OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA

FACULTY OF SCIENCE

DEPARTMENT OF GEOLOGY

Website:
http://www.gly.oauife.edu.ng/

2017 HANDBOOK

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THE OBAFEMI AWOLOWO UNIVERSITY

1.1 HISTORY OF THE UNIVERSITY

The Obafemi Awolowo University, Ile-Ife is one of the three Universities established in Nigeria between 1961 and 1962 as a result of the report submitted to the Federal Government in September, 1960, by a Commission it appointed in April 1959 under the Chairmanship of Sir Eric Ashby, Master of Clare College, Cambridge, to survey the needs of post-secondary and higher education in Nigeria over the next twenty years.

The Government of Western Nigeria first announced in 1960 its intention to establish as soon as possible a University in Western Nigeria which would be of the highest standard. Its policy would be to open its doors to students from all parts of the Federation and of the World.

The planning of the Obafemi Awolowo University was entrusted, to two Committees. The first was the University Planning Committee comprising persons qualified to advice on the planning of a new University, and who in effect undertook the preparatory work connected with the establishment of the University pending the setting up of the Provisional Council of the University. The other was a University Parliamentary Committee, which would be advisory to the Minister of Education. On 8th June, 1961, the Law providing for the establishment of the Provisional Council of the university was formally inaugurated under the Chairmanship of Chief Rotimi Williams.

On 11th June, 1970, an Edict known as the University of Ife Edict, 1970, was promulgated by the Government of the Western State to replace the Provisional Council Law of 8th June, 1961. This Edict has since been amended by the Obafemi Awolowo University, Ile-Ife (Amended) Edict No. 11 of 1975 (Transitional Provisions) Decree No. 23 of 1975. This new Decree effected a take-over of the Obafemi Awolowo University by the Federal Military Government and established a Provisional Council as an interim governing body of the University which shall, subject to the general direction of the Head of the Federal Government, control the policies and finances of the University and manage its affairs. This Provisional Council has since been replaced by a Governing Council.

The site selected for the University was at Ile-Ife, a town about 80 kilometres northeast of Ibadan in the Oyo State. Ife is famous as the centre of an ancient civilization and home of the Museum which contains the renowned Ife heads. It was intended that temporary buildings should be put up on the site to enable

teaching to commence in October 1962 while the permanent buildings were being planned and erected. But when the Federal Government transferred the Ibadan Branch of the Nigerian College of Arts, Science and Technology to the University, it was decided that it would be unnecessary to put up temporary buildings at Ife and the University was temporarily located on the site of Ibadan Branch of the Nigerian College.

Teaching began in October 1962 with an initial enrolment of 244 students. The teaching, administrative and technical staff, either transferred from the Nigerian College or newly recruited from abroad numbered about eighty.

The University started with five Faculties – Agriculture, Arts, Economics and Social Studies (now Social Sciences), Law and Science. Six new faculties have since been added, namely the Faculty of Education (established on 1st October, 1967), the Faculty of Pharmacy (established on 1st October, 1969), the Faculties of Technology and Health Sciences now (College of Health Sciences) (both established on 1st October, 1970) Faculty of Administration (which replaces the former Institute of Administration with effect from 1st October, 1979) and Faculty of Environmental Design and Management (established on April 6, 1982).

In 1992, the University established a Collegiate system with five Colleges. The system did not function effectively and was abandoned after two years. However, the Postgraduate College and the College of Health Sciences were retained. The College of Health Sciences now comprises of the Faculties of Basic Medical Sciences, Clinical Sciences and Dentistry.

The Adeyemi College of Education, located in Ondo, and the Institute of Agricultural Research and Training in Ibadan were initially integral part of the University. Although the Adeyemi College was separated from the University in 1975, however there is still a close relationship between the two institutions. The College offers degree programme of the University under a system that is closely monitored by University.

The Institute of Agricultural Research and Training lbadan, with a branch at Akure in Ondo State, used to be fully superintended by the University in 1991. However, the Akure branch and the College of Animal Science of the Institute continued to report to the Federal Government through the Director of the institute. In terms of funding, the institute of Agricultural Research and Training now relates to the Federal Ministry of Agriculture while the University still has administrative responsibility for the Research and Administrative staff of the Institution. The Director and the Secretary of the institute are responsible to the

University through the Vice-Chancellor and Registrar respectively. The Vice-Chancellor is the Chairman of the Institute's Governing Board.

The following other Institutes and major units exist in the University:

The Natural History Museum
The Institute of Ecology and Environmental Studies
The Centre for Gender and Social Policy Studies
The Centre for Industrial Research and Development
The Institute of Public Health
The Institute of Cultural Studies
The Technology Planning and Development Unit
The Computer Centre
The Drug Research and Production Unit
The Equipment maintenance and Development Centre
The Central Technological Laboratory Workshop
The Central Science Laboratory
The Distance Learning Centre

Finally, some other agencies over which the University has no director in some cases limited control, have premises within the University.

The Regional Centre for Training in Aerospace Surveys
The National Centre for Technology management
The Centre for Energy Research and Development
The African Regional Centre for Space Science and Education inEnglish

The student population rose steadily from 244 in 1962/63 to about 30,000 at the end of the 2015/2016 Session.

1.2 VISION, MISSION AND OBJECTIVES OF THE UNIVERSITY

(a) **Vision**

The vision is of a top rated University in Africa, that is, the technological flagship of the West African sub-region, as evidenced by its application of modern technology to teaching, research and community service, and its provision of practical solutions to social, cultural, and economic problems.

(b) **Mission**

The mission of the University, as stated in the University of Ife Edit 1970, is "to promote, by research and other means, the advancement of knowledge and its practical application to social, cultural, economic,

scientific and technological problems"; to create a conducive teaching and learning community for imparting skills, knowledge, behaviour and attitude; advance and protect the independence of the academic enterprise; engender a sense of selfless public service and promote the African culture and tradition.

(c) **Strategic Objectives**

1. To produce graduates of international standard, with appropriate knowledge and skills in their field of study, who will be highly employable and able to employ themselves.
2. To provide high quality research and development activities that will promote the development of the Nation and enhance the image of the University and the researchers.
3. To harness modern technology especially ICT and modern social, economic and financial strategies to run a cost efficient and effective academic programme and institutional management.
4. To provide services thathave relevance to and impact on the local community and the Nation.
5. To provide conditions of study, work and living in the University Community that are of appropriate standard.
6. To expand access to tertiary education in the face of unmet demand.
7. To operate as an equal opportunity educational institution, sensitive to the principle of gender equity and non-discriminatory on the basis of race, ethnicity, religion or physical disability.

1.3 MEMBERS OF THE UNIVERSITY

The members of the University as defined on statute 2(1) are:

(a) the Officers of the University;
(b) the members of the Council:
(c) the members of the Senate:
(d) the members of the Academic Staff;
(e) the Graduates;
(f) the students; and such other persons as may by Statute he granted the status of members.

A person shall remain a member of the University only as long as he is qualified for such membership under any of the sub-paragraphs of paragraph (1) of this Statute.

1.4 THE OFFICERS OF THE UNIVERSITY

The Officers of the University as contained in Statute 3 shall be:

(a) the Chancellor;
(b) the Pro-Chancellor;

(c) the Vice-Chancellor;
(d) the Deputy Vice-Chancellor (Academic);
(e) the Deputy Vice-Chancellor (Administration);
(t) theRegistrar;
(g) the Librarian;
(h) the Bursar; and
(i) such other persons as may by Statute be granted the status of officers.

1.5 ESTABLISHMENT OF THE UNIVERSITY COUNCIL

(a) Functions

The University Council to be known as the Council of ObafemiAwolowo University, Ile-Ife, was established by the Edict. The Edict states that Council shall be the governing authority of the University and shall have the custody, control and disposition of the property and finances of the University and, except may otherwise be provided in the Edict and the Statutes, shall manage and superintend generally the affairs of the University and, in any matter concerning the University not provided for under this Edict, the Council may act in such manner as appears to it best calculated to promote the interests, objects and purposes of the University.

The Council, subject to the provisions of the Edict and Statutes has the following functions among others:

(i) to determine in consultation with Senate, all University fees;
(ii) to establish after considering the recommendation of the Senate on that behalf, Faculties, Institutes, Schools, Boards, Departments and other units of learning and research; to prescribe their organization, constitution and function and to modify or revise the same;
(iii) to authorize after considering the recommendations of the Senate on that behalf, the establishments for the academic in the University, and with approval of the Senate, to suspend or abolish any academic post except a post created by this Edict or the Statutes;
(iv) to authorize the establishments for the administrative staff and other staff in the University and to suspend or abolish any such posts other than posts created by this Edict or the Statutes;
(v) to make the appointments authorized by this Edict and the Statutes;
(vi) to exercise powers of removal from office and other disciplinary control over the academic staff, the administrative staff and all other staff in the University;

(vii) to supervise and control the residence and discipline of students of the University and to make arrangements for their health and general welfare.

(b) **Composition of the Members of Council**

The Council as contained in Statute 10(1) as amended by Decree No. 11 of 1993 and Decree 25 of 1996 shall consist of the following members:

(i) Ex-Officio Members: Pro-Chancellor
The Vice-Chancellor
The Deputy Vice-Chancellors
(ii) 1 member from the Federal Ministry of Education
(iii) 9 members representing a variety of interest and broadly representative of the whole federation to be appointed by the President
(iv) 4 members of Senate appointed by Senate
(v) 2 members of the Congregation elected by the Congregation
(vi) 1 member of Graduates Association elected by Graduates

The Senate shall prescribe which Departments and subjects of study shall form part or be the responsibility of each of the Faculties. The next level of organization is the Faculty where the teaching and other activities of the Departments are co-coordinated. Proposals generally come from Departments to the Faculty Board although they can also be initiated at the Faculty level in which Departments normally have an opportunity to consider them before the Faculty Board takes a decision. The membership of the Faculty Board is stipulated in Statute 13(3) thus:

(a) The Vice-Chancellor
(b) The Deputy Vice-Chancellors
(c) The Dean of the Faculty
(d) The Professors and Heads o Departments comprising the Faculty;
(e) Such other full-time members of the academic staff of the Departments comprising the Faculty as the Senate may determine after considering the recommendation of the Faculty Board;
(f) Such other Professors and other Heads of Departments, as the Senate may determine after considering the recommendation of the Faculty Board;
(g) Such other persons within or outside the University as the Senate may appoint after considering the recommendation of the Faculty Board.

The next level is that of Departments which consist of groups of teachers and sometimes Research Fellows in a single subject with a Head who is usuallyalthough not always a Professor generally appointed by the Vice-Chancellor.

The Department is the normal basic unit of academic organization. It is at this level that the organization of teaching and the use of research facilities are primarily worked out. Senate may however recommend the creation of Institutes for groups of specialized subjects or discipline that require interdisciplinary research efforts and thus, cut across Faculties in scope.

1.6 ORGANISATION AND ADMINISTRATION

The Vice-Chancellor is theChief Executive Officer of the University and five other Principal Officers of the University,namely: the Deputy Vice-Chancellors (2), the Registrar, the University Librarian and the Bursar report to him. The University Librarian is in charge of the University Library while the Bursar takes charge of the University finances. The Registrar is the Secretary to Council and the Chief Administrative Officer of the University and he assists the Vice- Chancellor in the day-to-day administration of the University. He is also the Secretary to Senateand heads the Registry, comprising the Directorate of Academic Affairs, the Directorate of Council Affairs. Division of Corporate Services and the Director of Personnel Affairs. The Planning, Budgeting Monitoring/Management Information System Unit takes care of the academic planning, budgeting and monitoring needs of the University and is under the Vice-Chancellor's Office.

The University Central Administration also includes some Units providing common services. They are the Medical and Health Services, the Division ofMaintenance Services, the Physical Planningand Development Unit and the Computer Centre. Headsof these units report to the Vice-Chancellor.

1.6.1Congregation

The Congregation comprises all full-time members of the academic staff and every member of the administrative staff who holds a degree of any recognized University It discusses and declares an opinion on any matter whatsoever relating to thewell-being of the University. It has twelve elected membership in Senate and two elected members in the University Council.

1.6.2Information on Facilities

(A) Hezekiah Oluwasanmi Library

(i) **Plan of the Library**

The Library consists of the North and South wings, which are connected by walkways on two levels.

(ii) **Membership**

Membership of the Library is available, on completion of a registration card, to all students, members of the senior staff of the university and such other persons as may be determined by the Library Committee or the University Librarian on behalf of it.

Students are required to renew their registration at the beginning of each academic year. Library Cards and Borrower's Tickets are not transferable; books issued on them remain the responsibility of the person whose name appears on them.

A Lost Library Card or Borrower s Ticket may be replaced on submission of a written application.

(iii) **The Library Collections**

Hezekiah Oluwasanmi library now contains over 380,000 volumes. It consists of two main areas:

(a) The Undergraduate Areas and
(b) The Research Areas.

1. **Serial Collection**

The Serials Collection consists of:

(i) Current journals, the most current issues of which are shelved in the display section of the SerialsRoom.

a. Latest back flies i.e. the latest 10 years of journals which are on open access to register senior staff and postgraduate students.

b. Older back files i.e. journals older than ten years are on closed access to all categories of readers who must obtain and complete request forms at the serials hatch.

2. **African Special Collection**

The African Special Collection is a collection of rare and other books primary interest to people whose fields of interest are in African Studies. Staff publications and theses submitted for hither degrees of

the University as well as of other Universities are also housed there. The Collection is closed access.

3. **Documents Collection**

The Documents Collection includes official publications of the Federal Government of Nigeria, the old regional governments, the present state governments and the Federal Capital Territory. It also includes publications of other African governments and international organizations.

4. **Reference Collection**

Dictionaries, encyclopedia, handbooks, directories, atlases, University Calendars, etc. are shelved in the Reference Room. Bibliographies, indexes and abstracts are available in the Bibliography Room. Reference books do not ordinarily circulate.

A newspaper clippings file (*post-October, 1985)* and a vertical file or reprints and other pamphlet type material is kept in the Reference Room.

5. Reserve Collection

(i) **Day reserve collection**

Multiple copies of textbooks, particularly some of those recommended for specific courses, are shelved in the Reserve Books Room on Floor 3 North Wing East.

(ii) **Two Hour Reserve**

Some other materials, periodical articles in particular, are placed on 2 –hour reserve. These may be obtained on request (signature and seat number required) and retained for a period of two hours at a time, subject to renewal, provided other readers have not demanded the materials.

6. Recent Accessions

A selection of books added to the Library stock is normally displayed for several days before being put in the main collection. The books may not be borrowed while on display but may be reserved at the loans Desk.

Catalogues

A library catalogue is a finding list of books and other materials available in the library. The following catalogues can be found in the Catalogue Hall:

(i) The Author/Title Catalogue
(ii) The Subject Catalogue
(iii) The Shelf list
(iv) The Serials Catalogue
(v) The Documents Catalogue

Howto Borrowa Book
When you have found the book you want to borrow, you will be required to sign your name and address on the book card provided in duplicate. You must surrender a Borrower s Ticket for each book borrowed.

When you return a book, you must ensure that you receive your Borrower's Ticket back immediately.

Reservation
A book can be reserved by filling a reservation slip;in which case, it will not be renewed for the present borrower when returned, and, if it is already overdue, it will be recalled at once.

Inter-Library Loan
If the book you require is not in stock, it is often possible to borrow it from another library. This service is dependent on goodwill and cooperation between libraries, and readers who benefit from it are required to observe the regulations applying to each loan.

Photocopying Services
Within the limitations imposed by copyright, the library is able to supply readers with photocopies of periodical articles and parts of books at moderate charges.

Penalties for Overdue or Lost Books
Penalties for overdue books will be imposed as follows:

(a) N5.00 per day for the first 30 days; thereafter all loan privileges will stop
(b) Books specially recalled by the university Librarian will attract a fine of N 10.00 per day after third day from the date of recall.
(c) Books lost or damaged will attract a fine five times the current cost of the books?
(d) No student will be allowed to attend the Graduation Ceremony or receive his/her certificate without a clearance certificate from the University Library to the effect that no book or fine is outstanding against him or her.

Library Opening and Closing hour

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Monday - Friday	8.00a.m. -	8.00 p.m.
Saturday	8.00a.m. -	4.00 p.m.
Sunday	2.00p.m. -	8.00 p.m.

Vacation Period

Monday - Friday 8.00a.m - 6.00p.m.

B. Division of Students' Affairs.

1. **Guidance and Counseling Unit:**

The Division of Students' Affairs has Professional Counselors who are committed to helping students grow in self-understanding in the process of integrating their personal and academic experiences. The services are free to students and are confidential (i.e. not used as part of his/her other University records). The services include personal counseling, group counseling, study skills improvement, tests anxiety reduction, personal crisis intervention, psychological testing, career and occupational counseling and settlement of grievances between students. Where necessary, consultations are made with campus organizations, specialists and academic Departments, to ensure that students' problems are resolved satisfactory.

The Counselors can be contacted in Rooms 9 and 10 Division of Students' Affairs between 10.00am and 2.00pm. Monday to Friday.

2. **Scholarship and Financial Assistance:**

The Division of Students' Affairs serves as a link between students and sponsoring authorities, both within and outside Nigeria. Students are advised to check the Notice Boards in their respective faculties as well as those at the Division of Student Affairs Building for advertisements and other relevant information.

Liaison is also maintained between students and governments at various levels for scholarship and bursaries.

1.7 Roll of Honours for Students

Senate at a Special Meeting held on Wednesday, l November, 2006 decided that Roll of honours for Students be instituted in the University to enhance discipline and good performance among students.

All students are enjoined to strive to be on the Honours Roll.

The details are as follows:

(i) The Honours Roll should be at three levels, namely:
  (a) Departmental Honours Roll
  (a) Provosts/Deans Honours Roll
  (c) University/Vice-Chancellor's Honours Roll

(ii) The beneficiaries must have a minimum CGPA of 4.0 for Departmental Honours Roll; 4.25 for Provost/Deans honours Roll and 4.5 for Vice-Chancellor/University Honours Roll in all the Faculties except the Faculty of Pharmacy and College of Health Sciences where the candidates are expected to have a cumulative average of 60% and 62% respectively.

(iii) The beneficiary must maintain this grade annually to continue to enjoy the award.

(iv) The recommendations must be processed along with results of Rain Semester examinations.

(v) The student must be of good conduct.

(vi) He/she must not have outstanding or carry-over courses and must not be repeating year.

(vii) No student on LeaveAbsence shall enjoy the Annual Roll of Honours Award.

(viii) No student that has a disciplinary problem shall enjoy the award.

(ix) The award shall base on the recommendation of theDepartmental Board Examiners'and the Faculty Board ofExaminers, while that pertaining to the Vice-Chancellor/University shall be processed through the Committee ofDeans.

(x) Names of beneficiaries shall be displayed as follows:
Departmental Honours - Departmental Notice Board
Provost/Deans Honours - Faculty Notice Board
Vice-Chancellor/University Honours - Floor 'O' Secretariat Building

(xi) Each beneficiary shall be given a certificate.

1.8 University Examination Regulations

Some University Examination Regulations students should note as contained in University Examination Regulations for first Degrees, Diplomas and Certificates are:

1.8.1 Registration for University Examinations

(a) A candidate for a University examination must have registered the courses in the prescribed format not later than the closing date

prescribed for registration for such courses. Any candidate who fails to register for courses at the appropriate time as prescribed by Senate will not be allowed to take any examination in such courses. Any examination taken without course registration shall be null and void.

(b) Students who register for courses are committed to the number of units registered for and are expected to take examinants in such course. If a student failed to take an examination he would be scored 'OF' for the number of units he had registered for and in which he had failed to take the prescribed examination.

(c) Any student who does not have any course to offer in a particular semester should apply for leave of absence.

(d) A candidate who has less than 15 units in a particular semester to graduate should apply to his/her Faculty Board for permission to register for less than 15 Units. Failure to do so constitutes a breach of regulation which may result in the non-processing of the candidates results.

(e) A candidate, who cannot register for courses during the prescribed period for registration because of an illness, must ensure that medical report on his illness is forwarded by him or his parents/sponsors to reach the Dean of his Faculty not later than four weeks after the end of the normal registration period as scheduled in the University Calendar. Such a medical report should be forwarded for authentication by the Director of Medical and Health Services for it to be considered valid. Such a candidate shall be exempted from the penalties of late registration. All applications should be routed through the Head of Department.

(f) Students must attend a minimum of 75% of course instructions including lectures, tutorials and practical where required toqualify to sit for examination in any course.

1.8.2 Absence from Examination

Candidates must present themselves at such University examinations for which they have registered. Candidates who fail to do so for reason other than illness or accident shall be bound by the following regulations:

(a) Any student who fails to register for courses during one semester without permission should be deemed to have scored OF" in the minimum number of units required for full time students (i.e. 15 Units).

(b) Candidates who registered for courses, attended classes regularly, did all practical and tests but did not take required semester examinations should be given a continuous assessment grade in each of the affected courses and a grade of "O" in the examination which they should have taken, but which they did not take.

(c) Candidates who have less than 15 units to graduate but fail to take the required examinations should be deemed to have scored "O" in the outstanding courses only provided such candidates obtained permission to register for less than 15 units.

(d) Any candidate on account of illness, is absent from University examination may be permitted by the Senate on the recommendation from the appropriate Faculty Board, to present himself for such examination at the next available opportunity provided that:

(i) A full-time student in the University shall report any case of illness to the University Health Centre at all times.

(ii) When a student falls ill during examination he should report to the Director, Medical and Health Services before attending any hospital outside the University. A report of sickness should be made to the Registrar within a week and a medical certificate of validation of his illness within three weeks.

(iii) When a student falls ill before an examination he shall be under an obligation to send a medical report countersigned by the Director, Medical and Health Services within one week of such illness. Any time outside this period, shall be considered on its merit.

(iv) The Director of Medical and Health Services should within 48 hours, submit a medical report on a candidate who is ill during an examination and is taken to the Health Centre or referred by it to the hospital for treatment.

(v) A candidate applying for leave of absence on medical grounds must forward his application together with a medical report to the Dean of his Faculty through his Head of Department. The Medical Report must be countersigned by the Director, Medical and Health Services. All applications for Leave of Absence must be taken by the appropriate Faculty Board.

1.8.3Examination Offences and Penalties

(a) A candidate shall not be allowed during an examination to communicate by word or otherwise with any other candidates nor shall he leave his place except with the consent of an invigilator. Should a candidate act in such a way as to disturb or inconvenience other candidates, he shall be warned and if he persists he may, at the discretion of the invigilator be excluded from the examination room. Such action by the invigilator must also be reported in writing through the Head of Department to the Vice-Chancellor within 24 hours.

(b) It shall be an examination offence for any students, staff or any person whatsoever, to impersonate a candidate in any University examination. Any student or staff of the University found guilty under this regulation shall be subjected to disciplinary action by the appropriate authority of the University.

(c) No candidate shall take into an examination room or have in his possession during examination any book or paper or printed to written documents, whether relevant to the examination, or not, unless specifically authorized to do so. Any invigilator has authority to confiscate such documents.

(d) Mobile phones are not allowed in examination halls.

(e) A candidate shall not remove from an examination room any papers, used or unused, except the question paper and such book and papers, if any, as he is authorized to take into the examination room.

(f) Candidate shall comply with all “direction to candidates” set out on an examination answer book or other examination materials supplied to them. They shall also comply with duration given to them by an invigilator.

(g) Candidates shall not write on any paper other than the examination answer books. All rough work must be done in the answer books and crossed out neatly. Supplementary answer books, even if they contain only rough work must be tied inside the main answer books.

(h) When leaving the examination room, even if temporarily, a candidate shall not leave his written work on the desk but he shall hand it over to an invigilator. Candidates are responsible for the proper return of their written work

(i) Smoking shall not be permitted in examination room during examination sessions.

(j) Any candidate or staff who attempts in any way to unlawfully have or give pre-knowledge of an examination question or to influence the marking of scripts or the award of marks by the University examiner shall be subject to disciplinary action by the appropriate authority of the University.

(k) If any candidate is suspected of cheating, receiving assistance or assisting other candidates or of infringing any other examination regulation, a written report of the circumstance shall be submitted by the invigilatorto the Vice-Chancellor within 24 hours of the examination session. The candidate concerned shall be allowed to continue with the examination.

(l) Any candidate suspected of examination malpractice shall be required to submit to the invigilator a written report immediately after the paper. Failure to make a report shall be regarded as a breach ofdiscipline. Such report should be forwarded along with the Invigilators report to the Vice- Chancellor.

(m) Where a Head of Department fails to forward a report on examination malpractice to the Vice-Chancellor such action would be considered misconduct.

THE DEPARTMENT OF GEOLOGY

2.1 BRIEF HISTORY OF THE DEPARTMENT

The Department of Geology was established in April 1965. The Department ran a B.Sc. degree programme in Geology until the 1974/75 academic year when the B.Sc. Applied Geophysics degree programme was introduced. It was the first Department to introduce the undergraduate Applied Geophysics programme in Nigeria. In the same year, the Department introduced three M. Sc. Applied Geology degree programmes in Mineral Exploration, Hydrogeology/ Engineering Geology and Sedimentary/Petroleum Geology. It subsequently introduced the M. Sc. Applied Geophysics degree programme and the M. Phil. and Ph. D. Degree programmes in Applied Geology and Applied Geophysics.

Due to demand for an intensive postgraduate course of shorter duration (than the conventional 24-calender month M.Sc. programme) for professionals already serving in the industry and government agencies, a 12-calender month (one year) Professional Master programmes in Petroleum Geosciences, Petroleum Geophysics, Petroleum Geochemistry, Mineral Exploration and Groundwater and Environmental Geosciences were introduced in 2012.

Since its establishment over fifty years ago, the Department has graduated over 1000 students at undergraduate and postgraduate levels. Today, these graduates occupy key positions in the solid minerals, oil and gas, environmental, hydrogeological and other various sectors of the Nigerian economy, including politics and academia. In spite of the dwindling human and material resources, the Department of Geology has endeavoured, over the years, to maintain a high academic standard that has won her the prestigious Nigerian Mining and Geosciences Society (NMGS) prize for the best training Department and her students and staff several academic laurels.

The Department has a track record of high quality research as demonstrated by the fact that a substantial part of the research data generated in its first 40 years of existence were published in highly reputable international journals as well as local journals of international repute. These publications are over one thousand. Besides, one of its founding fathers (Professor O. S. Adégòkè) won the 1988 Nigerian National Merit Award. The pace of research has, however, somewhat slackened in the last decade because facilities have deteriorated and become grossly inadequate. Despite this fact, the current academic members of staff have endeavoured to distinguish themselves as high-calibre researchers in their various disciplines. Two of them have been inducted into the Nigerian Academy of Science (NAS) as Fellows.

2.2 VISION

To be a centre of excellence in geosciences that will rank amongst the best in the world and whose products will be globally sought after.

2.3 MISSION

To create enabling academic environment for teaching, learning and research in geosciences; advance the frontiers of knowledge in geosciences that are relevant to national and global development and train a crop of geoscientists that are employable and can generate employment.

2.4 PROGRAMME PHILOSOPHY

The academic programmes in the Department are designed to equip the students with requirements needed to serve in a professional capacity in most challenging fields such as Oil Companies, Oil Service Companies, Geological Survey agency of the Ministry of Solid Minerals Development, Ministries of Water Resources, Environment, State Water Boards, Civil and Road Construction Companies among others, in which qualified geologists and geophysicists are needed in Nigeria and in other developing countries of Africa. The programes are designed to promote self-employment and entrepreneurship in the geosciences in realisation of dwindling employment prospects in the formal employment sector.

2.5 PROGRAMME OBJECTIVES

The progamme objectives include

(i)To provide students with a broad and balanced background knowledge founded in ICT-based and computer driven technologies in the various aspects of geosciences.

(ii)To expose students to modern concepts of global geology.

(iii)provide effective field-based courses that emphasize integration of methodologies and techniques for solving complex geological and geophysical problems.

(iv)To train the capability of the students to conceive research problems and formulate methodologies to address them.

(v)To provide in-depth training for research in areas of geosciences that are of particular and immediate relevance to national and regional developments in Nigeria and other African countries.

2.6 LIST OF STAFF

The Department of Geology currently has eighteen permanent academic members of staff, and three associate academic staff as contained in Table 1. Table 2 contains the list of non-academic staff.

Table 1: Academic Staff Members

S/N	NAME	DESIGNATION	AREA(S) OF SPECIALIZATION	QUALIFICATION
1	S. A. Adekola	Senior Lecturer & HOD	Petroleum Geology/ Geochemistry	B.Sc(Ado-Ekiti), M.Sc (Ibadan), PhD (UWC)
2	M. O. Olorunfemi	Professor	Applied Geophysics	B.Sc, (Ife), M.Sc., Ph.D (Birmingham)
3	V. O. Olarewaju	Professor	Petrology/ Geochemistry/ Geological Mapping	B.Sc, (Ib) M.Sc(Zaria, D.I.C.(Imperial Coll), PhD (London)
4	J. O. Ajayi	Professor	Hydrogeology/ Engineering Geology	B.Sc, (Ife), M.Sc., Ph.D, (Arizona)
5	S. B. Ojo	Professor	Applied Geophysics	B.Sc. M.Sc. (ABU), Ph.D. (West Ontario, Canada)
6	M. T. Olowokere	Professor	Shell Professor of Geophysics	BTech.,MTech., PhD (Akure)
7	A. A. Adepelumi	Reader	Applied Geophysics	B.Tech., (Akure), M.Sc. (Ife), Ph.D. (Brazil)
8	S. L. Fadiya	Senior Lecturer	Micropaleontology / Biostratigraphy	B.Sc. (Ado-Ekiti), M.Sc., Ph.D. (Ife)
9	O. A. Alao	Senior Lecturer	Applied Geophysics	B.Sc., M.Sc. Ph.D.(Ife)
10	D. E. Falebita	Lecturer I	Applied Geophysics	B.Tech.,(Akure) M.Sc., Ph.D.(Ife)
11	O. Afolabi	Lecturer I	Applied Geophysics	B.Sc., M.Sc. Ph.D.(Ife)
12	B. M. Salami	Lecturer I	Hydrogeology/ Engineering Geology	B.Sc., M.Phil., Ph.D.(Ife)
13	A. O. Olorunfemi	Lecturer I	Mineralogy/ Geochemistry/ Geological Mapping	B.Tech.,(Akure) M.Sc., Ph.D.(Ife)
14	A. Adetunji	Lecturer I	Mineralogy/ Geochemistry/ Geological Mapping	B.Sc.,(Akure) M.Sc., Ph.D.(Ife)
15	A. B. Alao-Daniel	Assistant Lecturer	Mineralogy/ Geochemistry/ Geological Mapping	B.Sc.,(OOU) M.Sc. (Ife)
16	O. T. Akinsanpe	Assistant	Petroleum/	B.Sc., (Ife) M.Phil.

		Lecturer	Sedimentary Geology	(Ife)
17	I. A. Tubosun (CERD)*	Reader	Isotope Geochemistry	BSc., MSc, PhD
18	M. A. Olayiwola (NHM)*	Senior Research Fellow	Quaternary Geology, Biostratigraphy	B. Sc. (Zaria), Mphil. (Ife), PhD (South Africa)
19	O. M. Oyebanjo(NHM)*	Research Fellow	Mineralogy/ Geochemistry/ Geological Mapping	BSc., MSc., (Ife)

* CERD: Centre for Energy Research and Development
* NHM: Natural History Museum

Table 2: Non Academic Staff Members

S/N	NAME	DESIGNATION	QUALIFICATION
1	T. A. Adesiyan	Chief Technologist	HND, PGD, MTech.
2	N. Olanrewaju	Senior Laboratory Supervisor	SSCE
3	O. N. Fadahunsi	Senior Assistant Technologist	OND, HND
4	J. A. Ogundele	Senior Technical Assistant	Govt Trade Test
5	S. B. Gabriel	Principal Confidential Secretary	OND, HND, Postgraduate
6	J. Awoyemi	Senior Secretarial Assistant	SSCE
7	L. Fatai	Chief Clerical Officer	General Certificate
8	O. S. Adebiyi	Secretarial Assistant III	OND
9	O. A. Ojegbemi	Senior Driver	WAEC
10	M. K. Ipaye	Office Assistant	SSCE

2.7 DEPARTMENTAL FACILITIES

2.7.1 Laboratory/Teaching Facilities

(a) Microscope Laboratory (Mineralogy; Igneous, Metamorphic and Sedimentary Petrology)

The different disciplines of geosciences are all centered on rocks. Almost all rocks are made up of minerals. The mineral types, sizes of the mineral grains, their shapes and geometric arrangement (texture/fabric) vary from one rock type to another and form the basis of their classification. Identification of minerals and rocks is a basic skill that every geoscientist requires. In the Department of Geology these skills are taught in core courses such as Mineralogy, Igneous Petrology, Metamorphic Petrology and Sedimentary Petrology.

The basic equipment required for the identification of minerals and rock fabrics is a microscope. The study of the optical properties of minerals that are transparent in thin sections (the basis of their identification) and the textures/fabrics of rocks is done in the laboratory by means of a transmitted light petrographic microscope (also known as polarizing or petrologic microscope). Minerals that are opaque even in thin sections i.e. ore minerals are studied by means of reflected light petrographic microscope. Microfossils are studied by means of a zoom microscope. These microscopes therefore constitute minimum requirement for the practical classes in these core courses. The equipment pieces presently available in the Microscope laboratory are contained in **Table 3**.

Table 3: Listof Equipmentin the Microscope Laboratory

S/No.	EQUIPMENT	QTY
1	Petrographic (Leitz) Microscope	25
2	Research Microscope	2
3	Pocket Mirror Stereoscopes	25
4	Binocular Microscopes	4
5	Pocket Stereoscope	125

(b) Remote Sensing Laboratory

Before the late 1960s, remote sensing was a relatively simple science, requiring only stereoscopes and aerial photographs. Since then, the introduction of satellite-based systems has brought about an explosion of activity which led to diversification into many totally new aspects of remote sensing. The whole growth process continues to mushroom and has left a Department of Geology like ours well behind the current technology.

The Department has no Remote Sensing Laboratory as such but runs a course on photogeological interpretation using stereoscopes and traditional photographs taken from low-flying aircraft. Despite recent technological advancements, this still is the most used technique of remote sensing. For this

purpose, the Department has 15 mirror stereoscopes but borrows aerial photographs for teaching in laboratory classes.The current technology has, however, moved away from photographic systems, even though the final copy examined is commonly a photographic print. Un-manned satellites using multi-spectral scanners dominate the style of data gathering. The images obtained may be displayed as a series of black and white prints or as colour prints. Display on a computer visual display unit is a common means of examining these images.

The Department intends to establish a Remote Sensing Laboratory that is capable of handling satellite (digital) images as well as the traditional aerial photographs. This is highly desirable as Nigeria is currently investing heavily in satellite technology for the development of her minerals resources among others. However for now, the Department takes advantage of remote sensing facilities/laboratories at the Regional Centre for Training in Aerospace Surveys (RECTAS) and the African Regional Centre for Space Sciences and Education in English (ARCSCEE) located within the University.

(c) Geochemistry Laboratory

A well-equipped geochemistry laboratory is necessary to enhance quality of research and the production of data acceptable worldwide. The geochemistry laboratory was recently upgraded by the Petroleum Technological Development Fund (PTDF) and contains the equipment listed in**Table 4.**

Table 4: Listof Equipmentinthe Geochemistry Laboratory

S/No.	EQUIPMENT	QTY
1	Atomic Absorption Spectrometer with Graphite Furnace	1
2	X-Ray Diffractometer	1
3	High Temperature Furnace	1
4	Flask Shaker	2
5	Hot Box Oven	2
6	Distiller	1
7	Deionizer	1
8	pH Meter	2
9	Dissolved Oxygen Meter	2
10	Conductivity Meter	2
11	Fume Cupboard	2

(d) GeophysicsLaboratory

The Geophysics Laboratoryprovides advanced education in exploration geophysics and supports high-quality research. The laboratory has basic field equipment for magnetics, gravity, resistivity, seismic refraction and

electromagnetic method. A summary of the existing facilities in the Geophysics Laboratory is given in **Table 5**.

Table 5: Listof Equipmentin theGeophysics Laboratory

S/No.	GEOPHYSICAL METHOD	EQUIPMENT	QTY
1	Electrical Resistivity Method	(a) ABEM Terrameter LS	1
		(b) ABEM SAS 300C Terrameter	1
		(c) ABEM A.C. Terrameter (Analoque)	1
2	Seismic Method	(a) BISON 7000 Series	1
		(b) McSEIS-SX Seismometer	1
3	Magnetic Method	(a) Proton Precession Magnetometer (GSM-8)	1
		(b) FLUXGATE Magnetometer	1
4	Electromagnetic Method	(a) ENVI VLF	1
		(b) GPR Pulse EKKO PRO	1
5	Gravity Method	(a) WORDEN Gravity Meter	2

(e) Computer (ICT) Laboratory

A computer laboratory is essential for data analysis, processing and modeling. The Department runs workstations donated by Mobil/Schlumberger, Shell/Landmark and Chevron. Oil industry standard software (Geoframe, GeoGraphix and Kingdom Suite) are installed on these workstations. The department also has a PTDF equipped ICT Laboratory with thirty (30) personal computers.

(f) Palynology, Micropaleontology / Stratigraphy, Environmental Studies and Petroleum Geology Laboratory

The Department has a Palynology, Micropaleontology/Stratigraphy, Environmental Studies and Petroleum Geology laboratories to meet the challenges of the Millennium in the aforementioned fields.

(g) Hydrogeology / Engineering Geology Laboratory

Hydrogeology is the study of groundwater in all its ramifications. This course requires a thorough understanding of the component of the hydrologic cycle. This implies that the students must be exposed to field work on hydrometeorology, surface water flow, boreholes, and analytical facilities for

water quality investigations, computer and associated software for groundwater modeling and field trips to observe natural events or drilling activities.

Engineering Geology requires that students demonstrate all the materials being taught in class such as determination of specific gravity of materials, actual fractionation of sediments into different grain sizes using sieves and electromechanical sieve shaker, and so on. The existing equipment in the laboratory are listed in **Table 6**

Table6: List of Equipmentinthe Hydrogeology/Engineering Geology Laboratory

S/No.	EQUIPMENT	QTY
1	Hydrostat	1
2	Oven	1
3	Sample Extruder	3
4	Sieve Shaker	1
5	Linear Shrinkage Mould	2
6	Permeability Apparatus	2
7	Compaction Mould	4
8	Compaction Hammer	1
9	Water Absorption Equipment	1
10	Adreasen Pipette with Stand	1
11	Penetrometer Truck	1
12	Vacuum Pump	1
13	Drying Oven	1

(g) Geology Workshop

Making of thin sections of rocks and minerals for teaching and research purposes, crushing and grinding of rocks and minerals are usually done in a Geology Workshop. Every Department of Geology therefore requires equipment for doing this.The list of existing equipment is given in **Table 7**.

Table7: Listof Equipment in the Geology Workshop

S/No.	EQUIPMENT	QTY
1	Rock Cutting Machine with Diamond Cutting Blade	1
2	Grinding Machine with Diamond Impregnated Grinding Wheel	1
3	Jaw Crusher	1
4	Pulverizer	1
5	Hydraulic Splitter	1
6	Polishing Machine	1

(h) Teaching Aids

Modern Teaching Aids greatly enhance the quality of teaching. **Table 8** shows the teaching aids currently available in the Department.

Table 8: Listof Teaching Aid Equipment

S/No.	EQUIPMENT	QTY
1	Overhead Projectors	5
2	Slide Projectors	1
3	Video Recorder	1
4	Television Monitor	1
5	Screen	1
6	Seismic Sections	Several
7	Teaching Video Tapes	30
8	CD Rom	1

(i) Fieldwork Programmes

Fieldwork programmes are the cornerstones of the Department of Geology's Geosciences programmes. The Geosciences, as professional courses, cannot be adequately taught without adequate field exposure to students in addition to practical classes.

Fieldwork is the most basic practical application of the geosciences, providing students with the opportunity to test their skills in the world. Students learn to make observations, collect data, and formulate working hypothesis from incomplete data, make and test predictions from that hypothesis and present their results in concise reports. About 15 weeks of fieldwork is planned for in the four-year programme. **Table 9** provides the list of existing facilities for fieldwork in the Department.

Table 9: Listof Existing Facilities for Field Work

S/No.	EQUIPMENT	QTY
1	Toyota (18 Seater Bus)	1
2	URVAN (14 Seater Bus)	1
3	Mattresses	35
4	Mobile Generators (1, 3, 7.5 KVA)	3
5	Compass Clinometers	60
6	GPS	25
7	Medium Size Deep Freezer	1
8	Geologic Hammers	50
9	Sledge Hammers	20

2.7.2 Back-up Power Supply

The Department has a power supply back-up of two (2) (75 and 300 KVA) Diesel Generators that can effectively power the department and beyond during power outages.

2.8 THE UNIVERSITY/DEPARTMENTAL ACADEMIC SYSTEM

2.8.1 The Course Unit System and the Computation of Grade Point Average (CGPA)

Definition of Terms

(i.) **Student Workload:**This defined in terms of course units. One unit represents one hour of lecture or one hour of Tutorial or 2-4 hours of practical work per week throughout a semester. Thus for example, a course in which there are 2 hours of lectures and 1 hour of Tutorial per week is a 3 unit course.

(ii.) **Total Number of Units (TNU):** This is the total number of course units carried by a student in a particular semester. It is the summation of the load Units on all courses carried during the semester. For example, a student who is carrying 6 courses of 3 units each has a TNU of 18 for that semester. No student shall be allowed to carry (i.e. register for) or be examined in more than 24 units in any particular semester.

(iii.) **Cumulative Number of Units (CNU):** This is the summation of total number of units over all the semesters from the beginning to date. A student who is prone to repeating courses will finish (if he does not drop out) with a higher CNU than his non-repeating

colleague and will most likely require a longer time to complete requirements for the award of degrees.

(iv.) **Level of Performance Rating:** This is the rating of grades obtained in terms of credit points per load unit. The rating used is as follows:

Level of Performance	**Rating (credit point per unit)**
A = 70%-100%	5
B = 60%-69%	4
C = 50%-59%	3
D = 45%-49%	2
E = 40%-44%	1
F = 00%-39%	0

Based on the above, a student who obtained a grade of 'A' in a 4-unit course has scored 20 credit points, and one who obtained a grade of C in that course has scored 12 credit points.

(v.) **Total Credit Points (TCP):** This is the sum of the products of the course units and rating in each course for the entire semester period. For example, consider a student who took 4 courses of 5 units each. Let's say the grade obtained in the four courses were C, B, F, and D respectively. The TCP of this student is 5x3 + 5x4 + 5x0 + 5x2 = 45.

(vi.) **Cumulative Credit Points (CCP):** This is the summation of Total Credit Points over all semesters from beginning to date.

(vii.) **Grade Point Average (GPA):** This is the total credit points (TCP) divided by the total units (TNU). For example, consider the student's scores referred to above whose TCP of 45 and TNU is 20 (i.e. 4 courses at units each, for the semester) will have a GPA of 45 ÷ 20 = 2.25. The highest GPA that can be earned is 5.0 and that is when a student has earned a grade of 'A' in every course during the semester. The lowest GPA obtainable is 0.0 and this would happen if the student has F all round during the semester.

(viii.) **Cumulative Grade Point Average (CGPA):**This is the summation of TCPs for all semesters, divided by the summation of TNUs for the said semesters. Like the GPA, CGPA obtainable ranges from 0 to 5.

Sample Computation (example to be relevant to the Department)

Consider a student who has enrolled in a course programme designated as GLY and has just completed 2 full semesters in the University. His course programme and his GPA and CGPA could be as follows:

SEMESTER I

1	2	3	4	5	6	7	8
	L	T	P	Units		Results	
Course Code					Grades	Credit Points	GPA/CGPA
BIO 101	3	0	3	3	78% (A)	3X5=15	GPA = 49/17 = 2.88
CHM 101	3	1	3	5	60% (B)	5X4=20	CCP = 49+0 = 49
MTH 101	4	1	0	5	45% (D)	5X2=10	CNU = 17+0 = 17
PHY 101	3	0	0	3	38% (F)	3X0=0	CGPA = 49/17 = **2.88**
PHY 107	0	0	4	1	60% (B)	1X4=4	
				17 (TNU)		49 (TCP)	In this case the TCP, TNU, and GPA will be the same for CCP, CNU and CGPA

SEMESTER II

1	2	3	4	5	6	7	8
	L	T	P	Units		Results	
Course Code					Grades	Credit Points	GPA/CGPA
CHM 102	3	1	3	5	66% (B)	5X3=15	GPA = 63/18 = 3.50
PHY 102	3	0	0	3	72% (A)	3X5=15	CCP = 63+49 = 112
PHY 108	0	0	4	1	47% (D)	2X1=2	CNU = 18+17 = 35
MTH 102	4	1	0	5	53% (C)	5X3=15	CGPA=112/35= **3.20**
ZOO 102	3	1	2	4	60% (B)	4X4=16	
				18 (TNU)		63 (TCP)	

2.8.2 Final Assessment and Classification

(i.) A student's workload is defined in terms of course units. One unit represents one hour of lecture or one hour of tutorial, or 2-4 hours or practical work per week throughout a semester. All courses shall run for one semester or a full session of two semesters.

(ii.) The final award and the class of the degree shall be based on the Cumulative Grade Point Average (CGPA) obtained by each candidate in all prescribed courses approved by the University. The final cumulative grade point average shall be calculated on the

basis of the total number of credit points and the total number of course units registered for during the course of the student's programme. In the case of a failed course, the candidate must repeat the course at the next available opportunity. If the course is an elective, the candidate may substitute another course and shall not be required to pass the failed elective course. If the course is a restricted elective, substitution can only be made from the list of restricted electives. The failed grade would however be reflected in the transcript.

(iii.) A candidate who has satisfactorily completed all requirements for the degree with an overall grade point average of not less than 1.50 shall be awarded the honours degree indicated below:

First Class	4.50-5.00
Second Class (Upper Division)	3.50-4.49
Second Class (Lower Division)	2.40-3.49
Third Class Honours	1.50-2.39
Pass	1.00-1.49

(iv.) Passes in 12 units of Special Electives are requirements for graduation.

(v.) A candidate who scores a cumulative grade point average (CGPA) of less than 1.00 in two consecutive semesters shall be required to withdraw from the University.

2.8.3 Transfer within the University and Length ofStay in the University

(a) To qualify for a degree, a candidate will normally be required to spend a minimum of three academic years (by Direct Entry) and four years (by UTME entry) at the ObafemiAwolowo University.

(b) If a student transfers from one Faculty to another, the transfer would be treated as if he/she is just being admitted into the University since as part of the requirements for graduation the student has to take all the foundation/compulsory courses in the new Faculty/Department. In that case his/her stay in the new Faculty/Department should be 1 ½ times the number of semesters required to complete a programme.

(c) Where a student transfers from a science-based Faculty to another, the computation of his result in the new Faculty shall take cognizance of his previous CGPA in the new Department.

The duration of the stay in the University will be what remains of the 1½ times the number of semesters required to complete the programme as approved by Senate.

(d) Where a student is transferring from a science-based to a Humanities/Arts-based Faculty or vice-versa, the transfer should be treated as if the student is just being admitted into the University. The GPA of the student will not be transferred to the new Department. He/she will however be required to take all the Foundation/Compulsory courses in the new Department.

2.9 THE DEGREE PROGRAMMES IN THE DEPARTMENT

The Department of Geology runs undergraduate degree programmes in **Geology** and Applied Geophysics and postgraduate degree programmes in four distinct options: Sedimentary and Petroleum Geology, Applied Geophysics, Geochemistry and Mineral Exploration, and Engineering Geology and Hydrogeology.

2.9.1 Degrees offered

- B.Sc. (Honours) Geology and B.Sc. (Honours) Applied Geophysics.
- M.Sc. Mphil.and PhD.Geology (Sedimentary and Petroleum Geology, Geochemistry and Mineral Exploration, and Engineering Geology and Hydrogeology)
- M.Sc., Mphil. and PhD Applied Geophysics

2.9.2 Admission Requirements

Candidates can be admitted into the undergraduate degree programmes in the Department of Geology by any of the following three modes: Unified Tertiary Matriculation Examination (UTME), Direct Entry (DE) and Transfer.

(a) UTME Entry Requirement

The entry requirement shall be at least credit level passes in five (5) subjects including English Language, Chemistry, Physics, Mathematics and Biology at the Senior Secondary School Certificate or its equivalent (NECO, GCE O Level). Two UTME entry options are opened to candidates. **Option A** is for both Geology and Applied Geophysics candidates with UTME subject combination of English Language, Chemistry, Physics and Mathematics while **Option B** is for Geology candidates only with UTME subject combination of English Language, Chemistry, Biology and Physics or Mathematics.

(b) Direct Entry Requirement

The candidates must have three Advanced Level Science subjects plus English Language with a minimum of B average and must have satisfied the minimum undergraduate entry requirements as above

Candidates with Ordinary National Diploma (OND) in Geology must have passed with Upper Credit and also satisfy the minimum undergraduate requirements as above.

(c) Transfer Candidates

Candidates may be accepted on Transfer into the Faculty of Science at 200L only if he/she satisfies the Faculty and Departmental UTME requirements, do not carry over any course and has not been withdrawn from the University.

(The admission requirements into the postgraduate programmes are contained in the Postgraduate College's Bulletin - Regulations Governing Postgraduate Studies).

2.10 COURSE ASSESSMENT AND EXAMINATION

2.10.1 Pattern of Examination under the Course Unit System

(a) Each course shall be examined at the end of the Semester in which it is offered. The examination shall be conducted as prescribed by the Senate.
(b) Each course will normally be examined by a theory paper of 1-3 hours in addition to which there could be a practical paper and/or an oral examination.
(c) Field based courses shall be examined through graded field reports
(d) Continuous assessment is carried out through tests, homework, practical exercises and field reports.

2.10.2 Measurement Performance

The performance in each course shall be measured in terms of:
(a) The results of prescribed theory and practical examinations and or assessment of practical exercises or field reports.
(b) The results of continuous assessment which could constitute up to 40% of the final mark of 100%.

2.11 REQUIREMENT FOR THE AWARD OF DEGREE

To be eligible for the award of a degree, a candidate must satisfactorily complete a minimum number of **154 units** of course work for both the Geology and Applied Geophysics undergraduate programmes comprising the **University**, **Faculty** and **Departmental**requirements.

Students wishing to take the B.Sc. Geology degree could choose their Foundation Programme from either the **Scheme A** or the **Scheme B** options.

Students who are admitted directly into the Part Two of the programmes may be exempted from courses adjudged equivalent to the required foundation courses.

2.12 OUTLINE OF PROGRAMME BY PARTS AND SEMESTER

A. LIST OF UNDERGRADUATE COURSES: THE B. Sc. GEOLOGY PROGRAMME

(i)Foundation Programme (Faculty Requirements)

Course Code	Course Title	Units
MTH 101	Elementary Mathematics I	5
MTH 102	Elementary Mathematics II	5
MTH 201	Mathematical Methods I	4
MTH 202	Mathematical Methods II	4
PHY 101	General Physics I	3
PHY 102	General Physics II	3
PHY 105	Physics for Biological Sciences I	4
PHY 106	Physics for Biological Sciences II	4
PHY 107	Experimental Physics IA	1
PHY 108	Experimental Physics IB	1
*PHY 205	Introductory Modern Physics	3
PHY 207	Experimental Physics IIA	1
PHY 208	Experimental Physics IIB	1
CHM 101	Introductory Chemistry I	5
CHM 102	Introductory Chemistry II	5
BIO 101	Biology for Physical Sciences	3
BOT 101	Form and Function in Plants	4
ZOO 101	Introductory Zoology I	3
ZOO 102	Introductory Zoology II	3
ZOO 103	Experimental Zoology	1

(ii)Departmental Requirements – Compulsory Courses

Course Code	Course Title	Units
GLY 201	Introductory Geology	4
GLY 202	Invertebrate Paleontology	3
GLY 204	Introductory Map Interpretation and Geological Mapping	2
GLY 206	Mineralogy I	**3**
GLY 208	Environmental Geology	2
GLY 302	Metamorphic Petrology	3

GLY 303	Structural Geology	3
GLY 304	Advanced Map Interpretation	1
GLY 305	Photogeological Interpretation	1
GLY 306	Fundamentals of Hydrogeology	2
GLY 307	Sedimentary Petrology	3
GLY 308	Stratigraphic Principles and Interpretations	2
GLY 310	Principles of Geochronology and Isotope Geochemistry	1
GLY 312	Fundamentals of Geochemistry	2
GLY 314	Introductory Geostatistics	2
GLY 403	Igneous Petrology	3
GLY 405	Geology of Nigeria	2
GLY 409	Engineering Geology	2
GLY 411	Global Tectonics	2
GLY 413	Advanced Mapping Techniques	1
GLY 414	Independent Mapping Exercise	3
GLY 415	Petroleum Geology	3
GLY 416	Seminar	1
GLY 417	Economic Geology	3
GLY 421/422	Honours Thesis	6
GLY 424	Marine Geology	2
AGP 303	Introductory Exploration geophysics	3
CVE 301	Surveying I	3
CHM 201	Basic Inorganic Chemistry	4
CHM 203	Basic Physical Chemistry	4
CHM 205	Experimental Physical/Inorganic Chemistry	1
CSC 201	Computer Programming	3
CSC 208	Computer Technology	2

(iii)Departmental Requirements – Restricted Electives

Course Code	Course Title	Units
GLY 301	Mineralogy II	3
GLY 401	Paleoecology	1
GLY 402	Micropaleontology	3
GLY 404	Quaternary Geology	2
GLY 406	Structural Petrology	2
GLY 407	Techniques of Hydrogeology	2
GLY 408	Sedimentary Basins of Africa	1
GLY 410	Precambrian Geology of Africa	1
GLY 412	Mining Geology	2
GLY 418	Special Topics	1
GLY 419	Applied Geochemistry	2

GLY 423	Historical Geology	1
GLY 424	Marine Geology	2
BOT 102	Introductory Ecology	2
BOT 201	Form and Function in Plants II	3
BOT 202	Biometry	3
BOT 304	Systematics of Non-Flowering Plants	3
CHM 202	Basic Organic Chemistry	4
CHM 206	Experimental Organic Chemistry	1
CHM 301	Instrumentation and Analytical Chemistry I	2
CHM 302	Structural and Main Group Inorganic Chemistry	4
CHM 313	Instrumentation and Analytical Chemistry II	2
PHY 202	Introduction to Environmental Physics	3
MTH 301	Functions of a Complex Variable	2
ZOO 201	Principles of Animal Systematics	3

SUMMARY (GEOLOGY PROGRAMME)	SCHEME A (UNITS)	SCHEME B (UNITS)
Foundation Requirements	44	41
Departmental Requirements (Compulsory Courses)	80	79
Departmental Requirements (Restricted Electives)	14	18
Special Electives	12	12
Free Electives	4	4
TOTAL	**154**	**154**

B. LIST OF UNDERGRADUATE COURSES: THE B. Sc. APPLIED GEOPHYSICS PROGRAMME

(i)Foundation Programme (Faculty Requirements)

Course Code	Course Title	Units
MTH 101	Elementary Mathematics I	5
MTH 102	Elementary Mathematics II	5
MTH 201	Mathematical Methods I	4
MTH 202	Mathematical Methods II	4
PHY 101	General Physics I	3

PHY 102	General Physics II	3
PHY 107	Experimental Physics IA	1
PHY 108	Experimental Physics IB	1
PHY 204	Introductory Modern Physics	3
PHY 207	Experimental Physics IIA	1
PHY 208	Experimental Physics IIB	1
CHM 101	Introductory Chemistry I	5
CHM 102	Introductory Chemistry II	5
BIO 101	Biology for Physical Sciences	3

(ii)Departmental Courses – Compulsory Courses

Course Code	Course Title	Units
GLY 201	Introductory Geology	4
GLY 204	Introductory Map Interpretation and Geological Mapping	2
GLY 206	Mineralogy I	3
GLY 302	Metamorphic Petrology	3
GLY 303	Structural Geology	3
GLY 305	Photogeological Interpretation	1
GLY 306	Fundamentals of Hydrogeology	2
GLY 307	Sedimentary Petrology	3
GLY 312	Fundamentals of Geochemistry	2
GLY 405	Geology of Nigeria	2
GLY 409	Engineering Geology	2
GLY 413	Advanced Mapping Techniques	1
GLY 415	Petroleum Geology	3
GLY 417	Economic Geology	3
CVE 301	Surveying I	3
CSC 201	Computer Programming	3
CSC 208	Computer Technology	2
AGP 301	Physics of the Earth	2
AGP 302	Magnetic Methods in Prospecting	3
AGP 303	Introductory Exploration Geophysics	3
AGP 304	Gravity Methods in Prospecting	3
AGP 306	Electrical Methods in Prospecting	3
AGP 401	Seismic Methods in Prospecting	4
AGP 402	Engineering Geophysics	2
AGP 403	Electromagnetic Methods in Prospecting	3
AGP 404	Groundwater / Environmental Geophysics	2
AGP 405	Geophysical Well Logging	2
AGP 406	Geothermal Exploration	2
AGP 407	Radiometric Methods in Prospecting	1

AGP 408	Geophysical Field Practice	3
AGP 410	Honours Thesis	6
AGP 412	Seminar	1

(iii)Departmental Requirements – Restricted Electives

Course Code	Course Title	Units
GLY 314	Introductory Geostatistics	2
GLY 407	Techniques of Hydrogeology	2
GLY 412	Mining Geology	2
PHY 201	Classical Mechanics	3
PHY 202	Introduction to Environmental Physics	3
PHY 203	Electrical Circuits and Electronics	3
PHY 301	Mathematical Physics I	3
PHY 303	Electromagnetism I	3
PHY 304	Electromagnetism II	3
PHY 305	Thermodynamics and Kinetic Theory	3
PHY 306	Optics	3
MTH 301	Functions of a Complex Variable	2
MTH 302	Differential Equations	3
CSC 311	Techniques in Data Analysis	4

SUMMARY (APPLIED GEOPHYSICS PROGRAMME)	SCHEME B (UNITS)
Foundation Requirements	44
Departmental Requirements (Compulsory Courses)	82
Departmental Requirements (Restricted Electives)	12
Special Electives	12
Free Electives	4
TOTAL	**154**

C. COURSE CONTENTS/DESCRIPTION

GLY 201 – INTRODUCTORY GEOLOGY
3-0-3 (4 UNITS) HARMATTAN SEMESTER
The solar system; Fundamentals of plate tectonics; Physics of the Earth; Elementary crystallography, silicate structure; Properties of minerals and rocks; Economic minerals; Surface Processes; downslope movements of surface materials; Geologic work of river, wind and ice and associated landforms. Weathering and sedimentary rocks, igeneous activity and igneous rocks, metamorphism and metamorphic rocks; Geologic structures; Principles of historical geology; Fossils, introduction of stratigraphy and dating of rocks; Geologic Time Scale; Groundwater; A one-week field trip to Sedimentary and Basement Complex localities.

GLY 202 – INVERTEBRATE PALEONTOLOGY
2-0-3 (3 UNITS) RAIN SEMESTER
Fossils, fossilization, major fossil groups; Invertebrate Paleontology, morphology, classification, geologic history and paleoecology of major invertebrate phyla.

Pre-requisites: GLY 201

GLY 203 – GEOLOGY FOR ENGINEERS
2-0-3 (3 UNITS) HARMATTAN SEMESTER
Elements of crystallography and crystal chemistry.Physical properties of minerals.Introduction to rock forming minerals.Identification of common minerals.Igneous processes and igneous rocks.Weathering, erosion, transportation and deposition of sediments by running water and wind.Diagenesis and formation of sedimentary rocks.Sedimentary structure.Metamorphism, Description and Identification of igneous, metamorphic and sedimentary rocks.Introduction to basic principles of stratigraphy and applied physical stratigraphy.Introduction to Structural Geology and simple geologic structures; folds, faults and other fractures. Geologic hazards; landslides, rock falls, earthquakes, volcanic activity. Basic map reading and interpretation of simple geologic maps.A one-week field trip to Sedimentary and Basement Complex localities.

GLY 204 – INTRODUCTORY MAP INTERPRETATION AND GEOLOGIC MAPPING
0-0-6 (2 UNITS) RAIN SEMESTER
The Interpretation of simple geological maps involving the thickness of strata and the geometrical forms of outcrops.The interpretation of one-inch geological maps and the drawing of simple geological sections.Field mapping class during week-days, several short excursions during the session.

Pre-requisites: GLY 201

GLY 206 – MINERALOGY I
2-0-3 (3 UNITS) RAIN SEMESTER
Introduction to Mineralogy, Crystals and Crystallographic system crystal symmetry and elements of symmetry, crystal forms and crystal classes.Chemical properties of minerals and principles of crystal chemistry. Tonic sizes – and coordination number. Bonding of atoms, atomic substitution and solid solution in minerals.Isomorphism, polymorphism and pseudomorphism.Classification of minerals and introduction to common rock, forming minerals and their paragenesis.Characteristic properties and propagation of light.Petrographic microscope and optical properties of common rock forming minerals.Uses of minerals.Physical properties of minerals – colour, luster, streak, cleavage, fracture, hardness, density, tenacity, habits and forms of aggregation.

Pre-requisites: GLY 201

GLY 208 – ENVIRONMENTAL GEOLOGY
1-0–3 (2 UNITS) RAIN SEMESTER
Fundamental concepts in environmental geology.Earth material and processes. Hazardous earth processes and their remedies: Flooding landslides, earthquakes, volcanic activities, coastal hazards, solids mineral resources and environmental impacts. Waste disposal systems. Geologic aspects of environmental health.Environmental Geology in the Petroleum and related Industries.
Prerequisite: GLY 201 or GLY 203

GLY 301 – MINERALOGY II
2-0-3 (3 UNITS) HARMATTAN SEMESTER
Mineral separation techniques.Methods of chemical analysis (AAS, XRF, Electron Probe) of minerals and calculation of structural formulae.Stereographic Projection and study of crystal systems.Methods in determin- ative mineralogy and X-ray diffraction techniques.Study of non-silicate minerals.Mineral paragenesis.

Pre-requisites: GLY 206

GLY 302 – METAMORPHIC PETROLOGY
2-0-3 (3 UNITS) RAIN SEMESTER
Definition: Scope of metamorphism. Classification of metamorphic rocks.Physico-chemical processes in metamorphism. Thermo tectonic

modeling.Textures of metamorphic rocks.Classical concepts in metamorphism.Contribution from Grubenman-Beck, EskolaMiyashiro, Barrow, etc.Facies and facies series. Metamorphism associated with igneous intrusions and metamorphism associated with different plate tectonic environments. Eclogites, granulites, charnockites, gneisses and migmatites.Metamorphism and crustal evolution.Study of thin sections of metamorphic rocks from the different tectonic environments.

Pre-requisites: GLY 206

GLY 303 – STRUCTURAL GEOLOGY
2–0–3 (3 UNITS) HARMATTAN SEMESTER.
Nature of Structural Geology.Stress and strain in minerals.Determination of Strain in rocks.Recognition, classification and significance of faults.Normal faults, thrusts and reverse faults; Strike-slip faults.Regional example of faults. Relation of faults strain directions. Relation of fault orientation to stress direction; Mohr-Coulomb law of failure. Anderson's theory.Exceptions to the theory.Origin of joints.Description and Geometric analysis of folds, classification of folds.Kinematics and dynamics of folding.Description of cleavage; geometric relationship of cleavage to folding; types of cleavage; significance of cleavage.Origin of cleavage in metamorphic tectonics. Description and classification of foliation; Axial plane foliation, transposed foliation and fault zone foliation. Structures in sedimentary rocks: Growth Faults, Salt domes, Diapirs, etc. Description, classification, origin and Geometric analysis of lineation in tectonites.Structures in igneous bodies.Classification of igneous bodies.Mechanism of emplacement of igneous intrusions.Gravity-controlled structures; gravity sliding in nappes.mantled gneiss domes.

Prerequisite: GLY 204

GLY 304 – ADVANCED MAP INTERPRETATION
0-0-3 (1 UNIT) RAIN SEMESTER
Interpretation of geological maps of sedimentary basins and grabens, monotectonic sedimentary areas, polytectonic and polymetamorphosed sedimentary covers and basements.Drawing of cross-sections and structural maps. Writing reports on map interpretation and geological history, structural control of mineral deposits and groundwater.

Pre-requisites: GLY 204

GLY 305 – PHOTOGEOLOGICAL INTERPRETATION
0-0-3 (1 UNIT) HARMATTAN SEMESTER

Aerial Photography – types, stereoscopy, measuring and plotting instruments in photogeology and their procedures. The principles of interpretation – types of photogeologic studies (geomorphological, geological, etc) the factors that affect results; their identifications and interpretation. Typical examples and case histories – geomorphological and geological illustrations. The uses of photogeology in reconnaissance mapping, economic mineral prospecting and water resources.

GLY 306 – FUNDAMENTALS OF HYDROGEOLOGY
1-0-3 (2 UNITS) RAIN SEMESTER
History and scope of hydrogeology. Hydrologic cycle and origin of groundwater. Occurrence of groundwater under different geologic conditions. Hydrologic processes, variable and water budget. Analysis of hydrographs. Basic physical and chemical properties of water and porous media affecting groundwater flow. Elementary theory of groundwater flow; Darcy's law, hydraulic conductivity, transmissivity of aquifers, continuity, continuity equations of groundwater flow for confined, unconfined and leaky aquifer systems. Well hydraulics and estimation of aquifer parameters. Groundwater maps and flow nets. Methods of groundwater exploration and development in different geologic terrains. Water-well drilling techniques. Quality of water, radiochemistry and microbiological quality of groundwater. Presentation and interpretation of result of chemical analyses. Groundwater quality standards, pollution and groundwater quality protection strategies. Groundwater in Nigeria.

Pre-requisites: GLY 204

GLY 307 – SEDIMENTARY PETROLOGY
2–0–3 (3 UNITS) HARMATTAN SEMESTER
Weathering, transportation and deposition of particles: Entertainment and settling. Textures or clastic sediments, concepts of size, grade scales, methods of size analysis. Grain distribution and interpretation. Shape roundness fabric and surface texture of classics grains. Porosity and permeability. Non – clastics materials; transport and deposition. Composition and classification of sedimentary rocks, minerals in sedimentary rocks primary rocks (primary, secondary, detrital and authigenic). Microscope studies of heavy minerals fractions. Sedimentary structures; study of diagnostic processes; common sedimentary rocks.

Pre-requisites: GLY 206
GLY 308 – STRATIGRAPHIC PRINCIPLES AND INTERPRETATION
2–0–0 (2 UNITS) RAIN SEMESTER
Principles of stratigraphy. Review of development of modern stratigraphy, stratigraphic classification, definition and scope of sedimentary environments;

basic tools of environmental analysis, classification of depositional environments, facies concepts and models, facies association, discussion on continental, transitional and marine environments using examples. Sequence Stratigraphy.

Pre-requisite: GLY 307

GLY 310 – PRINCIPLES OF GEOCHRONOLOGY AND ISOTOPE GEOCHEMISTRY
1-0-0 (1 UNIT) RAIN SEMESTER
Principles of Geochronology.Methods of radiometric dating.Stable Isotopes.Data Interpretations.

Pre-requisites: GLY 201, CHM 101, CHM 102

GLY 312 – FUNDAMENTAL OF GEOCHEMISTRY
2-0-0 (2 UNITS) RAIN SEMESTER
Definition and scope of geochemistry. Historical development of geochemistry. Elemental abundance and distribution in sun, meteorite and the earth.Structural (isomorphous, solid solutions, ionic radii/change, etc.) and thermodynamic (entropy, free energy, phase rule, etc) controls and elements during magnetic and metamorphic processes.Geochemistry of aqueous systems (chemical equilibria, chemical weathering, redox processes, minerals/rocks stability, etc), Eh-pH diagrams and their utilities.Elements distribution during sedimentary processes.The geochemical environment, dispersion, migration and the mobility of elements.The geochemical cycle.

Pre-requisites: GLY 201, CHM 101, CHM 102

GLY 314 – INTRODUCTORY GEOSTATISTICS
1-0-3 (2 UNITS) RAIN SEMESTER
Introduction to data analysis in geology.Elementary statistics, elementary matrix algebra, least squares, etc.Geological population, population distribution, sampling distribution and statistical influence.Geological sampling, probability theory and application of probability in model building. Digital computing and geology statistical techniques of data analysis (vis: mean, chi-square, linear model, ANOVA, etc) and application in Geology.

Pre-requisites: GLY 201
GLY 401 – PALEOCOLOGY
1–0–0 (1 UNIT) HARMATTAN SEMESTER.

Ecology and paleoecology defined: Classification of sedimentary environments. Petroleum-bearing rocks and their paleoecology.Mode of life of organisms and organic influence on sediments.Chemical and biological factors of the environment.Association of organisms (Paleosynecology).Origin and study of fossiliferous horizons.Case study of some modern and ancient sedimentary environments.

Pre-requisite: GLY 202, GLY 308.

GLY 402 – MICROPALEONTOLOGY
2–0–3 (3 UNITS) RAIN SEMESTER.
Definition of Micropaleontology and microfossils. Collection, preparation and preservation of animal and plants microfossils. Morphological classification, paleontology, paleoecology and geological history of major microfossils groups – foraminifera, ostracodes, radiolarians, silicoflagellates, diatoms, pteropods, onodonts, etc.Application of Micropaleontology in the Oil Industry.Importance of Palynology (and palynomorphs) in Applied Geology.Elementary treatment of spores, pollen grains and organic-walled microplankton (dinoflagellate cysts, acritarchs, etc.).Relationship of palynomorphs to sedimentation.

Pre-requisites: GLY 202, GLY 308.

GLY 403 – IGNEOUS PETROLOGY
2–0–3 (3 UNITS) HARMATTAN SEMESTER
Magmas and nature of igneous rocks (textures, cooling behaviour, physical and chemical properties, mode, norm, occurrence, mineralogy).Classification and variety of igneous minerals.Sources of magma (basalts, granites, etc), plate tectonics and environments of magma generation. Rock association; layered complexes, ultramafic and ultrabasic rocks: basalts (quartzs-tholeiite, dolorite association and alkali olivine basalts). Potassic rocks and Nephelinitesyenites: rocks of extreme composition – nephelinites, carbonatite). Orogenic association (basalt – andesite – rhylite association, etc and their plutonic equivalents.Older and younger granite of Nigeria.

Pre-requisites: GLY 206, GLY 312

GLY 404 – QUARTENARY GEOLOGY
2–0–0 (2 UNITS) RAIN SEMESTER.
World-wide geological events in Quaternary tmes – Classical and interglacial periods, marine transgressions and regressions. Shifting climatic belts in the topics. Mineral deposits in Quaternary environments. Origin of man and the earliest use of rocks and minerals. Quaternary geology of west Africa with special emphasis on Nigeria.

Pre-requisites: GLY 202, GLY 308.

GLY 405 – GEOLOGY OF NIGERIA
2–0–0 (2 UNITS) RAIN SEMESTER.
Study of the evolution, structure and stratigraphy of the Nigerian sedimentary basins. The pre-Cambrian of Nigeria especially in the context of West Africa. Mineraldeposits. A two-week excursion to the main geological units and mineral deposits of the country. The report/examination on the excursion for 40% of the final grade.

Pre-requisites: GLY 302 and GLY 307 for Geology Students and GLY 307 and GLY 310 for Geophysics Students.

GLY 406 – STRUCTURAL PETROLOGY
1–0–3 (2 UNITS) RAIN SEMESTER
Microtextures and microstructure of magnetic and metamorphic rocks: relationships between deformation and crystallization. Stereo – projection of mineral axes and interpretation.
Pre – requisites: GLY 302, GLY 303.

GLY 407 – TECHNIQUES OF HYDROGEOLOGY
1–0–3 (2 UNITS) HARMATTAN SEMESTER

Hydrogeological processes affecting ground water recharge: base-flow analysis. Aquiver models: porous and fractured media.Hydraulic principles and grounwater flow. Flow models in different aquiver systems: confined, unconfined and leaky.Well hydraulics. Pumping tests and determination of chemical transport.Chemical significance of properties and constituents in water analysis: Buffer capacity, pH, specific electrical conductance, alkalinity, acidity, major, minor and trace constituents of water (silica, aluminium, iron, chloride, flouroide, e.t.c.). Water criteria.Exploration techniques.Exploration techniques.Management methods.

Pre–requisites: GLY306, CHM204 / 205, MTH 201 or consent of instructor.

GLY 408 – SEDIMENTARY BASINS OF AFRICA
1–0–0 (1 UNIT) RAIN SEMESTER
Regional phanerozoic stratigraphy of Africa with special reference to coastal and other sedimentary basins.

Pre–requisites: GLY 308

GLY 409 – ENGINEERING GEOLOGY
2–0–0 (2 UNITS) HARMATTAN SEMESTER
Soil classification, permeability of sooils, permeability tests, compressibility of soils.The consolidation test. Unconfined test, shearing resistance, of resistance of soils.Triaxial compression test. Unconfined compression test. Rock as an engineering material.Stress and strain – basic principles. Stress / strain behaviour of rocks indicating deviations from ideal behaviour.Anisotrophy, fluids and temperature effects, strength and failure in rocks, measurement of stress and strain in the laboratory and in the field. Geology in the solution of problems usually encountered during the design and / or construction of highways, dams. Foundation slopes and embankments. Excavations in the soils and rocks.quarries and construction materials. Erosion problems.

Pre–requisites: GLY 307

GLY 410 – PRECAMBRIAN GEOLOGY OF AFRICA.
1–0–0 (1UNIT) RAIN SEMESTER
Principles of Precambrian Stratigraphy and application to major shield areas of the world. Precambrian of Nigeria in the context of west Africa. Precambrian of Africa.

Pre–requisites: GLY 302, GLY 310, GLY 403.

GLY 411 – GLOBAL TECTONICS
2–0–0 (2 UNITS) HARMATTAN SEMESTER
The solar system: Description, Characteristics, Origin and Evolution. The earth: earthquakes – effects, measurements and wave characteristics, distribution, location, magnitude and intensity. Causes, mechanisms and control of earthquakes.The earth's gravity.Gravity anomalies.The earth's density and moments of Inertia; Isostasy.The structure of the earth based on seismology and gravity studies.Bulk composition of the earth – The chondrite earth model and its validity. Meteorites: chemical fraction processes in the formation of meteorites. Heterogeneous and homogenoeus accretion models.The origin and composition of the earth's core.The earth's magnetic field, Geomagnetism, paleomagnetism.The earth's heat, sources of the earth's heat. Oceanic, continental and global heat flow, mantle convection and evolution of the

mantle.Oceanic crust, upper mantle and ophiolitic sequences.Continental crusts – composition, layering and evolution, absolute and relative plate motion.Consequences and constraints of plate boundaries.Plate tectonics and mantle convection.Causes of plate motion.Classical concepts of orogeny.Plate tectonics and orogeny.

Pre–requisites: GLY 303, GLY 312.

GLY 412 – MINING GEOLOGY
2–0–0 (2 UNITS) RAIN SEMESTER
Approaches to mining; role of geological factors in mining and mine development; Mining methods. Underground geological mapping and mine surveying; pre grade control. World mineral supply and demand; metal prices and mineral marketing; mapping legislation, mineral rights royalties, Oil Industry Mining. Environmental impact of mining.

Pre-requisite: GLY 417

GLY 413 – ADVANCED MAPPING TECHNIQUES
(I UNIT) END OF HARMATTAN SEMESTER
Field mapping class at the end of the Harmattan Semester. A report is to be submitted and graded along with the rain semester Examinations.

Pre–requisites: GLY 204, GLY 302, GLY 303 AND GLY 307.

GLY 414 – INDEPENDENT MAPPING EXERCISE
2–0–3 (3 UNITS) END OF RAIN SEMESTER
A student – independent mapping exercise lasting at least four weeks at the end of the rain semester. A report on the exercise must be written and submitted at the beginning of the following Rain Semester.

Pre–requisites : GLY 413

GLY 415 – PETROLEUM GEOLOGY
2–0–3 (3 UNITS) HARMATTAN SEMESTER
The origin and occurrence of petroleum. Organic matter and distribution in nature. Oil field waters; chemical and physical properties of oil and natural gas. Organic matter diagenesis and petroleum generation, Migration of Petroleum (primary and secondary).Reservoir rocks (clastics and carbonates) and porosity types.Traps-structural, stratigraphic, combination, hydrodynamics. Formation evaluation (logs and well – log analysis). Exploration methods, drilling and completion operations.The Niger Delta petroleum province.

Pre-requisites: GLY 303, GLY 307, GLY 308.

GLY 416 - SEMINAR
(1 UNIT) 2-SEMESTER (SESSIONAL)
One hour per week (compulsory for all geology students). Topics of importance in Geology and allied fields are discussed weekly by staff and students. Each one would be expected to prepare and deliver at least one seminar during the session. Guest speaker within and outside the University will be invited from time to time.

GLY 417 - ECONOMIC GEOLOGY
2-0-3 (3 UNITS) HARMATTAN SEMESTER
Principles and processes in the formation of mineral deposit. Ground preparation and ore localization. Wall-rock alteration, paragenesis and zoning in mineral deposits. Ore textures : classification and distribution of mineral deposits. Metallic mineral deposit: ferrous, ferralloy, non-ferrous and precious metals. Non-metallic mineral deposit and their classification: Ceramic materials, structural and building materials, industrial, manufacturing, chemical and refractory minerals. Metallogenic belts and epochs.Mineral deposits of Nigeria.

Pre-requisites: GLY 206, GLY 303, GLY 312.

GLY 418 - SPECIAL TOPICS
(1 UNIT) - 2 SEMESTERS (SESSIONAL)
This course is designed for students who have scored a minimum of B^+ grade in a certain course and are desirous of more in-depth knowledge in that field.

Pre-requisites: Consent of the Head of Department.
GLY 419 - APPLIED GEOCHEMISTRY
2-0-0 (2 UNITS) HARMATTAN SEMESTER

Instrumental analysis, Principles of analytical techniques;AAS, XRD, XRF, Colorimetry, etc. Data treatment and reduction. Introduction to exploration Geochemistry.
Geochemical anomalies and statistical assessment of background and threshold.Lithogeochemical, pedageochemical, biogeochemical, geobotanical, gaseous and stream sediments, survey techniques of mineral exploration.Introduction to Environmental Geochemistry.Processes and product of water-air and sediment-water interfaces.Organic substances in natural water.Metal-organic-sediment interactions.Some concepts in water pollution.

Pre-requisites: GLY 312

GLY 421 / 422 HONOURS THESIS
6 UNITS - 2 - SEMESTERS (SESSIONS): 009 3 UNITS -HARMATTAN 009 3 UNITS – RAIN

An independent research project , selected on the basis of student's interest and supervised by staff , is designed during the final year of study. The project may take the form of original research, a review , or compilation of data in any area of geology. Students are required to submit a one – page short description of the project during the first week of the semester in which the thesis is to be submitted and three copies of the thesis are due latest on the last day of lectures of the semester in which the thesis is to be examined. Assessment based on the dissertation and on performance in an oral examination.

Pre–requisites: GLY 413 and relevant courses in proposed field of study.

GLY 423 - HISTORICAL GEOLOGY
(1 UNIT) HARMATTAN SEMESTER

The Geological Time Scale. The Paleozoic; Mesozoic and Cenozoic Era. Brief, treatment of the different systems ; African and Nigerian examples to be cited where applicable. Emphasis will be on paleo-geography, tectonics , organic life and economic products. Pleistocene epoch as it relates to plants, animals, water bodies and the development of Man.

Pre – requisite: GLY 202

GLY 424 – MARINE GEOLOGY
2–0–0 (2 UNITS) RAIN SEMESTER.

The scope of Oceanography: Physical, chemical and biological aspects.
Shorelines and shoreline processes. The study of the ocean floors: Continental margins, Oceanic ridges and rises, etc., major ocean basins. The origin, classification and distribution of marine sediments. Ocean resources.

Pre – requisites: GLY 307, GLY 308

AGP 301 - PHYSICS OF THE EARTH
2–0–0 (2 Units) HARMATTAN SEMESTER

The earth in space. Geochronology and the age of the earth. Gravity and the figure of the earth.Earths magnetic field – its morphology, temporal variations (micropulsations to reversals), history and origin. Earthquakes – their distribution, focal mechanism, and prediction. Seismology and the planetary interior.Geothermics and Planetary.

Prerequisites: GLY 201, MTH 201, MTH 202, PHY 204, PHY 207, PHY 208.

AGP 302 - MAGNETIC METHOD IN PROSPECTING
2–0–3 (3 Units) RAIN SEMESTER
Basic concepts, definitions and units. Elements of Geomagnetism. Temporalvariations. The magnetic properties of minerals and rocks. Magnetic prospecting instruments and magnetic survey procedures, including the correction of magnetic data, magnetic anomalies of some idealised sources and their geologic equivalents, magnetic interpretation by characteristic points, half slopes, monograms, and polynomials. Regional, residual, derivatives and continuation. Airborne, ground and marine magnetic surveys and their applications.

Prerequisites: GLY 201, MTH 201, MTH 202, PHY 204, PHY 207, PHY 208.

AGP 303 - INTRODUCTORY EXPLORATION GEOPHYSICS
2–0–3 (3 Units) HARMATTAN SEMESTER
The nature and scope of geophysics and the role of geophysics in geological prospecting and exploration, principles, methods and techniques and principal applications of the gravity, magnetic, resistivity, electrochemical, electromagnetic, refraction and reflection seismic and radiometric surveys. Resolving different geological mapping mineral and hydrocarbon exploration, groundwater surveys and engineering problems using the geophysical methods.

Prerequisites: GLY 201, MTH 201, MTH 202, PHY 204, PHY 207, PHY 208. Geology students require only GLY 201 as Prerequisite.

AGP 304 - GRAVITY METHODS IN PROSPECTING
2–0–3 (3 Units) RAIN SEMESTER
Basic definitions and units. Variations of earth's gravity field with latitude and elevation. Mineral and rock densities.Gravity prospecting instruments, fluids operations and reductions. Gravity anomalies of some idealised sources and their geologic equivalents. Simplified methods of rapid gravity interpretation. Regional, residual derivatives and continuation.Ground, marine and airborne gravity surveys and some case histories of gravity surveys.

Prerequisites: GLY 201, MTH 201, MTH 202, PHY 204, PHY 207, PHY 208.

AGP 306 - ELECTRICAL METHODS IN PROSPECTING
2–0–3 (3 Units) RAIN SEMESTER
Electric conduction and the electrical properties of earth materials. Electrical resistivity prospecting – electrode arrays; and apparent resistivity formulae: profiling and sounding, interpretation of resistivity data; geological problems amenable to resistivity investigation; some case histories. The self potential (SP) method – origin, measurement interpretation and examples. The induced

polarization (IP) method – phenomenon of IP in ore bearing rocks and sediment; time and frequency domain measurements; pseudo sections; geological applications and some case histories.

Prerequisites: GLY 201, MTH 201, MTH 202, PHY 204, PHY 207, PHY 208.

AGP 401 - SEISMIC METHODS IN PROSPECTING
3–0–3 (4 Units) HARMATTAN SEMESTER

Seismic wave propagation in n elastic medium. Elastic properties of rocks. Principles of refraction and reflection seismic in horizontal and inclined single and multiple interfaces. Seismic prospecting instrumentation and fied procedures.Simple methods of interval velocity extermination. Variable velocities, wave fronts and ray paths. Elements of seismic data processing – migration, deconvolutione.t.c. introduction to vertical seismic profiling and seismic stratigraphy. Some direct seismic signals in hydrocarbon search (e.g. velocity sag, Vp /Vs ratio, bright and flat spots). Use of seismic methods in geological prospecting and exploration and in solving simple engineering problems.

Prerequisites: GLY 201, MTH 201, MTH 202, PHY 204, PHY 207, PHY 208.

AGP 402 - ENGINEERING GEOPHYSICS
2–0–0 (2 Units) RAIN SEMESTER

Geophysical methods in engineering site investigations: foundation studies, highway routes, oil pipeline route, dam sites investigation e.t.c. determination of soil/Bedrock engineering characteristics – nature of soil/bedrock, soil corrosivity, depth to bedrock (or overburden thickness), formation parameters (porosity, permeability, etc.), dynamic elastic constants, rock quality designation (RQD) and fracture frequency (FF), bedrock structural disposition. Location of construction materials, mineral resource (metallic, non – metallic, quarry) evaluating (disposition and quantification) and strategy for mode of mining. Location of disused mine shafts, buried cables, land mines, capsized submarines/ships, etc. case Histories

Prerequisites: GLY 201, MTH 201, MTH 202, PHY 204, PHY 207, PHY 208.

AGP 403 - ELECTROMAGNETIC METHODS IN PROSPECTING
2–0–3 (3 Units)HARMATTAN SEMESTER
Elementary theory – description of electromagnetic fields, combination of E>M fields, amplitude and phase relations.Ground electromagnetic methods

(principles, field practice and data interpretation). Tilt angle, turam, horizontal loop systems, VLF, AFMAG, Telluric and magnetotelluric methods. Airborne electromagnetic methods, their principles and practices – Rotary – m fields, AFMAG, VLF, transient (INPUT) methods Quadrature, long wire systems. Applications of electromagnetic methods in mineral prospecting, geological mapping and groundwater investigation.Case histories.

Prerequisites: GLY 201, MTH 201, MTH 202, PHY 204, PHY 207, PHY 208.

AGP 404 - GROUNDWATER / ENVIRONMENTAL GEOPHYSICS
2–0–0 (2 Units) RAIN SEMESTER
Application of geophysical methods in groundwater and environmental pollution studies. Direct and indirect investigation techniques. Aquiver identification and delineation in typical basement complex and sedimentary areas. Mapping of geological structures favorable to groundwater accumulation, determination of aquiver parameters, porosity and its mapping. Groundwater quality determination, mapping of saline water zones and chemical pollution plumes. Case histories.

Prerequisites: GLY 201, MTH 201, MTH 202, PHY 204, PHY 207, PHY 208.

AGP 405 - GEOPHISICAL WELL LOGGING
1–0–3 (2 UNITS) HARMATTAN SEMESTER
Types of geophysical well logs and information obtainable from them. Archie'sLaw. A general survey of the electrical Logs (S.P, resistivity – conventional and focused), induction, radiation, density and sonic methods of borehole geophysics – their applicability, advantages and limitations.

Prerequisites: GLY 201, MTH 201, MTH 202, PHY 204, PHY 207, PHY 208.

AGP 406 – GEOTHERMAL EXPLORATION
2–0–0 (2 Units) RAIN SEMESTER
Origin and nature of heat flow from the earth. Geothermal systems and thie characteristics. Geophysical investigation of geothermal systems, identification and delineation of geothermal reservoirs. Geothermal resources and their uses.Description of known geothermal energy fields.

Prerequisites: GLY 201, MTH 201, MTH 202, PHY 204, PHY 207, PHY 208.

AGP 407 - RADIOMETRIC METHODS IN PROSPECTING
1–0–0 (1 Unit) HARMATTAN SEMESTER
Radiometric methods of geophysical prospecting, Fundamental Principles and Techniques.Interpretation and application in mineral and groundwater investigation.

AGP 408 - GEOPHYSICAL FIELD PRACTICE
0-0–9 (VACATION COURSE) (3 UNITS)
Independent geophysical field exercise of 4 – 6 weeks duration to be carried out during the long vacation at the end of the part three school year and to be evaluated based on the report to be submitted before the end of the first semester of the final year of study.

Pre-requisites: GLY 413

AGP 410 – HONOURS THESIS
0–0–18 (6 Units) 2 SEMESTERS (SESSIONAL)
An independent research project, selected on the basis of the students interest and the availability of facilities and supervised by staff. The project initiated at the beginning of the final year, takes the form of original research, a revive or a compilation and analysis of data in any branch of geophysics or in any application of geophysics in an exploration problem. Students are required to submit a one page short description of the project during the first week of the semester in which the thesis is to be submitted and three copies of the thesis is to be submitted and the three copies are due latest on the last day of lectures of the semester in which the thesis is to be examine. Assessment is based on the discretion and performance in an oral examination

Pre-requisites: AGP 408

AGP 412 - SEMINAR
0–0–3 (1 Unit) 2 SEMESTERS (SESSIONAL)
A seminar talk, to be given by the student during the final year on any assigned topic of geophysicalinterest and relevance.

2.13 THE POSTGRADUATE PROGRAMMES AND CONTENTS

1. Hydrogeology and Engineering Geology Option
GLY 600 - Geological Photo-interpretation and Photogrammetry.
GLY 601 - Soil and Rock Mechanics
GLY 602 – Advanced Engineering Geology
GLY 603 – Advanced Structural Geology

GLY 604 – Applied Hydrology
GLY 605 – Hydrogeology
GLY 606 – Applied Geophysics in Site Investigation
GLY 620 – Seminar and
GLY 621 – Special Projects.

2. Mineral Exploration Option
GLY 600 – Geological Photo-interpretation and Photogrammetry.
GLY 607 – Economic Geology / Mine Evaluation and Mineral Economics.
GLY 608 – Geophysical Methods of Mineral Prospecting
GLY 609 – Geochemical Methods of Mineral Prospecting
GLY 610 – Fundamentals of Geochemistry
GLY 612 – Advanced Mineralogy
GLY 613 – Advanced Petrology.
GLY 620 – Seminar and
GLY 621 – Special Projects.

3. Sedimentary and Petroleum Geology Option
GLY 614 – Advanced Micropaleontology
GLY 615 – Advanced Stratigraphy (including Sequence Stratigraphy)
GLY 616 – Advanced Sedimentology and Sedimentary Petrology.
GLY 617 – Subsurface Geology
GLY 618 – Reservoir Geology and Petroleum Engineering
GLY 619 – Petroleum Economics
GLY 620 – Seminar and
GLY 621 – Special Projects
GLY 622 – Palynology
GLY 623 – Seismic Interpretation (including Seismic Stratigraphy).

4. Hydrogeology Option
GLY 604 – Applied Hydrology
GLY 620 – Seminar and
GLY 621 – Special Projects.
GLY 625 – Well Hydraulic and Pumping Test Analysis
GLY 626 – Water Quality
GLY 636 – Applied Geophysics in Hydrogeological Investigations

Elective Courses
Six units of electives courses must be taken from the following elective courses:
GLY 600 Geological photo-interpretation and Photogrammetry
GLY 601 Soil and Rock Mechanics
GLY 602 Advanced Engineering Geology
GLY 603 Advanced Structural Geology

GLY 615	Advanced Stratigraphy(including Sequence Stratigraphy)
GLY 617	Subsurface Geology
GLY 627	Groundwater Modeling and Case Studies
GLY 628	Isotopic techniques in Groundwater Studies
GLY 629	Planning and Management of Water Resource Projects
GLY 636	Applied Geophysics in Hydrogeology Investigations

DETAILS OF COURSES

GLY 600 – Geological Photo Interpretation and Photogrammetry Harmattan Semester 1+0+3 (2 Units)
Characteristics of air photographs and mosaics.Interpretation of geology by various techniques such as drainage pattern analysis, tonal, vegetation and geomorphological studies. Use of air photographs in applied geological studies. Map reading and topography. Binocular vision, parallaxes.Floating marks.Principles of stereo photogrammetry.Inner relative and absolute orientation.Determination of height and dips. Map making with stereoscope and parallax bar. Photogrammetry instruments.Preparation of thematic maps from aerial photographs.

GLY 601 – Soil and Rock Mechanics, Harmattan Semester 2+0+3 (3 Units) Field Trips.
Engineering classification of rock and soils. Weathering and weathering factors. Weatherability of minerals. Soil types, structures and textures in rocks and soils. Clay mineral types, structures, identification and influence on soil properties. Stress and strain in two and three dimensions.Representation of stress and strain.Theories of elasticity and plasticity. Stress fields and their measurements. Criteria of failure and yield.Classification of soils. Flow of water in soil – steady state transient conditions. Shear strength and its measurement. Limiting conditions in a semi-infinite space.Soil properties and their measurement.Earth pressures.Bearing capacity.

GLY 602 – Advanced Engineering Geology, Rain Semester 2+0+3 (3 Units) Field Trips.
Exploration of building subsoils. Open cuts and retaining walls. Foundations slopes and their stability.Engineering geological maps and their evaluation.Mining and tunneling (Theory and methods). Dams – types, design and construction. Elements of a road pavement.Site investigation in engineering practice.Rock as a construction material.Laterite soils and black cotton soils – distribution and nature, physical characteristics, chemistry and mineralogy.Structure and engineering properties.Interaction with engineering.

GLY 603 – Advanced Structural Geology, Harmattan Semester 1+0+3 (2 Units).
Stress in 2-dimensions, trajectories, Mohr diagram. Strain in 2- and 3-dimensions, progressive deformations, deformations, fabric resulting from strain. Rheology, stress-strain relations of elastic, viscous and visco elastic materials.Geometric techniques of structural analysis.Projection techniques. Fracture analysis. Mapping techniques.Geotectonics, crustal morphology, world patterns theories of orogenesis.

GLY 604 – Applied Hydrology, Harmattan Semester 2+0+0 (2 Units)
Introduction to open channel flow – Chezy's and Manning formulae.Tubular and laminar flow.Hydrological cycle – precipitation, evapotranspiration, infiltration, run off measurement of flow.Hydrograph analysis.Hydrological forecasting.Choice of dam sites and safety consideration of slopes.Drainage characteristics of Nigerian Rivers.Erosion problems in Nigeria.

GLY 605 – Hydrogeology, Rain Semester 2+0+3 (3 Units) Field Trips
Occurrence of groundwater, groundwater recharge as part of hydrological cycle, groundwater and well hydraulics.Exploration for groundwater – remote sensing, geological and geophysical methods.Groundwater extraction – perforation methods. Well completion, well development, pumping test. Water quality and purification.Artificial recharge of groundwater.Salt water intrusion in coastal aquifers. Problems of water resources planning and management in Nigeria.

GLY 606 – Applied Geophysics in Site Investigation, Harmattan Semester 2+0+3 (3 Units) Field Trips
Geophysical methods of investigation foundation problems.Resistivity and seismic techniques. Application of geophysics to water supply engineering, location of sewer pipes, etc.

GLY 607 – Economic Geology/Mine Evaluation and Mineral Economics, Rain Semester 4+0+0 (4 Units) Field Trips
Distribution of the ore minerals and their geochemistry.Metallogenic epochs and provinces.Mechanics of transport and accumulation of ore minerals during processes of igneous activity, metamorphism, sedimentation, weathering and erosion.Estimation of reserves.Discussion of selected examples from the main groups of mineral deposits.Historical aspects of mining and relationship to industrialization.Laws, taxation and investment.Financing a mineral investment.Mineral management and policy.Small operators and large companies.Marketing and technological problems.Price fluctuations and factors affecting them.Trend in utilization of mineral products.Conservation and the environment.

GLY 608 – Geophysical Methods in Mineral Prospecting, Rain Semester 2+0+3 (3 Units) Field Trips

The principles and practice of prospecting for mineral deposits by electrical, magnetic, electromagnetic, gravity and seismic methods.Interpretation and applications.Case histories, field demonstrations.

GLY 609 – Geochemical Methods in Mineral Prospecting, Harmattan 2+0+3 (3 Units) Field Trips

Surveying, mapping, sampling (including drilling methods), Radiometric methods, semi quantitative field methods, UV-spectrum. Laboratory techniques of geochemistry.Interpretation of results, discussion of selected examples.Field demonstrations.

GLY 610 – Fundamentals of Geochemistry, Harmattan Semester 2+0+0 (2 Units)

Classification of elements. Distribution of elements in cosmic systems, meteorites lithosphere, hydrosphere, atmosphere. Geochemistry of different rock types; igneous, sedimentary, metamorphic, Weathering and soil formation.

GLY 612 – Advanced Mineralogy, Harmattan Semester 1+0+3 (2 Units)

Crystal symmetry and stability relation of rock-forming minerals. Effects of paragenesis on the chemistry of minerals. Phase relations of the major rock-forming minerals. Techniques in mineral analysis. Silicate analysis by atomic absorption spectrophotometry and/or X-ray fluorescence spectrometry. Evaluation and interpretation of chemical analytical data of minerals. Physical methods in determinative mineralogy. Universal stage methods, X-ray powder diffraction methods, density determination.

GLY 613 – Advanced Petrology, Rain Semester 2+0+0 (2 Units)

Advanced study of the evolution of igneous and metamorphic rocks with emphasis on phase equilibrium.Study of selected igneous provinces.Origin and evolution of magma.Metamorphic facies and facies series. Petrochemistry and petrochemical calculations. Trace elements and their applicationtopetrogenetic problems. Review of developments in experimental petrology. Principles of rock analysis. Application of statistical methods of petrology.

GLY 614 – Advanced Micropaleontology, 1+0+3 (2 Units) Harmattan Semester

Definition and practical value of Micropaleontology.Historical Review of Micropaleontology.Development of Commercial Micropaleontology. Physical, Chemical, and Biological factors of marine and non-marine microenvironments and their effects on microscopic organisms. Environmental distribution of microorganisms.Evolutionary and phylogenetic relationships within

microorganism groups (e.g., Foraminifera, Ostracoda, Calcareous Nannofossils - particularly Coccoliths and Discoasters, Radiolarians, Diatoms, Silicoflagellates, Conodonts and Pteropoda).Ecological and Paleoecological relationships of living and fossil microorganisms. Taxonomy and morphological (particularly diagnostic features) biostratigraphically and paleoecologically important taxa of Foraminifera, Ostracoda, Calcareous Nannofossils (particularly Coccoliths and Discoasters, Radiolarians, Diatoms, Silicoflagellates, Conodonts and Pteropods). Applications of Micropaleontology to high-resolution Biostratigraphy. Pale bathymetry, Paleofacies analyses, Paleoecology, etc. in Oil Exploration and Production. Micropaleontological characteristics of systems tracts, condensed sections etc.Applications of Micropaleontology to other fields (e.g., Engineering Geology and Mineral Exploration.

GLY 615 – Advanced Stratigraphy (including Sequence Stratigraphy)2+0+0 (2 Units) Harmattan Semester

Principles of Stratigraphy.Type areas and boundary problems.Correlation.Stratigraphic Nomenclature.Biostratigraphy and biostratigraphic refinements with emphases on African (including Nigerian) examples. Sequence Stratigraphy: Definitions of sequences, systems tracts, parasequences, parasequence sets etc. and various surfaces. Integrating seismic, well log, and high-resolution biostratigraphic and paleoenvironmental data in Sequence Stratigraphy.Applications of Sequence Stratigraphy in Petroleum Exploration and Production.The Niger Delta.

GLY 616 – Advanced Sedimentology and Sedimentary Petrology2+0+3 (3 Units) Rain Semester

Origin of Sediments.Mode of transportation and deposition of Sediments. Texture of clastic sediments – surface textures, size, shape, porosity, permeability etc. Lithification and Diagenesis.Composition of sedimentary rocks.Sedimentary Structures.Heavy mineral analysis and provenance studies.Preparation of thin sections, grain mounts, and staining techniques.Identification, classification, and origin of sedimentary rocks. Carbonate rocks: petrology, microfacies, cathodoluminescence, etc. Carbonate reservoir rocks. Petrophysical characteristics of sedimentary rocks.Sedimentology and sedimentary petrology of petroleum reservoir rocks. Sedimentology in Sequence Stratigraphy: Sedimetological characteristics of Lowstand, Transgressive, and High stand Systems Tracts and Condensed Sections.

GLY 617 – Subsurface Geology2+0+3 (3 Units) Rain Semester

Subsurface maps: Choice of datum horizon, contour interval, construction, interpretation and uses. Electrical Log cross-sections and qualitative

interpretation of Electrical Log diagrams.Criteria for identifying subsurface faulting. Basin analysis: Basins in their plate tectonic environment. The lithosphere's physical state.Basins due to lithospheric stretching and to flexure.Effects of mantle dynamics. Basins associated with strike-slip deformation. Sediment routing systems. Basin stratigraphy Subsidence and thermal history.The petroleum play.

GLY 618 – Reservoir Geology and Petroleum Engineering2+0+3 (3 Units) Rain Semester

Clastic reservoir rocks and porosity types.Oil Field waters and subsurface pressures. Operations related to drilling and completing a well – coring and sidewall sampling, casing, drilling time and drill stem tests. Geological Factors affecting choice of techniques and completion operations. Fundamentals of fluid-permeated rocks.Porosity and permeability.Darcy's Equation.Pressure – Volume – Temperature relationship and use.Condensate reservoir.Mechanisms controlling oil production.Calculation of Oil and Gas in place (including material balance techniques).

GLY 619 – Petroleum Economics2+0+2 (2 Units) Rain Semester

The Global distribution of petroleum.World oil and energy crisis.Current world situation of the Oil Industry.The Giant Petroleum Companies. Capital budgeting decision. Objectives of the Firm.Characteristics of Natural Resources.Need for Economic Analysis.Economic evaluation – Nomenclature, Utilization, Equity. Economic evaluation techniques: Time value of money and interest calculations, Discounted cash flow method, Rate of return and present value, taxes inflation, Profitability criteria. Application to Oil and Gas Exploration and Production.Net value of produced oil and gas.Acceleration projects.Tax shelters.Introducing probability and statistics to the oil industry: Events and random variables, Expected values etc. Decision trees and executed monetary value. Utility theory and its applications: Subjective value of money, Relationship of Utility and monetary value. Expected utility value.

GLY 620 – Seminar Rain and Harmattan Semesters

Important topics in applied geology will be discussed by staff and students in weekly seminars. Each student will be required to prepare and deliver at least one seminar during the year. Seminars may also take the form of group discussion of a common subject or be related to special projects. Assessment will be based on comprehension of subject matter, coherence and depth of presentation as well as participation in the group discussion.

GLY 621 – Special Projects

An independent research project selected on the basis of student interest, supervised by staff will be assigned toward the end of the rain semester.

Generally, such project will require several weeks of independent field and/or laboratory work and analysis of data collected. The project will thus take the form of an original research. Reviews or extensive compilation of data may also be accepted depending on the content. The completed dissertation must be submitted in conformity with the regulation of the Graduate Studies Committee.

GLY 622 – Palynology, 1+0+3 (3 Units) Harmattan Semester

Definition of Palynology and some palynological terms.General survey of palynological representatives of the plant and animal kingdoms.Morphological (sculptural and structural) considerations of the exine of pollen and spores.Systematics and nomenclature in palynology.Relationship of deposition and preservation of palynomorphs to sedimentary processes.Sample reliability in relation to palynological analyses. Dinoflagellate cysts, acritarchs, tasmanitids and other organisms commonly found in palynological preparations. Paleoecolocical significance of palynomorphs.General considerations of palynomorphs from different geological periods with special emphasis on Cretaceous, Tertiary and Quaternary assemblages. Palynology in Sequence Stratigraphy: Palynological characteristics of Lowstand, Transgressive, and Highstand Systems Tracts, Condensed Sections and Maximum Flooding Surfaces. Palynofacies analysis.Palynology and thermal maturation studies.

GLY 623 – Seismic Interpretation (including Seismic Stratigraphy) 0–0–3 (1 Unit) Rain Semester

Refraction techniques for exploration. Advanced reflection technique (data collection) for exploration. Seismic signal analyses.The propagation of elastic waves through solids.The effect of boundaries between different media. Direct detection of hydrocarbon deposits. Techniques of marine seismic investigation. Specialized interpretation techniques of reflection seismic data (both land and sea). Velocity spectra, velocity determination, static and dynamic correction, normal move out correction. Synthetic seismogram and migration. Seismic Stratigraphy: Seismic sequence analysis, Seismic facies analysis, Analysis of relative sea level change**.**

GLY 625 – Well Hydraulics and Pumping Test Analysis, Harmattan Semester 2+0+0 (2 Units)

Flow to wells in aquifers. Design and interpretation of pumping test data from confined, unconfined and leaky aquifers. Hydrogeology of fractured rock aquifers.

GLY 626 – Water Quality, Rain Semester 2+0+3 (3 Units)

Classification and distribution of elements.Chemical reactions affecting solute transport and composition of naturally occurring waters. Microbiological indices of water quality.Geochemistry of natural groundwater in different environment.

Surveying and sampling methods. Laboratory techniques of water analyses. Pollution and quality protection strategies. Water treatment methods.

GLY 627 – Groundwater Modelling and Case Studies, Rain Semester 2+0+0 (2 Units)

Finite difference and finite element methods for subsurface fluid flow and mass or energy transport. Development and use of numerical models in groundwater investigations.Case studies.

GLY 628 – Isotopic Techniques in Groundwater Studies, Harmattan Semester 1+0+3 (2 Units)

GLY 629 – Planning and Management of Water Resources Projects, Rain Semester 2+0+0 (2 Units)

Resource characteristics of water.Economic evaluation of water projects.Planning precepts.Institutional and policy consideration in water project management.Applications of quantitative methods to water resource management. Benefit cost analysis. Management models and case studies in water management.

GLY 636 – Applied Geophysics in Hydrogelogical Investigations, Harmattan Semester 3+0+3 (4 Units)

Application of geophysical methods to hydrogeological investigation.Principles, field procedures and interpretation of surface techniques (electrical resistivity, seismic refraction, induced polarization, gravity and electromagnetic methods and fluid conductivity).Case histories.

5. Applied Geophysics Option

Course Code	Description	Course units
AGP 601	Gravity and Magnetic Methods	(2+0+3) 3
AGP 602	Static and Time Varying Field Theory	(2+0+0) 2
AGP 603	Seismic Methods	(2+0+3) 3
AGP 604	Digital Computer Techniques for Geophysical Applications	(2+0+0) 2
AGP 605	Electrical and Electromagnetic Methods	(3+0+3) 4
AGP 606	Borehole Geophysics	(1+0+0) 1
AGP 607	Geophysical Field Work	1
AGP 608	Thesis	6
AGP 610	Radioactivity Methods	(2+0+0) 2
AGP 611	Physical Properties of Rocks and Minerals (Laboratory Studies)	(0+0+6) 2
AGP 612	Paleomagnetism	(2+0+0) 2

AGP 613	Modelling in Geophysical Prospecting	(1+0+3) 2
AGP 614	Advanced Data Processing	(1+0+3) 2
AGP 615	Solid Earth Geophysics	(2+0+0) 2
AGP 616	Instrumentation	(0+0+6) 2

Elective Courses (Compulsory Courses)

Course Code	**Description**	**Course units**
*AGP 430	Mathematics for Geologists	(4+0+0) 4
*AGP 431	Geology for non-geologist	(4+0+0) 3
*AGP 433	Electronic Techniques for Geophysicists	(0+0+3) 1
*AGP 432	Introduction to Geophysical Prospecting	(3+0+3) 4
*CVE 301	Surveying I	(3+0+1) 4

* Remedial Course

Courses are to be selected according to various backgrounds in Geophysics, Geology, Physics, Mathematics, Electronic and Electrical Engineering including other Technologists.

Course Details

AGP 601: Gravity and Magnetic Methods: Rain Semester 2+0+3 (3 Units)
Gravity and Magnetic fields.Ambiguity in interpretation and conditions for uniqueness.Resolution of anomalies.Limiting formulae.Gravity and magnetic effects of some simple models, anomaly characteristics, depth rules, geometric constructions and use of integral transformations, Computation of gravity and magnetic anomalies for irregular bodies.Regional, residual and vertical derivatives.Upward and downward continuation and their uses.Poissons relation between gravity and magnetic potential.Magnetic reduction to pole.Remanent magnetization in magnetic interpretation.Frequency domains analysis.Field examples.

AGP 602: Static and Time Varying Fields: Rain Semester 2+0+0 (2 Units)
Maxwell's electromagnetic field equations and their physical meanings.Wave, induction and Laplace equations.Static boundary conditions and boundary value problems.Resistivity theory of layered media.Theorems on potential.Long wavelength approximation for slowly varying electromagnetic potentials and boundary value problems.Conducting loop and sphere in uniform oscillating magnetic similitude and modelling.

AGP 603: Seismic Methods: Rain Semester 2+0+3 (3 Units)
The propagation of elastic waves through solids.The effect of boundaries between different media.The Raypath method.Detection of ground motion and

the theories of mechanical and electrical seismographs.Advanced refraction techniques for exploration.Data acquisition in modern practice.Sources: Explosives and implosive, airgun, sparker and others. Recording System: Sources and detector arrays.Vibroseis. Marine seismic methods, seismic signal analysis. Refraction seismic interpretation. Specialized interpretation techniques of refraction, seismic data (land and sea). Velocity spectra, velocity determination, static migration.Synthetic seismogram technique.Modern Seismic interpretation techniques (3D, 4D & 4C), Sequence Stratigraphy.

AGP 604: Digital Computer Techniques for Geophysical Applications: Harmattan Semester 2+0+0 (2 Units)

Signal theory. Theory of discrete–Time Linear Systems, Convolution and Correlation.

Special Analysis: Transforms, Power Spectral Analysis, Filtering techniques and statistical methods. Applications to geophysical data processing. Practical examples and class work. Applied numerical methods.Linear and non linear optimization techniques.Linear programming. Numerical models of dynamic systems Automatic interpretation algorithms. Geophysical numerical modelling.

AGP 605: Electrical and Electromagnetic Methods: Rain Semester 3+0+3 (4 Units)

Advanced electrical resistivity (E.R.), Self-Potential (S.P), and induced polarization techniques of geophysical prospecting. Data collection, correlation and consideration of specialized interpretation techniques.Application of the electrical methods in geological mapping mineral investigation, engineering site investigation, groundwater and geothermal energy investigation. Detailed treatment of case histories seminars and classwork.Electromagnetic theory: Description of EM fields, combination of fields. Amplitude and phase relations, mutual inductance, ground Electomagnetic prospecting methods: Tilt (or Dip) Angle methods, Turam and Slingram arrangements. VLF and AFMG.Field Techniques and interpretation. Type curves and phasor (Argand) diagrams airborne EM methods: quardrature methods, long wire system, rotary field. AFMAG VLF and INPUT methods.Field and data interpretation procedures.

AGP 606: Borehole Geophysics Rain Semester 1+0+0 [1 Unit]

Theories and methods of borehole geophysics.Logging Techniques. Log Interpretation. Borehole drilling and completion techniques.Borehole drilling fluids and their effects on geophysical logs.Formation characteristics, lithology, porosity, permeability and geometry.Various types of geophysical logging tools; lithologic, resistivity, porosity and dipmeter.Instrumentation / interpretation and petrophysical parameters derivable from them.Logging whilst drilling and modern concepts of geophysical well log Interpretation.

AGP 607: Geophysical Field Work: Rain Semester (I Unit)

a. At least 10 Weekend field trips during the semester.
b. Each student will work on a given problem using combined geophysical techniques for a period not lasting more than 10 days. At the end of the programme, each student will be required to submit a report.

AGP 608: Thesis Harmattan and Rain Semester (6 Units)

Each student will be assigned an individual project, which is to be undertaken under the guidance of supervisor(s). The project could be of two types:

a. Critical review of certain solved geophysical problems, or
b. Field work and interpretation to resolve a geophysical problem

The dissertation is subject to an oral examination where the student is required to defend his work.

AGP 610: Radioactivity Methods Harmattan Semester 2+0+0 (2 Units)

Principles of radioactivity. Radioactivity of rocks and minerals. Ionization chamber.Geiger-Muller counter, scintillation meter. Miscellaneous instruments and Calibration Field techniques. Spectrometric surveys. Aero-spectrometric methods. Interpretation procedure.

AGP 611: Physical Properties of Rocks and Minerals (Laboratory studies): Harmattan Semester 1+0+6 (2 Units)

Rock physics. Determination of density, magnetic susceptibility, permeability, elastic constants, porosity. Techniques of measurement. Micro-statistics of thin sections of rocks. Prediction of in-situ characteristics of rocks.

AGP 612: PaleomagnetismHarmattan Semester 2+0+0 (2 Units)

Detrital Magnetization, Thermo-remanent magnetization, Collection and treatment of Data, Magnetic cleaning, Measurement of natural remanent magnetization.Instrumentation. Investigation of other magnetic properties of rocks. Temperature effects, Stereographic projection. Application of results of paleomagnetism.Polar wandering.

AGP 613: Modelling in Geophysical Prospecting; Harmattan Semester 1+0+3 (2 Units)

Basic Equation of Geophysical Phenomena.Modelling Conditions.Modeling parameters.The resistively model tank.Magnetic response modeling.Electromagnetic Scale modeling.Applications of modeling to geophysical interpretation.

AGP 614: Advanced Data Processing, Harmattan Semester 1+0+3 (2 Units)
Applied Numerical Methods, Linear and Non-linear Optimization techniques.Linear programming. Numerical models of dynamic system. Automatic interpretation algorithms.Geophysical numerical modeling.

AGP 615: Solid Earth Geophysics, Harmattan Semester 2+0+0 (2 Units)
Physical and chemical characteristics of the Earth.Figure of the Earth.Mass, Moment of Inertia and Rotation.The internal structure of the Earth, Seismology, Techniques and results of Crystal seismology.The magnetic Earth; main field, secular variation.Age and Thermal State of the Earth.Geochronology, Geodynamics.

AGP 616: Instrumentation, Harmattan Semester 0+0+6 (2 Units)
The development and modification of geophysical Instruments.

AGP 430: Mathematics for geologists: Harmattan Semester 4+0+0 (4 Units)
Limits, continuity and differentiability, mean value theorem, maxima and minima, error analysis and least square Techniques.Vector analysis, differentiation of a vector.Sequences and series, Fourier series, Tailors series.Elementary numerical analysis line.Surface and volume integrals. The Fourier and Laplace Transforms. Solution of Laplace equations.Spherical Harmonic Analysis.Polynomial surface and their computation.

AGP 431: Geology for Non Geologists: Harmattan semester 4+0+0 (4 Units)
Introduction to and scope of Geology, identification of various rock types and their composition. Introduction to petrology: igneous, metamorphic and sedimentary. Simple geological structures, interpretation of folds, faults.Basic map reading, photo geology and interpretation.Introduction to Structural geology and interpretation for potential mineral resources.Economic geology; mineral deposits, their geology and uses.Industrial minerals and their uses.Introduction to basic principles of stratigraphy.Applied physical Stratigraphy.Geology of petroleum.Oil accumulation and nature, origin of oil, migration and accumulation of oil.Discussions of various traps and salts Domes.Basic concepts of Hydro/Engineering geology and Marine geology.

AGP 432: Geophysical Prospecting, Harmattan Semester 3+0+3 (4 Units)
Gravity and Magnetic methods.Electrical methods.Seismic methods.Electromagnetic methods.Radiometric methods.

AGP 433: Electronic Techniques for Geophysicists: Harmattan Semester 0+0+3 (1 Units)
Basic understanding of the Electronic design of geophysical equipments. Troubleshooting. Physical principles of Electronic devices Analysis and design

of electronic circuits, filters, Amplifiers, Oscillators, Pulse and Switching circuits, Amplitude frequency Pulse modulation, Power Supplies, microprocessor and their applications in Geophysical instruments.

PROGRAMMES FOR THE MASTER IN PETROLEUM GEOSCIENCE, MASTER IN PETROLEUM GEOPHYSICS, MASTER IN PETROLEUM GEOCHEMISTRY, MASTER IN MINERAL EXPLORATION, AND MASTER IN GROUNDWATER AND ENVIRONMENTAL GEOSCIENCES

Justification

The department has had a longstanding, mutually beneficial relationship with the industry and in response to our desire to continuously improve the quality of the graduates, the department has actively sought and obtained support from government and the industry. For example, the Petroleum Technology Development Fund (PTDF) has donated an extension to our building and is providing some facilities all valued at about ₦450 million. Some of the major Exploration & Production Companies, e.g. Shell, ExxonMobil, Landmark and dGB (The Netherlands) have also donated workstations and software.

There is at present a demand for an intensive course of shorter duration from professionals already serving in the industry and government agencies who cannot take two years off their jobs to pursue a 24-calendar month M. Sc. Programme presently on offer. Young graduates wishing to improve their chances of joining the industryare also demanding for such a shorter duration masters programme. PTDF currently sponsors hundreds of such young graduates to pursue 12-calendar month professional masters degree in universities abroad specifically designed to provide skilled manpower for the oil and gas industry in Nigeria at great cost. However, many of the beneficiaries do not return to serve the country. It is in this light that the Department feels encouraged to once again respond positively to the needs of the industry and country by introducing the following 12-calendarmonth home-basedMasters programmes:

- Master in Petroleum Geosciences;
- Master in Petroleum Geophysics;
- Master in Petroleum Geochemistry;
- Master in Mineral Exploration; and

- Master in Groundwater and Environmental Geosciences.

Objectives

The specific objectives of the programmes are to

i) produce well equipped graduates to pursue geosciences careers in the industry;

ii) respond to the shortage of skilled geosciences personnel, within the oil, mining, groundwater and environment and service sectors;

iii) attract graduates with a strong theoretical background in mathematics, the physical sciences and engineering to a career in the geosciences;

iv) provide advanced training for graduates who already have some experience in practical application of geosciences principles, but seek to further their understanding and skills in a particular area of specialization;

v) provide a solid grounding in the geophysical, geological and production geosciences concepts required to understand and exploit the various techniques at all stages, from exploration, through development to production and reservoir management;

vi) encourage and develop interdisciplinary skills across all aspects of the geosciences; and

vii) Provide the skills needed to undertake independent research projects both in the industry and within the university environment.

Admission Requirements

The Admission Requirements are as stated in Regulations 8, 9 and 10 of the Obafemi Awolowo University's Regulations Governing Postgraduate Studies (2005). An applicant for admission to the Masters degree shall be a graduate of ObafemiAwolowoUniversity or a graduate of any other approved University or a person who holds a recognized qualification approved by the Senate of the University. The person shall, normally, possess not lower than a Second Class, Lower Division Honours Degree to be eligible for admission.

Duration of the Programme

The courses are full-time courses designed to run for twelve calendar months comprising of Harmattan and Rain Semesters for course work, and a Post-Rain Semester for the independent project. The courses will comprise of lectures, practicals, field work, group projects as well as independent projects.

Conditions for Award of the Degrees

Candidates shall fulfil the course work examination requirements as stated in the Obafemi Awolowo University's Regulations Governing Postgraduate Studies

(2005) for the award of the Degree of Master of Science. In addition, the candidates will fulfil the following requirements for each programme.

(a) **Master in Petroleum Geosciences:**
The candidate shall pass 41 units comprising 34 units of core courses, 3 units of elective and 4 units of project.

(b) **Master in Petroleum Geophysics:**
The candidate shall pass 44 units comprising 40 units of core courses and 4 units of project.

(c) **Master in Groundwater and Environmental Geoscience:**
The candidate shall pass 40 units comprising 36 units of core courses and 4 units of project.

(d) **Master in Petroleum Geochemistry:**
The candidate shall pass 42 units comprising 38 units of core courses and 4 units of project.

(e) **Master in Mineral Exploration:**
The candidate shall pass 40 units comprising 36 units of core courses and 4 units of project.

COURSE STRUCTURES

I. MASTER IN PETROLEUM GEOSCIENCE

The Master's course is a twelve-calendar month, full-time course designed to provide full training in integrated petroleum geosciences to equip students with the knowledge and skills necessary to perform a wide range of technical functions in the petroleum industry. It is designed for new graduates seeking careers in the petroleum and allied service industries as well as those with some industrial experience. The course presents the methods and practices of the modern petroleum industry but considerable emphasis is also placed on developing transferable skills.

	Harmattan Semester		
Code	**Course Title**	**L T P**	**UNITS**
PGS601	Fundamentals of Petroleum Exploration and Production	2 - 0 - 0	2
PGS603	Structure and Stratigraphy of Sedimentary Basins	2 - 0 - 3	3
PGS605	Sedimentology of Petroleum Systems and Reservoir Modeling	2 - 0 - 0	2
PGS607	Geochemistry, Petroleum System and Basin Modeling	2 - 0 - 0	2
PGS609	Petroleum Structural Geology	1 - 0 - 3	2
PGS611	Geostatistics	2 - 0 - 0	2
PGS613	Petroleum Geoscience Practicals	0 - 0 - 3	1
PGS615	Applied Micropaleontology*	2 - 0 - 3	3
PGS617	Occupational Safety and Health	2 – 0 - 2	2
PGS619	Fieldwork I	0 – 0 - 3	1
PGP603	Introduction to Seismic Acquisition, Processing and Interpretation	2 - 0 - 3	3
	Total		**23**

Rain Semester

Code	**Course Title**	**L T P**	**UNITS**
PGS602	Formation Evaluation and Petrophysics	2 - 0 - 3	3
PGS604	Prospect Evaluation and Petroleum Economics	2 - 0 - 3	3
PGS606	Petroleum Engineering	2 - 0 - 3	3
PGS608	Environmental Impacts of Petroleum Exploration and Production	2 - 0 - 0	2
PGS610	Production Geoscience/Geophysics Group Project	0 –0 - 6	2
PGS612	Communication and Research Skills	1 - 0 - 0	1
PGS614	Strategic Management in Geosciences	1 - 0 - 0	1
PGS616	Fieldwork II	0 - 0 - 3	1
PGP606	Advanced Seismic Interpretation and Imaging*	2 - 0 - 3	3
	Total		**19**

Post-Rain Semester

PGS618	Project		4

* Elective Courses: Candidate to select one

COURSE DESCRIPTIONS

PGS 601 FUNDAMENTALS OF PETROLEUM EXPLORATION AND PRODUCTION

Definition and analysis of petroleum systems; stratigraphic principles in oil geology; structure of sedimentary basins and trapping mechanisms; the subsurface environments (temperature and pressure); basic petroleum economics and reserve calculations; play fairways and prospect analysis, and global example of oil provinces; and the usage and display of subsurface geological data and the limits on the reliability of such data.

PGS 602 FORMATION EVALUATION AND PETROPHYSICS

Definitions of fundamental reservoir properties such as porosity, saturation, single and multiphase permeability, capillarity and wettability and their relation to hydrocarbon exploration and production; laboratory measurements of rock properties and their application to reservoir studies. Introduction to reservoir petrophysics, the geophysical logs and logging tools that measure the electrical, radioactive, acoustic and dielectric properties of the rocks penetrated in boreholes. Data acquisition. Qualitative interpretation. Techniques of quantitative log interpretation. Porosity derivation; calculation of water and hydrocarbon saturation, shale volume fraction and assessment of commercial viability, borehole imaging. Case studies of various oil and gas bearing reservoirs and shaly formations.

PGS 603 STRUCTURE AND STRATIGRAPHY OF SEDIMENTARY BASINS

Sedimentary basin formation, structural styles and basin evolution, seismic and sequence stratigraphy and prospectivity of the main types of sedimentary basins. The theories of basin formation, and the methods used to classify basins in terms of driving mechanisms and structural style; the structure, subsidence history and sedimentary fill of the main types of sedimentary basin (rifts, passive margins, strike-slip, foreland/thrust-top) as well as gravity and salt tectonics; practical skills to analyze a sedimentary basin to determine its structure, subsidence history and evolution, and determine the controls on its sedimentary fill; application of seismic and sequence stratigraphic techniques to the evaluation of geological data applicable to exploration and production scales; concept of a petroleum system and the use of basin analytical techniques to define the hydrocarbon potential of an area.

PGS 604 PROSPECT EVALUATION AND PETROLEUM ECONOMICS

Role of the explorationists in identifying and developing a play and producing leads and prospects; petroleum system analysis, and play fairway definition;

case studies of a number of Petroleum Provinces and selected fields; Development of mapping techniques and an understanding of the data required to evaluate a lead/prospect; estimation of reserves; the concept of Chance of Success and the quantification of risk; and basic grounding in petroleum economics, to assess the value of a prospect.

PGS 605 SEDIMENTOLOGY OF PETROLEUM SYSTEMS AND RESERVOIR MODELLING

Introduction of sediments that form a typical hydrocarbon play (reservoir, source, seal) in clastic and carbonate successions. The philosophy that underpins their nomenclature and the fundamental sedimentological processes and controls that govern their spatial and temporal variability. Introduction of the parameters (porosity and permeability) that control reservoir quality and how these parameters vary spatially and with burial, due to depositional facies variability and diagenetic processes. Reservoir Modelling for better understanding of 3-D relationships and geometries and subsequent improvement of production through flow simulation.

PGS 606 PETROLEUM ENGINEERING

Applications of petroleum engineering principles to the characterization of reservoir rocks and fluids; well drilling and testing; geological applications of pressure data; reserves determination.

PGS 607GEOCHEMISTRY, PETROLEUM SYSTEM AND BASIN MODELLING

The concept of petroleum systems: organic geochemistry, sedimentology of source rocks, and the kinetics of oil and gas formation. Introduction to 1D thermal modelling. Methods of analyzing the source rocks (petrography, vitrinite reflectance, Rock-Eval), of oils and extracts. Practical application. 2D and 3D modelling as a means of understanding and predicting the migration of hydrocarbons in basins. Methods for the characterization of reservoirs.

PGS 608 ENVIRONMENTAL IMPACTS OF PETROLEUM EXPLORATION AND PRODUCTION

Environmental impacts and the natural (geological) and artificial (man-made or man-induced) processes that can precipitate them. Components of the ecosystem that are the immediate recipient of environmental impact and those amenable to geophysical investigations. Geophysical methods applied to environmental impact assessment. Field procedures, data acquisition, processing and result presentation. Mapping of ancient landfill sites or buried waste dumps, delineation of their margins and physical characterization of the constituents. Exploration for new landfill or disposal sites and trenches. Mapping of chemical

pollution plumes arising from industrial and agricultural wastes, or well blowout, spilled hydrocarbon from failed or sabotaged oil pipelines and leaking underground oil tanks. Evaluation of nature of soil for assessment of soil corrosivity, electrical earthing and overburden protective capacity. Mapping of saline water zones and fresh/saline water interface in coastal areas. Monitoring of remediation efforts. Case Histories.

PGS 609 PETROLEUM STRUCTURAL GEOLOGY

Brittle and ductile deformation of rocks. Mechanisms of deformation. Folds, faults and fault-fold association. Balanced cross-section. Fractured reservoirs. Effects of faulting on reservoirs. Mapping of faults and faulted surfaces. Structural style in different tectonic settings. Structures in compressional, extensional and strike-slip terrains. Gravity induced structures. Diapirism. Stratum contour and isopach maps for structural and stratigraphic interpretation of reservoir units.

PGS 610 PRODUCTION GEOSCIENCE/GEOPHYSICS GROUP PROJECT

A group project designed to develop practical application of the skills and knowledge acquired in Basin Analysis, Reservoir Modelling and Petrophysics incorporating structural analysis, seismic and sequence stratigraphy and pay analysis.

PGS 611 GEOSTATISTICS

Introduction to applications of geostatistics in petroleum geosciences. Introduction to basic statistics: random variables; univariate and joint probability distributions; expectation; variance, covariance and conditional distribution. Introduction to random functions: stationarity; second-order stationarity; quasi-stationarity; intrinsic random functions; non-stationary random functions; co-regionalization; covariance and variogram; properties and modelling concepts of regularization and change of support. Estimation: ordinary and simple kriging, cokriging; transfer functions; indicator kriging. Simulation of random functions: non-conditional and conditional simulation; sequential simulation; LU-based simulation; simulated annealing; co-simulation; truncated Gaussian and indicator simulation; introduction to object-based simulation. Application of simulation techniques in petroleum geology: simulation of facies and reservoir characteristics.

PGS 612 COMMUNICATION AND RESEARCH SKILLS

The course is designed to develop effective communication and research skills; give practical experience of written and oral presentations; develop effective and critical research analysis and the art of reporting it correctly; provide formal and workgroup experience of a similar standard to current working practice in oil

companies; develop skills of critical scientific analysis; teach skills to produce industry standard reports, short memos and executive summaries; and equip students with basic computing skills, such as Word, Excel, PowerPoint and graphics packages.

PGS 613 PETROLEUM GEOSCIENCE PRACTICALS

The practical classes provide the student with hand-on experience with tools and software used for analysis and interpretation of geosciences data.

PGS 614 STRATEGIC MANAGEMENT IN GEOSCIENCES

Opportunity management: types of contracts; production sharing contracts, joint venture contracts, sole risk; financial obligations, risks and rewards; negotiating skills; government regulations such as acreage awards, bidding processes, royalties, taxes and rents to government agencies; interface with government agencies. Effective technical communication skills. Production business strategy elements.

PGS 615 APPLIED MICROPALEONTOLOGY

Basin classification and their characteristics; tectonic framework of basins and their architecture; economic significance of basin analysis; facies concept, process-response models and interpretation of sedimentary environments; carbonate and clastic facies models; seismic facies stratigraphy; well-log facies application in sequence stratigraphy; sequence stratigraphy; stratigraphic correlation; basin mapping: structure and isopach contouring; lithofacies and biofacies maps; preparation of stratigraphic cross-sections and palaeogeographic synthesis; regional and global stratigraphic cycles.

Surface and subsurface sampling methods for micropalaeontological studies; brief description of major microfossil groups used in hydrocarbon exploration; palaeonenvironmental interpretation using microfossils; biostratigraphic classification, dating and correlation of stratigraphic sequence, standard planktonic formainiferal zones; application of micropalaeontology in sequence stratigraphy, case studies of Indian sedimentary basins.

PGS 616/619 FIELDWORK

The fieldwork is an integrated course covering: examination of exposures of sedimentary rocks in order to understand structural relationships, sedimentary processes in the context of sequence stratigraphy and reservoir parameters relevant to the oil industry; interpretation of sedimentary environments from field relationships emphasizing the spatial and temporal distribution of petroleum source rocks and reservoirs; examination of field exposures to appreciate rock body geometries in the context of petroleum reservoirs and teaching of safe geological practices in all aspects of geological fieldwork.

PGS 617 OCCUPATIONAL SAFETY AND HEALTH
Basic concepts of occupational safety in oil and gas industry, mining and allied geological activities and cost of industrial accident and occupational illnesses. Job hazard analysis, risk assessment and record keeping in Occupational Health and Safety. Effective communication in Occupational Health and Safety. Industrial safety, principles of unsafe acts, unsafe conditions and investigation of accidents and incidents. Occupational health; relationship between health and work; prevention of work-related diseases and accidents. Industrial Law; Environmental health, and Environmental Science.

PGS 618 PROJECT
This is an independent but supervised research project typically involving the integration and interpretation of modern seismic and well data supplied by the oil industry. During the project, the student will apply skills learnt in the courses offered; develop skills in project and time management and research project design and be able to produce a well-written dissertation and develop presentation skills.

II. MASTER IN PETROLEUM GEOPHYSICS

The Master's course is a twelve-calendar month, full-time course designed to provide full training in integrated petroleum geophysics to equip students with the knowledge and skills necessary to perform a wide range of technical functions in the petroleum industry. It is designed for new graduates seeking careers in the petroleum and allied service industries as well as those with some industrial experience. The course presents the methods and practices of the modern petroleum industry but considerable emphasis is also placed on developing transferable skills.

	Harmattan Semester		
Code	**Course Title**	**L T P**	**UNITS**
PGP601	Rock Properties and Rock Physics	2 - 0 - 3	3
PGP603	Introduction to Seismic Data Acquisition, Processing and Interpretation	2 - 0 - 3	3
PGP605	Signal Processing and Inverse Theory	2 - 0 - 0	2
PGP607	Fieldwork I	0 - 0 - 3	1
PGS601	Fundamentals of Petroleum Exploration and Production	2 - 0 - 0	2
PGS603	Structure and Stratigraphy of Sedimentary Basins	2 - 0 - 3	3
PGS609	Petroleum Structural Geology	2 - 0 - 0	2
PGS611	Geostatistics	2 - 0 - 0	2
PGS617	Occupational Safety and Health	2 - 0 - 0	2
	Total		**20**

Rain Semester

Code	**Course Title**	**L T P**	**UNITS**
PGP602	Reservoir Characterization and Basin Analysis	2 - 0 - 3	3
PGP604	Non-Seismic and Emerging Geophysical Methods	1 - 0 - 0	1
PGP606	Advanced Seismic Processing and Imaging	2 - 0 - 3	3
PGP608	Fieldwork II	0 - 0 - 3	1
PGS602	Formation Evaluation and Petrophysics	2 - 0 - 3	3
PGS604	Prospect Evaluation and Petroleum Economics	2 - 0 - 3	3
PGS606	Petroleum Engineering	2 - 0 - 3	3
PGS608	Environmental Impacts of Petroleum Exploration and Production	2 - 0 - 0	2
PGS610	Production Geoscience/Geophysics Group Project	0 - 0 - 6	2
PGS614	Management Elective	1 - 0 - 0	1
	Total		**22**

Post-Rain Semester

PGP609	Project		4

COURSE DESCRIPTIONS

PGP 601 ROCK PROPERTIES AND ROCK PHYSICS
Fundamental definitions of reservoir rock properties related to hydrocarbon exploration and production; concept of scales in rock properties and the effect of heterogeneity. Theoretical relationships and empirical correlations between the storage and transport properties of reservoir rocks. The physical basis for the properties that can be measured by geophysical techniques including compressional and shear seismic velocities (isotropic and anisotropic). The influence of fluids on the physical properties and non-seismic parameters such as resistivity.

PGP 602 RESERVOIR CHARACTERIZATION AND BASIN ANALYSIS
Modern approaches to the utilization of geophysical information for reservoir characterization. Calibration and extraction of rock properties, such as porosity, from 3D seismic data, as well as mapping of fluid movement form 4D seismic data.

PGP 603 INTRODUCTION TO SEISMIC DATA ACQUISITION, PROCESSING AND INTERPRETATION
Introduction to earth parameters which can be deduced from seismic reflection data. Basic concept of reflection seismology including wave propagation, time series analysis, time-depth conversion, processing and interpretation of 2D and 3D seismic datasets; introduction to industry-standard computer workstation and software.

PGP 604 NON-SEISMIC AND EMERGING GEOPHYSICAL METHODS
Non-seismic methods for reservoir mapping and characterization: Seismic refraction analysis for near-surface analysis; gravity, magnetic and electromagnetic techniques for reservoir location and identification.

PGP 605 SIGNAL PROCESSING AND INVERSE THEORY
Time series analysis and inversion for the analysis of geophysical data; concepts convolution, correlation and deconvolution; principles of model parameter estimation from geophysical data.

PGP 606 ADVANCED SEISMIC PROCESSING AND IMAGING
Details of modern 2D, 3D and 4D seismic acquisition for both land and marine environments; vertical seismic profiling (VSP); navigation, seismic sources and receivers, recording equipment, logistics, methodologies and basic seismic survey design. Advanced seismic data processing methods and their application to exploration, field development and reservoir management. Modern

approaches to the analysis of seismic data: tomographic inversion, trace and waveform inversion, Amplitude Variation with Offset (AVO) analysis.

PGP 607/608 FIELDWORK
The field trip aimed at consolidating the concepts taught in the lectures with emphasis on the role of outcrop analogues in understanding subsurface reservoirs. It also aims at introducing the different elements of petroleum plays in an active hydrocarbon basin.

PGP 609 PROJECT
This is an independent but supervised research project typically involving the integration and interpretation of modern seismic and well data supplied by the oil industry. During the project, the student will apply skills learnt in the courses offered; develop skills in project and time management and research project design and be able to produce a well-written dissertation and develop presentation skills.

III. MASTER IN GROUNDWATER AND ENVIRONMENTAL GEOSCIENCES

The Master's course is a twelve-calendar month, full-time course designed to provide full training in groundwater and environmental geosciences to prepare students with the knowledge and skills necessary to perform a wide range of technical functions in the groundwater and environmental industry. It is designed for new graduates seeking careers in the groundwater and environmental industry as well as those with industrial experience. The course presents the methods and practices of the modern groundwater and environmental industry with considerable emphasis on developing transferable skills.

	HARMATTAN SEMESTER		
Code	**Course Title**	**L T P**	**UNITS**
GEG601	Applied Geomorphology	2 - 0 - 3	3
GEG603	Applied Hydrology	2 - 0 - 3	3
GEG605	Physical Hydrogeology	2 - 0 - 3	3
GEG607	Groundwater Geophysics	2 - 0 - 3	3
GEG609	Environmental Geology	2 - 0 - 3	3
GEG611	Fieldwork I	0 - 0 - 3	1
PGS611	Geostatistics	2 - 0 - 0	2
PGS617	Occupational Safety and Health	2 - 0 - 0	2
Total			**20**

Rain Semester

Code	Course Title	L T P	UNITS
GEG602	Hydrogeology and Water Quality	2 - 0 - 3	3
GEG604	Remote Sensing and GIS	2 - 0 - 3	3
GEG606	Groundwater and Environmental Geosciences Group Project	0 - 0 - 6	2
GEG608	Groundwater Modelling	1 - 0 - 3	2
GEG610	Groundwater Management	2 - 0 - 3	3
GEG612	Environmental Impact of Groundwater Development	2 - 0 - 0	2
GEG614	Management of Earth Resources	1 - 0 - 0	1
GEG618	Fieldwork II	0 - 0 - 3	1
PGS612	Communication and Research Skills	1 - 0 - 0	1
Total			**18**

Post-Rain Semester

GEG616	Project		4

COURSE DESCRIPTIONS

GEG 601 APPLIED GEOMORPHOLOGY

Significance of geomorphology in environmental processes: environmental planning; geomorphological techniques for resource evaluation, including sampling, data collection, analyses and interpretation; environmental hazards and protection; and strategies for managing environmental impacts and change. Emphasis will be placed on tropical geomorphology, including landforms, slope processes, action of rivers, coastal processes, weathering, erosion and sediment generation.

GEG 602 HYDROGEOLOGY AND WATER QUALITY

Classification and distribution of elements. Chemical reactions affecting solute transport and composition of naturally occurring waters. Inorganic and organic compounds in groundwater. Geochemistry of natural groundwater in different geological environments. Laboratory techniques of water analyses. Interpretation of water quality data. Chemical and microbiological indices of water quality. Groundwater pollution, protection and remediation strategies. Water treatment methods.

GEG 603 APPLIED HYDROLOGY

The hydrologic cycle. The drainage basin. The hydrologic budget. Rainfall runoff processes. Measurement and collection of data on the various components of the hydrologic cycle. Groundwater and stream flow. Hydrograph analyses. Hydrological forecasting. Hydrologic routing. Erosion, sedimentation, water quality and the river basin. Deterministic hydrological models. Statistical Hydrology. Drainage characteristics of Nigerian river systems. Applications of hydrology to environmental problems.

GEG 604 REMOTE SENSING AND GIS

Fundamentals of remote sensing, digital image data formats, image rectification and restoration techniques – geometric correction, radiometric correction and noise suppression, image histograms, density slicing, image enhancement techniques – contrast manipulation, spatial filtering and edge enhancement, multi-image manipulations – spectral ratioing, vegetation indices, principal components analysis, multi-spectral image classification involving supervised and unsupervised algorithms, Recent developments and applications.

Fundamentals of Geographical Information System (GIS), vector, raster and attribute data models, vector and raster data structure, spatial data input and editing, visualization and query of spatial data, spatial data transformations, spatial analysis, case studies of geological applications, current issues and trends in GIS. Principles of Global Positioning Systems (GPS) and its applications.

GEG 605 PHYSICAL HYDROGEOLOGY

The origin and occurrence of groundwater as part of the hydrological cycle. Water Budget. Surface water and groundwater interactions, stream hydrographs and groundwater base flow. Occurrence of groundwater in different geological terrains. Coastal aquifers. Aquifer properties, physics of groundwater flow and well hydraulics. Flow nets. Analyses and interpretation of hydrogeological data, including pumping tests. Groundwater resource evaluation. Groundwater recharge and safe yield. Water well design, drilling and construction. Groundwater basin management and conjunctive use. Groundwater and environmental problems. Groundwater planning and development in Nigeria.

GEG 606 GROUNDWATER AND ENVIRONMENTAL GEOSCIENCES GROUP PROJECT

The project will provide students with the opportunity to collaborate with counterparts from the other programmes and perform the activities of an asset team.

GEG 607 GROUNDWATER GEOPHYSICS

Geophysical methods applied to groundwater exploration and development. Field procedures, data acquisition and processing and result presentation. Subsurface sequence delineation and aquifer identification in basement complex and sedimentary terrain. Aquifer types and estimation of depth and lateralextent. Mapping of geologic structures that are favourable to groundwater accumulation. Mapping of saline water zones and fresh/saline water interface in coastal areas. Determination of groundwater head and flow direction. Groundwater potential evaluation and strategy for borehole locationand optimum drill depth determination. Case Histories.

GEG 608 GROUNDWATER MODELLING

Groundwater component of the hydrologic cycle; groundwater and surface water interactions. Quantitative, qualitative and environmental considerations. Basic theory of groundwater flow in 1- 2- and 3-dimensions for steady state and transient flow. Analytical and numerical approaches for solving regional groundwater flow problems. Groundwater models: conceptual, physical, analytical and numerical groundwater models. Coupled physical/economic models. Parameter estimation in groundwater models. Examples and case studies.

GEG 609 ENVIRONMENTAL GEOLOGY

The physical environment. societal interface with the physical environment and potential for environmental risks and hazards. Natural processes with potential for environmental hazards: seismic activities, landslides, subsidence, floods and droughts, storm and ocean surges. Man-induced environmental hazards. Environmental changes at different size-scales from local to global. Spatial and temporal effects associated with hazards. Society risks and environmental hazards. Environmental conservation and sustainable development in a hazardous environment. Mitigation of hazards. Early warning systems. Case histories from around the world.

GEG 610 GROUNDWATER MANAGEMENT

Groundwater occurrence in different geological environments. Physical and economic resource characteristics of groundwater. Sustainable development of groundwater; safe yield and overdraft concepts, technical issues and socio-economic concepts related to groundwater availability and allocation efficiency. Nature, issues and impacts of groundwater development. Physical, public policy, legal, economical, environmental and administrative framework for groundwater management. Principles and standards for groundwater planning and management. Groundwater management methods and models. Case studies.

GEG 611/618 FIELDWORK

The field methods course is designed to train students in field methods and integrated problem solving related to groundwater and environmental geosciences. Topics will include terrain and land-use analyses, field methods in surface and groundwater evaluation, geophysical exploration for groundwater, applications of geophysics to environmental problems, water quality analyses, site evaluation and appraisal techniques, and environmental change.

GEG 612 ENVIRONMENTAL IMPACT OF GROUNDWATER DEVELOPMENT

Environmental impacts and the natural (geological) and artificial (man-made or man-induced) processes that can precipitate them. Components of the ecosystem that are the immediate recipient of environmental impact and those amenable to geophysical investigations. Geophysical methods applied to environmental impact assessment. Field procedures, data acquisition, processing and result presentation. Mapping of ancient landfill sites or buried waste dumps, delineation of their margins and physical characterization of the constituents. Exploration for new landfill or disposal sites and trenches. Mapping of chemical pollution plumes arising from industrial and agricultural wastes, or well blowout, spilled hydrocarbon from failed or sabotaged oil pipelines and leaking underground oil tanks. Evaluation of nature of soil for assessment of soil corrosivity, electrical earthing and overburden protective capacity. Mapping of saline water zones and fresh/saline water interface in coastal areas. Monitoring of remediation efforts. Case Histories.

GEG614 MANAGEMENT OF EARTH RESOURCES

Definition and characteristics of earth resources: oil and gas, metals and minerals; soils, aggregates and water. General supply and demand problems; conflicts between development and conservation. The role of government in earth resources and environmental management, scientific, technological, economic, legal, political, and social dimensions of policy formation and implementation. Institutional arrangements for earth resources and environmental management. Private-Public Partnership in management of earth resources. Environmental health and sustainability issues in earth resources management. Case studies in earth resources and environmental management: oil & gas; metals, minerals and mining.

GEG616 PROJECT

This is an independent but supervised research project typically involving the integration and interpretation of geological, geophysical, borehole, environmental, satellite imagery and economic data obtained from the groundwater and environmental industry. During the project, the student will

apply skills learnt in the taught part of the courses, develop skills in project and time management and research project design, develop skills in research methodology, be able to integrate and critically analyze data, and be able to produce a well-written dissertation and develop presentation skills (written, oral and poster)

IV. MASTER IN PETROLEUM GEOCHEMISTRY

The Master's course is a twelve-calendar month, full-time course designed to provide full training in integrated petroleum geochemistry to equip students with the knowledge and skills necessary to perform a wide range of technical functions in the petroleum industry. It is designed for new graduates seeking careers in the petroleum and allied service industries as well as those with some industrial experience. The course presents the methods and practices of the modern petroleum industry but considerable emphasis is also placed on developing transferable skills.

	Harmattan Semester		
Code	**Course Title**	**L T P**	**UNITS**
PGC601	Exploration Geochemistry	2 - 0 - 3	3
PGC603	Instrumental Analysis	1 - 0 - 3	2
PGC605	Fieldwork I	0 - 0 - 3	1
PGP603	Introduction to Seismic Data Acquisition, Processing and Interpretation	2 - 0 - 3	3
PGS603	Structure and Stratigraphy of Sedimentary Basins	2 - 0 - 3	3
PGS605	Sedimentology of Petroleum Systems and Reservoir Modelling	2 - 0 - 0	2
PGS607	Geochemistry, Petroleum System and Basin Modelling	2 - 0 - 0	2
PGS609	Petroleum Structural Geology	1 - 0 - 3	2
PGS611	Geostatistics	2 - 0 - 0	2
PGS617	Occupational Safety and Health	2 - 0 - 0	2
Total			**22**

Rain Semester

Code	Course Title	L T P	UNITS
PGC602	Sandstone Petrology	1 - 0 - 3	2
PGC604	Special Topics in Geochemistry	1 - 0 - 0	1
PGC606	Isotope Geochemistry	2 - 0 - 3	3
PGC608	Petroleum Geochemistry Group Project	0 - 0 - 6	2
PGC612	Fieldwork II	0 - 0 - 3	1
PGS602	Formation Evaluation and Petrophysics	2 - 0 - 3	3
PGS604	Prospect Evaluation and Petroleum Economics	2 - 0 - 3	3
PGS608	Environmental Impacts of Petroleum Exploration and production	1 - 0 - 3	2
PGS614	Strategic Management in Geosciences	1 - 0 - 0	1
Total			**18**

Post-Rain Semester

PGC610	Project		**4**

COURSE DESCRIPTIONS

PGC 601: EXPLORATION GEOCHEMISTRY
Review of fundamentals of exploration geochemistry; organic matter; source and reservoir rocks; petroleum generation and migration; maturation and alteration of reservoired petroleum; and exploration geochemical techniques.

PGC 602: SANDSTONE PETROLOGY
Study of the mineralogy and composition of sandstones; texture and maturity of sandstones; classification and nomenclature of sandstones and related clastic sedimentary rocks.

PGC 603: INSTRUMENTAL ANALYSIS
Basic Petroleum Geochemistry and instrumental analysis techniques including: Hempel Distillation; Soxhlet extraction; Column and Gas Chromatography; Mass Spectrometry; GC-Mass Spectrometry and Stable Isotope Ratio Mass spectrometry.

PGC 604: SPECIAL TOPICS IN GEOCHEMISTRY
Topical issues in Petroleum Geochemistry will be assigned to students for detailed review, presentation and discussion in class.

PGC 605/612: FIELD WORK
The fieldwork is an integrated course covering the following: examination of sedimentary rock exposures in order to understand the geologic setting of reservoir and source rocks and demonstrate organic geochemical sampling and field techniques; field trips to the tar sand belt of S. W. Nigeria to familiarize the students with the geochemical setting of the bitumen deposits; teaching of safe geological practices in all aspects of geological fieldwork.

PGC 606: ISOTOPE GEOCHEMISTRY
Basic concepts of nuclear structure and reactions applied to cosmic and geological problems including geochronology, isotopic fractionation and petroleum exploration.

PGC 608: PETROLEUM GEOCHEMISTRY RESEARCH GROUP PROJECT
This is a supervised group project involving analysis of source rocks and/or oil samples; interpretation of data obtained and report writing.

PGC 610: PROJECT
The candidates will be assigned field/laboratory-based independent research/projects relevant to petroleum geochemistry which will involve application of skills required in the programme.

V. MASTER IN MINERAL EXPLORATION

The Master's course is a twelve-calendar month, full-time course designed to provide full training in integrated mineral exploration to prepare students with the knowledge and skills necessary to perform a wide range of technical functions in the mineral exploration. It is designed for new graduates seeking careers in the mineral exploration and allied service industries as well as those with some industrial experience. The course presents the methods and practices of the modern Solid Mineral Industry whilst considerable emphasis is also placed on developing transferable skills.

	Harmattan Semester		
Code	**Course Title**	**L T P**	**UNITS**
MEX601	Mining Geophysics	2 - 0 - 3	3
MEX603	Geology and Geochemistry of Mineral Deposits	2 - 0 - 0	2
MEX605	Applied/Advanced Structural Geology	1 - 0 - 3	2
MEX607	Fieldwork I	0 - 0 - 3	1
GEG607	Remote Sensing and GIS	1 - 0 - 3	2
PGC601	Exploration Geochemistry	2 - 0 - 3	3
PGC603	Instrumental Analysis	1 - 0 - 3	2
PGS611	Geostatistics	2 - 0 - 0	2
PGS617	Occupational Safety and Health	2 - 0 - 0	2
	Total		**19**

Rain Semester

Code	**Course Title**	**L T P**	**UNITS**
MEX602	Mineral Exploration Proposals	1 - 0 - 0	1
MEX604	Ore Deposits Geology/Advanced Economic Geology	2 - 0 - 3	3
MEX606	Mineral Processing/Separation	0 - 0 - 3	1
MEX608	Prospect Evaluation and Mineral Economics	2 - 0 - 0	2
MEX610	Economic Geology of Nigeria (+ Field Visits)	2 - 0 - 3	3
MEX612	Mineral Exploration Group Project	0 - 0 - 6	2
MEX614	Environmental Impacts of Exploration	1 - 0 - 3	2
MEX616	Fieldwork II	0 - 0 - 3	1
GEG614	Management of Earth Resources	1 - 0 - 0	1
PGC606	Isotope Geochemistry	2 - 0 - 3	3
	Total		**19**

Post-Rain Semester

MEX611	Project		4

COURSE DESCRIPTIONS

MEX 601 MINING GEOPHYSICS

Principles of gravity, gravity of the earth, isostacy, instrumentation, gravity survey, gravity reductions, data processing and interpretation with case studies. Geomagnetism and Magnetic Prospecting Magnetism of the earth, rock magnetism, polar wandering, seafloor spreading, plate tectonics, magnetometers, magnetic surveys and interpretation with case studies. Electrical Prospecting: electrical properties of rocks and minerals, fundamentals of current flow in the

earth, origin of self potential and induced polarization, geoelectric methods of prospecting - Self Potential (SP)/Induced Polarization (IP) and Resistivity methods, instruments, application and interpretation with field examples. Electromagnetic methods of prospecting. Applications of integrated geophysical methods for mineral exploration with case studies.

MEX 602 MINERAL EXPLORATION PROPOSALS

Development of mineral exploration proposals and programmes based on geological, economic and corporate considerations.

MEX 603 GEOLOGY AND GEOCHEMISTRY OF MINERAL DEPOSITS

Ore forming systems/processes, ore geochemistry, genesis and classification. Regional distribution of mineral deposits. Mineralization in space and time.

MEX 604 ADVANCED ECONOMIC GEOLOGY OR ORE DEPOSITS GEOLOGY

Discussions on classic examples of mineral deposits in relation to rock associations and environments of deposition such as: magmatic and hydrothermal mineral deposits, Stratiform sulphides, oxides and sulphate deposits of sedimentary and volcanic environments, chemical sedimentation deposits, residual, supergene environments, placer deposits, and industrial minerals.

MEX 605 APPLIED MINING GEOSTATIC AND RESOURCE EVALUATION/ESTIMATION

Introduction to resource modelling, statistics and their roles in resource estimation. Interpretations and visualization. Estimation techniques, boundary constraints and effect on predictability.

MEX 606 MINERAL PROCESSING/SEPARATION

An advanced course covering amalgamation, cyanidation, gravity concentration, flotation, roasting and leaching. Ore handling and particle size analysis. Communition, liberation, crushers, grinding mills, heavy media separation, magnetic and high tension separation.

MEX 607/616 FIELDWORK

Design and execution of geochemical mineral exploration programme: sampling on both regional and small scales. Identification and detailed mapping of mineral occurrences. Teaching of safe geological practices in all aspects of

geological fieldwork. Field visits to known mineral deposits in sedimentary and crystalline rocks.

MEX 608 PROSPECT EVALUATION AND MINERAL ECONOMICS
The functional and dynamic role of resources – human, capital and technological - in the development of the mineral industry; the economic aspects of minerals and the mining environment – exploration, marketing, etc.; the mineral industry and government.

MEX 610 ECONOMIC GEOLOGY OF NIGERIA
Orthomagmatic, metamorphic, sedimentary and pegmatitic/pneumatolitic deposits in Nigeria. Geology of the metallogenic belts. Mineral potential of Nigeria with emphasis on the metallic minerals, precious minerals, gemstones, industrial minerals of chemical, metallurgical/refractory, abrasive and dimension stones subgroups; the fossil fuels and radioactive minerals (mineral fuels). Development of exploration/exploitation proposals. Site visits to major mineral producing areas and some important mineral deposits in Nigeria.

MEX 612 MINERAL EXPLORATION GROUP PROJECT
This is a supervised research project aimed at addressing specific topics in mineral exploration. Students are expected to demonstrate initiative and apply skills learnt during the course, develop capability in research methodology and be able to integrate and analyze data to produce well-written dissertations.

MEX 611 PROJECT
Candidates will be assigned a field/laboratory-based independent research/project relevant to mineral exploration that will involve application of skills acquired in the programme.

MEX 614 ENVIRONMENTAL IMPACT OF MINING
Hydrogeology, mine waste, mine dewatering, tailings disposal, acid mine drainage, soil and water contamination, erosion control and landslides. Environmental planning and economic considerations for decommissioning, closure and reclamation of mine site.