UNIVERSITY OF PORT HARCOURT

DEPARTMENT OF PETROLEUM & GAS ENGINEERING

HANDBOOK

FOR

B. ENG DEGREE PROGRAMME

2016-2018

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1. INTRODUCTION

INFORMATION FROM HOD'S OFFICE FOR HISTORY PROGRAMMS AND NON ACADEMIC STAFF

1.1. BRIEF HISTORY OF THE DEPARTMENT OF PETROLEUM AND GAS ENGINEERING:

Federal Government of Nigeria founded the University of Port Harcourt in 1975 as a college of the University of Lagos. The college gained the University status in 1977. The academic units of the University are organized into faculties and Departments. One of such academic units is the Faculty of Engineering. The faculty started in 1979 with two programmes, viz: Electrical and Petroleum Engineering. Other programmes which were added later include Chemical Engineering in 1982, Civil Engineering in 1983, Mechanical Engineering in 1988, Gas Engineering and Environmental Engineering in 2000. In 1999 the Electrical Engineering programme was upgraded to Electrical/Electronic Engineering programme, while the now upgraded Petroleum and Gas Engineering Department teaches and conducts research in Petroleum and Gas Engineering.

Petroleum Engineering is the practical application of the basic sciences of physics, chemistry, mathematics and geology, and all the Engineering sciences to the development, recovery and processing of petroleum. Engineering problems must be solved with due consideration to economic factors, and the petroleum engineer must be thoroughly familiar with the basic economic relationships which involve investment, operating expenses, taxation and profitability analysis. If you are interested in becoming involved in solving today's energy problems, then consider a career in Petroleum Engineering where initiatives and engineering skills of the highest order are essential, but

equally important is the ability of the petroleum engineer to work harmoniously with his or her associates. In petroleum development, the petroleum engineer supervises the drilling of wells and their completion if oil or gas is discovered. In the recovery of crude oil and natural gas, petroleum engineers aim toward:

Controlling and efficiently using the natural energy in an underground reservoir Providing additional energy by injecting fluids into the reservoir; Increasing the flow capacity of the reservoir or the petroleum in it through sound engineering techniques; Reducing the cost of oil and gas recovery; and Minimizing waste and protecting the environment Compared with other branches of engineering, Petroleum Engineering is a relatively new professional field. However, because of the rapidly increasing demand for oil and gas and the advances of petroleum technology, it has attained an important position. The unique problems of the oil and gas industry have stimulated the demand for men and women trained in such specialties as reservoir engineering, production engineering, drilling engineering, natural gas engineering, and economics. Since the petroleum industry is expanding rapidly in many parts of the world, ample opportunities for travel and for advancement of positions of high salaries and marked responsibilities is to be found in the profession.

Petroleum Engineering Department admitted its first batch of undergraduate students in the 1979/80 session. Over the years, students' population has grown steadily; many of them have graduated with very impressive degree classes, including the 1st class honours category. Many of these graduates are working with some of the key industries around Port Harcourt and beyond. We note with pride that many of our graduates have excelled at their places of work, particularly those in the oil sector.
The Department, having consolidated the undergraduate programme, now offers Post Graduate Diploma in Petroleum Engineering, Master of Engineering and PhD Degree Programmes.

1.2 Philosophy and Objectives

The philosophy is to produce a well-balanced Petroleum/Gas Engineers. The objectives are:

(i) That the product of the programme should be a competent Petroleum/Gas Engineer, but an expert in one of the specializations in the discipline.

(ii) That the product of the programme should be confident enough to establish a small engineering business if ready – made jobs are not available.

(iii) Finally that the product of the programme can pursue a post-graduate programme in one of the areas in Petroleum/Gas Engineering.

1.3 Admission Requirements

Candidates applying to the undergraduate programme in Petroleum/Gas Engineering should have five credit pass in Chemistry, Physics, Mathematics, English language and Biology (or Agricultural science) at WAEC and/or NECO at not more than two sittings.

Candidates are also expected to have a minimum score of 200 out of 400 in both the UME and Post UME before they can be admitted into the departments

1.4 Petroleum &Gas Engineering Programme Structure

The programme structure in Petroleum/Gas Engineering requires five academic calendar years (of ten semesters) of which nine of the ten semesters are actually used for formal class room/laboratory studies. One semester (in the fourth year) and the two long vacations (at the end of second and third and year) are used for industrial training. At the fifth year of studies, students are assigned research project topics and design

project topics which they are expected to defend at the end of the tenth semester under an external examiner not below the rank of a Professor.

2.0 ACADEMIC AND SENIOR TECHNICAL STAFF

2.1 Past/Present Deans/Provost

S/N	NAME	PERIOD	DESIGNATION
1.	Engr. Prof. Chi. U. Ikoku	1983-1999	Dean
2	Engr. Prof. Y.O. Beredugo	1999-2000	Acting dean
3	Engr. Prof. Nwaogazie, Ify. L.	2000-2002	Dean
4	Engr. Prof. A.O. Kuye	2002-2004	Dean
5	Engr. Prof. C. Umezuruike	2004-2005	Dean
6	Engr. Dr. A. Dosunmu	2005-2006	Acting dean
7	Engr. Prof. D.P.S Abam	2006-2008	Dean
8	Engr. Prof. D. Appah	2008-2009	Dean
9	Engr. Prof. J.U Okoli	2009—2011	Dean
10	Engr. Prof. S.U Ejiezie	2011-2013	Dean
11	Engr. Prof. D. Appah	2013-2015	Provost
12	Engr. Prof. O.M.O Etebu	2015 - Date	Dean

2.2 PAST/PRESENT HEADS OF DEPARTMENT

S/N	**NAME OF STAFF**	**PERIOD**	**DESIGNATION**
1.	Dr. E.O. Udegbunam	1984 – 86	Ag. Head
2.	Dr. M. C. Mkpadi	1986 – 88	Ag. Head
3.	Dr. M.J. Ichara	1988 – 90	Ag. Head
4.	Dr. Mike Onyekonwu	1990 – 92	Ag. Head
5.	Dr. M.J. Ichara	1992 – 95	Ag. Head
6.	Dr. J.A. Ajienka	1995 – 97	Ag. Head
7.	Dr. A. Dosunmu	1997 – 2001	Ag. Head

8.	Dr. D. Appah	2001 - 2006	Ag. Head
9.	Engr. R.E. I. Kadana	2006 – 2008	Ag. Head
10.	Dr. D.M. Okoye	2008 – 2009	Ag. Head
11.	Dr. B.S. Kinigoma	2009 – 2010	Ag. Head
12.	Dr. S.S. Ikiensikimama	2010 – 2014	Ag. Head
13.	Engr. Dr. A. B. Oriji	2014 – Date	Ag. Head (Pet)
14	Engr. R.E. I. Kadana	2014 - 2015	Ag. Head (Gas)
15	O.F. Joel	2015 - Date	Head (Gas)

2.3 Academic Staff

Department of Petroleum/Gas Engineering

S/N	Name(s)	Qualification	Field of Specialization	Designation
1	A. Ajienka	B.Sc (Ibadan), M.Eng, Ph.D. (Uniport), R.Eng (5285)	Petroleum Production Engg/ Multiphase Fluid Flow in Pipes	Professor
2	M. O. Onyekonwu	B.Sc. (Ibadan), M.S, Ph.D (Stanford), R.Eng (3536)	Reservoir & Gas Engineering	Professor
3	A. Dosunmu	B.Sc (Ibadan), M.Eng Ph.D (Uniport),MNSE, R.Eng (3562)	Drilling & Gas Engineering	Professor
4	D. Appah	M.Sc Mining, Eng., Dip. Edu. (Baku) Ph.D (Uniport),	Formation Evaluation	Professor

		MNSE, R.Eng (7961)		
5	O. F. Joel	B.Tech, Chem. Engg. (UST), M.Sc Eng Mgt. (Uniben), Ph.D Pet./Chem. UST)	Drilling & Environmental Engineering	Senior Lecturer
6	S. S. Ikiensikimama	B.Eng., M.Eng. (Chem), M.Eng (Pet), (Uniport), Ph.D. Chem. (Unilag), R.Eng (10595)	Reservoir Engineering, Petroleum Economics, Petroleum Refining	Senior Lecturer
7	B. S. Kinigoma	B.Sc (RSUST), M.Eng., (Uniport) Ph.D (Uniport)	Energy and Environmental Engineering	Senior Lecturer
8	A. B. Oriji	B.Eng, M.Eng, Ph. D. Pet Engg (Uniport)	Drilling Engineering/ Drilling Fluid	Senior Lecturer
9	C. E. Ubani	B.Eng, M.Eng. PhD Pet. Engg. (Uniport) R.24348	Formation Evaluation	Senior Lecturer
10	J. Amiebibama	B.Eng Pet. (Uniport), M.Eng Gas (Uniport), M.Sc. Oil & Gas Enterprise Management,; PhD (Aberdeen)	Reservoir Engineering	Senior Lecturer

11	E. Okafor	B.Eng Chem. (ESUT), M.Sc Mech.& Process Eng. Germany), Ph. D. Pet. Engg. (London)	Gas Engineering	Senior Lecturer
12	U. Osokogwu	B.Eng, M.Eng. Pet.Engg (Uniport)	Production Engineering	Lecturer I
13	L. Ikeh	B.Eng, M.Eng (Uniport), M.Sc. (Newcastle upon-Tyne	Gas & Pipeline Engineering	Lecturer I
14	O. C. Ekeh	B.Eng, M.Eng. Pet.Engg. (Uniport)	Reservoir Engineering	Lecturer II
15	P. O. Wachuku	B.Eng., M. Eng. Pet. Engg. (Uniport)	Reservoir Engineering	Lecturer II
16	J. L. Ichenwo	B.Eng, M. Eng. Pet. Engg. (Uniport)	Drilling Engineering	Lecturer II
17	J. V. Aimikhe	B. Eng (Benin), M.Eng. Pet Engg (Uniport). R.28853	Gas Engineering	Lecturer II
18	I. I. Azubuike	B.Eng. Polymer Eng. (FUTO), M.Eng. Pet. Engg. (Uniport).	Reservoir Engineering	Lecturer II
19	T. O. Odutola	B.Tech Chem.(LAUTECH) , M. Sc. Pet. Engg.	Production Engineering	Lecturer II

		(AUST) R.30662		
20	C. Anyanwu	B.Eng., M. Eng. Pet. Engg. (Uniport) R.33330	Drilling Engineering	Lecturer II

2.4 Technical Staff

S/N	Name	DESIGNATION
1	Mr. Gbarale, John Nwika	Chief Technologist
2	Mrs. Uwajingba, Ebineppre C.	Senior Technologist
3	Mrs. Suwari, Caroline Preteowei	Technologist I
4	Mr. Fulalo, Lucky Donatus	Technologist II
5	Mr. Amukwo, James Bide	Technologist II
6	Mrs. Ndubuisi, Elizabeth C.	Technologist II
7	Mr. China Kelvin Esor	Technologist II
8	Mr. Isaiah, Samuel	Technologist II
9	Elkanah, Konye Kalio	Technologist II
10	Mrs. Ovwromoh, Blessing	Senior Lab. Attd.
11	Mr. Tonwee, Loveday	Lab. Asst.
12	Mr. Ojikpo, Felix	Lab. Asst.
13	Kufre Daniel Akpan	Laboratory Assistant
14	Chimele, C. Deborah	Laboratory Assistant
15	Chisa Didia Sandra	Laboratory Assistant

2.5 Administrative Non-Teaching Staff

S/N	Name	DESIGNATION
1	Ugochi Chituru Orluwene	Personal Secretary II
2	Mrs. Njoku, Ngozi Joyce	Personal Secretary III
3	Mrs. Uzorka Carolyn. K	Admin. Officer
4	Mrs. Nwauzi Evelyn	Asst. Admin Officer
5	Mrs. Amadi, Ihuoma	Higher Executive Officer
6	Owhonda Blessing	Higher Executive Officer
7	Mr. Andrew Sokens	Asst. Admin. Officer
8	Mr. Nyekweru, Egonu	Senior Clerical Officer
9	Mrs. Obunezi, E. Confidence,	Clerical Officer I
10	Ejekwu, Confidence Apaago	Computer Operator II
11	Aleru Victoria	Caretaker
12	Wordu Blessing	Caretaker
13	Ebulu Patience	Caretaker
14	Kenneth Chukwu	Caretaker
15	Woko Love	Caretaker
16	Ashara Leticia	Messenger/Cleaner
17	Anthony, Beauty	Messenger/Cleaner

3. ACADEMIC POLICIES

3.1 Highlights

The following extracts have been taken from the document "Statement of Academic Policies, University of Port Harcourt 1996". This document was issued first in 1977, revised in 1983 to reflect the reorganization from a school system to a Faculty system; and revised in 1990 to reflect changes in line with the NUC Minimum Academic Standards. The present revision reflects changes made by Senate in 1995. Students are advised to familiarize themselves with this document. General Remarks has been included to alert the fresh student on the implications of the

new grading system in relation to his/her final degree classification, and the virtue of and reward for hard work, honesty and abstinences from vices: examination malpractice and cultism.

3.2 Grading System

The following system of Grade Points shall be used for all Faculties:

Table 3.1: Grading Point System

Mark/score	Students	
	Letter Notation	*Grade Point (GP)*
70% & above	A	5.00
60-69	B	4.00
50-59	C	3.00
45-49	D	2.00
40-44	E	1.00
0- 39	F	0.00

Students are obliged to sit for examinations in all registered courses. Any student who fails to sit for a course examination without satisfactory reason earns the grade of "F".

3.3 Computation of Grade Point Average

Every course carries a fixed number of Credit Units (CU); one Credit Unit being when a class meets for one hour every week for one semester, or three hours every week in the laboratory, workshop or field. Quality Points (QP) are derived by multiplying the Credit Units for the course by the Grade Points (GP) earned by the student: e.g. in a course with 3 Credit Units in

which a student earned a B with 4 Grade Points, the Quality Points is: 3 x 4 = 12.

Grade Point Average (GPA) is derived by dividing the Quality Points for the semester by the Credit Units for the semester: e.g. in a semester where the student earned 56 Quality Points for 18 Credit Units, the GPA is: 56/18 = 3.11.

Cumulative Grade Point Average CGPA) is derived by adding the Total Quality Points (TQP) to date and dividing by the Total Credit Units (TCU) to date: e.g. if the TQP are 228 and the TCU is 68, the CGPA is: 228 ÷ 68 = 3.35.

Table 3.2: Typical Example for GPA – CGPA Computation

First Year, Semester One

Course Code	Credit Units (CU)	Letter Grade	Grade Point (GP)	Quality Points (QP)	Grade Point Average (GPA)	Cumulative Grade Point Average (CGPA)
APC 100	3	B	4	12	QP = 66	TQP = ∑QP
APC 101	2	C	3	6	CU = 17	= 66
APC 102	1	C	3	3	GPA =	TCU ∑CU
APC 103	4	B	4	16	66 ÷ 17	= 17
APC 104	5	A	5	25	= 3.88	CGPA
APC 105	2	D	2	4		= 66/17
Total	17			66		= 3.88

First Year, Semester Two

Course Code	Credit Units (CU)	Letter Grade	Grade Point (GP)	Quality Points (QP)	Grade Point Average (GPA)	Cumulative Grade Point Average (CGPA)
APC 106 APC 107 APC 108 APC 109 APC 110	5 4 5 3 3	E D B F A	1 2 4 0 5	5 8 20 0 15	QP = 48 CU = 20 GPA = 48÷20 = 2.40	TQP = ∑QP = 66 + 48 = 114 TCU ∑CU =17+20 = 37 CGPA = 114 ÷37 = 3.08
Total	20			48		

NB: The procedure is repeated for the 2nd, 3rd, 4th and 5th years, giving rise to CGPA computation at graduation.

Detailed example of how to calculate GPA and CGPA is as presented in Table 3.2

The following points are noteworthy for GPA/CGPA computation:

(i) Grades obtained in all approved courses of a student's prescribed programme, excluding audited courses, shall be used to compute the GPA.

(ii) Where a student has registered more than the allowed number of free elective courses, only the grades obtained in the allowed number of elective courses, chosen in the order of registration, will be used in computing the CGPA. Other elective courses will be treated as audited courses and will not be used in calculating the CGPA.

(iii) Where a student was registered for a course but the result is unavailable, due to no fault of the student, no result will be recorded for that course and the student will re-register for it in the next academic year.

(iv) When a student transfers from one Faculty to another, only the grades obtained in the courses in the new prescribed programme of study will be used to compute the CGPA. Courses which were completed before the change of programme and which are not part of the new prescribed programme will be treated as audited courses.

3.4 Continuation, Probation and Withdrawal

The essential points on the subject matter are as highlighted below:

(i) Continuation Requirement

The continuation requirement in the University is a CGPA of 1.00 at the end of every academic year.

(ii) Probation

Probation is a status granted to a student whose academic performance falls below an acceptable standard. A student whose Cumulative Grade Point Average (CGPA) is below 1.00 at the end of a particular year of study earns a period of probation for one academic session

(iii) Limitation of Registration

Students on probation may not register for more than 18 credit units per semester. The purpose of the restriction is to give the students a chance to concentrate on improving their performance and thus raising their CGPA.

(iv) Warning of Danger of Probation

Students should be warned by their Department if at the end of any semester their GPA falls below 1.00

(v) Repeating Failed Course Unit(s)

Subject to the conditions for withdrawal and probation, a student must repeat the failed course unit(s) at the next available credit units carried during that semester does not exceed 24, and the Grade Points earned at all attempts shall count towards the CGPA.

(vi) Temporary Withdrawal from Study

A student may apply for temporary withdrawal from study for a period of one year which may be renewed up to a maximum of 2 years.

(vii) Withdrawal

A student whose Cumulative Grade Point Average is below 1.00 at the end of one year's probation shall be required to withdraw from the programme

3.5 Auditing of Courses

Students may attend a course outside their prescribed programme. The course shall be recorded in their transcript only if they have registered for it with the approval of the Head of their Department and the Dean of their Faculty and taken the prescribed examination. An audited course shall not be used in calculating the CGPA.

3.6 Academic Advisers

Every student is attached to an Academic Adviser who is a member of the academic staff and who will advise him/her on academic affairs as well as on personal matters. Academic Advisers are expected to follow their students' academic progress and provide counseling to them. It is the duty of the Head of Department to assign an Academic Adviser to each student at the beginning of each session. Academic Advisers should give clear information on the notice-boards or on their office doors about appropriate times and places at which they will be available to students who wish to consult them.

3.7 Classification of Degrees

The degree shall be awarded with 1st, 2nd Upper, 2nd Lower, or 3rd Class Honours, or as a Pass degree. The Cumulative Grade Point Average (CGPA) for these classes shall be:

Table 3.3: Classification of Degrees

	Cumulative Grade Point Average (CGPA)
Class of Degree	Students

1st Class	4.50 – 5.00
2nd Class Upper	3.50 – 4.49
2nd Class Lower	2.40 – 3.49
3rd Class	1.50 - 2.39
Pass	1.00 – 1.49

3.7.1 General Remarks

All the students admitted into the 1st year of the Faculty of Engineering programmes must have met the entry requirements, and thus, eligible to pursue the available careers in the Faculty. However, experience has shown that many of these students relax their efforts in the early years of study, apparently assuming that, like the practice in the primary and secondary schools, they would make up the lost efforts in their later years of study. This assumption is false in the Nigerian University System.

Here, at the University of Port Harcourt, every registered course (except officially dropped):

(i) requires a minimum of 70% attendance to lecture/tutorial (L) and/or laboratory/Practice (P);

(ii) Must be continuously assessed through assignments, tests, etc;

(iii) Must culminate in an examination, and

(iv) Must have a grade returned for every student who registered for it, which must comprise of at least 30% from the continuous assessment and 70% from the examination.

Each course in the programme contributes toward the Cumulative Grade Point Average (CGPA) with its weight (credit units). In the Faculty of Engineering, the weights for courses may be 1, 2 or 3 credit units as the case may be, except for the final year project whose weight is 6 credit units. The Industrial Training courses offered during the 2nd and 3rd year long vacations and the second semester of year 4, and for which reports are presented, have Nine credit units.

Most top job opportunities in the industry are usually reserved for graduates with excellent or very good degree classification (1st class or 2nd class upper division). For example, to be qualified to become a lecturer in the University, the applicant's first degree must not fall below 2nd class upper division. And to qualify for admission into a post-graduate degree programme at the University of Port Harcourt, candidate's first degree must not fall below a 'high' 2nd class lower division (that is, his/her final CGPA must not be below 3.0).

Therefore, for the ambitious student, hard work begins from year 1 and spans through year 5. Few low grades can thwart his/her ambition. However, one should always be true to his/her abilities, and not resort to cheating to claim what does not belong to him/her.

Students are therefore advised to completely avoid vices (such as secret cult and examination malpractice) that will ultimately put them out of course and disrepute. They are rather encouraged to be obedient, humble and law-abiding and to act in such a manner as to achieve their primary purpose of advancing their education.

3.8 Criteria for Graduating Students

Students, except those in engineering, shall be allowed to graduate with a maximum of any two (2) failed courses, provided these are not Research Projects, Design Project, Teaching Practice, Students Industrial Work Experience Scheme (SIWES), GES Courses, Year abroad Programme and Community Service Courses.

The following courses: Research Projects, Design Project, Teaching Practice, Students Industrial Work Experience Scheme (SIWES), GES Courses, Year abroad Programme and Community Service Course must be used in computing the degree results.

Each Department will specify its own minimum requirements for the award of its degrees, subject to a minimum of 120 credit units and a maximum of 148 credit units for a 4-year programme, or a minimum of 150 credit units and a maximum of 210 credit units for a 5-year programme. A well-balance programme should require between 120 and 148 credit units for a 4-year programme and between 150 and 210 credit units for a 5-year programme to be taken.

Each Department shall publish in its brochure the specified minimum credit units and courses that are compulsory for the award of degree in the Department.

Pass grade(s) shall replace fail grade(s) and the pass grade(s) shall be used to compute the CGPA. The maximum grade to be earned in respect of replacement of fail grade with a Pass grade is `C`.

The Official Transcripts shall record only the replaced grades in case(s) of previous failure(s).

Elective/audited courses, on request, shall be recorded in transcripts of the University.

Only the Registry shall issue academic transcripts of the University.

4.0 CURRICULUM

4.1 Course Structure and Course Schedule

The Department runs a five-year undergraduate programme leading to the award of a Bachelors Degree in Petroleum and Gas Engineering (**B. ENG.).** Generally, the programme can be divided into two broad areas:- Basic Engineering Courses and Core Engineering Courses

- **Basic-Engineering Courses:** This covers courses taken in years one and two. These are general foundation courses for all engineering disciplines. This programme is dominated by common Science, General Studies and Engineering courses required by all engineering students.

- **Core Engineering Courses**: This covers courses taken from year three to year five. The courses taken at this level are professional engineering courses mainly from within the Faculty of Engineering.

Apart from these, the students undertake 3-month industrial training at the end of their year three and 6 months industrial training in the second semester of year 4. During the industrial training period, the students are supervised by both lecturers and industry-based supervisors Details on the individual programmes of study/course schedule and course descriptions, are presented below. The Faculty common courses denoted as ENG courses, the General Studies courses (denoted as GES courses), and the Science courses (denoted as CHM for Chemistry; MTH for Mathematics; and PHY for Physics). The departmental course codes are PNG for Petroleum and GNG for Gas Engineering respectively.

4.2 Petroleum Engineering Programme

YEAR ONE
First Semester

Course Code	Course Title	L	P	C
GES 100.1	Communication Skills in English	3	0	3
GES 102.1	Introduction to Logic and Philosophy	2	0	2
CHM 130.1	General Chemistry	2	3	3
PHY 101.1	Mechanics and Properties of Matter	3	0	3
PHY 102.1	Physics Laboratory I	0	3	1
MTH 110.1	Algebra and Trigonometry	3	0	3
MTH 120.1	Calculus	3	0	3
ENG 101.1	Engineering Drawing I	1	3	2
Total		**17**	**09**	**20**

Second Semester

GES 101.2	Computer Appreciation & Application	2	0	2
GES 103.2	Nigerian People and Culture	2	0	2
CHM 131.2	General Chemistry II	2	3	3
PHY 112.2	Electricity and Magnetism	3	0	3
PHY 103.2	Physics Laboratory II	0	3	1
MTH 124.2	Coordinate Geometry	3	0	3
ENG 102.2	Engineering Drawing II	1	3	2
ENG 103.2	Engineerg –in-Society	1	0	1
ENG 104.2	Manufacturing Tech./Workshop Practice	1	3	2
Total		**15**	**12**	**19**

Year Two
First Semester

GLY 201.1	Stratigraphy and Historical Geology	2	0	2
PHY 216	Vibration, Waves and Optics	3	0	3
ENG 201.1	Engineering Mathematics I	3	0	3
ENG 202.1	Engineering Mathematics II	2	0	2
ENG 203.1	Engineering Mechanics	3	0	3
ENG 204.1	Basic Engineering Materials	2	0	2
ENG 210.1	Basic Electrical Engineering	3	0	3
ENG 213.1	Computer Programming for Engineers	1	3	2
Total		**19**	**3**	**20**

Second Semester

CHM 240.2	Physical Chemistry	2	3	3
ENG 206.2	Engineering Mathematics III	3	0	3
ENG 207.2	Basic Fluid Mechanics	2	0	2
ENG 208.2	Basic Strength of Materials	2	0	2
ENG 209.2	Basic Thermodynamics & Heat Transfer	3	0	3
ENG 205.2	Engineering Laboratory I	0	3	1
ENG 211.2	Engineering Laboratory II	0	3	1
ENG 212.2	Community Service	0	3	1
CEG 231.2	Engineering Geology	2	0	2
Total		**14**	**12**	**18**

Year Three

First Semester

ENG 301.1	Engineering Mathematics IV	3	0	3
ENG 302.1	Technical Writing and Presentation	2	0	2
CHE 315.1	Transport Phenomena I	3	0	3
CHE 317.1	Separation Processes I	3	0	3
MEG 303.1	Strength of Materials II	2	0	2
PNG 301.1	Introduction to Petroleum Industry	3	0	3
PNG 302.1	Rock and Fluid Properties	3	0	3
PNG 303.1	Petroleum Engineering Laboratory I	0	6	2
Total		**19**	**06**	**21**

Second Semester

GLY 313.2	Introduction to Geophysics	2	0	2
ENG 303.2	Engineering Mathematics V	2	3	3
CHE 314.2	Transport Phenomena II	3	0	3
PNG 304.2	Drilling Fluids Technology	2	0	2
PNG 305.2	Petroleum Engineering Laboratory	0	6	2
PNG 306.2	Drilling Engineering I	3	0	3
PNG 307.2	Fundamentals of Reservoir Engineering	3	0	3
PNG 308.2	Petroleum Production Engineering I	3	0	3
GES 300.2	Fundamentals of Entrepreneurship	3	0	3
Total		**18**	**09**	**24**

LONG VACATION

ENG 300.3	Industrial Training I	Pass/Fail

Year Four

First Semester

ENG 401.1	Engineering Mathematics VI	3	0	3
ENG 402.1	Engineering Economics	2	0	2
PNG 401.1	Drilling Engineering II	3	0	3
PNG 402.1	Formation Evaluation I	3	0	3
PNG 403.1	Natural Gas Engineering	3	0	3
PNG 404.1	Well Completion and Workers	2	0	2

PNG 405.1	Petroleum Engineering Laboratory III	0	6	2
GLY 401.1	Petroleum Geology	3	0	3
Total		**19**	**6**	**21**

Second Semester and Long Vacation

ENG 400.2	Industrial Training	9

Year Five

First Semester

ENG 501.1	Professional Practice and Procedures	2	0	2
ENG 502.1	Engineering Management	2	0	2
PNG 501.1	Well Testing	3	0	3
PNG 502.1	Petroleum Production Engineering II	2	0	2
PNG 503.1	Enhanced Recovery Methods	3	0	3
PNG 504.1	Computer applications in Petroleum Engineering	1	3	2
PNG 505.1	Seminar/Research Methodology	1	0	1
PNG 510.1	Alternate Hydrocarbon Sources	3	0	3
PNG 515.1	Formation Damage Assessment and Control	3	0	3
Total		**20**	**03**	**21**

Second Semester

PNG 506.2	Elements of Reservoir Simulation	2	3	3
PNG 507.2	Petroleum Economics & Property Valuation	3	0	3
PNG 508.2	Natural Gas Processing	2	0	2
PNG 509.2	Industrial Safety & Oil and Gas Pollution Control	3	0	3
PNG 5- .2	Elective	3	0	3
GNG 520.2	Final Year Project	0	18	6
Total		13	21	20

Elective Courses (3 Credits each)

GLY 406.1	Applied Geophysics & Mineral Exploration
PNG 515.1	Formation Damage Assessment and Control
PNG 511.2	Multiphase Flow in Pipes
PNG 512.2	Fundamentals of Rock Mechanics
PNG 513.2	Formation Evaluation II

4.3 Gas Engineering Programme

Year One
First Semester

Course Code	Course Title	L	P	C
GES 100.1	Communication Skills in English	3	0	3
GES 102.1	Introduction to Logic and Philosophy	2	0	2
CHM 130.1	General Chemistry I	3	3	3
PHY 101.1	Mechanics and Properties of Matter	3	0	
PHY 102.1	Laboratory Practice I	0	3	1
MTH 110.1	Algebra and Trigonometry	3	0	3
MTH 101.1	Calculus	3	0	3
ENG 101.1	Engineering Drawing I	1	3	2
Total		**19**	**09**	**20**

Second Semester

GES 101.1	Computer Appreciation & Applications	1	3	2
GES 103.2	Nigerian Peoples and Cultures	2	0	2
CHM 131.2	General Chemistry II	2	3	3
CHM 132.2	Intro. To Principles of Organic Chemistry	3	0	3
PHY 112.2	Electricity and Magnetism	3	0	3
PHY 103.2	Laboratory Practice II	0	3	1
MTH 124.2	Coordinate Geometry	3	0	3
ENG 102.2	Engineering Drawing II	1	3	2
ENG 103.2	Engineer –in-Society	1	0	1
ENG 104.2	Manufacturing Tech./Workshop Practice	1	3	2
Total		**17**	**15**	**22**

Year Two
First Semester

PHY 216	Vibration, Waves and Optics	3	0	3
CHM 260.1	Organic Chemistry I	3	0	3
ENG 201.1	Engineering Mathematics I	3	0	3
ENG 202.1	Engineering Mathematics II	2	0	2
ENG 203.1	Engineering Mechanics	3	0	3

ENG 204.1	Engineering Materials	2	0	2
ENG 210.1	Basic Electrical Engineering	3	0	3
ENG 213.1	Computer Programming for Engineers	1	3	2
Total		**20**	**3**	**21**

Second Semester

CHM 240.2	Physical Chemistry	3	0	3
ENG 206.2	Engineering Maths III	3	0	3
ENG 207.2	Basic Fluid Mechanics	2	0	2
ENG 208.2	Basic Strength of Materials	2	0	2
ENG 209.2	Basic Thermodynamics & Heat Transfer	3	0	3
ENG 205.2	Engineering Laboratory I	0	3	1
ENG 211.2	Engineering Laboratory II	0	3	1
ENG 212.2	Community Service	0	3	1
Total		**13**	**9**	**16**

Year Three

First Semester

ENG 301.1	Engineering Mathematics IV	3	0	3
ENG 302.1	Technical Writing and Presentation	2	0	2
CHE 315.1	Transport Phenomena I	3	0	3
CHE 317.1	Separation Processes I	3	0	3
MEG 303.1	Strength of Materials II	2	0	2
MEG 307.1	Engineering Thermodynamics	2	3	3
PNG 301.1	Introduction to Gas Industry	3	0	3
PNG 302.1	Rock and Fluid Properties	3	0	3
Total		**21**	**3**	**21**

Second Semester

ENG 303.2	Engineering Mathematics V			
CHE 312.2	Separation Processes II	3	0	3
CHE 314.2	Transport Phenomena II	3	0	3
CHE 316.2	Process Instrumentation	1	3	2
PNG 306.2	Drilling Engineering I	3	0	3
PNG 307.2	Fundamentals of Reservoir Engineering	3	0	3

PNG 308.2	Petroleum Production Engineering I	3	0	3
GNG 301.2	Gas Engineering Laboratory I	0	6	2
GES 300.2	Fundamentals of Entrepreneurship	3	0	3
Total		**18**	**12**	**24**

LONG VACATION

ENG 300.2	Industrial Training I	Pass/Fail

Year Four
First Semester

ENG 401.1	Engineering Mathematics VI	3	0	3
ENG 402.1	Engineering Economics	2	0	2
CHE 417.1	Introduction to Polymer Processing	3	0	3
PNG 403.1	Natural Gas Engineering	3	0	3
GNG 401.1	Industrial Gas Utilisation	3	0	3
GNG 402.1	Fuel Technology	3	0	3
GNG 403.1	Gas Engineering Laboratory II	0	6	2
Total		**17**	**6**	**19**

Second Semester and Long Vacation

ENG 400.2	Industrial Training II	9

Year Five
First Semester

ENG 501.1	Professional Practice and Procedures	2	0	2
ENG 502.1	Engineering Management	2	0	2
PNG 502.1	Petroleum Production Engineering II	3	0	3
GNG 501.1	Catalysis and Fuel Synthesis	3	0	3
GNG 502.1	Energy Conservation and Management	3	0	3
XXX 5XX.1	Elective	3	0	3
GNG 503.1	Technical Seminar	0	3	1
Total		**16**	**3**	**17**

Second Semester

PNG 507.2	Petroleum Economics & Property Valuation	3	0	3
PNG 508.2	Natural Gas Processing	2	0	2
PNG 509.2	Industrial Safety & Oil and Gas Pollution	3	0	3
GNG 504.2	Energy Law and Policy	3	0	3
GNG 520.2	Final Year Project	0	18	6
Total		11	18	17

Elective Courses (3 Credits each)

GNG 505.1	Petrochemical Processes
GNG 506.1	Pipeline Technology
GNG 507.1	Offshore Technology
GNG 508.1	Corrosion Engineering
CHE 550.1	Technology of fossil Fuel Processing

5.0 COURSE CONTENT

5.1 Faculty-wide Courses

5.1.1 General Studies Courses (GES)

GES 100.1: **Communication Skills in English (3 Credits)**

Study skills and methods including use of language and use of the library. Listening comprehension skills. Reading skills. Using grammar in reading and writing. Writing skills. Examination techniques.

GES 101.2 Computer Appreciation and Applications (2 Credits)

History of Computers. Generations and classification of computers. IPO model of a computer. Components of a computer system – hardware and software. Programming languages, organization of data. Data capture techniques. Introduction to computer networks. Software and its application. Use of keyboard as an input device. DOS, Windows, word processing, spreadsheets. Application of computers in Medicine, Social Sciences, Humanities, Education and Management Sciences.

GES 102.1: Introduction to Logic and Philosophy (2 Credits)

The nature, definition and branches of Philosophy. Philosophy and other disciplines. Nature of philosophical problems. Periods in the history of Philosophy.

Philosophy and national development. Types of argument and reasoning. Inferences.

GES 103.2: Nigerian Peoples and Culture (2 Credits)

The concept of culture. Pre-colonial cultures and languages of Nigeria. Principles of kinship, descent and marriage in Nigeria cultures. Nigerian economic institutions. Nigerian political institutions. Education and development in Nigeria. Religion in Nigerian culture. Culture, environment and health practices in Nigeria.

5.1.2 Science Courses (CHM,MTH, PHY)

CHEMISTRY (CHM)

CHM 130:1: General Chemistry 1 (3 credits)

Basic principles of matter and energy from the chemist's point of view. A broadly based course suitable from students from various schools as well as those from the faculty of science. Topics to be covered will include atomic theory and molecular structure stoichiometry, the periodic classification of the elements, atomic structure, chemical bonding properties of gases, solids, liquids and solutions, chemical equilibrium, ionic equilibria, chemical thermodynamics, electro-chemistry and chemical kinetis. (includes laboratory sessions.)

CHM 131.2: General Chemistry II (3 credits)

Application of the principles of chemical and physical change to the study of the behaviour of matter and the interaction between matter. Course content includes, the

chemistry of representative elements and their common compounds with emphasis on gradation of their properties-brief chemistry of the first series of transition elements, general principles of extraction of metals; introductory to nuclear chemistry. (includes Lab Session.)

CHM 240.2: **Physical Chemistry (3 Credits)**

Introduction to basic physical chemistry. The emphasis is on the properties of gases, the three laws of thermodynamics and the principles of chemical kinetics and electrochemical cells.

PHYSICS (PHY)

PHY 101.1: Mechanics and Properties of Matter (3 Credits)

Topics covered in this course will include the following: motion in one dimension, motion in a plane, work and energy, conservation laws, collisions, solid friction, rotational kinematics and rotational dynamics, equilibrium of rigid bodies oscillations, gravitation, fluid statics and fluid dynamics. Surface tension, elasticity and viscosity. Pre-requisite: WAEC credit in Physics,

PHY 102: 1: Physics Laboratory Practice (1 Credit.)

Laboratory exercises drawn from PHY 101.1

PHY 112.2: Electricity and Magnetism (3 Credits)

This is an introductory course on electricity and magnetism. Topics covered will include the electric field. Gauss law. Electric potential, capacitors and dielectric,

current and resistance, electromotive force and circuits, the magnetic field, Ampere's law, Faraday's law of induction.

PHY 103.2: Physics Laboratory II (1 Credit)

The experiments carried out in this course will cover areas discussed in Phy 112.2. These experiments include verification of the laws of electricity, .measurement of the electrical properties of conductors; D.C. and A.C. circuit properties, series and parallel resonant circuits; transformer characteristics; and other electrical circuit problems.

PHY 216. 1: **Vibration, Waves and Optics (3Credits)**

This course is an introduction to oscillations and waves phenomena. Topics covered will include vibrations and waves, types of waves, sound waves and wave optics.

GLY 210.1 Stratigraphy (2 Credits)

Elements of chrono, litho, bio and magneto and seismic stratigraphy. Global regressions and transgressions. Principles of Stratigraphy, stratigraphic evolution of sedimentary basins (emphasise on Benue trough) and geohistory analysis. Practical to include faces maps, correlations and stratigraphy analysis. Practical to include faces maps, correlations and stratigraphic cross-sections. Coprequisite GLY 213.2.

GLY 313.2 Introduction to Geophysics (2 Credits)

Introduction to geophysical technologies (seismic, gravity, magnetic, resistivity) Geophysical data acquisition, processing and interpretation in petroleum geology and

economic minerals. Borehole logging and analysis. Elements of basin analysis.

GLY 401.1 Petroleum Geology (3 Credits)

The physical and chemical properties of petroleum; distribution in time and space. The origin, migration, accumulation and entrapment of petroleum. Types of reservoir rocks and traps. Source rock characteristics, maturation and destruction of petroleum, abnormal pressures, formation water. Evaluation of petroleum prospects, exploration and appraisal methods, reserve estimation and classification. Pre-requisite; CHM 260.1.

GLY 406.1 Applied Geophysics and Mineral Exploration (3 Credits)

Induced polarization and electromagnetic methods, seismic exploration; Principles of seismic stratigraphy. Data acquisition, processing and interpretation. Application of these methods to mineral exploration, Engineering geology and hydrogeology. Pre-requisite:

MATHEMATICS/COMPUTER SCIENCE (MTH)

MTH 110.1: Algebra and Trigonometry (3 credits)

Elementary notions of sets, subsets, union, intersection, complements; Ven Diagrams. Real numbers, integers. Rationals and Irrationals, Mapping of a set. Real Functions and their compositions. Quadratic Functions. Cubic Function. Roots of quadratic and cubic functions. Partial Fractions. Equations with complex roots. Complex number, Geometric representation of complex numbers,

De Moirvers, series and sequences. Principles of mathematical induction. Binomial theorem. Trigonometric functions of angles. Circular functions. Addition theorems. Double and half angles.

MTH 120:1: Calculus (3 Credits)

Function of a real variable, graphs, limits and idea of continuity. The derivative as limit of rate of change. Technique of differentiation: Methods of change. Technique of integration: Methods of integration. Definite integrals. Application to areas, volumes.

MTH 124.2: Coordinate Geometry (3 Credits)

Straight lines, circles, parabola, ellipse, hyperbola. Tangents, normal. Addition of Vectors. Scalar and vector products. Vector equation of a line and plane. Kinematics of a particle. Components of velocity and acceleration of a particle moving in a plane. Force, momentum, laws of motion, under gravity, projectiles, resisted particle motion, elastic, string, simple pendulum impulse. Impact of two smooth sphere, and a sphere on a smooth sphere. Addition of Vectors.

5.1.3 ENGINEERING SCIENCE COURSES (ENG)

ENG 101.1: Engineering Drawing I (2 Credits)

Introduction to drawing instruments, scales, draughting aids and their proper use. Size of paper and drawing layout. Dimensioning, line work and lettering. Geometrical constructions and Engineering graphics.

Development of geometrical figures and intersection of solids and curves. Introduction to projections.

ENG 102.2: Engineering Drawing II (2 Credits)

Orthographic projections in first and third angles. Isometric Projection; sections and sectioning, auxiliary views and staggered sectioning. Freehand sketching. Conventional practices with Simple examples, including threads and threaded fasteners, cam profiles and Assembly drawing from detailed components. Pre-requisites ENG 101.1.

ENG 103.2: Engineer-in-Society (1 Credit)

History of Engineering and technology and the Philosophy of Science. Development of the Engineering industry up to the present day. Safety and health at work. The role of engineers in Nation Building. Food production, housing, transportation, employment opportunities, energy supply, communication and social infrastructure, etc. The choice of Engineering solutions and decision-making process, risk analysis, etc. Lectures by invited professionals.

ENG 104.2: Manufacturing Technology/Workshop Practice (2 Credits)

Manufacturing methods with metal materials (cold and hot workings) such as deep drawing; wire drawing; spinning and rolling; extrusion. Machine-tool manufacture (turning, milling and shaping, etc), Fabrication by welding and threaded fasteners and riveting, etc, metal-casting; Manufacture of plastic products (moulding and blowing).

Use of hand-tools, bench work and measuring instruments. Fitting and joining processes (soldering, brazing) wood-working and machinery. Surface finishes, forging, etc

ENG 201.1: Engineering Mathematics I (Mathematical Analysis (3 Credits)

Functions of several variables: functions of 2, 3 or more variables, partial derivatives, differentials, total differentials, application to approximate computations, Higher-order partial derivatives and differentials. Differentiation of composite, and implicit functions of several variables. Extrema and conditional extremum. Change of variables. Multiple integrals: Double and triple integrals, analysis in Cartesian coordinates, change of variables to polar, cylindrical, and spherical coordinates, curvilinear coordinates, application to problems of mechanics. Integral dependent on parameters, improper integrals, line integrals, Green's formula, conditions for independence of line integral on path, application of problems of mechanics and thermodynamics. Surface integrals , fluid flux across a surface, properties, Stroke's formula. Field theory, vector field and vector lines. Applied series: Expansion of power series, applications of Taylor's series, Fourier series orthogonal systems of functions, the Parseval's relation. Hilbert space, orthogonality with weight function, Fourier integral, Fourier transformation, applications. Special Functions, Gamma, Beta, Error, Bessel, Legendre and hypergeometric functions. Introduction to analytic

functions, Cauchy-Riemann equations, conformal mappings. **Pre-requisite: MTH 120.1**

ENG 202.1: Engineering Mathematics II (Linear Algebra and Analytic Geometry) (2 Credits)

Surfaces and curves in space, cylinders, cones, and surfaces of revolution. First and second-order algebraic surfaces, ellipsoids, hyperboloids and paraboloids. Systems of linear equations: Determinants, minors and cofactors, evaluation methods. Vector space, linear spaces, Euclidean space, orthogonality, change of basis, inverse matrix, eigenvectors and eigenvalues of a matrix, rank. Linear mappings, symmetric, bilinear and quadratic forms. Differentiation and integration of matrices. Applications of matrix algebra **Pre-requisite MTH 110.1 and 124.2**.

ENG 203.1: Engineering Mechanics (Statics and Dynamics) (3 Credits)

Basic concepts and principles of mechanics, equilibrium of particles in 2- and 3 – dimensions, moment and couple , system of forces, equilibrium of rigid bodies, friction – wedges, screw, wheel bolts and statically determinate structure - beams, trusses, frames and machines. Linear and curvilinear motions, acceleration, Kinetics of parties, Newton's Second law, impulse , momentum, impact and restitution, work, energy, power and efficiency. **Pre-requisite: PHY 101.1 and MTH 120.1**.

ENG 204.1: Basic Engineering Materials (2 Credits)

Atomic and crystal structure, Crystal imperfections and impurities in solids. Fundamentals of crystallography. Atomic vibrations and diffusion. Mechanical properties – Engineering and true stress – strain curves, ultimate strength, ductility, impact strength, hardness. Electrical properties- conductivity, semi-conductivity and super-conductivity. Optical and magnetic properties of materials. Simple phase diagrams of alloys, with emphasis on the iron-iron carbide system. The relationship between structure and properties. Creep, fatigue. Heat treatment processes. Stability of materials in the services environment – corrosive media, sub-zero and elevated temperatures, irradiation. Basic criteria for the selection of materials for Engineering applications. Engineering properties of wood, concrete, ceramics, polymers, and non-ferrous metals and alloys. **Pre-requisite: CHM 131.2 and MATH 124.2**.

ENG 205.2: Engineering Laboratory I (3 Credits)

Assigned laboratory exercises to reflect the basic Engineering courses in Applied Mechanics, Materials Science, Fluid Mechanics, Strength of materials. Thermodynamics and Heat transfer. Guidance on specific experiments and calculations will be provided by the various Lecturers.

ENG 206.2: Engineering Mathematics III (Differential Equations) (3 Credits)

Ordinary differential equations; First-order equations, examples of Engineering models, equations with variables separable, Bernoulli's equation; exact equations; the envelops of a family of curves, singular solutions, Clairaut's and Lagrange's equations, orthogonal and isogonal trajectories. Second-and higher-order equations and systems of equations, transformation of higher-order equations to system of first-order equations, first integrals. Linear equations, general theory, boundary value problems. Euler's equations, geometrical and physical interpretation of solutions. Operators and the operator method of solving equations, system of linear equations. Operational calculus, Laplace transform, theory and application to initial-value problems. Introduction to partial differential equations elliptic, hyperbolic and parabolic equations. **Pre-requisite: MTH120.1 and 124.2**

ENG 207.2: Basic Fluid Mechanics (2 Credits)

Fluid properties, fluid statics, principles of fluid flow and applications, flow measurements. Real fluid flow, curvilinear flow (2-dimensional). Dimensional analysis and similitude. Pipe flow and friction factors. Boundary layers and drag **Pre-requisite: PHY101.1 and ENG 205.1**

ENG 208.2: Basic Strength of Materials (2 Credits)

Force equilibrium – free body diagrams, centroids and second moment of area. Concept of stress and strain; stress-strain diagram. Axially loaded members, composite bars; temperature stresses; relation between elastic constants. Thin cylindrical spherical and conical pressure vessels, cylindrical shells with rings, torsion of circular shafts and power transmission of shafts. Axial force, shear force and bending moment diagrams. Pure bending of beams, bending stresses in composite beams, shearing stresses in beams, complex stresses; principal stresses. **Pre-requisite: ENG 205.1**.

ENG 209.2: Basic Thermodynamics and Heat Transfer (3 Credits)

Engineering Thermodynamics: Basic concepts definitions, thermodynamic properties; the thermodynamic system units; equations of state for perfect and real gases, and gas mixtures, thermodynamics work and heat; the First law of thermodynamics, energy equations and analysis; basic thermodynamic processes and cycles for ideal gas, pure substance and mixtures; reactive systems; thermodynamic relations; the Second law of thermodynamics and introduction to irreversible processes. Heat Transfer Basic concepts, heat transfer modes and rate processes. Fourier's law of heat conduction; Newton's law of cooling; Stephan-Boltzmann law of thermal radiation and configuration factor algebra; stationary heat conduction in simple geometries and composite bodies; correlational

equations for convective heat transfer, boiling and condensation; heat transfer by combined modes; insulation and intensification of heat transfer; electrical and triple analogies; introduction to heat exchangers. **Pre-requisite: PHY 101.1**

ENG 210.1: Basic Electrical Engineering (3 Credits)

Circuit elements (R, L, C,) DC and AC circuits and signals Electrostatics and Electromagnetism, Basic circuit laws and theorems. Three phase circuits, power and power factor. Electrical and electronic measurements and measuring instruments. Introduction to machines. Introduction to Electronics; Semi-conductors. **Pre-requisite; PHY 101.1**

ENG 211.2: Engineering Laboratory II (1 Credit)

Assigned laboratory exercises to reflect the basic Engineering course in Electrical/Electronics. Guidance on specific experiments and calculations will be provided by the Lecturer.

ENG 212.2: Community Service (1 Credit)

Civil works beneficial to the University community and its environs including but not limited to farming, road building and maintenance, landscaping, planting of flowers and hedges, grass-cutting and general cleaning of campus and its environs, concreting and laying of seating and footpath slabs.

ENG 213.1 Computer Programming for Engineers (2 Credits)

Computers, Computing and Engineering, Algorithms, flour chart and pseudo code. Computer languages, programming in Fortran 77 or later versions. Debugging techniques. Computer code security. Laboratory: Hands-on experience on computers through the use of Compilers to run programs' and to solve simple analysis problems in fluid, the thermodynamics, heat transfer and electrical systems. **Pre-requisite: GES 101.2**.

GES 300.3 Fundamentals of Entrepreneurship (2 Credits)

History and the development of entrepreneurship, the entrepreneurship qualities and Characteristics, the opportunities; Starting and developing new business ventures, legal ownership; feasibility Studies; role of small and medium scale enterprise (SME) in the economy, role of government in entrepreneurship, business location and layout, accounting for SME, financing SME, managing of factors of SME, Marketing in SME, risk management of SME, Success and failure factors of SME prospects and challenges of entrepreneurship and entrepreneurship ethical behavior in small business.

ENG 300.3: Industrial Training I (0 Credit)

The practical exposure of the student through direct participation in the work of an industry, to real life working condition. During the training, the student acquires a familiarity with Engineering works, organization. Physical layout, and the flow of information,

materials and operations. This information is expected to complement and integrate the student's classroom instruction and laboratory/workshop exercises. Duration: 3 months.

ENG 301.1: Engineering Mathematics IV (Probability and Statistics) (3 Credit)

Theory of probability: Motivation, probability models, probability axioms, combinatorial problems. Conditional probability, independence of events, Bernoulli trials. Discrete and continuous random variables, mass, distribution, and generating functions, random vectors, independent random variables, exponential distribution, reliability, failure density, hazard function, some important distributions, functions of two random variables, transform methods, computation of mean time to failure, inequalities and limit theorems. Conditional distribution and expectation, Stochastic process, Bernoulli, Poission, and Renewal processes, availability analysis, random incidence. Introduction to discrete and continuous Markov chains. Measures of central tendency. Statistical inference, parameter estimation, Hypothesis testing. Regression, correlation and analysis of variance. Elements of experimental design. **Pre-requisite: ENG 201.1**

ENG 302.1: Technical Writing and Presentation (2 Credits)

Data gathering and presentation. Technical correspondence: letters of inquiry and replies, letters of application and memoranda. Illustrating technical writing

using tables, graphs, diagrams, equations and appendices. Report writing: progress reports, proposals, students project, thesis and dissertations. Oral and visual presentation. Computer-aided technical writing and presentation; word processing and word-processing software packages.

ENG 303.2: Engineering Mathematics V (Numerical Methods and Computer Applications) (3 Credits)

Review of the number systems and error analysis. Numerical schemes, error analysis, computer algorithms and programs for the solution of the following problems: interpolation by polynomial; nonlinear equations; systems of linear equations, determinants and matrix eigenvalue problem; approximations; data fitting, orthogonal polynomials, least-squares, splines and fast Fourier transforms; differentiation and integration; difference equations; differential equations by Runge-kutta and other methods; boundary-value problems in ODE. Introduction to the finite-difference method for partial differential equations. **Pre-requisite ENG 202.1 and ENG 206.1**

GES 400.2 Entrepreneurship Project (2 Credits)

The Students are given project topic to write on. **Pre-requisition: GES 300.2**.

ENG 400.2: Industrial Training II (9 Credit)

The practical exposure of the student through direct participation in the work of an industry, to real life working condition. During the training, the student

acquires a familiarity with Engineering works, organization, physical layout, and the flow of information, materials and operations. This information is expected to complement and integrate the student's classroom instruction and laboratory/workshop exercises. Duration: 6 months.

ENG 401.1: Engineering Mathematics VI (Mathematical Modeling and Operations Research) (3 Credits)

Basic concepts, methodology, structures, information support and systems approach. Synthesis, analysis, validation and computer simulation of mathematical models. Mathematical modeling of Engineering design objects at micro-, macro- and meta-levels; synthesis, analysis and optimization of design objects. Models for Engineering decision making in design and operations, including environmental, social and economic considerations. Optimization of design and operations: unconstrained and constrained problems, sensitivity analysis; linear, integer, goal, geometric, dynamic, nonlinear and stochastic mathematical programming. Allocation, routing, searching, project scheduling, sequencing, replacement, inventory, gaming and queuing problems. Computer-aided mathematical modeling of Engineering design and operations. Application software packages. **Pre-requisite: ENG 206.2, 301.1 and 303.2.**

ENG 402.1: Engineering Economics (2 Credits)

Scope of Engineering investment decisions; compounding, discounting, and economic equivalence; cash flow analysis and inflation. Choosing between alternatives: methods for evaluating investments; depreciation, taxes, and cost of capital; comparing alternative investments; replacement analysis, budget and budget control, evaluation of public projects. Decisions and cost analysis; lease-or-buy decisions; economic feasibility study of Engineering projects. Computer-aided Engineering economics. **Pre-requisite: ENG 301.1**

ENG 501.1: Professional Practice and Procedure (2 Credits)

Registration of engineers, duties and code of conduct and practice. Ethics, professional responsibilities and practice of Engineering in Nigeria. Typical problems and solutions in various areas of Engineering. Engineering projects, planning, feasibility studies and their relevance, guide-predesign survey and stages of Engineering design project scheduling Law: sources and branches of Nigeria Law, courts and tribunals. Law of contracts, the engineer as an expert witness. Industrial legislation concerned with incapacity or injury, working conditions, wages, redundancy, Trade Unions, structure, right and liabilities. Industrial disputes, safety and environmental protection. **Pre-requisite: ENG 103.2**.

ENG 502.1: Engineering Management (2 Credits)

Organizational structure, goals and functions. Project planning and control. Cost Engineering; capital and operation cost estimating, contingencies and allowances. Production forecasts. Phases and constraints, decline functions. Productivity improvement Purchasing and materials management. Maintenance management. Contract management. **Pre-requisite: Good academic standing**.

CHEMICAL ENGINEERING COURSES (CHE)

CHE 315.1 Transport Phenomena I (3 Credits)

Fundamentals of transport phenomena (fields, flux density, field intensity, rate equation, conservation laws – Newton's, and Fick's); laminar and turbulent flow of incompressible viscous fluids (sothermal flow over a flat plate, in tubes; non-isothermal flow); Flow in non-circular tubes; Non-Newtonian fluids; Heat transport – stationary and non-stationary heat conduction, Molecular diffusion in fluids; Interphase mass transfer; Diffusion in solids, *Pre-requisites:* ENG 207.2, ENG 209, CHE 212.2

CHE 317.1 Separation Processes I (3 Credits)

Interface mass transfer. Gas-Liquid operations, Equipment for gas-liquid operations; Humidification operations; Isothermal gas absorption; Binary distillation, Hydrodynamics of packed columns. *Pre-requisite* CHM 240.2; ENG 206.2; CHE212.2

CHE 314.2 Transport Phenomena II (3 Credits)

Boundary-layer theory, Navier-Stokes equation and applications in Chemical Engineering problems; Turbulent flow in pipes and channels; one-dimensional compression flow; Energy equation; Free and forced convective heat transfer (over a flat plate, in a tube); Convective mass transfer, Introduction to multiphase phenomena (bubble dynamics, cavitation, fundamentals of two phase flow), *Pre-requisite:* CHE 315.1; CHE 212.2

CHE 417.1 Polymer Science and Technology (3 Credits)

Basic structures of polymer. Physical stages and Transitions; Polymerization processes; Molecular weight of polymers. Viscous flow; Mechanical properties at small Deformations; Ultimate properties; Failure, Tests, Creep Failure, fatigue, fabrication processes; Carbon chain polymers; Heterochain polymers, Analysis and identification of polymers. *Pre-requisite:* Good academic standing.

CHE 550.1 Technology of Fossil Fuel Processing (Credits)

Source, availability, and characterization of fossil fuel (petroleum, including natural gas, coal, tar sands). Modern processing technology. Choice of product lines and products. Alternative product lines and products, and product specification to be emphasized. Pre-requisite: Good academic standing.

MECHANICAL ENGINEERING COURSES (MEG)

MEG 303.1 Strength of Materials II (2 Credits)

General state of stress and strain at a point. Bening of beams with unsymmetrical sections, skew bending, bending of curved bars, thin plates, beams on elastic foundations. Torsion of thin walled sections. Statically indeterminate systems and stability analysis. Introduction to plastic behaviour of materials, elastic, perfectly plastic and strain hardening materials, linear viscoelastic materials, theories of failure. Problems in stress analysis, thin shells of revolution, pressure vessels, stresses due to shrinkage fit, concentrated forces, contact stresses. Computational methods and software design for analysis of strength of the materials. Pre-requisite: ENG 208.2

MEG 307.1 Engineering Thermodynamics (3 Credits)

Review of the Second Law of thermodynamics: entropy, availability, irreversibility. Helmoholtz and Gibbs functions. Gas and vapour cycles ideal and modified. Imperfect gasses. Relations between thermodynamic properties. Mixtures of gases and vapour. Reactive systems. Gas compressors, turbines and jet engines. Reversed cycles. Nozzles and diffusers. Thermodynamics of irreversible processes. Computational methods, computer algorithms and programs for energy audit and other thermodynamic analysis.

Laboratory: Laboratory sessions are based on materials covered in this course.

Pre-requisite: ENG 209.2.

PETROLUEM ENGINEERING (PNG)

PNG 301.1: Introduction to Petroleum Industry (3 Credits)

Geophysical methods of petroleum exploration; Principles of petroleum geology Drilling for oil and gas: Oil and gas reservoir; Oil and gas production; Oil and gas processing; Oil and gas transportation; Basic petroleum economics; Tar sands, Coal and solar energy. Pre-requisite: None

PNG 302.1: Rock and Fluid Properties (3 Credits)

Composition and porosity of reservoir rock; Darcy's Law and the concept of permeability and relative permeability; capillary phenomena, surface tension forces, wettability, compressibility and static distribution of fluids; Electric conductivity; chemical, physical and thermodynamic properties of underground fluids; Gas Laws, behavior of Liquids, phase equilibrium, viscosities of hydrocarbons; uses of fluid properties in Reservoir Engineering; Rock and fluid property correlation's. Pre-requisitions: CHE 240.2, ENG 207.2, ENG 209.2, MTH 280.1.

PNG 303.1: Petroleum Engineering Laboratory 1 (PVT/CORE Analysis Laboratory) (2 Credits)

Analysis of drill cutting; determination of lithology; determination of porosity, fluid saturations, capillary pressure, permeability, electrical properties, effective permeability and relative permeability; physical properties of petroleum and its products, gravity viscosity, surface tension, thermodynamic behavior of naturally occurring hydrocarbon mixture, Differential and flash vapourisation

tests at elevated pressures and temperatures. Co-prequisite: PNG 302.1. Pre-requisite: CEG 213.2.

PNG 304.2: Drilling Fluids Technology (3 Credits)

Types and functions of drilling fluids; Drilling fluid additions and chemical composition; drilling mud calculations: Control of mud properties; clay mineralogy in Niger Delta formation; Formation damage caused by drilling fluid and chemistry of reaction between fluid and formation; Drilling mud performance evaluation; Well completion fluids; Uses and Problems. Other drilling fluids: Air Foam and etc. Pre-requisite. PNG 302.1 CHE 240.2, CHEM 130.1, CHE 131.2.

PNG 305.2: Petroleum Engineering Laboratory II (Drilling Mud/Cement Laboratory) (2 Credits)

Mud preparation and treatments; measurement of drilling and well completion fluid properties: Cement: types, properties and testing; laboratory observations of reactions between drilling and workover fluids on formation; Rheology, filtration and relations between functions and measurable drilling mud and completion fluid properties. Co-requisite. PNG 304.2.

PNG 306.2: Drilling Engineering I (3 Credits)

Introduction to Drilling Engineering. Fundamental concepts in oil well drilling. Well planning and cost estimation. Drilling team, drilling rigs, rig power system,

hoisting system, circulation system, the rotary system, the well control system, well-monitoring system, special marine equipment, drilling cost analysis, Bit types available. Rock failure mechanisms. Bit selection and evaluation. Factors affecting tooth wear, bearings wear, terminating a bit run. Factors affecting penetration rate, bit operation, drilling fluids and drilling hydraulics, well head equipment. Overview of drilling and casing programs. Drilling performance evaluation, drilling report format.

PNG 307.2: Fundamentals Reservoir Engineering (3 Credits)

Introduction: Functions of a Reservoir Engineer; Characteristics of petroleum reservoir; Geological concepts in reservoir Engineering; Recovery methods and definitions of reservoirs. Determination of Hydrocarbon in-Place Oil Recovery: Volumetric methods; Material balance and applications; water influx models and calculations; uncertainties in reserve calculations. Fluid flow concepts; flow potential; Darcy's Law. Decline Curvey Analysis. Co-requisite; PNG 304.2, PNG 305.2 Pre requisite; ENG 204.1, ENG207.2, ENG 208.2.

PNG 308.2: Petroleum Production Engineering I (3 Credits)

Introduction to Petroleum Engineering: Subsurface and surface operations. Operational functions and output of subsurface production engineer. Nodal Analysis in flow and outflow performances: governing equations, inflow performance relationship (IPR), productivity index,

formation damage, fines migration and skin effect, vertical lift well head equipment performance and pressure losses, choke performance. Problem wells analysis: sand, water, hydrate, scale, unstable flow, surge, waxy crude production, etc. Well surveillance. Well stimulation: Fracturing and acidizing. Introduction to artificial lift methods. Gas lift and pumping system.

PNG 401.1: Drilling Engineering II (3 Credits)

Hydrostatic Pressure, pore pressure and fracture gradient calculations, pressure control and blow out prevention. Equipment, Indicators and methods of kick controls. Cementing; Properties, Equipment, Hole conditions volume calculations and Rate of circulation, squeeze cementing and testing of cement, coiled tubing drilling, slim hole drilling, directional and horizontal drilling techniques and equipment, developments in drilling fluids technology, wellbore stability and concepts. Fishing: Tools and methods, drilling services and contract specifications. Offshore drilling technology, introduction to drilling optimization, advances in drilling engineering measurement while drilling (MWD). Pre-requisite; PNG 306.2, 304.2,305.2, Co-Requisite PNG 404.1. PNG.

PNG 402.1: Formation Evaluation (3 Credits)

Concepts of formation evaluation and comparison of the various methods well logging, coring, well testing etc. Well logging: classification and principles. Electric, acoustic and radioactive properties of reservoir rocks.

Reserve estimation based on well logs. SP curve, conventional resistivity logs (normal and lateral devices), focusing-electrode logs (laterolog and spherically focused logs), induction logs, micro-resistivity logs (microlog, microlaterology, proximity log, microSFL), radio-activity logs (gamma ray, neutron, formation density and thermal time decay) sonic log, electromagnetic propagation tool and the Repeat formation tester.

PNG 403.1: Natural Gas Engineering (3 Credits)

Production and Transportation of Gas: Gas Flow Pipes; Compression; Well Performance; Estimation of Gas Reserves: Field handling of Natural Gas; Sour Gas Problems; Gas Condensate Fields and Storage of Gas. Pre-requisite: PNG 302.1, 303.1, 307.2.

PNG 404.1: Well Completion and Work-Over Operation (3 Credits)

Casing Design; Mechanical properties: tension, collapse and burst; Designing a casing string; well completion designed: types, equipment procedures and guidelines: Tubing design and tubular; cementing and perforation: formation Testing; sand control method. Hydraulic fracturing, completion fluid design, well completion operations; perforation, sand control design, gravel packs. Sand consolidation (SCON), monobore, coil tubing application. Workover candidate screening workover well design, workover operations. Types of tubing selection, selection of tubing hanger, Christmas tree. Subsea well

completion. Pre-requisite; PNG 306.2, 308.2, Co-requisite; PNG 401.1.

PNG 405.1: Petroleum Engineering Laboratory III

(Production/Project Lab). (2 Credits)

Rheological measurements: Waxy and non-waxy crude; Flow metering of liquids and gas: determination of meter accuracy. Uses and operations of various pressure regulators; pressures loss measurement along pipes: Determination of friction factors; Bottom hole pressure determination; Oilfield quality control; oilfield chemical tests; setting-up of project labs. Pre-requisite; PNG 302.1, 303.1, CHE 315.1, 314.2.

PNG 501.1: Well Testing (3 Credits)

Purpose of BHP surveys, types of BHP surveys, ideal conditions for running tests, BHP survey equipment, correct procedures for conducting tests, gauge quality check procedure. Theory of well testing-phases and flow geometries flow equations and solutions, analysis models, skin concept; analysis of BHP tests Drawdown, buildup, interface etc. Field practices and other factors that affect tests, examples of bad and good tests.

PNG 502.1: Petroleum Production Engineering II (Surface

Production Operations) (3 Credits)

Surface Equipment: Gathering systems, Design and Testing of flow lines, service and cleaning of systems;

Phase separation: Separation process, separators and components design and construction of separators, dehydration, emulsion problems. Oil emulsion, emulsifying agents and de-emulsifiers. Choice and fosage of de-emulsifiers; corrosion and controls; storage fiscalization and custody transfer, offshore surface operations. Pre-requisite PNG 308.2, 403.1 and 404.1.

PNG 503.1: Enhanced Recovery Method (3 Credits)

Review of current recovery methods; recovery mechanism; Multiphase flow concepts; immiscible displacement concepts; sweep efficiency; water flood performance prediction; Miscible flooding; Chemical flooding; Thermal recovery concepts. Pre-requisite PNG302.1, 303.1, 307.2.

PNG 504.1: Computer Applications in Petroleum Engineering (2 Credits)

Computer application in all aspects of petroleum engineering. Computer-aided design of drilling, work-over and production facilities. Computer-aided well test design and automates history matching and drilling optimization. Development of correlations and softwares: oilfield automation and information management. Expert systems. Computer languages, use of available softwares and evaluation of performances, etc. Evaluation of petroleum engineering softwares in drilling, formation evaluation, production reservoir engineering petroleum economics and natural gas engineering.

PNG 505.1: Seminar/Research Methodology in Petroleum Engineering

(2 Credits)

Designed to expose students to research methodology in Petroleum Engineering, advances in petroleum engineering, techniques, and formats for technical paper and report writing and strategies of representation to technical audience. Students shall be look at overview of research logic, technical progress introduction to research purposes, writing of proposals and research funding, research literatures and material gathering types of research projects, data processing and analysis, presentation of results, economics, Limitations, observations, conclusion and recommendations, case studies, paper review, advances in petroleum engineering research.

Seminars, Pre-requisite: ENG 302.1.

PNG 506.2: Elements of Reservoir Simulation (**3 Credits)**

Introduction to reservoir simulation' Singe Fluid Flow Equation; Multiphase Flow Equation; Finite-Difference Approximations; Consistency, convergence and stability; Grid Systems and Boundary Conditions; Solution Methods; Discussion of black-oil simulator; Practical considerations in reservoir simulation; simulation study with black-oil simulation.

PNG 507.2: Petroleum Economics and Property Valuation (3 Credits)

Profitably analysis in oil and gas investments, inter-relation of technical and economic data, time value of money compound interest and annuity calculations depreciation methods, capital budgeting projects evaluations. Decline curves analysis, risk uncertainly in oil and gas exploration, decision tree analysis. Monte Carlo simulation, preference theory, pricing and bidding strategies, optimum field development, Nigerian petroleum profit tax law.

PNG 508.2: Natural Gas Processing (3 Credits)

Application of the concepts of thermodynamics, and phase behavior in the processing and conditioning of natural and liquids. Absorption, adsorption and fractionation processing; gasoline plant design; liquefied petroleum gas (LNG); liquefied natural gas (LNG). Other sources of gas. Pre-requisite: ENG 207.2, ENG 209.2, PNG 403.1.

PNG 509.2: Industry Safety and Oil Pollution Control (3 Credits)

The operating environment; development of industrial safety, scope and magnitude of the problem; safety regulations. Burning of gases, mechanisms of flame propagation. Fire and explosion, limits of flammability. Toxiaty and toxicology. Labeling and identification of hazardous materials, storage facilities. Industrial fire protection. Causes of oil pollution; blowout, pipeline and

flowline leakages, sour gas production, sea transportation hazards, need for oil spill prevention and control; impact on the environment, ecology. Methods of control; mechanical, chemical and biological. Global pollution problems; government regulations and contingency plants. Clean Nigerian Association (CAN) and other interested bodies.

PNG 510.1: Alternative Hydrocarbon Sources (3 Credits)

World energy sources, natural sources, uses and properties of fossils and other energy sources. Alternative hydrocarbons resources in Nigeria. Exploration and mining of such resources. Existing and proposed industrial processes for conversion of such resources into Engineering materials and energy. Technologies for the use of coal, shale, tar sands and biomass. Economic assessment of hydrocarbon resources. Environmental advantages/disadvantages of alternative hydrocarbons.

PNG 511.2: Multiphase flow in Pipes (3 Credits)

Principles of two-phase flow; the general energy equation; evaluation of friction losses. Single-phase flow variables used in two-phase flow; flow patterns. Horizontal pressure loss prediction methods. Prediction of horizontal flow patterns. Flow through restrictions.

PNG 512.2: Fundamentals of Rock Mechanics (3 Credits)

Fundamentals of rock mechanics, crater formation: plastic and pseudoplastic characteristics of rocks load rate mechanism, static and impact loading; tooth penetration as a function of differential pressure on drilling rate.

PNG 513.2: formation Evaluation II (3 Credits)

Review/overview of basic well logging. We log interpretation methods. Log normalization, cross-plots, computer process interpretation overlays and office processed logs. MWD system. Applications and problems of log interpretation. Production logging; CBL flow meter, temperature logs and other special purpose logs. Recent advances in logging and log analysis such as fluid contacts, water or gas entry points, thief zone, faults identification, permeability anisotrophy. Production logging measurements. Logging while Drilling. Computer aided well log interpretations. Pre-requisite; PNG 402.1.

PNG 514.2: Introduction to Production Optimization (3 Credits)

Principles of well surveillance; Waxy crude oil engineering; nodal analysis; productivity improvement; new developments in production optimization.

PNG 515.1: Formation Damage Assessment and Control (3 Credits)

Well diagnostics; Decline diagnosis; well Performance; Types and Causes of formation damage; Symptoms of formation damage; formation damage control and remedial measures; stimulation solvent washers;. Matrix acidization. Pre-requisite. Good academic standing.

PNG 520.2: Final Year Project (6 Credits)

Independent investigation of petroleum engineering problem under the supervision of an academic staff. Pre-requisite: Good academic standing.

GAS ENGINEERING (GNG)

GNG Gas Engineering Laboratory 1 (2Credits)

Applications for thermometers, pressure gauges, thermocouples, flow meters, and manometers in gas systems. Construction and operation of simple pipelines using steel and plastic pipes, dies and stocks, and pipe wrenches.

GNG 401.1 Industrial Gas Utilization (3 Credits)

Fundamental technologies and Engineering aspects of industrial gas utilization. Relevant aspects of fluid dynamics, hat transfer, combustion, and acoustics, Technology of industrial gas utilization, including refractory materials, burner and furnace design, safety, measurement and control. Gas utilization in the following industries: glass, aluminum, steel,. Fertilizer,

petrochemicals, cement, paper and pulp, power plants, drying, and air conditioning. Temperature control of furnaces; waste heat recovery; efficiency of furnaces. Domestic gas utilization. Effects of gas prices, characteristics and quality. Emphasis will be laid on safety and control.

GNG 4O2.1 Fuel Technology (3 Credits)

Global energy flows. Energy sources and patterns of usage. The technology of energy use. Combustion of fossil bed combustion; combustion of liquid and gaseous fuels. Thermodynamics of combustion. Energy-related environmental problems thermal and air pollution. Methods of reduction alternative energy sources and energy conservation.

GNG 403.1 Gas Engineering Laboratory II (2 Credits)

Measurements of the thermal efficiency of simple gas furnaces. Comparisons of thermal efficiencies of small gas electric furnaces. Safety and control in furnace operation.

GNG 501.1 Catalysis and Fuel Synthesis (3 Credits)

This courses deals with the breaking down less useful fuels into their components and rebuilding them into more useful types of fuel using catalysis. The course equips the gas engineer with the ability to convert and synthesis fuels. It deals also with the production of fuels from plant sources by digestion and fermentation. Coal: classification, fuels derived from coal; carbonization and gasification processes, e.g Lurgi Gasification process. Fischer-Tropsch process; hydrogenation. Petroleum: Origin and production, sampling and testing of liquid fuels; conversion processes, cracking, reforming,

petroleum, chemicals, olefins, aromatic and paraffinic hydrocarbons, synthesis of alcohols, keystone resins and plastics. Synthesis of gases: production of methane and methanol through CO and H_2 reaction, etc.

GNG 502.1 Energy Conservation and Management (3 Credits)

Energy conservation schemes in residential, industrial, transportation, and commercial establishments. Conservation of electricity in electric appliances and air conditioners. Energy conservation through building design. Recycling of waste materials. Energy storage, total energy systems and energy analysis or energy budgeting as tools for energy conservation. Economics of supply and demand. Government policy to promote conservation. Environmental impacts.

GNG 503.1 Gas Engineering Seminar (1 Credit)

Review and presentation of advances in gas Engineering.

GNG 504.2 Energy Law and Policy (3 Credits)

Examination of the energy regulatory process and current laws and policies affecting energy development and use. National and international energy policies; roles of OPEC, APPA, NNPC/NAPIMS, DPR, FEPA. Energy pricing. Petroleum Industry, unions and the communities. Safety, health and environmental consideration in gas exploitation and utilization will be fully addressed.

GNG 505.1 Petrochemical Processes (3 Credits)

Process description for different processes such as cracking and reforming. Feedstocks and products. Mechanisms, temperature and pressure effects where applicable. Reforming catalysis. Dehydrogenation of cychexanes and dehydrocyclisation of paraffin.

Isomerisation of butane, cycloparaffin, alkylation, desulphurization.

GNG 506.1 Pipeline Technology (3 Credits)

Transportation in the petroleum industry. Pipeline design specifications and standards. Rheology, concepts and models. Pipeline design models, conventional models and Energy Cost Optimisation models. Gas pipeline handing facilities, compressors/pumps, sizing, selection and operations. Corrosion control. Pipeline surveillance.

GNG 507.1 Offshore Technology (3 Credits)

The offshore environment. Offshore drilling: Offshore prospecting; offshore rigs; stationary and floating rigs; rig movement and stability; drilling from a Floating vessel; sub-sea BOP stack; marine risers; sub-sea wealhead. Offshore production. Sub-sea well completion methods; offshore processing equipment and design; loading systems and other transportation; multiphase pumping and metering. Offshore operations; logistics, contingency planning; environmental considerations, oil spill and oil removal, corrosion control.

GNG 508.1 Corrosion Engineering (3 Credits)

Fundamental consideration: principles of corrosion; nature of corrosion reaction, anode, cathode, electrolyte; type of corrosion; thermodynamic considerations. Chemistry of corrosion: anode and cathodic reactions; industrial corrosion and causes, galvanic corrosion, crevice corrosion, passivity, corrosion of buried metals (pipelines), bacterial corrosion, atmospheric corrosion (dry corrosion of metals and allows), reaction between metals and oxygen. Oxidation of alloys. Stress corrosion. Corrosion fatigue. Corrosion under moving liquids. Protective corrosion; inhibitive (galvanic) protection; cathodic

protection; protective coatings. Corrosion control and monitoring; monitoring and inspection through maintenance and operational control; importance of corrosion monitoring materials assessment.

GNG 520.2 Final Year Project (6 Credits)

Experimentation, analytical or computational study and research of bachelor's Project.

STUDENT'S ACADEMIC RECORDS (PET)

Name of Student:
Mat. No.:

Academic Session……. Year One 1ST Semester

Course Code	Course Title	Credit unit	Mark	Grade	Quality Point
GES 100.1	Communication Skills in English	3			
GES 102.1	Introduction to Logic and Philosophy	2			
CHM 130.1	General Chemistry	3			
PHY 101.1	Mechanics and Properties of Matter	3			
PHY 102.1	Physics Laboratory I	1			
MTH 110.1	Algebra and Trigonometry	3			
MTH 120.1	Calculus	3			
ENG 101.1	Engineering Drawing I	2			
	TOTAL	**20**			

Year One 2nd Semester

Course Code	Course Title	Credit units	Mark	Grade	Quality Point
GES 101.2	Computer Appreciation and Application	2			
GES. 103.2	Nigerian Peoples of Culture	2			
CHM.131.2	General Chemistry II	3			
PHY. 112.2	Electricity & Magnetism	3			
PHY. 103.2	Physics Laboratory II	1			
MTH. 124.2	Coordinate Geometry	3			
ENG. 102.2	Engineering Drawing II	2			
ENG. 103.2	Engineer-In-Society	1			
ENG. 104.2	Manufacturing Tech./Workshop Practice	2			
	TOTAL	19			

TCU= **TQP=** **GPA=**

STUDENT'S ACADEMIC RECORDS (PET)

Mark	Grade Point	Letter	Description
70% and above	5.0	A	Excellent
60% - 59%	4.0	B	Good
50% - 49%	3.0	C	Average
45% - 49%	2.0	D	Satisfactory
40% - 44%	1.0	E	Pass
0% - 39%	0.0	F	Failure

STUDENT'S ACADEMIC RECORDS (PET)

Name of Student:
Mat. No.:

Academic Session……Year Two1st Semester

Course Code	Course Title	Credit units	Mark	Grade	Quality Point
GLY 201.1	Stratigraphy and Historical Geology	2			
PHY 216	Vibration, Waves and Optics	3			
ENG 201.1	Engineering Mathematics I	3			
ENG 202.1	Engineering Mathematics II	2			
ENG 203.1	Engineering Mechanics	3			
ENG 204.1	Basic Engineering Materials	2			
ENG 210.1	Basic Electrical Engineering	3			
ENG 213.1	Computer Programming for Engineers	2			
	TOTAL	**20**			

Year Two 2nd Semester

Course Code	Course Title	Credit	Mark	Grade	Quality point
CHM 240.2	Physical Chemistry	3			
ENG 206.2	Engineering Mathematics III	3			
ENG 207.2	Basic Fluid Mechanics	2			
ENG 208.2	Basic Strength of Materials	2			
ENG 209.2	Basic Thermodynamics & Heat Transfer	3			
ENG 205.2	Engineering Laboratory I	1			
ENG 211.2	Engineering Laboratory II	1			
ENG 212.2	Community Service	1			
CEG 231.2	Engineering Geology	2			
	TOTAL	**18**			

TCU= **TQP=** **GPA=**

STUDENT'S ACADEMIC RECORDS (PET)

Name of Student:
Mat. No.:

Academic Session…… Year Three 1st Semester

Course Code	Course Title	Credit Unit	Mark	Grade	Quality Point
ENG 301.1	Engineering Mathematics IV	3			
ENG 302.1	Technical Writing and Presentation	2			
CHE 315.1	Transport Phenomena I	3			
CHE 317.1	Separation Processes I	3			
MEG 303.1	Strength of Materials II	2			
PNG 301.1	Introduction to Petroleum Industry	3			
PNG 302.1	Rock and Fluid Properties	3			
PNG 303.1	Petroleum Engineering Laboratory I	2			
	TOTAL	**21**			

Year Three 2nd Semester

Course Code	Course Title	Credit Unit	Mark	Grade	Quality Point
GLY 313.2	Introduction to Geophysics	2			
ENG 303.2	Engineering Mathematics V	3			
CHE 314.2	Transport Phenomena II	3			
PNG 304.2	Drilling Fluids Technology	2			
PNG 305.2	Petroleum Engineering Laboratory	2			
PNG 306.2	Drilling Engineering I	3			
PNG 307.2	Fundamentals of Reservoir Engineering	3			
PNG 308.2	Petroleum Production Engineering I	3			
	TOTAL	**21**			

TCU= TQP= GPA=

STUDENT'S ACADEMIC RECORDS (PET)

Name of Student:
Mat. No.:

Academic Year……..Year Four 1st Semester

Course Code	Course Title	Credit Unit	Mark	Grade	Quality Point
ENG 401.1	Engineering Mathematics VI	3			
ENG 402.1	Engineering Economics	2			
PNG 401.1	Drilling Engineering II	3			
PNG 402.1	Formation Evaluation I	3			
PNG 403.1	Natural Gas Engineering	3			
PNG 404.1	Well Completion and Workers	2			
PNG 405.1	Petroleum Engineering Laboratory III	2			
GLY 401.1	Petroleum Geology	3			
ENG 401.1	Engineering Mathematics VI	**3**			
	TOTAL	**21**			

Year Four 2nd Semester

Course Code	Course Title	Credit Units	Mark	Grade	Quality Point
ENG 400.2	Industrial Training	9			
GES 400.2	Entrepreneurship Project	2			
	TOTAL	11			

TCU= **TQP =** **GPA =**

STUDENT'S ACADEMIC RECORDS (PET)

Name of Student:
Mat. No.:

Academic Year…….. **Year Five 1st Semester**

Course Code	Course Title	Credit Unit	Mark	Grade Point	Quality Point
ENG 501.1	Professional Practice and Procedures	2			
ENG 502.1	Engineering Management	2			
PNG 501.1	Well Testing	3			
PNG 502.1	Petroleum Production Engineering II	2			
PNG 503.1	Enhanced Recovery Methods	3			
PNG 504.1	Computer applications in Petroleum Engineering	2			
PNG 505.1	Seminar/Research Methodology	1			
PNG 510.1	Alternate Hydrocarbon Sources	3			
PNG 515.1	Formation Damage Assessment and Control	3			
	TOTAL	**21**			

Year Five 2nd Semester

Course Code	Course Title	Credit Units	Mark	Grade point	Quality Point
PNG 506.2	Elements of Reservoir Simulation	3			
PNG 507.2	Petroleum Economics & Property Valuation	3			
PNG 508.2	Natural Gas Processing	2			
PNG 509.2	Industrial Safety & Oil and Gas Pollution Control	3			
PNG 5- .2	Elective	3			
GNG 520.2	Final Year Project	6			
	TOTAL	20			

TCU= **TQP=** **GPA=** **FINAL CGPA =**

Class of Degree ……

STUDENT'S ACADEMIC RECORDS (GAS)

Name of Student:
Mat. No.:

Academic Session……. Year One 1ST Semester

Course Code	Course Title	Credit unit	Mark	Grade	Quality Point
GES 100.1	Communication Skills in English	3			
GES 102.1	Introduction to Logic and Philosophy	2			
CHM 130.1	General Chemistry	3			
PHY 101.1	Mechanics and Properties of Matter	3			
PHY 102.1	Physics Laboratory I	1			
MTH 110.1	Algebra and Trigonometry	3			
MTH 120.1	Calculus	3			
ENG 101.1	Engineering Drawing I	2			
	TOTAL	**20**			

Year One 2nd Semester

Course Code	Course Title	Credit units	Mark	Grade	Quality Point
GES 101.1	Computer Appreciation & Applications	2			
GES 103.2	Nigerian Peoples and Cultures	2			
CHM 131.2	General Chemistry II	3			
CHM 132.2	Intro. To Principles of Organic Chemistry	3			
PHY 112.2	Electricity and Magnetism	3			
PHY 103.2	Laboratory Practice II	1			
MTH 124.2	Coordinate Geometry	3			
ENG 102.2	Engineering Drawing II	2			
ENG 103.2	Engineering –in-Society	1			
ENG 104.2	Manufacturing Tech./Workshop Practice	2			
	TOTAL	**22**			

TCU= **TQP=** **GPA=**

STUDENT'S ACADEMIC RECORDS (GAS)

Mark	Grade Point	Letter	Description
70% and above	5.0	A	Excellent
60% - 59%	4.0	B	Good
50% - 49%	3.0	C	Average
45% - 49%	2.0	D	Satisfactory
40% - 44%	1.0	E	Pass
0% - 39%	0.0	F	Failure

STUDENT'S ACADEMIC RECORDS (GAS)

Name of Student:
Mat. No.:

Academic Session……Year Two1st Semester

Course Code	Course Title	Credit units	Mark	Grade	Quality Point
PHY 216	Vibration, Waves and Optics	3			
CHM 260.1	Organic Chemistry I	3			
ENG 201.1	Engineering Mathematics I	3			
ENG 202.1	Engineering Mathematics II	2			
ENG 203.1	Engineering Mechanics	3			
ENG 204.1	Engineering Materials	2			
ENG 210.1	Basic Electrical Engineering	3			
ENG 213.1	Computer Programming for Engineers	2			
PHY 216	Vibration, Waves and Optics	**3**			
	TOTAL	**21**			

Year Two 2nd Semester

Course Code	Course Title	Credit	Mark	Grade	Quality point
CHM 240.2	Physical Chemistry	3			
ENG 206.2	Engineering Maths III	3			
ENG 207.2	Basic Fluid Mechanics	2			
ENG 208.2	Basic Strength of Materials	2			
ENG 209.2	Basic Thermodynamics & Heat Transfer	3			
ENG 205.2	Engineering Laboratory I	1			
ENG 211.2	Engineering Laboratory II	1			
ENG 212.2	Community Service	1			
	TOTAL	**16**			

TCU= **TQP=** **GPA=**

STUDENT'S ACADEMIC RECORDS (GAS)

Name of Student:
Mat. No.:

Academic Session…… Year Three 1st Semester

Course Code	Course Title	Credit Unit	Mark	Grade	Quality Point
ENG 301.1	Engineering Mathematics IV	3			
ENG 302.1	Technical Writing and Presentation	2			
CHE 315.1	Transport Phenomena I	3			
CHE 317.1	Separation Processes I	3			
MEG 303.1	Strength of Materials II	2			
MEG 307.1	Engineering Thermodynamics	3			
PNG 301.1	Introduction to Gas Industry	3			
PNG 302.1	Rock and Fluid Properties	3			
	TOTAL	**21**			

Year Three 2nd Semester

Course Code	Course Title	Credit Unit	Mark	Grade	Quality Point
ENG 303.2	Engineering Mathematics V	3			
CHE 312.2	Separation Processes II	3			
CHE 314.2	Transport Phenomena II	2			
CHE 316.2	Process Instrumentation	3			
PNG 306.2	Drilling Engineering I	3			
PNG 307.2	Fundamentals of Reservoir Engineering	3			
PNG 308.2	Petroleum Production Engineering I	2			
GNG 301.2	Gas Engineering Laboratory I	**3**			
	TOTAL	**21**			

TCU= TQP= GPA=

STUDENT'S ACADEMIC RECORDS (GAS)

Name of Student:
Mat. No.:

Academic Year……..Year Four 1st Semester

Course Code	Course Title	Credit Unit	Mark	Grade	Quality Point
ENG 401.1	Engineering Mathematics VI	3			
ENG 402.1	Engineering Economics	2			
CHE 417.1	Introduction to Polymer Processing	3			
PNG 403.1	Natural Gas Engineering	3			
GNG 401.1	Industrial Gas Utilisation	3			
GNG 402.1	Fuel Technology	3			
GNG 403.1	Gas Engineering Laboratory II	2			
	TOTAL	**19**			

Year Four 2nd Semester

Course Code	Course Title	Credit Units	Mark	Grade	Quality Point
ENG 400.2	Industrial Training	9			
GES 400.2	Entrepreneurship Project	2			
	TOTAL	11			

TCU= **TQP =** **GPA =**

STUDENT'S ACADEMIC RECORDS (GAS)

Name of Student:
Mat. No.:

Academic Year…….. **Year Five 1st Semester**

Course Code	Course Title	Credit Unit	Mark	Grade Point	Quality Point
ENG 501.1	Professional Practice and Procedures	2			
ENG 502.1	Engineering Management	2			
PNG 502.1	Petroleum Production Engineering II	3			
GNG 501.1	Catalysis and Fuel Synthesis	3			
GNG 502.1	Energy Conservation and Management	3			
XXX 5XX.1	Elective	3			
GNG 503.1	Technical Seminar	1			
	TOTAL	**17**			

Year Five 2nd Semester

Course Code	Course Title	Credit Units	Mark	Grade point	Quality Point
PNG 507.2	Petroleum Economics & Property Valuation	3			
PNG 508.2	Natural Gas Processing	2			
PNG 509.2	Industrial Safety & Oil and Gas Pollution	3			
GNG 504.2	Energy Law and Policy	3			
GNG 520.2	Final Year Project	6			
	TOTAL	17			

TCU= **TQP=** **GPA=** **FINAL CGPA =**

Class of Degree ……

STUDENT'S ACADEMIC RECORDS

Name of Student:
Mat. No.:

Academic Year…….. **Year Six 1st Semester**

Course Code	Course Title	Credit Unit	Mark	Grade Point	Quality Point
	TOTAL				

Year Six 2nd Semester

Course Code	Course Title	Credit Units	Mark	Grade point	Quality Point
	TOTAL				

TCU= **TQP=** **GPA=** **FINAL CGPA =**

STUDENT'S ACADEMIC RECORDS

Name of Student:
Mat. No.:

Academic Year…….. **Year Seven 1st Semester**

Course Code	Course Title	Credit Unit	Mark	Grade Point	Quality Point
	TOTAL				

Year Seven 2nd Semester

Course Code	Course Title	Credit Units	Mark	Grade point	Quality Point
	TOTAL				

TCU= **TQP=** **GPA=** **FINAL CGPA =**

APPENDIX A

A. EXAMINATION MALPRACTICE

A.1 Definition of Examination Malpractice

Examination malpractice shall be defined as all forms of cheating, which directly or indirectly falsify the ability of the students. These shall include cheating within an examination hall and any involvement in all examination related offences.

Forms of cheating are categorized as follows:

A.2 Cheating Within an Examination Hall/Room

- Copying from one another or exchanging questions/answer sheets.
- Bringing in prepared answers, copying from textbooks, notebooks, laboratory specimens and any other instructional aides smuggled into the hall.
- Oral/written communication between and amongst students.
- Bringing in prepared answer written on any part of the body.
- Receiving information whether written or oral from any person(s) outside an examination hall.
- Refusal to stop writing at the end, within half a minute in an examination.
- Impersonation
- Illegal removal of answer scripts from the examination hall.
- Non-submission of answer scripts from the examination.
- A check-off system of students who have actually submitted answer scripts should be devised.

- *Extracts from the University Statement of Academic Policies.*

A.3 Another Form of Examination Malpractice

Plagiarism is a form of examination malpractice and should be investigated and punished in the same way as cheating in the examination hall/room.

Plagiarism is the use of another person's work (ie in writing term papers, final year project, seminar presentation, etc) without appropriate acknowledgement (both in the text and in the references at the end).

A.4 Punishment for Examination Malpractice

Any student found guilty of examination malpractice after due process shall be dismissed from the university. This decision shall be pasted on all notice boards throughout the University and shall be contained in each Faculty Prospectus so as to give it the widest possible publicity,

B GUIDE FOR UNDERGRADUATE PROJECT REPORT

B1. Highlight

The Faculty of Engineering with the approval of the Board of Studies in a meeting held in the later part of 1984commissioned the preparation of this manuscript. This is aimed at achieving uniformity in student final year project documentations. The emphasis are direct to the following areas:

- the order off paging for binding;
- the manner of presenting abstract and acknowledgement
- standard format for title and signature page, table of content, conclusion, appendix and reference; and

- general remarks on typing and margins, quality of paper, tables, figures, photographs, equations and total number of pages for the entire text.

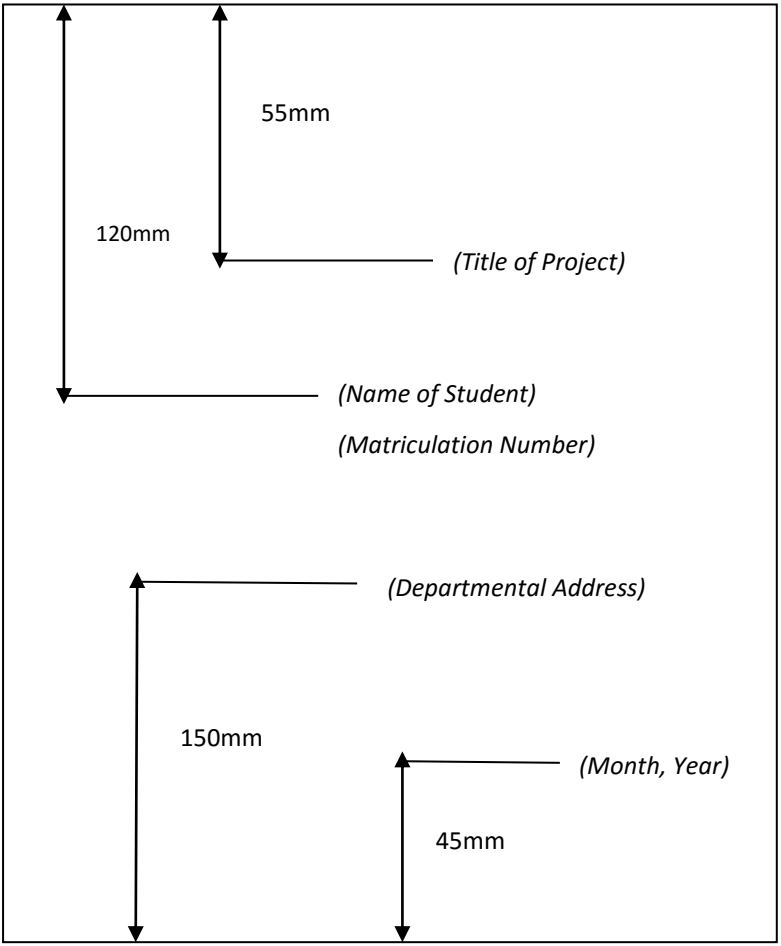
To meet these 'preparation guidelines', students are highly encouraged to work closely with their project supervisors. Final reports must be reviewed and edited for grammatical errors before binding.

B2 Cover Page

Recommended colour is light green. Must be hard cover of quoto size and should bear in print the title of the project (about 55mm from the top and properly corrected). This is immediately followed by student name (about 120mm from the top) and matriculation number (ie double space); the student department, written for example is:

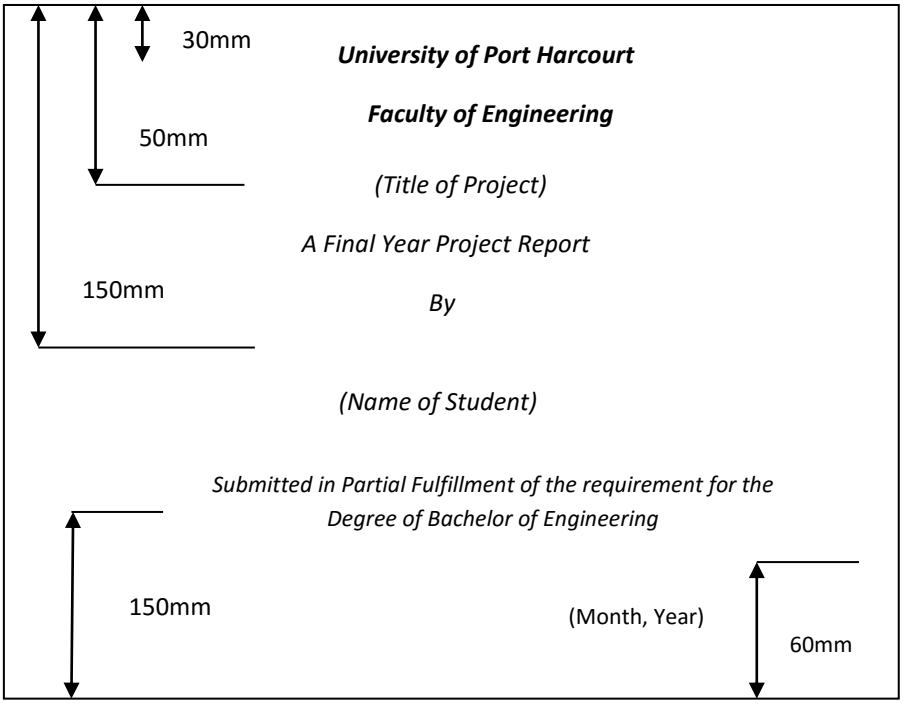
Department of Petroleum Engineering College of Engineering
Faculty of Process & Energy Systems Engineering
University of Port Harcourt

and; finally the month and year of graduation (about 45mm from the bottom), see Figure B1.


55mm
120mm
(Title of Project)
(Name of Student)
(Matriculation Number)
(Departmental Address)
150mm
(Month, Year)
45mm

B.3 Title Page

This should contain the following items: title of the project, name of the author, year and some inscription as shown in Figure B.2



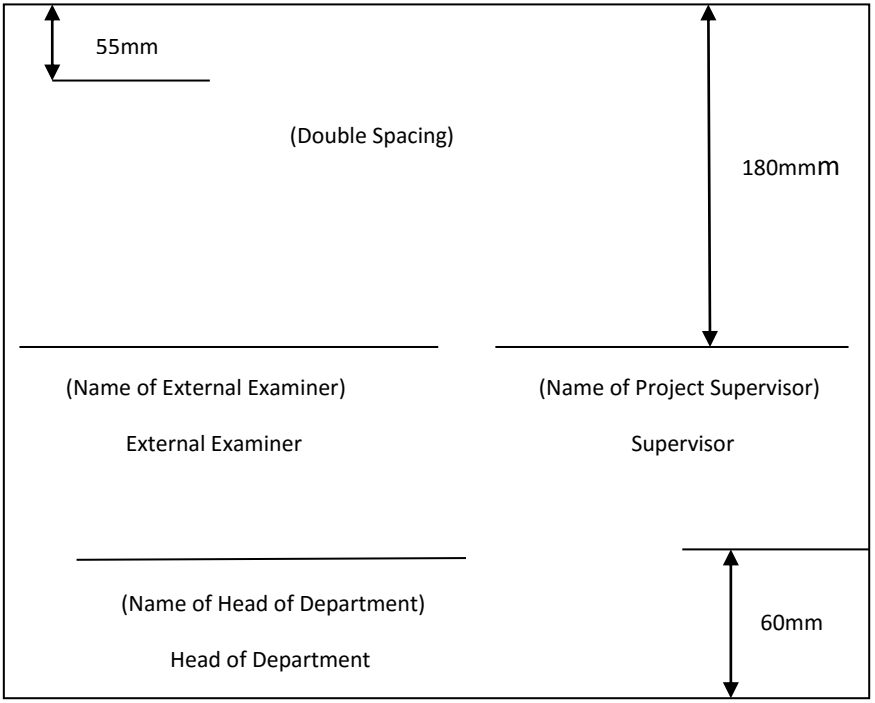
B.4 Dedication Page

Where need be, students who wish to dedicate their project report are free to do so. This should be type-written at the center of the page leaving equal spacing above and beneath.

B.5 Signature (Approval) Page

It should be on a separate page. Required signature must be obtained after the entire report has been edited, corrected and approved by the project Supervisor, Head of Department, External Examiner and probably the Dean of the Faculty. The recommended format is shown on the specimen copy in Figure B3.

B.6 Acknowledgement Page



Number of lines is limited to the range of 10 and 12. This should reflect appreciation directed to all those individuals who offered significance to the student project. And where the project is funded (matching grants, allotment grants, Faculty or University incentive fund, etc) a note of thanks will be worthwhile.

B.7 Abstract Page

The abstract write-up should not be a mere summary of the project findings. Description should reflect the scope, method of study and results. A well-written abstract affords the readers a quick overview of the project methodology and what it wishes to accomplish (Nwangozie, 1986; Houp and Pearsall, 1973; Menzel and others, 1961). The entire text need not be acceptable, it should not exceed 150 words.

B.8 Table of Content

The following standard format is recommended.

Abstract
List of Figure
List of Table
List of Plates (Photographs)

1. Introduction
   Background
   Area of study
   Study objectives
   Scope of work
   Methodology
2. Literature Review
3. Main Body
4. Summary and Conclusion
5. References

6. Appendices
7.

Note: Appendix is most appropriate for description of tedious equations or other pertinent information considered inadequate for the main text (chart, major calculations, etc)

B.9 Main Body

The main body of the report should be divided into convenient chapters as listed in the table of content. Each chapter can be sub-divided and given appropriate sub-headings. Where applicable, sub-headings. And sub-headings can be employed. Students are highly encouraged to discuss with their project supervisor on relevant style. The recommended format for uniformity sake is:

3.1

(Onyekonwu, 1994; Nwaogozie 1992; Pruitt, 1985, Gunning, 1968):

Chapter 3

3.1 (Sub-heading)
3.1.1 (Sub-sub-heading)
etc.
3.2 ……
etc.
Use Arabic numbering system.

B.10 Conclusion

Should be a summary of the project findings. Significant results should be itemized.

Recommended format:

Based on the results of this study, the following conclusions can be drawn:

- Nigerian engineers should register with professional bodies for proper implementation of the code of practice and ethics.
- To enhance Engineering research in Nigeria, government as well as private support is vital, etc.

B.11 References

Should confirm with the standard format for journals, Conference Proceedings, Seminars Books, Monographs, etc. (Onyekonwu, 1994; Nwaogazie, 1992; Pruitt, 1995; Gunning, 1968):

1. Journal

The last name(s) of author(s) should be written first, followed their initials, in
year brackets, title of the paper, abbreviations for the journal name, volume, and
the page Abbreviations for each journal should conform to the standard format for
the particular Journal. Students are advised to see how they are abbreviated and
referenced.

Example:

Smith, J. A. and Jone, A. K. (1982): "Combustion of Kerosine", J. Oil and Gas, Vol. 3
pp. 210-215.

2. Book

Authors last names first, followed by their initials, year in brackets, title of book
(underlined or printed in bold face), edition, publisher, city and page.

Example 1:

James, B. A, (1975): Fluid Mechanics, 2nd edition, McGraw-Hall Publishers, New
York, p. 247.

Example1:

Spiers, H. M., Jr. (1961): technical Data on Fuel, The British National Committee on
Energy,London.

3. Conference Proceeding

Authors' last names first, followed by their initials, year in brackets, title in quatation Sign, abbreviations for the proceeding volume and page.

Example 1:

Baker, R.A. (1974); "Design of a Digital System", Proc. R. Soc., London, 292, pp 45-99.

Example 2:

Spiff, R.B. (1983): "Furnace performance", 19th Symposium (International) on Combustion. The Combustion Institution, pp. 1021-1036.

4. Report

Should confirm with the standard format for the particular type of report (memorandum Technical, etc.)

Example:

Kofi, A.K. (1975): Agip Memorandum Report, No. ANL-031

5. Seminar

Should include the names of author(s), the title of seminar, the theme of the seminar and the date.

Example:

Adegoke, S. R. (1984): "Role of Management in Power Generation", Seminar on Electric Power Systems, University of Port Harcourt, Port Harcourt.

6. Personal Communcation

This concerns information collected through personal interview or oral conversation and can be referenced as follows:

Example

Nwachukwu, C. C. (1985): Personal Communication, Department of Management University of Port Harcourt, Rivers State, Port Harcourt.

7. Referencing in Text

Referencing in the text serves the purpose of crediting the original source of Information cited. In presenting "Literature Review" or the body of the report, Information such as: previous research findings, sources of governing equations to be used, etc. must be referenced. Recommended format: write the surname o of the author(s), immediately followed by the year of publication in parenthesis.

some sample of popular referencing techniques are presented below (Nwaogazie, 1992):

i. Single Author

(a) The variational principle is based on the works of Rayliegh (1877) and Ritz (1909).

(b) Puls (1928) establishment a curve of relation….

(c) The method of characteristics is highly suitable for rapidly varied flows (Amein, 1966)

(d) Interested readers are referred to the basic texts on hydrology (Chow, 1964; Viessman, 1972).

N/B: If an author has more than one publication, in the same year; to be referenced use alphabets such as 1984a, 1984b, 1984c, etc. to distinquish them.

ii. Two Authors

(a) Amein and Fang (1969) also used an implicit scheme in solving…….

(b) The major criticism of this approach is that it may not yield a general scheme (Desai and Christian, 1977; Oden and Fost, 1973)

iii Three or More Authors

Name only the first author and use "and others" to replaced the rest of the authors' names:

(a) Isaacson and others (1954, 1956) investigated……..

(b) The early works of Zienkwiez and others (1966), Javandel and others (1968)…….

iv Personal Communication

Referencing personal communication in the text is similar to item (i)through (iii) as may be applicable: The field data were provided by Nwachukwu (1985)

N/B: In the References, all the publications or works referred to in the text must be arranged with the author' surnames in the alphabetical order.

B.12 General Remarks

1. **All project documentation** should be limited to 30-50 pages. Sentences should be geared towards explaining an idea or directed to a concept or objective flamboyant expressions should be avoided.

2. Drawing: major drawings should be on a full page as figure with a title placed beneath. This is where Engineering drawing finds significant utility and such skills must be demonstrated. Avoid drawing on stencils.

3. **Quality of Paper:** We suggest quarto (white in colour) because of its availability and low cost.

4. **Typing Margins:** Should be double spacing, enough margins should be left at the four adjoining corners of the page. For a chapter page, top margin willordinarily be 38mm. However, margin to the left side will be about 38,, all pages to allow enough clearance for binding, whereas 25.4mm suffices as the right side margin.

5. **Tables:** All tables and figures should meet the margin specifications or otherwise should appear in the appendix. Suggested title format for tables:

Table 1: Rainfall-runoff Components of flood modeling.

6. **Equations:** For sake of convenience in referencing, mathematical equations should be numbered consecutively for each chapter. For instance, chapter 3: MODEL DEVELOPMENT ten equations are found and are numbered as follows: 3.1, 3.2, 3.3, …..3.10. This numbering technique has the advantage of associating equations to respective chapters where they first appeared, thus, enabling easy referencing. For chemical equations

(reaction-type-equations), the above numbering technique applies, in addition to the inclusion of letter "R" before the number. The format for referencing equations in the text is as follows:

(a) Equation (3.1) implies that…….

(b) The computer program solution of Equation (3.8) is facilitated by the use of …….

N/B: Do not abbreviate equation in the text; for example, Eqn. (3.1), Eq (3.1) (3.1) or (3.1) is unacceptable.

B.13 Order of Paging for Binding

The following order should be followed:

1. Title page
2. Dedication page
3. Approval (Signature) page
4. Acknowledgement page
5. Abstract page
6. Table of Content
7. List of Figures
8. List of Tables
9. Body (Text)
10. Summary and Conclusion
11. References
12. Appendices