.0 Understand the principles of measurement of angles with theodolites and bearing with a magnetic compass and perform such measurement.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	3.1 Describe the various units of angular measure e.g. the principles grade and radian measures, working out their convertion factors. 3.2 Explain the working principles of a 'surveyor (Prismatic) compass. 3.3 Describe the procedure of observation with a 'surveyor' (Prismatic) compass. 3.4 Explain the method of theodolites. 3.5 Explain the difference in the reading procedure of a theodolite. 3.6 Carryout angular measurements with prismatic compass and theodolites.					
	General Objective: 4.0 Understand the basic principles and method of using total station and GPS equipment.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	4.1 Describe a total station and its accessories.					

	4.2 Compare total station with a theodilite. 4.3 Explain the working principles of a total station. 4.4 Describe the procedures of observation with a total station. 4.5 Carry out a simple survey using a total station. 4.6 Retrieve the measured from total station field data on to a PC. 4.7 Process the data from the PC. 4.8 Plot the plan of the surveyed area manually. 4.9 Describe the various types of GPS equipment e.g. hand held and tripod types. 4.10 Explain the working observations on selected points.					
	General Objective: 5.0 Understand the principles of survey computations and plotting.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	5.1 Reduce the measured field data with a theodilite to obtain required angles. 5.2 Deduce bearings from the obtained angles. 5.3 Carryout traverse computation to obtain coordinates. 5.4 Carryout traverse computation adjustment to obtain corrected (final) coordinates. 5.5 Adjust compass bearings of the compass surveyed					

	area. 5.6 Carryout the computation 5.5 above. 5.7 Retrieve the measured field data of the surveyed area by a total station onto a PC. 5.8 Process the data using the PC. 5.9 Plot the plan of the surveyed area manually at different scales (small, medium and large).					
	General Objective: 6.0 Read, interpret and make measurements from maps, lay-out and engineering plans.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	6.1 State the use of different types of map e.g. topographical, engineering and guide maps. 6.2 Explain the principles of map scale. 6.3 State the relationships between map scales or representative fractions and the contour interval. 6.4 Identify map symbols and conventional signs. 6.5 Explain their basis and use. 6.6 Identify various Nigerian map series. 6.7 Use map catalogues. 6.8 Decribe various method of showing relief on maps e.g. spot heights, hachures, contours. 6.9 Define map grids. 6.10 Use map grids.					

	6.11 Explain how to establish different reference directions e.g. true north, grid north and magnetic north. 6.12 Define the relationship between the different direction i.e. convergence, declination and compass variation. 6.13 Scale off grid coordinates. 6.14 Interpret different types of map, layout plans and diagrams/sketches. 6.15 Identify simple planimetric details on imageries. 6.16 Measure distances from curves from given diagram. 6.17 Determine radius of curves from given diagram. 6.18 Read off direction/bearing between given features. 6.19 Describe different map reference systems.					

BASIC PRINCIPLES IN SURVEYING II

PROGRAMME: NATIONAL DIPLOMA (ND) SURVEYING AND GEOINFORMATICS						
COURSE: Basic Principles in Surveying II			**COURSE CODE: SUG 102**		**CONTACT HOURS: 75HRS**	
Course Specification: Theoretical Contents				**Practical Content**		
	General Objective: 1.0 Understands the use of equipment and methods for electro-magnetic distance measurement.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	1.1 Observe small vertical angles precisely by repetition. 1.2 Determine horizontal distance using vertical stage and tacheometer. 1.3 Explain special characteristics and use of self reducing tachometer. 1.4 Measure distance using a theodilite as tacheometer. 1.5 Determine spot-height and survey detail by tacheometry. 1.6 Measure distance using EDM and total station. 1.7 Work out accuracies attainable in various methods of Electromagnetic distance measurement (EDM).			1.1 Carryout a measurement of about 2km using EDM. 1.2 Carryout a boundary survey of a small area using third order theodolite and total stations. 1.3 Carryout a computation of traverses in 2 above. 1.4 Carryout a minor triangulation scheme. 1.5 Carryout a computation of the triangulation net. 1.6 Carryout levelling a distance of a distance of about 2km using ordinary and digital spirit levels. 1.7 Carryout computations of the levelling. 1.8 Carryout topographical survey of a given area.		
	General Objective: 2.0 Understands the procedure and methods of third order theodilite and total station traversing			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Traversing (Tertiary) 2.1 Identify the various items of equipment used in theodolite and total station					

	traversing. 2.2 List specifications for equipment of angles and distances, determination of bearings and tolerable linear and angular misclosures for tertiary traverses. 2.3 Explain the need for connection to and procedure for verification of existing controls. 2.4 Describe field methods of traversing using surface taping. 2.5 Explain the various precautions in field measurements. 2.6 Describe the field checks applicable. 2.7 Use the force centring equipment explaining special advantage thereof. 2.8 Explain the role of theodilite and total station traversing in provision of control for surveys. 2.9 Carryout total station traverse using surface taping. Verifying the control to which the survey is connected, surveying adjacent detail (by radiation and intersection), computing g the traverse, adjusting distances, bearings and coordinates and producing a plan in ink.					

	General Objective: 3.0 Understand the principles, field methods and calculation procedures for minor triangulation.			General Objective		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Minor Triangulation 3.1 Explain the basic principles of triangulation. 3.2 Enumerate other parameters of triangulation such as selection, beaconing, numbering of triangulation stations, baseline, azimuth determination, extension of connected triangles, angular repletion, reciprocal observations, angular misclosures, field measurement checks etc. 3.3 Explain methods of computing coordinates and heights from filed records. 3.4 Carry out minor triangulation in area of 100sq.m. 3.5 Carryout GPS observation on the triangulation stations in 3.4 above. 3.6 Identify the relative merits and demerits of triangulation and GPS methods.					
	General Objective: 4.0 Understand the methods of heighting and tertiary levelling.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Tertiary Levelling 4.1 List the basic principles of ordinary spirit levelling					

	and digitak spirit levelling. 4.2 List specifications of tertiary levelling. 4.3 Explain the (optimum) observing procedure. 4.4 Describe the use of and criteria for selection of levelling datums. 4.5 Adjust collimination error in level. 4.6 Describe the construction and use of semi-permanent and permanent tertiary bench-marks. 4.7 Books field observations. 4.8 Reduce level. 4.9 Explain arithmetical checks in level reduction. 4.10 Carry out tertiary levelling, reduction and adjustment to produce elevations of all permanent stations along a circuit of about 2km, using ordinary and digital levels. 4.11 Enumerate the uses of tertiary levelling.					
	General Objective: 5.0 Understand problems involved in producing contoured plans.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Contoured Plans 5.1 Name the different reference directions describing method of determining these and explain their mutual					

	relationships. 5.2 Explain basic need for heights in Topographical, Engineering and Township Surveys. 5.3 Illustrate optimum distribution of spot heights for contoured plans. 5.4 Describe the use of grids of levels. 5.5 Carry out contouring at 0.5m. vertical interval from a mesh of spot heights.					
	General Objective: 6.0 Understand setting out procedure for a medium sized building including access roads.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Setting Out for Construction 6.1 Identify the equipment required to set-out a building with accompanying access roads. 6.2 Explain how to set-out a building and the accompanying constraints. 6.3 Construct profiles and datum for a building. 6.4 Explain how profiles are used to control excavation and foundation levels. 6.5 Identify the instruments used for taking internal and external dimensions. 6.6 Determine the areas of a building and its site. 6.7 Explain how running internal and external measurements are taken					

	horizontally and vertically. 6.8 State the procedure for checking vertically of building using Theodolite, Optical Plumb and Plumb-Bulb. 6.9 Describe the invert of a drain, a sight rail and a traveler. 6.10 Calculate suitable length of a traveler and reduced levels of sight rails from given drawings. 6.11 Establish sight rails for horizontal and depth control of a straight drain between manholes. 6.12 Explain the survey terms used in road construction. 6.13 Describe methods of route surveying. 6.14 Describe the types of control used for Embarkments, cuttings and levels. 6.15 Calculate volumes of cut and fill on a given straight road with transverse sloping ground.					

CADASTRAL SURVEYING COURSES
SUG 108, 201, 202, 301 AND 302

CADASTRAL SURVEYING I

PROGRAMME: NATIONAL DIPLOMA (ND) SURVEYING AND GEOINFORMATICS						
COURSE: Cadastral Surveying I			**COURSE CODE: SUG 108**		**CONTACT HOURS: 75HRS**	
Course Specification: Theoretical Contents				**Practical Content**		
	General Objective: 1.0 Understand the scope of cadastral Surveying including layouts, mutations and dispute surveys.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	General Scope of cadastral Surveying 1.1 Describe the historical background of Cadastral Surveying. 1.2 Explain the meaning of Cadastral Boundary. 1.3 Explain the meaning of cadastral Layouts. 1.4 Distinguish between the various types of subdivisions and other mutations. 1.5 Outline the significance of administrative boundaries. 1.6 Give reasons why Cadastral Survey is controlled by law.			1.1 Carryout surveys when a natural or man made features forms a boundary of the property to be surveyed. 1.2 Carryout a boundary survey of a property in accordance with the regulations. 1.3 Carryout computation of a plot transverse in accordance with the regulations.		
	General Objective: 2.0 Understand the rules and regulation governing demarcation.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	2.1 Outline the steps prior to a cadastral survey. 2.2 Describe the types of					

	survey beacons used for cadastral boundaries. 2.3 Carry out survey when a river/stream, major road or a railway reserve forms a boundary of a property to be surveyed. 2.4 Use special beacons used for the demarcation of boundaries of .all lands which are subjects of applications made under the provisions of the Minerals Ordinances. 2.5 Describe the procedure to be adopted when placing beacons in accordance with computed data. 2.6 Solve the problems when a deacon cannot be placed at a corner due to an obstacle. 2.7 Adopt some of the special provisions with regards to demarcations in the cases of country and urban lands. 2.8 Describe the procedure to be adopted when a boundary side of a new property coincides with a longer boundary of a previously surveyed property. 2.9 Explain the methods of preserving survey beacons. 2.10 Carry out the demarcation of a property in accordance with the regulation.					

	General Objective: 3.0 Understand the rules and regulations governing Cadastral Boundary Surveying.			General Objective		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Cadastral Boundary Survey 3.1 Select the equipment used for different types of cadastral surveys. 3.2 Explain the standard of accuracy expected of the different types of cadastral surveys. 3.3 State the need to connect the survey to Government Survey beacons. 3.4 Explain the reasons for confirming the stability of existing controls before such controls are used for connection. 3.5 Choose the methods to be adopted for the actual survey. 3.6 Explain how to control the direction of the survey. 3.7 Use the standard meridians in Nigeria, i.e. the NTM and the UTM grids. 3.8 Solve the problem when the survey is connected to beacons of previous surveys. 3.9 Explain how to survey an irregular boundary such as a stream. 3.10 Use the methods .of keeping filed books and marking filed reduction and checks.					

	3.11 Carry out a boundary survey of a property in accordance with the regulations.					
	General Objective: 4.0 Understand the methods of connecting Cadastral Survey to controls.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Connection of Cadastral Survey to Controls 4.1 Describe how to connect a survey by traversing and the methods of controlling the bearings. 4.2 Describe how to connect a survey by triangulation and the need to use well-conditioned triangles. 4.3 Establish a local origin and the precautions to be taken to preserve it. 4.4 Connect a survey by the resection method. 4.5 Solve the problem of connection using the two-kilometers to the control points.					
	General Objective: 5.0 Understand method of carrying out Cadastral Traverse.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Cadastral Traverse 5.1 Describe the instruments needed for carrying out cadastral traversing e.g. theodolite, ranging poles, steel bands, linen tapes arrows, etc.					

	5.2 Explain the necessity for carrying out proper temporary, station adjustment after setting up the instrument. 5.3 Describe the methods of angle reading and booking. 5.4 Measure a line with steel band on the ground. 5.5 Explain the necessity for proper alignment when the line to be measured in longer than the chain length. 5.6 Determine the observations needed to effect the correction necessary for cadastral traverse e.g. slope reading, tension, temperature etc.					
	General Objective: 6.0 Know how to carry out the computation and adjustment of traverse coordinates and the computation of areas.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Computation of Coordinates and Areas 6.1 Identify the materials required for computations e.g. forms tables, calculations etc. 6.2 Apply the corrections to measured lengths. 6.3 Deduce the angular misclosure adjusting the bearings. 6.4 Carry out traverse computation with the closing errors.					

	6.5 Adjust the traverse to obtain adjusted coordinates of the stations. 6.6 Carry out back computation to obtain bearings and distances. 6.7 Compute the area of property from the adjusted coordinates. 6.8 Determine the area when a side of the property is irregular. 6.9 Carry out the computation of a plot traverse in accordance with the regulations.					
	General Objective: Understand the methods of drawing original plans and their use			**General Objective:**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Production of Original Plans and Their Uses 7.1 List the equipment and materials used in the drawing of equipment and materials used in the drawing of original plans. 7.2 Use the equipment for drawing of grids and other features. 7.3 State the various ink colours to be used. 7.4 State the used of original plan for cadastral purposes. 7.5 Write neatly using free-hand lettering. 7.6 Prepare an original plan of a 5-hectare plot in					

	accordance with the regulations. 7.7 List the uses of original plans for cadastral purposes.					

TOPOGRAPHICAL SURVEYING I

PROGRAMME: NATIONAL DIPLOMA (ND) SURVEYING AND GEOINFORMATICS						
COURSE: Topographical Surveying I			**COURSE CODE: SUG 210**			**CONTACT HOURS: 60HRS**
Course Specification: Theoretical Contents				**Practical Content**		
	General Objective: 1.0 Understand the properties a topographical map.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Properties of Topographical maps. 1.1 List the topography i.e. map scales currently used in Nigeria. 1.2 Tabulate the ideal sequence of scales of topographical maps. 1.3 Outline the nomenclature and numbering of the national topographical map series. 1.4 List the common conto9ur intervals in use for various topographical maps. 1.5 Name the source materials for topographical maps. 1.6 Explain the salient features of special maps on topographical scales' – engineering projects maps, strip maps for boundaries, dam sites, designated area township and environ maps.			1.1 Carryout Engineering and Land measurement from Topographical maps. 1.2 Carryout a plane table survey. 1.3 Carryout the tacheometric survey of a parcel of land. 1.4 Establish photo point for Township mapping. 1.5 Carryout quantitative and qualitative checks to verify air-survey compilations.		
	General Objective: 2.0 Know the uses of topographical maps.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Uses of Topographical Map 2.1 Carry out engineering and					

	land measurements from topographical maps. 2.2 Use maps for administrative purposes e.g. charting cadastral administrative, areas, census etc. 2.3 Use topographical maps as base for thematic information in geology, forestry, agriculture, demography, etc. 2.4 Explain the use of topographical maps for military purposes.					
	General Objective: 3.0 review the use of plane table for topographical mapping.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Plane Tabling for Topographical Mapping 3.1 Describe the nature of the control points suitable for plane tabling. 3.2 Use plane table to extend the density of control points. 3.3 Fix points by intersection, resection and radiation. 3.4 State the accuracy of plane table surveys. 3.5 Carry out a plane table survey at a scale of 1:25,000 using existing controls and heights by radian clinometer.					
	General Objective: Understand the use of Tachometry for contouring.			**General Objective**		

WEEK	Specific Learning Objective	Teachers Activities	Learning Resources	Specific Learning Objective	Teachers Activities	Learning Resources
	Tachometry for Contouring 4.1 Use the optical formulae in stadia method of measuring a distance. 4.2 Derive the formula for calculating horizontal distance using stadia method. 4.3 Derive the formula for the calculation of height of staff station. 4.4 Determine the theodilite constants (multiplying and additive). 4.5 Fix detail and spot heights by tacheometry. 4.6 Carry out the tachometric survey of a parcel of land.					
	General Objective: Know the methods of establishing photo-point for township mapping.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Establishment of Photo-points for Township Mapping. 5.1 Explain the required density and distribution of planimetric and height points in a photo-model. 5.2 Select planimetric and heights points in the field, for large scale mapping. 5.3 Identify photo-point description. 5.4 Prepare a photo-point description. 5.5 Explain the methods of					

	fixing photo-points for large scale mapping e.g. by traverse, by theodolite rays, etc. 5.6 Explain methods of heighting photo-points for large scale mapping.					
	General Objective: 6.0 Understand the process of field completion and ground verification of compiled photo-grammetric points.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Photogrammetric 6.1 Carryout quantitative and qualitative checks to verify air-survey compilations. 6.2 Obtain natural cultural information and names. 6.3 Identify obscured details. 6.4 Complete map information in all other respects e.g. vegetation, boundaries, etc.					
	General Objective: 7.0 Know the comparison between ground and aerial methods of mapping.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Ground and Aerial Mapping 7.1 Compare the merits and demerits. 7.2 State the relative advantages and disadvantages of photo-annotation before mapping and verification of air-survey compilation.					

	7.3 Outline the relative roles of single air-photographs, mosaics, orthophoto-maps and topographical maps.					

FIELD ASTRONOMY I

PROGRAMME: NATIONAL DIPLOMA (ND) SURVEYING AND GEOINFORMATICS						
COURSE: Filed Astronomy I			**COURSE CODE: SUG 203**			**CONTACT HOURS: 60HRS**
Course Specification: Theoretical Contents				**Practical Content**		
	General Objective: 1.0 Know the solar system and the stars.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Solar Systems and the Stars 1.1 Describe the solar system. 1.2 Describe the earth's orbital. 1.3 Explain the phenomena of the seasons and night and day. 1.4 State the apparent motion of the sun and its variation in declination over the year. 1.5 Explain the nature of stars and stellar distances. 1.6 Describe the grouping of stars into constellations.			1.1 Determination of Azimuth by Altitude of the sun method. 1.2 Determination of Azimuth by hour-angle of Polaris.		
	General Objective: 2.0 Understand the basic concepts of field astronomy.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Field Astronomy 2.1 Explain the significance of the three principal directions in field astronomy i.e. the directions from the earth's centre to the celestial pole, the observer's zenith and the celestials object. 2.2 Explain the concepts of the astronomical triangle.					

	2.3 Illustrate the six elements of spherical triangle in terms of centre of the sphere by the three directions forming the triangle. 2.4 Derive the mathematical relationships between the angles formed by three directions emanating from a point i.e. the cosine formula, the sine formula, the cot formula. 2.5 Demonstrate the applicability of 2.4 above to the elements of the spherical triangle. 2.6 Define the quantities of latitude, declination, altitude. 2.7 Determine the values of the corresponding elements of astronomical triangle for sun east and sun west.					
	General Objective: 3.0 Know the basis of corrections to horizontal and vertical angles and how to evaluate and apply the corrections.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Corrections to Horizontal and vertical Angles 3.1 Explain the need for plate-level corrections to horizontal angles observed to the sun. 3.2 Derive the formula for their evaluation from L and R readings of the					

	plate-level. 3.3 Explain the need foe refraction corrections to vertical angles to the sun. 3.4 Demonstrate the method of their evaluation using refraction tables. 3.5 Explain the need for parallax corrections to vertical angles to the sun. 3.6 Evaluate the formulae for the corrections in 3.5 above for application purposes.					
	General Objective: 4.0 Understand the basic of the determination of azimuth by observed altitudes of the sun.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Determination of Azimuth 4.1 Explain the need for orientation of surveys and the use of astronomical azimuths for this purpose. 4.2 Explain the basic principles the astronomical determination of the bearing of a line on the ground. 4.3 Derive the cosine formula for azimuth of the sun in term of latitude, declination and altitude. 4.4 Demonstrate how to deduce the full-circle value					

	of A from the cosine formulae for sun east and sun west. 4.5 Derive the expression: True bearing to R.O. = A – Angle (+360'). 4.6 Demonstrate the general validity of 4.5 above. 4.7 Show that an accuracy of one minute in U.T. suffices to evaluate declination of the sun to one second of arc. 4.8 Demonstrate how to use the star almanac SUN table to obtain the value of declination from the U.T. of observation. 4.9 Establish the optimal range in altitude of the sun for observed altitude determination. 4.10 Derive the formulae for the error in A caused by an error in assumed latitude. 4.11 Show how the effect of an error in assumed latitude may be minimized by taking east and west observations balanced for altitude.					

FIELD ASTRONOMY II

PROGRAMME: NATIONAL DIPLOMA (ND) SURVEYING AND GEOINFORMATICS						
COURSE: Filed Astronomy II			**COURSE CODE: SUG 204**		**CONTACT HOURS: 45HRS**	
Course Specification: Theoretical Contents				**Practical Content**		
	General Objective: 1.0 Understand the concepts relating to time and hour- angle			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	1.1 Define sidereal day and mean solar day. 1.2 Prove that the mean solar day exceeds the sidereal day by 3m 565 6. 1.3 Explain the quantity R and how it varies with time. 1.4 Explain the concept that of the "First Point of Aries". 1.5 Define (i) Greenwich sidereal time (G.S.T.) (ii) right ascension (R.A.). 1.6 Define univewrsal time (U.T.). 1.7 Show that G.S.T. = U.T. + R. 1.8 Define the hour angle (t) of a star. 1.9 Derive the relationship: (t) = U.T. + R + A – R.A.					
	General Objective: 2.0 Understand the system of tabulation of star data in the star almanac for land surveyors and how to extract values of R.A. and declination.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Star Data and the Star Almanac for Land Surveying 2.1 Describe the method of selection of stars for inclusion in the star					

	almanac and its bearing on the likelihood of a given star being in the almanac. 2.2 Explain the order of tabulation and accuracy of star data in the star almanac. 2.3 Demonstrate how to extract values of R.A. and declination for identified stars.					
	General Objective: 3.0 Understand the methods of identification of stars.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Identification of Stars. 3.1 Explain how to identify stars using star charts. 3.2 Explain the basis of identification by calculation of R.A. and declination. 3.3 Derive the formulae meeded for com,putation of R.A. and declination from O, A, H and T. 3.4 Obtain approximate value of A, h and t from a' preliminary round' of observations. 3.5 Use the formulae to obtain approximate R.A. and declination. 3.6 Identify the star. 3.7 Use a programmable calculation to make rigid positive identifications in the field. 3.8 Write a suitable program.					

	General Objective: 4.0 Understand the apparent motion of the stars with particular reference to star elongation.			General Objective		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Apparent Motion of Stars and Star Elongation 4.1 Prove that the elevation of the celestial pole is equal to the observer's latitude. 4.2 Describe the apparent diurnal motion of the stars about the celestial pole. 4.3 Define formulae. 4.4 Derive formulae cos A = tan 0 coth given "elongation azimuths'. 4.5 Evaluate 'elongation azimuths'(east and west) for a given latitude and range of altitudes near-elongation star for observation. 4.6 Describe a method of selecting near-elongation star for observation. 4.7 Explain the advantages of using azimuth determinations.					
	General Objective: 5.0 Understand the basis of the determination of azimuth by observed altitudes of E-W stars near elongation.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Determination of Azimuth by Observed Altitudes. 5.1 explain the need (as for sun observations) of taking E-W observations balanced for altitude by proving that, at elongation. A = sin A. tan h.					

	5.2 demonstrate the implications of the formula. 5.3 Derive the cosine formula for A in term of h and (as for sun observations). 5.4 Explain how the relative invariance of star declinations obviates the need for time readings except for star identification purposes. 5.5 Prove that parallax corrections are negligible for all stars. 5.6 Establish the optimum range of altitude (using similar arguments to those for sun observations).					
	General Objective: 6.0 Know hoe to observe and compute azimuth by observed altitude of E-W stars near elongation.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Observation and computation of Azimuth. 6.1 describe the special techniques needed for star observations using (i) the equipment used for theodilite and R.O. illumination. (ii) the techniques used to facilitate observations by using predicted circle readings to come onto the star and the R.O. (iii) cross-hair illumination to ensure rapid and accurate readings.					

	6.2 Select a pair of near-elongation E-W stars at optimal elevations'. 6.3 Take 'preliminary round' of observations. 6.4 Identify the star in the field using a programmable calculator. 6.5 Observe at least 4 rounds from approximately 20' altitude in the east, 4 rounds from approximately 35' altitude in the west. 6.6 Make the field book reductions. 6.7 Correct for refraction and dislevelmeth. 6.8 Compute both sets of observations using a calculator. 6.9 Deduce the means of balanced pairs. 6.10 Verify that the means fall within a range of 10". 6.11 Compute the final true bearing. 6.12 Convert to UTM bearing.					
	General Objective: 7.0 Understand the basis of the determination of azimuth by hour-range of Polaris.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Purpose of Determination of Azimuth by Hour Angle of Polaris 7.1 Draw a diagram depicting the motion of Polaris about the celestial pole. 7.2 Evaluate the approximate ranges of					

		altitude and azimuth of polaris for a given (Nigerian) latitude.					
	7.3	Explain the availability of polaris in Nigeria at different latitudes and seasons, in various types of terrain and ground cover.					
	7.4	Derive approximate expressions for the azimuth and apparent altitude of polaris using the parameters contained in the star almanac pole star tables.					
	7.5	Explain how you would use these conditions.					
	7.6	Prove the formula: A" = P" sec of sin t = - p" sec) sin t cost where p = 90 -.					
	7.7	Prove that, in Nigerian latitudes, an accuracy of 5 secs in UT suffices to give the azimuth of polaris accurate to 1".					
	7.8	Prove that, in Nigerian latitudes, accuracy of 1" in assumed longitude suffices to give an accuracy of 1" in A.					
	7.9	Prove that, in Nigerian latitudes, an accuracy of 1" in A.					
	7.10	Explain how plate-level corrections for					

	polaris observations can be evaluated using the latitude obviating the need for observation of vertical angles. 7.11 Outline the observing requirements for azimuth by hour-angle of polaris - no identification, time to about 1 sec only, no vertical angles.					
	General Objective: 8.0 Know how to observe and compute azimuth by hour-angle of polaris.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Observation and Computation of Azimuth by Hour-Angle of Polaris 8.1 Locate polaris, either by naked eye or by using the method of 7.4 above. 8.2 Make the observations – at least 4 rounds; comprising horizontal angle, watch time plate – level readings only. 8.3 Determine the watch error on UT to the nearest second by comprising withradio time-signal. 8.4 Make the filed book reductions, applying plate-level corrections. 8.5 Compute the values of true bearing to R.O. (using the formula of 7.6). 8.6 Verify the range within					

	10" convert the final true bearing to UTM bearing.					
	General Objective: 9.0 Know the relative merits of E-W Stars and Polaris.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Merits of E-W Star and Polaris Methods 9.1 Compare E-W stars and polaris methods of observing azimuth. 9.2 State relative merits of the two methods. 9.3 Justify the use of polaris method whenever observing conditions allow.					

PHOTOGRAMMETRY COURSES
(SUG 103, 104, 201 AND SUG 202)

BASIC PRINCIPLES IN PHOTOGRAMMETRY AND REMOTE SENSING

PROGRAMME: NATIONAL DIPLOMA (ND) SURVEYING AND GEOINFORMATICS						
COURSE: Basic Principles In Photogrammetry And Remote Sensing			**COURSE CODE: SUG 103**		**CONTACT HOURS: 60HRS**	
Course Specification: Theoretical Contents				**Practical Content**		
	General Objective: 1.0 Know the general scope of photogrammetry.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	General Scope of Photogrammetry 1.1 Define photogrammetry. 1.2 Differentiate between the different types of photogrammetry e.g. terrestrial, aerial space photogrammetry and digital. 1.3 Enumeral areas of various applications of photogrammetry. 1.4 Relate accuracy and economy to the categories of photogrammetry such as: analogue, analytical and digital categories.			1.1 Stereoscopic view using stereogrammed hidden words. 1.2 Use of pocket stereoscopes on aerial photographs. 1.3 Use of mirror stereoscopes on aerial photographs. 1.4 Photo-interpretation.		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	General Objective: Understand the general principles of aerial photogrammetry.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	General Principles of Photography 2.1 Explain image formation in a lens camera.					

	2.2 Describe non-metric camera and aerial survey camera. 2.3 Classify aerial cameras used in mapping e.g. a. Narrow angles lens camera b. Normal angle lens camera c. Wide angles lens camera d. Super wide angle lens camera. 2.4 Describe the general procedure of aerial photographic coverage of an area. 2.5 Classify aerial photographs e.g. vertical photographs, convergent photographs. 2.6 Describe the step in film processing. 2.7 Distinguish between negative print, positive print and diapositives.					
	General Objective: 3.0 Understand the simple geometry of vertical aerial photograph.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Simple geometry of a Vertical Aerial Photograph 3.1 Define the related technical terms such as: principal point, principal distance, perspective centre, angle of tilt, principal line, Nadir point and isocentre.					

	3.2 Relate focal length and flying height to photographic scale. 3.3 Compute the scale of a vertical photograph using different methods. 3.4 Explain relief displacement. 3.5 Determine object heights using relief displacement. 3.6 Determine photo-coordinates on a vertical photograph. 3.7 Calculate ground distances from the photo-coordinates of a vertical photograph. 3.8 Explain the factors limiting the accuracy of measurements taken directly from photograph e.g. a. Tilt displacement b. Shrinkage or expansion of photographic materials c. Lens distortion d. Relief displacement e. Scale change f. Atmospheric refraction distortion.					
	General Objective: 4.0 Appreciate the geometry of a stereo pair of photograph.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Geometry of a Stereo Pair of Photographs 4.1 Define the terms associated with the geometry of a pair of photographs, such as air					

	base overlap stereoscopic model. 4.2 Illustrate the elementary theory of binocular vision. 4.3 Explain the vertical exaggeration in stereoscopic height. 4.4 Recognise the condition for correct stereoscopic viewing of photographs under stereoscopes. 4.5 Explain the use of image characteristics identification of objects on photographs. 4.6 Identify the difference between the mirrostereoscope and pocket stereoscope.					
	General Objective: 5.0 Understand the principles and problems of securing a satisfactory air cover for mapping.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Survey Mission and Flight Planning 5.1 List out the main navigational equipment for a flight mission. a. Aircraft b. Aerial camera and view finder 5.2 State the guiding factors in the choice of air craft, such as: a. Aircraft coiling b. Adaptation for aerial photography. 5.3 State the guiding factors in the choice of aerial					

	camera, e.g. a. Nature of terrain – as dead group should be minimized b. Based height ratio for higher metric accuracy. 5.4 Describe the factors that influence choice of photo scales and flying height. a. atmospheric weather condition – as flying over much clouds should be avoided. b. Planimetric and heighting accuracy requirement. 5.5 Prove that accuracy decreases with increase in flying height. 5.6 Explain the main problem in securing satisfactory air cover. 1. Weather condition 2. Direction of air craft 3. Exposure interval 4. Verticality of camera axis 5. Maintaining constant flying height. 5.7 Describe the contents in aerial photography documents, such as in: a. Condition of contract b. Specification 5.8 Calculate time interval between exposures for the intervalometer settings. 5.9 Estimate number of aerial photographs to cover a					

	known area of ground at any photo scales. 5.10 Suggest aircraft aerial camera, flying height and photographic season for photographic mapping project.					
	General Objective: 6.0 Understand the principles of parallax bar measurement.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	The Principles and Methods of Parallax Bar Measurement 6.1 Define stereoscopic parallax. 6.2 Explain the relationship on photographs and its elevation on the ground. 6.3 Prove the parallax formulae in different ways. 6.4 Describe the procedure of setting up a stereo pair of photographs for parallax measurement. 6.5 Carryout parallax measurement with the stereoscope and the parallax bar. 6.6 Calculate heights from parallax values. 6.7 Solve for the five unknowns of the correction equation.					
	General Objective: 7.0 Understand the basic principles of remote sensing data acquisition system.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Principles of Remote sensing Data Acquisition System					

	7.1 List various Remote Sensing Data Acquisition System. 7.2 Describe each system and its characteristics and satellite imaging system. 7.3 Differentiate between aerial imaging system and satellite imaging system. 7.4 Differentiate between optical and microwaves satellite system. 7.5 Explain the data characteristics of each system.					

INTRODUCTION TO PHOTOGRAMMETRY AND REMOTE SENSING

PROGRAMME: NATIONAL DIPLOMA (ND) SURVEYING AND GEOINFORMATICS						
COURSE: Introduction to Photogrammetry and Remote Sensing			**COURSE CODE: SUG 104**			**CONTACT HOURS: 60HRS**
Course Specification: Theoretical Contents				**Practical Content**		
	General Objective: 1.0 Understand the three axes x, y, z, system, it transition along and rotation about these.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Three-Dimensional Coordinates 1.1 Draw the right-handed three dimensional coordinate system x, y, z,. 1.2 Indicate by arrows the three translations along the three axes. 1.3 List three shifts and the three small variations of these motions. 1.4 Sketch the positive directions of rotation of the three rotations about these axes and their symbols. 1.5 Sketch the effects of translations and rotations on x – and y – parallaxes.			1.1 Carryout inner orientation on available instruments. 1.2 Carryout relative orientation of various models. 1.3 Carryout absolute orientation using any available analogue stereplotter on at least 2 models. 1.4 Carryout map completion of at least one model. 1.5 Carryout simple digital image processing using any available software.		
	General Objective: 2.0 Understand the purpose of orientation on an instruments and the main stages involved in achieving it.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Instrument Orientation 2.1 Explain the principle of the "bundle of rays' has made the photograph. 2.2 Describe the process of restitution of "bundles of					

	rays' to create a model. 2.3 Explain the need for carrying out "orientation" on the instrument. 2.4 List th three stages of orientation i.e. inner, relative and absolute orientation. 2.5 Explain in detail the effect of each of the above stages. 2.6 Orientate a given instrument.					
	General Objective: 3.0 Understand the procedure of Inner orientation.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Inner Orientation 3.1 List the steps involved in inner orientation. 3.2 Explain lens distortion and ways of correcting it. 3.3 Distinguish between principal point and fiducial centre. 3.4 Explain the importance of setting the correct focal length. 3.5 Describe the procedure of carrying out the inner orientation on an instrument. 3.6 Carry out inner orientation of a given model.					
	General Objective: 4.0 Understand the procedure of relative orientation.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**

	Relative Orientation 4.1 Explain the purpose of R.O. 4.2 Demonstrate the position of the six standard points for carrying out R.O. 4.3 Identify the R.O. elements having maximum influence on Y – parallax at each orientation point. 4.4 Select the elements in the sequence to be used for carrying out R.O. 4.5 Show that R.O. is achieved by using five of the R.O. elements. 4.6 Identify the causes of residual errors in R.O. 4.7 Explain the procedure of distribution of residual error after R.O. in the model. 4.8 Distribute residual error accordingly.					
	General Objective: 5.0 Understand the procedure of absolute orientation.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Absolute Orientation Explain the purpose of A.O. Identify the main steps of A.O. i.e. scaling and leveling. Specify the control requirement for each of the steps in 5.2 above. Prepare the map sheet for absolute orientation phase. Explain the setting up of					

	pantograph on the instrument according to enlargement or reduction from model to map. Explain the procedure of A.O. Carry out A.O. of a given model.					
	General Objective: 6.0 Recognise the orientation elements on different photogrammetric instruments.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Orientation Elements 6.1 Identify the elements of inner orientation on the instruments. 6.2 Identify the elements of relative orientation on the instruments. 6.3 Identify the elements of absolute orientation on the instruments.					
	General Objective: 7.0 Understand the influence of relative orientation elements on points in the model space.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Motions of Projectors 7.1 Set up a model on the instrument. 7.2 Note the effects of the rotation elements on the Y – parallax at different points in the model space. 7.3 Draw diagrams to show the effects of 7.2 for each projector. 7.4 Note the effects of the translation elements on the Y – parallaxes at different points in the model space.					

	7.5 Draw diagrams to show the effects of 7.4 for each projector.					
	General Objective: 8.0 Know how to perform R.O. of a flat terrain model.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Relative Orientation of a Flat Terrain Model 8.1 Identify the elements of R.O. 8.2 Identify the six standard points for elimination of Y – parallax. 8.3 Obtain the over-correction factor for w – solution. 8.4 Set up the model on the instruments. 8.5 Perform R.O. by using only rotation elements of both projectors.					
	General Objective: 9.0 Know how to perform A.O. of a flat terrain model and carry out stereo compilation.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Absolute Orientation of a Flat Terrain Model 9.1 Identify the elements of A.O. 9.2 Prepare the map sheet. 9.3 Set up the model. 9.4 Perform A.O. 9.5 Scale the model. 9.6 Level the model. 9.7 Plotting of planimetric details. 9.8 Plotting					

	General Objective: 10.0 Understand digital image processing techniques.			General Objective		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Data Image Processing (DIP) 10.1 Explain the rudiments of digital image processing techniques. 10.2 Define DIP. 10.3 Explain the mathematical concepts of DIP. 10.4 Explain the basis of DIP. 10.5 Enumerate examples of softwares.					

CADASTRAL SURVEYING II

PROGRAMME: NATIONAL DIPLOMA (ND) SURVEYING AND GEOINFORMATICS						
COURSE: Cadastral Surveying II			**COURSE CODE: SUG 201**			**CONTACT HOURS: 75HRS**
Course Specification: Theoretical Contents				**Practical Content**		
	General Objective: 1.0 Understand all aspects of cadastral surveys.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Cadastral Layout Surveys 1.1 Outline the overall objects of cadastral layouts. 1.2 Explain the involvement of land, survey, town planning and works divisions in the planning, execution and development of layouts. 1.3 Establish controls for base-maps and for setting out. 1.4 Use base maps for layout designs. 1.5 Explain the required planning principles and their uses in evaluating layout designs prior to setting out.			1.1 Carryout alignments and ranging from intermediate points. 1.2 Compute layout values including final values for individual plots. 1.3 Prepare layout plans. 1.4 Carryout the surveys of mining leases. Exclusive Prospective Lucenses (EPLL) water license, water rights etc, including connections by traverse, resection triangulation and trilateration. 1.5 Carryout corner shifts and peg shift. 1.6 Prepare plans for mining lease.		
	General Objective: 2.0 Know how to carry out cadastral layout surveys.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Preparation of cadastral Layout 2.1 Explain the design of layout surveys including use of subsidiary traverses. 2.2 Select key points relative to mapped features and					

	survey controls to required accuracy. 2.3 Set out key points. 2.4 Solve miscellaneous setting-out problems especially those arising in non-rectangular layouts. 2.5 Carry out alignments and ranging from intermediate points. 2.6 Survey a layout completely. 2.7 Compute layout values including final data for individual plots. 2.8 Prepare layout plans. 2.9 Use layout plans. 2.10 Preserve layout beacons during road construction and building development.					
	General Objective: 3.0 Understand basic setting out processes.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Basic Setting Out Processes 3.1 Set out long straight lines. 3.2 Set out right angle using chain, optical square and theodilite. 3.3 Line in more points between stations. 3.4 Set out precise measured distances using steel bands, invar tapes, or EDM. 3.5 Set out a line on a given bearing 3.6 Set out from plan/map data.					

	General Objective: 4.0 Understand methods of minesfield surveys.			General Objective		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Methods of Minefield Surveys 4.1 Define various survey terms used on the minesfield. 4.2 Explain the legal aspects of the terms used. 4.3 State the required specifications of sketch plans of proposed leases. 4.4 Prepare sketch plans for proposed leases. 4.5 Charts given sketch plans on priority sheet. 4.6 Identify exclusion e.g. villages and venerated areas. 4.7 Explain th rules governing contiguous boundaries, demarcation and survey of mining leases. 4.8 Carry out the survey of mining leases, Exclusive Prospective Licenses (EPLL), water license, water rights, etc, including section, triangulation and trilateration. 4.9 Compute for final data in connection with mining lease surveys. 4.10 Carryout corner shifts and peg shifts. 4.11 Prepare plans for mining leases.					

CADASTRAL SURVEYING III

PROGRAMME: NATIONAL DIPLOMA (ND) SURVEYING AND GEOINFORMATICS						
COURSE: Cadastral Surveying III			**COURSE CODE: SUG 202**			**CONTACT HOURS: 60HRS**
Course Specification: Theoretical Contents				**Practical Content**		
	General Objective: 1.0 Understand the survey procedures required for cadastral sub-division.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Survey Procedure for Cadastral 1.1 Identify the types of sub-divisions possible. 1.2 Calculate the required data for various types of sub-divisions. 1.3 Set out the sub-divisions beacons in the field. 1.4 Carryout the survey of the sub-divisions. 1.5 Compute the final values from the sub-division surveys. 1.6 Produce the plan of the sub-division. 1.7 Explain other mutations generally.			1.1 Carryout survey of claims boundaries adopting appropriate survey methods. 1.2 Produce cadastral plan using a total station. 1.3 Produce the same cadastral plan using GPS equipment.		
	General Objective: 2.0 Understand the procedure for undertaking compensation surveys.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Compensation Survey 2.1 Explain the legal position as it affects claims for buildings, undeveloped land, standing crops and other development, loss or rights and disturbances.					

	2.2 Appraise the required accuracy of compensation surveys. 2.3 Carryout surveys of claims boundaries adopting appropriate survey methods. 2.4 Use aerial photographs for the depiction of claims boundaries fro compensation purposes. 2.5 Prepare claims plans to show depiction, enumeration and evaluation. 2.6 Tabulate claims areas. 2.7 Explain what to do in the event of conflicting claims. 2.8 Explain the use of supporting details.					
	General Objective: 3.0 understand the application of EDM and ODM in Cadastral Surveying.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Application of EDM and ODM in Cadastral Surveying 3.1 Compare the EDM, ODM and steel band. 3.2 Use the EDM and ODM in distance measurement for general cadastral survey purposes. 3.3 Apply the EDM and ODM for the survey of mining leases and layouts.					

	General Objective: 4.0 Understand the procedures of using total station and GPS in Cadastral Surveying.			General Objective		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	The use of total station and GPS in Cadastral Surveying 4.1 Measure angles and distances of a cadastral plot. 4.2 Compute the coordinates of the corner points. 4.3 Plot the corresponding cadastral plan. 4.4 Use GPS to determine the geographic coordinates of the corner points of 4.2 above. 4.5 Plot the cadastral plan. 4.6 Compare 4.3 and 4.5 above. 4.7 Discuss the discrepancies arising from 4.6 above.					
	General Objective: 5.0 Know in detail the laws and regulations governing Cadastral Surveying as contained in CAP 194.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Laws and Regulations Governing Cadastral Surveying 5.1 Explain the necessity for regulating Cadastral Surveying. 5.2 Apply fully the regulations governing Cadastral Surveying. 5.3 Explain the laws relating to survey of lands as contained in the laws of the Federal Republic of Nigeria.					

	5.4 Use technical instructions relating to cadastral surveying.					

CARTOGRAPHY COURSES
(SUG 105, 106)

BASIC PRINCIPLES IN CARTOGRAPHY I

PROGRAMME: NATIONAL DIPLOMA (ND) SURVEYING AND GEOINFORMATICS						
COURSE: Basic Principles in Cartography I			**COURSE CODE: SUG 105**			**CONTACT HOURS: 45HRS**
Course Specification: Theoretical Contents				**Practical Content**		
	General Objective: 1.0 Understand the use and care of drawing instruments and materials.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Drawing Instruments and Materials 1.1 Describe the use and care of drawing instruments. 1.2 Explain properties and characteristics of drawing materials. 1.3 List the types of drawing. 1.4 Explain types of drawing materials appropriate for jobs. 1.5 Describe the use of set squares in drawing parallel lines. 1.6 Carry out assignment with compass divider, spring bow, etc.			1.1 Carryout assignment using compass, divider, spring bow etc. 1.2 Prepare freehand lettering of a given assignment. 1.3 Stencil a given assignment. 1.4 Construct a5 different map scales. 1.5 Enlarge and reduce plans at different scales. 1.6 Construct across section of a medium topography.		
	General Objective: 2.0 Apply the techniques of line drawing.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Line Drawing 2.1 Define line. 2.2 Explain the techniques of line drawing. 2.3 Draw lines with pencils on cartridge paper. 2.4 Draw lines with pen and ink (freehand line drawing).					

	2.5 Describe line gauges. 2.6 Prepare line gauges with ruling pen (free hand). 2.7 Prepare line gauges with straight and curve lines. 2.8 Prepare a combination of straight and curve lines. 2.9 Prepare border lines.					
	General Objective: 3.0 Apply elementary principles of lettering.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Lettering 3.1 Identify the basic strokes and shapes. 3.2 Draw basic strokes and shapes with pencil. 3.3 Draw basic strokes and shapes with pen and ink. 3.4 Describe size and type-faces of letters. 3.5 Explain the use of graph paper to construct letters. 3.6 Describe lettering guide-vertical and inclined ascenders, biddy and descenders. 3.7 Prepare lettering. 3.8 Copy from lettering pamphlet different size and type faces. 3.9 Describe spacing of letters. 3.10 Prepare freehand lettering of a given assignment. 3.11 Describe stenciling. 3.12 Stencil a given assignment.					

	General Objective: 4.0 Understand the construction of map scales.			General Objective		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Map Scales Construction 4.1 Define a map. 4.2 Define scale. 4.3 Explain the use of scales. 4.4 Calculate carious scales in kilometer and miles (Nautical). 4.5 Describe the division of lines geometrically. 4.6 Describe single, double and three lines. 4.7 Construct a given scale graphically. 4.8 Determine distances from map. 4.9 Construct diagonal, linear and roomer scales. 4.10 Determine distances from maps. 4.11 Explain large, medium and small scales.					
	General Objective: 5.0 Understand the methods of transferring detail from base information.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Transfer of Details From Base Information 5.1 Describe method of transferring details from base information. 5.2 Trace details from plans and maps on to drawing base materials and plastics, in pencil and ink. 5.3 Transfer inking-in new map details onto plan/map.					

	5.4 Explain pecked lines in relation to other details. 5.5 Prepare tracing from plans/maps.					
	General Objective: 6.0 Apply the methods of reduction of plans.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Enlargement And Reduction of Plans 6.1 Describe the methods of enlargement and reduction. 6.2 Calculate enlargement and reduction ratios. 6.3 Enlarge by squares rays, proportional dividers and mechanical methods. 6.4 Reduce by mechanical methods. 6.5 Produce enlargement and reduction of a given map.					
	General Objective: 7.0 Understand the method of preparing cross-sections.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Cross-Sectioning 7.1 Define cross section of profile. 7.2 Describe vertical and horizontal scales. 7.3 Draw the base line of the profile on a sheet of graph paper. 7.4 Distinguish between dips and rises. 7.5 Draw the outlines of summits. 7.6 Describe series of cross-section plateau, valley,					

	spur. 7.7 Explain the usefulness of cross-section. 7.8 Explain the methodical execution of cross-section. 7.9 Prepare cross-section of a given land form.					
	General Objective: 8.0 Know the standard of Nigerian map series.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Nigerian Map Series 8.1 Define map index. 8.2 Describe map index (Cadastral). 8.3 Describe map index (Topographic). 8.4 Describe the geographical extent of map series.					
	General Objective: 9.0 Construct National grid and graticule.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	National Grid and Graticule 9.1 Define national grid and graticule. 9.2 Identify the difference between grid graticule. 9.3 Extract coordinates values from coo-ordinate register. 9.4 Explain grid reference system and map references. 9.5 Determine the scale and grid interval. 9.6 Calculate the use of coordinatograph. 9.7 Describe the use of					

	coordinatograph. 9.8 Plot a given assignment by co-ordinates.					
	General Objective: 10.0 Understand contours and contouring.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Contours 10.1 Define Contour. 10.2 Describe index, regular and form lines. 10.3 Define vertical and horizontal equivalent. 10.4 Explain the scale of slopes. 10.5 Describe spot heights as aid to contouring. 10.6 Describe methods of contouring by spot heights. 10.7 Explain the method of depicting contourlines with respect to rivers. 10.8 Prepare contour interpolation from given heights.					
	General Objective: 11.0 Understand the graphic representation of information in maps.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Graphic Representation of Information 11.1 Define graphics. 11.2 List categories of information on map. 11.3 Explain the graphic representation of line in map. 11.4 Explain the graphic representation of point in					

	map. 11.5 Explain the graphic representation of area in map. 11.6 Describe the contents in large scale maps. 11.7 Describe the contents in topo, scale map. 11.8 Describe the contents in special map. 11.9 Define map specification. 11.10 Describe the impact of specification. 11.11 Prepare graphic representation of given information.					

BASIC PRINCIPLES IN CARTOGRAPHY

PROGRAMME: NATIONAL DIPLOMA (ND) SURVEYING AND GEOINFORMATICS						
COURSE: Basic Principles in Cartography			**COURSE CODE: SUG 106**		**CONTACT HOURS: 45HRS**	
Course Specification: Theoretical Contents				**Practical Content**		
	General Objective: 1.0 Understand the use of conventional signs and symbols.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Conventional Signs and symbols 1.1 Define symbols. 1.2 Identify symbols in maps. 1.3 Describe the basic parameters of symbols. 1.4 Explain the categories of symbols. 1.5 Explain the impacted symbols in map. 1.6 Illustrate symbols that occur in large scale map. 1.7 Illustrate symbols that occur in medium and small. 1.8 Describe point, line and area symbols. 1.9 Construct map symbols.					
	General Objective: 2.0 Understand the construction of grids.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Construction of Grids 2.1 Define grid. 2.2 Define Northings and Eastings, Southings and Westings (Quadrant). 2.3 Explain true origin. 2.4 Explain false origin. 2.5 Describe arbitrary grid. 2.6 Determine scale.					

	2.7 Calculate intervals of grid. 2.8 Describe methods of laying grid. 2.9 Construct a grid.					
	General Objective: 3.0 Plot by bearing and distance.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Bearing and Distance 3.1 Define bearing and distance. 3.2 Describe a compass. 3.3 Identify true north and magnetic north. 3.4 Describe measurement of distance by ruler and pair of dividers. 3.5 Define offset. 3.6 Extract data from surveyor's books. 3.7 Explain offset method of inserting detail survey. 3.8 Plot a compass traverse from filed book.					
	General Objective: 4.0 Understand the various methods of area determination.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Area Determination 4.1 Explain the methods of area determination. 4.2 Calculate areas of squares, rectangle, triangle, dots, etc. 4.3 Explain the method of determining area of irregular figure. 4.4 Describe a planimeter.					

	4.5 State the formular for planimeter. 4.6 Calculate the area of a given figure by planimeter.					
	General Objective: 5.0 Recognise types of maps.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Maps and Maps Types 5.1 Define map. 5.2 List type of maps. 5.3 Distinguish between a cadastral map and topographic map. 5.4 Explain the significance of each type. 5.5 Describe thematic map. 5.6 Describe navigational chart. 5.7 Describe a derived map. 5.8 Distinguish between basic scale map and derived map. 5.9 Illustrate the various types of maps.					
	General Objective: 6.0 Understand the Principles of Map Orientation.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Map Orientation 6.1 Define map orientation. 6.2 Describe setting a map orientation compass. 6.3 Describe setting a map by the sun. 6.4 Describe setting a map by comparison with straight lengths features. 6.5 Describe setting a map by association of features on					

	the map and in the country. 6.6 Orientate a given map using the above methods.					
	General Objective: 7.0 Understand the place of Cartography in Gls.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Cartography and GLS 7.1 Define GLS. 7.2 Explain the components of GLS. 7.3 Explain the principles of digitizing. 7.4 Edit digitized data. 7.5 Print digitized information					

CONTROL AND ENGINEERING SURVEYING COURSES
(SUG 208 AND 209)

CONTROL SURVEYS

PROGRAMME: NATIONAL DIPLOMA (ND) SURVEYING AND GEOINFORMATICS						
COURSE: Control Surveys			**COURSE CODE: SUG 209**		**CONTACT HOURS: 45HRS**	
Course Specification: Theoretical Contents				**Practical Content**		
	General Objective: 1.0 Understand how to measure distances using E.D.M.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	The use of E.D.M. 1.1 Measure distances using E.D.M. 1.2 Apply corrections to measured EDM distances such as slope instrumental constants, temperature and pressure.			1.1 Carryout the establishment of minor control point using GPS and Total Station. 1.2 Carryout both opened and closed traverses using Total Station. 1.3 Carryout GPS observation on selected controls between 5 – 10 points.		
	General Objective: 2.0 Understand the procedures in angular measurement.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Angular Measurement 2.1 Measure on face left and face right of the total station. 2.2 Change zeros between sets of observations 5 times on the same station.					
	General Objective: 3.0 Understand the establishment of orientation for surveys.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Establishment of Orientation 3.1 Explain the need for orientation of surveys. 3.2 Determine the relationship					

	between the references directions-true, magnetic and grid. 3.3 Distinguish between bearing and azimuth.					
	General Objective: 4.0 Understand the methods of tertiary theodolites traversing.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Tertiary Traversing 4.1 Explain the classification of traverses (first, second and third orders). 4.2 Enumerate the accuracy specifications for tertiary traverse. 4.3 Construct beacons. 4.4 Number beacons. 4.5 Apply azimuth check to control bearings. 4.6 Connect traverses to higher order work. 4.7 Carry out both open and closed traverses using total station. 4.8 Provide proper methods of checks in the two types of traverses mentioned above.					
	General Objective: 5.0 Understand the procedures for GPS observations.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	GPS Control Surveys 5.1 Initialise GPS on a known station. 5.2 Determine the mode of operation e.g. static mode, rapid-static kinematic etc. 5.3 Enumerate optimum					

	conditions for GPS observation e.g. clear field of view, clearance from transmission lines power station, any other obstruction etc. 5.4 Carryout GPS Observation on selected control (between 5 and 10 points).					

ENGINEERING SURVEY I

PROGRAMME: NATIONAL DIPLOMA (ND) SURVEYING AND GEOINFORMATICS						
COURSE: Engineering Survey I			**COURSE CODE: SUG 208**		**CONTACT HOURS: 75HRS**	
Course Specification: Theoretical Contents				**Practical Content**		
	General Objective: 1.0 Understand the basic principles and scope of engineering surveying			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Scope of Engineering Surveying 1.1 List the types and scales of plans required for constructions. 1.2 Describe the general procedure of setting out engineering works. 1.3 Describe the general procedure of "as built" surveys. 1.4 List the methods of surveying for construction. 1.5 State examples of engineering surveys where photogrammetry may be used. 1.6 Apply the uses of modern computational methods in engineering. 1.7 Apply the used of modern survey instruments in engineering surveys.			1.1 Carryout ranging, levelling, calculation, plotting and drawing of longitudinal section and cross sections at 30m internal of a proposed road alignment. 1.2 Carryout the methods of surveying for existing and new works as finally constructed. 1.3 Carryout simple circle ranging.		
	General Objective: 2.0 Understand the basic principles of geometric design of routes.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Geometric Design of Routes 2.1 Lists the types and scales of plans required for route					

	design. 2.2 Identify the geometrical elements of routes especially roads. 2.3 Distinguish between geometric design requirements of roads, railways, pipelines, electric power lines etc.					
	General Objective: 3.0 Know how to set out routes consisting of straight and circular curves.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Setting of Routes 3.1 Describe the process of setting out long straight lines. 3.2 Derive mathematical relationships between circular curve elements. 3.3 Solve the problem of setting out the circular curve if there are obstructions to sighting the deflection angles. 3.4 Run through the chainage in a route comprising straight and circular curves. 3.5 Derive necessary formulae to set deflection angles. 3.6 Describe other methods of setting out circular curves. 3.7 Utilise the tabulated deflection angles when occupying successive instrument stations along the curve. 3.8 Set out a long circular					

	curve by deflection angles using successive instrument stations.					
	General Objective: 4.0 Understand the methods of running, calculating plotting and drawing longitudinal sections and cross sections.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Longitudinal and Cross Section 4.1 Describe the basic principles of sectioning. 4.2 Distinguish between longitudinal sections and cross sections. 4.3 Range and set out cross sections. 4.4 Describe the methods of levelling the longitudinal section. 4.5 Illustrate methods of booking sectional observation. 4.6 Reduce the levels of all points and plot longitudinal section and cross sections. 4.7 Explain the essential; difference between the plot of longitudinal section and cross section. 4.8 Explain why in practice cross sections are usually taken at intervals. 4.9 Carry out ranging, levelling, calculation, plotting and drawing of longitudinal sections at 30m intervals of a					

	proposed road alignment.					
	General Objective: 5.0 Understand methods of area computations.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Area Computations 5.1 Distinguish between rectilinear and irregular areas. 5.2 Describe the methods of obtaining the area using formulae for geometric figures. 5.3 Use the planimeter. 5.4 Calculate areas by the trapezoidal and by Simpson's rules. 5.5 Compare the methods of area calculations.					
	General Objective: 6.0 Understand methods of volumes computations.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Volume Computations 6.1 Explain the need for calculation of volumes of earthworks. 6.2 Derive the trapezoidal and prismoidal formulae. 6.3 Calculate volumes from cross sections using the formulae. 6.4 Calculate volumes from contour lines. 6.5 Calculates volumes from spot heights.					
	General Objective: 7.0 Understand the process of setting out structures.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**

	Setting out of Structures 7.1 Explain how setting out differs from ordinary surveying. 7.2 Describe the forms of horizontal and vertical controls needed by the setting out process. 7.3 Determine plans required for setting out. 7.4 Describe all the stages of setting out engineering structures. 7.5 Set out buildings.					
	General Objective: 8.0 Understand the specialized aspects of "as built" surveys.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	As build Surveys 8.1 Explain the need for "as built" surveys. 8.2 Identify the requirements of as "build" surveys. 8.3 Carry out the methods of surveying for existing and new works as finally constructed. 8.4 Use photogrammetric methods of recording new construction works.					

SURVEY INSTRUMENTS COURSES
(SUG 207)

SURVEY INSTRUMENTS I

PROGRAMME: NATIONAL DIPLOMA (ND) SURVEYING AND GEOINFORMATICS						
COURSE: Survey Instruments I			**COURSE CODE: SUG 207**		**CONTACT HOURS: 45HRS**	
Course Specification: Theoretical Contents				**Practical Content**		
	General Objective: 1.0 Understand the principle features and functions of the surveying telescope			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Surveying Telescope 1.1 Identify the optical components of the surveying telescope. 1.2 Explain how the image is formed. 1.3 Explain how the line of sight is defined. 1.4 Define parallax, its occurrence and elimination. 1.5 Explain various qualities of the telescope resolving power brightness of image, magnification, filed of view. 1.6 Describe the main lens defects and the process of minimising them in the surveying telescope. 1.7 Explain how Ramsden's circle is formed and it influence on the design of eye-pieces.			1.1 Carryout tests and adjustments in respect of plate bubble, horizontal and vertical collimation trunnion axis, dishevelment vertically of vertical hair. 1.2 Carryout collimation adjustment for each type of level.		
	General Objective: 2.0 Understand the working principles of the theodolites.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Theodilite 2.1 Explain the basic functions of the theodolite.					

	2.2 Identify the essential parts of the theodilite. 2.3 Define the three geometric axes of the theodilite and their relationships when the theodolite is in adjustment. 2.4 Explain how to level the theodilite. 2.5 Identify the distinguishing features of the vernier theodilite. 2.6 Describe the improved features of the optical theodolite as compared with the vernier theodilite. 2.7 Explain the optical circle reading systems. 2.8 Explain the working principle of automatic vertical collimation. 2.9 Explain the principle of optical plummet. 2.10 Describe the internal illumination system of the optical theodolite. 2.11 Explain the functioning of various theodolite accessories diagonal eye-piece, forced centring tribrachs, roof plummet etc.					
	General Objective: 3.0 Understand the various tests and adjustments of the theodilite.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Tests and Adjustment of the Theodolite 3.1 Explain the effects of various instrumental					

	defects e.g. circle graduation defects, eccentricity of the circles, misplaced indexes, trunnion axis dislevelment. 3.2 Explain the observational procedures followed to reduce the effects of instrumental errors. 3.3 Explain the temporary adjustments of the theodolite levelling, centring the focusing. 3.4 Explain the permanent adjustments of the theodolite plate level adjustment, collimination adjustment, diaphragm adjustment, vertical index error adjustment. 3.5 Carry out tests and adjustments in respect of plate bubble, horizontal and vertical collimination, trunnion axis dislevelment, verticality of vertical hair.					
	General Objective: 4.0 Understand the working principles and method of adjustment of the various types of level.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Levels 4.1 Explain how an adjusted level provides a horizontal line of sight. 4.2 Define collimation error in a level. 4.3 Describe its effect and observational techniques to minimize the effect.					

	4.4 Identify the distinctive types of level-dumpy, stilting and self-aligning. 4.5 Describe the working principles of each of 4.4 above. 4.6 Describe how to test for collimation error and how to adjust the collimation error and how to adjust the collimation of various types of levels. 4.7 Carry out collimation adjustment for each type of level.					
	General Objective: 5.0 Understand the working principles of optical distance measuring instruments.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Optical Distance Measuring Instruments 5.1 Explain the working principles of optical range-finders and telemeters. 5.2 Describe the construction of the sub-tense bar and the principle of subtense measurements with it. 5.3 Explain the working principles of reduction tacheometers (using vertical staves). 5.4 Explain working principle of the optical wedge tacheometer using horizontal staves. 5.5 Explain the function of the anallactic lens in tacheometry.					

	General Objective: 6.0 Understand the working principles of EDM instruments.			General Objective		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	EDM Instruments 6.1 Explain the basic principles of EDM measurement. 6.2 Classify EDM instruments according to carrier waves. 6.3 Compare the mode of operation and performance of each class of EDM instrument.					
	General Objective: 7.0 Understand the working principles of the total station.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Total Station 7.1 Explain the basic principles of total station measurements. 7.2 Explain the major components of a total station. 7.3 Set-up and adjust a total station. 7.4 Enumerate the mode of operation of total station.					
	General Objective: 8.0 Understand the working principles of the GPS.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Global Positioning System (GPS) 8.1 Describe the various parts/accessories of a GPS e.g. controller, sensor, antenareter. 8.2 Describe the various GPS					

	signal. 8.3 Explain the measuring principles of a GPS for positioning/point fixing. 8.4 Enumerate the methods of GPS observations e.g. static, kinematics, differential, etc.					

GEO-INFORMATICS COURSES
(GIT 201 AND 203)

GIS DATABASE CREATION AND USAGE

PROGRAMME: NATIONAL DIPLOMA (ND) SURVEYING AND GEOINFORMATICS						
COURSE: GIS Database Creation and Usage			**COURSE CODE: GIT 203**			**CONTACT HOURS:60HRS**
Course Specification: Theoretical Contents				**Practical Content**		
	General Objective: 1.0 Understand database structures and data classification.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Structure and Classification of Database 1.1 Define database (with examples) Database structures, database classification. 1.2 Explain the principles of database structures e.g. relational networking, object-oriented etc. 1.3 Enumerate the classes of database e.g. planimetric, altimetric, planimetric – altimetric, etc. 1.4 Explain the uses of database system.			1.1 Carryout simple analysis of information derivable from the graphic displays. 1.2 Creation of simple data base table. 1.3 Simple Query of the created table. 1.4 Design of a simple data base using digital acquisition tools.		
	General Objective: 2.0 Understand the principles of and procedures for data layer and creation of data files.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Data Layer and Files 2.1 Explain data layer and data files. 2.2 Explain types of data layers. 2.3 Explain types of data files. 2.4 Explain the principles of referencing common features. 2.5 Describe creation of data files.					

	2.6 Enumerate the procedures for linking data layer and data files. 2.7 Create data files for different layers.					
	General Objective: 3.0 Understand the principles and procedures for data capture.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Data capture 3.1 Explain the principles of data capture. 3.2 Explain the procedures for data capture suing digital acquisition tools, tablets, scanners, digital photogrammetry work station, analytical plotters, digital image processing system etc. 3.3 Capture data using the tools in 3.2 above. 3.4 Edit errors arising from data capture technique.					
	General Objective: 4.0 Understand the storage of spatial and non-spatial data.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Storage of Spatial and Non-Spatial Data 4.1 Describe spatial data and non-spatial data. 4.2 Explain the characteristics of spatial data. 4.3 Explain the characteristics (attributes) of Non-spatial data. 4.4 Acquire spatial data using the tools in 3.2 above. 4.5 Correct for errors arising					

	from the acquisition of 4.4 above. 4.6 Input non-spatial data into tabular database. 4.7 Correct for errors arising from inputting the non-spatial data in 4.6 above. 4.8 Link spatial and non-spatial data of 4.5 and 4.7 above.					
	General Objective: 5.0 Undertake basic operations on geographic database.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Operations on Geographic Database 5.1 Explain the basic operations on a geographic database. 5.2 Select various terrains features (one after the other) and display graphically. 5.3 Carryout simple analysis of graphic displays. 5.4 Request for displays and their associated attributes.					

ELEMENTS OF GEO-INFORMATICS

PROGRAMME: NATIONAL DIPLOMA (ND) SURVEYING AND GEOINFORMATICS						
COURSE: Elements of Geo-Informatics			**COURSE CODE: GIT 201**		**CONTACT HOURS: 60HRS**	
Course Specification: Theoretical Contents				**Practical Content**		
	General Objective: 1.0 Understand the general concept of Geo-Informatics.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Concepts of Geo-Informatics 1.1 Explain Geo-Informatics, map, digital mapping, databases etc. 1.2 Explain the basic concepts of Geo-Informatics. 1.3 Explain the basic principles of digital mapping. 1.4 Enumerate the accuracy of each type of data.			1.1 Familiarization with hardware and software. 1.2 Carryout exercises on map digitizing and scanning. 1.3 Demonstration of GIS software.		
	General Objective: 2.0 Know the hardware and software requirements of Geo-Informatics.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Hardware and Software of Geo-Informatics 2.1 Mention the various components of hardware for Geo-Informatics. 2.2 Explain the memory opacity required (such as RAM – 32 Mb or higher, harddisk of 1`.2 Gb or higher, s 2.3 Peed of 200 MHz of higher SVGA VRAM – IMB or greater, 24xCD drive, 3.5 drive of 1.44 Mb, etc.).					

	2.4 Mention the various Geo-Informatics software e.g. CAD Auto Cad, GIS Vector-MAP INFO, GIS-Raster, DIP, PC – Arc/Info (Windows based), Arc view (windows based) etc.					
	General Objective: 3.0 Understand the various sources of data for Geo-Informatics.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Sources of Data 3.1 Mention different types of map (e.g. topographic, thematic, digital, etc.). 3.2 Mention different types of images (e.g. aerial, satellite, radar, scanned aerial photos, etc.). 3.3 Explain the different types of observed data (e.g. from theodolite, PGS, Total station, levels, hydro-phones, geo-phones, statistical, etc.). 3.4 Enumerate historical sources of data (e.g. cadastral, history, archeological, natural resources etc.)					
	General Objective: 4.0 Understand the methods of data acquisition for data base creation.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Methods of Data Acquisition 4.1 List the various methods of data acquisition (e.g. aerial. Satellite, surveying, digitization, scanning, radar, statistical survey,					

	etc.). 4.2 Explain the procedures of 4.1 above. 4.3 Outline the specification and limitations of 4.1 above for Geo-Informatics requirements. 4.4 Explain data conversion processes. 4.5 Enumerate the procedure of data base management.					
	General Objective: 5.0 Understand the areas of application of Geo-Informatics.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Application of Geo-Informatics 5.1 Mention the various areas of application of Geo-Informatics (e.g. map revision, environmental monitoring and assessment, natural resources management, defence and security, utilities planning, engineering, population, forestry, agriculture, transport and aviation, petroleum resources, health, education, sports development, finance, archeology etc.). 5.2 Relate each of the above applications to national development. 5.3 Discuss the means of achieving the above applications in Nigeria. 5.4 Enumerate if any, the					

	obstacles that could hinder the achievement of the application of Geo-Informatics in Nigeria. 5.5 Explain the role of Geo-Informatics experts in the society.					

INTRODUCTION TO COMPUTER

PROGRAMME: NATIONAL DIPLOMA (ND) SURVEYING AND GEOINFORMATICS						
COURSE: Introduction to Computer			**COURSE CODE: SUG 109**		**CONTACT HOURS: 05HRS**	
Course Specification: Theoretical Contents				**Practical Content**		
	General Objective: 1.0 Know the definition, history, evolution, classification and uses of computer.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Definitions, history, evolution, classification and uses of computer 1.1 Define computer. 1.2 Discuss history and evolution of computer. 1.3 Classify computer e.g. mainframe, micro and mini computers. 1.4 List the uses of computers e.g. storage, calculation, typing document etc.					
	General Objective: 2.0 know the basic components, rudiment of computer maintenances.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Basic component of Computer and Rudiments of Computer Maintenance 2.1 List the components of computer e.g. input unit, storage, memory, logical, output etc. 2.2 List the rudiments of computer maintenance.					

	General Objective: Know operating system, Basic storage units hierarchy of data organisation.			General Objective		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	Operating Systems , Storage Units and data Organisation 3.1 Use DOS. 3.2 Use Windows. 3.3 List Basic storage units e.g. bits, bytes etc. 3.4 Describe hierarchy of data organisation.					
	General Objective: Know methods of file organisation, file classification and file naming.			**General Objective**		
WEEK	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objective**	**Teachers Activities**	**Learning Resources**
	File organisation, classification and file naming 4.1 List methods of file organisation. 4.2 Classify files. 4.3 Name files.					

LIST OF PHYSICAL FACILITIES

LIST OF PHYSICAL FACILITIES

PROGRAMME	LABORATORY	STUDIO/STORE/DRAWING ROOM
ND/HND Surveying and Geo-Informatics	1. Physics Laboratory 2. Photogrammetry Laboratory. 3. Geo-Informatics Laboratory (Photogrammetry Cartography Instrument, Remote Sensing Instrument) etc. 4. Computer.	1. Cartographic Studio 2. Land Surveying Equipment Store. 3. Drawing Room 4. Computer Facilities 5. Printing and Duplicating Room 6. Camping Equipment.