UNIVERSITY OF PORT HARCOURT

DEPARTMENT OF
SCIENCE LABORATORY TECHNOLOGY
FACULTY OF SCIENCE

STUDENT'S HANDBOOK
JUNE, 2016

PREFACE

This prospectus contains information on the various courses offered at different levels in the Department and their descriptions. It also contains existing regulations governing the student's academic programmes. It is necessary for students to acquaint themselves with all the information contained in this handbook. This knowledge will help the students go through their chosen programme with little or no problem and equip them with the ability to be the technologist of tomorrow and therefore achieve their main objective of acquiring degree in the Department of Science Laboratory Technology, University of Port Harcourt.

Welcome on board the ship of Technologists! Best wishes!!

PROFESSOR GRACE D. B. AWI-WAADU
B. Sc. (Ibadan) M.Sc., Ph. D (Aberdeen)
HEAD, DEPARTMENT OF SCIENCE LABORATORY TECHNOLOGY
June, 2016

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1.0 INTRODUCTION

There is an increasing demand for technologists in today's Nigeria. Despite the seeming industrial and economic stagnation between the 1980s and the early 1990s, Nigeria has witnessed some level of industrial growth in the period after. This has increased the demand for the middle and top level man power, to man the industries arising from this growth. Science laboratory technologists play a very important role in meeting the needs of these industries. However, the production of this caliber of manpower has not risen with Nigerian industrial capacity needs. There is therefore lack of manpower to develop our own indigenous technology in order to translate the country's dreams of technological transformation into reality.

1.1 BACKGROUND

The Department of Science Laboratory Technology (DSLT), University of Port Harcourt was formally known as the Institute of Science Laboratory Technology (ISLT). It was housed in the Faculty of Science of the University of Port Harcourt.

The SLT programme started in 1978 with the cooperation of the Nigerian Institute of Science Laboratory Technology (NISLT) as a preparatory programme for NISLT Basic Technology certificate (BTC), Intermediate Diploma (ID) and Final Diploma (FD) qualifying examinations. This was upgraded to award of National Diploma (ND) and Higher National Diploma (HND) in 1998/1999 session, after the evaluation and accreditation of the programme by the National Board for Technical Education (NBTE).

Following the decision of the National Board for Technical Education (NABTE) to stop the recognition of Diploma Graduates from Nigerian Universities, but only those of the Polytechnics from 2005, the Senate of the University mandated the restructuring of the Institute of Science Laboratory Technology to draw up curricula for certificate and degree programmes in Science Laboratory Technology that would enable it maintain its viability.

In 2011, the Senate of the University of Port Harcourt graciously approved the establishment of the Department of Science Laboratory Technology (DSLT) to run the Bachelor of Technology (B. Tech.) degree in Science Laboratory Technology with specialization in any of the following options:
Biochemistry and Chemistry Technology
Biomedical Technology
Geology and Mining Technology
Industrial Chemistry and Petrochemical Technology
Microbiology Technology
Physics with Electronics Technology

PREVIOUS DIRECTORS OF THE INSTITUTE OF SCIENCE LABORATORY TECHNOLOGY

PROF. T.M. ABBEY	1998-2002
PROF. L.O. ODOKUMA	2002-2005
PROF. B.C. NDUKWU	2005-2010
PROF. A.E. ATAGA	2010-2012

SUCCESSIVE HEADS OF DEPARTMENT OF THE SLT DEPARTMENT
PROF. A.E. ATAGA 2012-2014
PROF. G.D.B. AWI-WAADU 2014-DATE

VISION OF THE DEPARTMENT:
The vision of the Department is to become the foremost institution of excellence in the training of world class science laboratory technologists who will be creative and innovative.

MISSION OF THE DEPARTMENT:
The Department of Science Laboratory Technology has a mission to be an institution that is technologically and professionally sound, committed to pursuit of academic innovation and practical skills through excellence in teaching, research and community service.

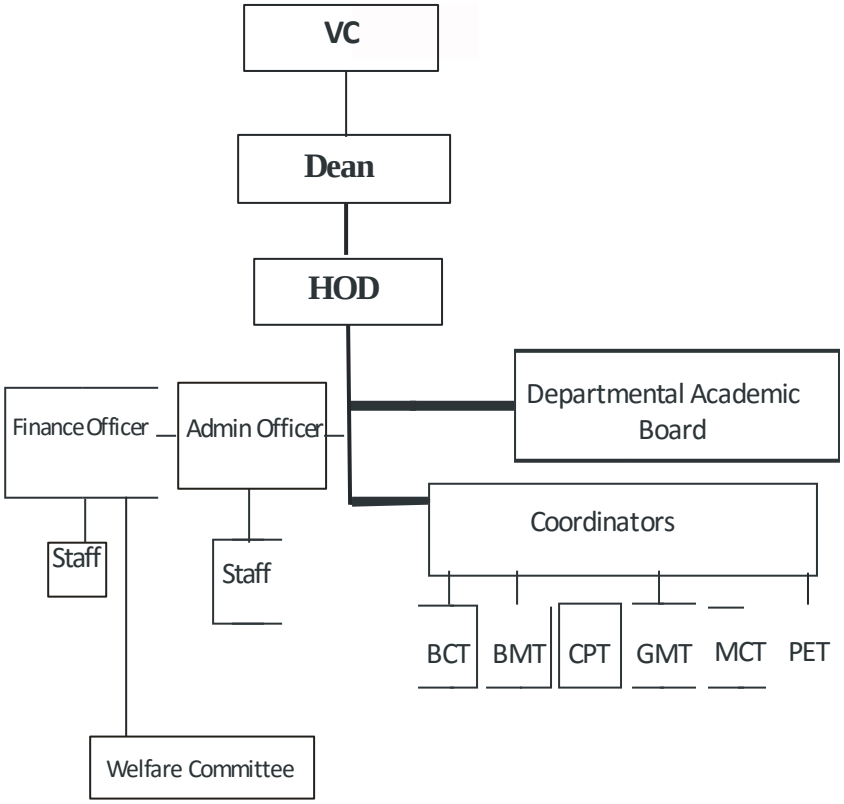
PHILOSOPHY OF THE DEPARTMENT:
The philosophy of the Department of Science Laboratory Technology is to produce Science Laboratory Technology graduates with requisite practical skill, knowledge and competence to manage institutional, industrial and research laboratories and workshops.

OBJECTIVES:
The objectives of the Department are to:

i. Educate and train science laboratory technologists with the requisite practical skills, knowledge and competence to manage institutional, industrial and research laboratories and workshops;
ii. Produce science laboratory technologists with capacity to design, develop, test, produce and maintain devices, systems and products that are beneficial to the human race;
iii. Produce science laboratory technologists with capacity to design, execute and coordinate science –based experiments and research in the laboratories and workshops
iv. Train science laboratory technologists with requisite skills for purchase and maintenance of stock of laboratory and workshop materials
v. Ensure socio-economic relevance of the academic programme with particular reference to the capacity of graduates for self-employment and the needs of employers of labour
vi. Enhance sustainable national development through research.
vii. Identify the scientific and technological needs and problems of the Society and strive to find solutions to them in a quest to facilitate national development.

Graduates of Science Laboratory Technology are expected to have the ability to apply knowledge and skills to solving theoretical and practical problems in Science Laboratory Environment in relation to national and societal problems.

2.0 DEPARTMENT ORGANISATIONAL STRUCTURE



The Department is administered by the HOD who is the administrative and academic head of the Department. The Head is actively assisted by the Coordinators of programme options, Administrative Officer, the Department Board and various Departmental committees. Specific guidance and leadership in the various options would be provided by the Coordinators who are in-charge of the day-today needs of their programme options. Students are expected to direct all academic matters to their Coordinators in the first instance.

2.1 UNIVERSITY OF PORT HARCOURT
DEPARTMENT OF SCIENCE LABORATORY TECHNOLOGY
DEPARTMENT ADMINISTRATION

LIST OF ACADEMIC STAFF, DSLT

No	NAME OF STAFF	QUALIFICATION	FIELD OF SPECIALIZATION	RANK
1	PROF.(MRS.) G.D.B. AWI -WAADU	B. Sc. (Ibadan) M. Sc. Ph. D (Aberdeen)	Animal Ecology	PROFESSOR/HOD
2	PROF. A.E. ATAGA	B. Sc., M. Sc., (Jos), Ph. D (Manchester)	Plant Pathology	PROFESSOR
3	PROF. T.M. ABBEY	B. Sc. (UPH); M. Sc., Ph. D (Ibadan)	Applied Physics	PROFESSOR
4	PROF. V.U. UKAEGBU	B. Sc. UPH M. Sc. (Jos) PhD (UPH)	Mineral Exploration/ Mining Geology	PROFESSOR
5	PROF. LEO OSUJI	B. Sc., UPH; M. Sc., Ph. D Ibadan	Petroleum/ Environmental Chemistry	PROFESSOR
6	PROF. O.E. ABUMERE	B. Sc. (Ife); Ph. D (Manchester)	Solid State Physics	PROFESSOR
7	PROF. C.C. MONAGO	B. Sc., M. Sc., PhD (UNN) AIMLS	Medical Biochemistry/ Toxicology	PROFESSOR
8	PROF. A. NWAFOR-CHUMUERE	Ph. D	Membrane Physiology	PROFESSOR
9	PROF. D.V. DA PPER	B. Med., MBBS, M. Sc., MD	Blood Physiology	PROFESSOR
10	DR. I.P. OKOYE	B. Sc. (Benin), M. Sc., Ph.D. (UMIST)	Petroleum Chemistry	READER
11	DR. C.J. OGUGBUE	B. Sc. (ABSU), M. Sc., PhD (UPH)	Environmental Microbiology and Toxicology	SNR. LECTURER/ Coordinator, MCT
12	DR, C.N. EHIRIM	B. Sc., (ABSU); M. Sc. (FUTO); PhD (UPH)	Applied Geophysics	SENIOR LECTURER/ Coordinator, Physics/Electronics Tech. (PET)

13	DR. B.S. KINIGOMA	B. Sc. (UST), M. Eng., PhD (UPH)	Oil/Gas & Environmental Techn ology	SENIOR LECTURER/ Coordinator, Industrial Chemistry/Petroch emical Tech. CPT
14	DR. O.M. ADIENBO	B. Sc., MBBS (UPH), MB, B.ch (Cal.) PhD (UPH)	Reproductive Physiology	SENIOR LECTURER/ Coordinator, Biomedical Tech. (BMT)
15	DR. K.O. MONAGO	B. Sc. (Nigeria), M. Sc. PhD (London)	Process Dev. & Applied Thermodynamics	SENIOR LECTURER/ Coordinator, Biochemistry/Che mistry Tech (BCT)
16	DR. J.I. NWOSU	M. Sc. (Moscow) PhD. (St. Petersburg)	Mining Engineering	SENIOR LECTURER/ Coordinator, Geology/Mining (GMT)
17	DR. C. ARIOLE	B.Sc., M.Sc., Ph.D (UPH)	Environmental Microbiology	SENIOR LECTURER
18	DR. F.S. IRE	B. Sc., M.Sc., Ph.D (UNN)	Industrial Microbiology	SENIOR LECTURER
19	DR. H. STANLEY	B. Sc. (UPH), PGDE (Unical) MEM (AAU)	Environmental Microbiology	SENIOR LECTURER
20	DR. B.C. BELONWU	B. Sc. M.Sc. PhD	Environmental Biochemistry	SENIOR LECTURER
21	DR. (MRS.) A. JAMES	B. Sc. (Osu), M. Sc. (UPH), Ph. D (Ibadan)	Inorganic /Corrosion Chem.	SENIOR LECTURER
22	DR. (MRS.) M. IBEZIM-EZEANI	B. Sc., M. Sc., PhD (UPH)	Physical Chemistry	SENIOR LECTURER
23	DR. M.K. ODUOLA	M. Sc. (Pet Eng.), Ph.D (Chem .	Chemical Engineering	SENIOR LECTURER
24	DR. S.A. UGWU	M. Sc. PhD (Nig.)	Geophysics	SENIOR LECTURER
25	DR. N.E. EKEOCHA	B. Sc., M. Sc., PhD (UPH)	Engineering Geology	SENIOR LECTURER
26	DR. E.O. CHUKWUOCHA	B. Sc., M. Sc., PhD (UPH)	Solid State Physics	SENIOR LECTURER

27	DR. E. OSAROLUBE	B. Sc. Tech. (FUTO); M. Sc. (Ibadan)	Material Physics	SENIOR LECTURER
28	DR. Y.E. CHAD-UMOREN	B. Sc. (UST), M. Sc., PhD.	Nuclear Physics	SENIOR LECTURER
29	DR. P.I. ENYINNA	B. Sc. (Unical), M. Sc., PhD. (UPH)	Environmental Physics	SENIOR LECTURER
30	DR. C.W. PAUL	B. Sc. (UPH), MBBS (Benin), M. Sc.	Anatomy	SENIOR LECTURER
31	DR. J. APRIOKU	B. Pharm. (Benin), M. Sc., PhD. (UPH)	Pharmacology	SENIOR LECTURER
32	DR. E. NWAICHI	B.SC., M.SC., Ph.D (UPH)	Nutrition/Toxicology	LECTURER I
33	DR. A.E. ABAH	HND, ANIST, AIMIS, PGDM, M.Sc.; M.Sc.; PhD (UPH)	Microbiology/ Parasitology	LECTURER I
34	DR. N. EGESI	B. Sc., M. Sc. (Jos)	Structural Petrology&	LECTURER I
35	DR. J.A. AMUSAN	B. Tech. M. Sc.	Electronics & Renewable Energy	LECTURER I
36	MR. H.P. OBONG	B. Sc. (Unical) M. Sc. (UPH)	Theoretical Physics	LECTURER I
37	DR. E. OSUNWOKE	B. Sc., Med. Sc. PhD	Developmental Anatomy & Medical	LECTURER I
38	DR. H.O. NWANKWOALA	B. Sc. (UPH), M. Sc. (RUST), PhD (UPH)	Environmental Geology	LECTURER I
39	DR. K. O. OKENGWU	B. Sc. (Unical), M. Sc.; PhD (UPH)	Sedimentology	LECTURER I
40	MRS. J. ONWUALU	B. Sc. (NAU), M. Sc. (RUST)	Petrology	LECTURER I
41	DR. U. CHUKWU	B. Sc. (NAU), M Sc. PhD (UPH)	Inorganic Chem.	LECTURER I

42	DR. C. OSU	B. Sc. (ABSU), M. Sc. PhD (MOUA)	Environmental Chemistry	LECTURER I
43	DR. O. ACHUGASIM	B. Sc. (Unical), M. Sc.(UPH), PhD (UPH)	Organic Chem.	LECTURER I
44	DR. P.C. IBEACHU	B. Sc., M.Sc., PhD (UPH)	Developmental Anatomy	LECTURER II
45	MR. I.P.C. OKORIE	B. Tech. M. Sc.	Applied Geophysics	LECTURER II
46	DR. R. OHIRI	B. Sc., M. Sc.	Environmental Biochemistry	LECTURER II
47	MR. G.C. ONWUGBUTA	B.Sc., M.Sc. (UPH)		LECTURER II
48	DR. O.N. AKOMAH, ONYINYECHI	ND-SLT, B.Sc.; M.Sc.; PhD (UPH)	Microbiology Technology	LECTURER II
49	DR. C.C. NWANKWO	OND; HND; M.Sc.; PhD. (UPH)	Microbiology Technology	LECTURER II
50	MR. J.C ISIRIMA, JOSHUA	HND, PGD, M.Sc. (UPH)	Physio/Pharm	LECTURER II
50	DR. R.U. IDEOZU	B. Sc., M. Sc. (UPH)	Sedimentology	LECTURER II
51	MR. V. AIMIKHE	B. Eng. M. Eng.		LECTURER II
52	MR M. ACHADU	B. Eng. (Minna), M. Eng. (UPH)	Chemical Engineering	LECTURER II
53	MR. A.D. OSAYANDE	B. Sc., M. Sc. (Benin)	Env. Geology	ASSISTANT LECTURER
54	Ms. H.O. NNADI	HND, PGD, AIMLS, FNISLT, M.Sc.,	Hematology, Physio/Pharm	ASSISTANT LECTURER
55	MS. P.E. DIKE	B. Tech. (UPH)	Microbiology Technology	ASSISTANT LECTURER
56	MR. C.D. ONWUKWE	B. Tech. (UPH)	Microbiology Technology	ASSISTANT LECTURER
57	MR. J.M. OGUGUA	B. Tech. (UPH)	Physics with Electronics Technology	ASSISTANT LECTURER
58	MR. E.M. SAM	B. Tech. (UPH)	Geology/Mining	GRAD. ASSISTANT

59	MRS. T.O. ADEOTI	B. Tech. (UPH)	Biochemistry/Chemistry Technology	GRAD. ASSISTANT
60	MR. T.E. AMAKOROMO	B. Tech. (UPH)	Physics with Electronics Technology	GRAD. ASSISTANT
61	MR. I. UCHEGBULAM	OND-SLT, B. Eng.	Physics with Electronics Technology	GRAD. ASSISTANT
62	MRS. B.U. OGWU	B. Tech. (UPH)	Microbiology Technology	GRAD. ASSISTANT
63	MR. C. O. WODU	B. Tech. (UPH)	Biomedical Technology	GRAD. ASSISTANT
64	MR. E. OLOMU	B. Tech. (UPH)	Industrial Chemistry/Petrochemical Technology	GRAD. ASSISTANT

LIST OF DSLT ADJUNCT ACADEMIC STAFF

S/No	NAME OF STAFF	QUALIFICATION	FIELD OF SPECIALIZATION	RANK
1	PROF. G.J. UDOM	B. Sc., M. Sc. (Unical), PhD (Unical)	Hydrogeology	ADJUNCT/ PROFESSOR
2	PROF. JOEL OGBONNA	B. Tech. Chem. Eng. (UST), M. Sc., Eng. Mgt. (Uniben), PhD Pet./Chem. (UST)	Gas Engineering Drilling & Environmental Engineering	ADJUNCT/ PROFESSOR

UNIVERSITY OF PORT HARCOURT
DEPARTMENT OF SCIENCE LABORATORY TECHNOLOGY

LIST OF NON - TEACHING STAFF, SSLT

S/NO.	STAFF NAME	RANK/DESIGNATION
1.	MR. G.O. UDOAKANG	PRINCIPAL ASSISTANT REGISTRAR
2.	MR. A.N. WUGO	SENIOR ACCOUNTANT

3.	MR. K.C. NAA-IRI	PERSONAL SECRETARY I
4.	MR. N.E. OKERE	SENIOR ACCOUNTANT
5.	MRS. E.C. WORGA	ASST. REGISTRAR
6.	MR. M.C. ARINZE	SENIOR EXECUTIVE OFFICER
7.	MRS. B.B. NWIKANA	ACCOUNTANT I
8.	MRS. I.B. ALIEZI	ADMIN. ASSISTANT
9.	MRS. R.O. AJUNWA	ADMIN. ASSISTANT
10.	MR. S.E. NAGI	HIGHER EXECUTIVE OFFICER
11.	MRS. C.B. NKWO	CHIEF CLERICAL OFFICER
12.	MRS. F.C. ANUKAM	CHIEF CLERICAL OFFICER
13.	MRS. B.O. IGWE	SNR. CLERICAL OFFICER I
14.	MS. L.B. ADOUBU	COMPUTER OPERATOR II
15.	MS. P.W. ANELE	MESSENGER/CLEANER
16.	MR. A. ISRAEL	HEAD DRIVER
17.	MRS. J. JAMES	MESSENGER/CLEANER

2.2 COORDINATORS OF PROGRAMME OPTIONS

S/N	NAME	QUALIFICATION	OPTION
1	Monago, K. O	B. Sc. (Nigeria), M. Sc. PhD (London)	Coordinator for Biochemistry/Chemistry Tech. (BCT)
2	Adienbo, O. M.	B. Sc., MBBS (UPH), MB. B.Ch (Cal.) PhD (UPH)	Coordinator for Biomedical Tech. (BMT)
3	Nwosu, J. I. .	M.Sc. (Moscow) PhD (St. Petersburg)	Coordinator for Geology/Mining Tech. (GMT)

4	Kinigoma, B. S.	B. Sc. (UST), M. Eng., PhD (UPH)	Coordinator for Industrial Chemistry/Petrochemical Tech. (CPT)
5	Ogugbue, C. J.	B. Sc. (ABSU), M. Sc., PhD (UPH)	Coordinator for Microbiology Tech. (MCT)
6	Ehirim, C. N.	B. Sc., (ABSU), M. Sc. (FUTO), PhD (UPH)	Coordinator for Physics/Electronics Tech. (PET)

2.3 DEPARTMENT ACADEMIC BOARD COMPOSITION

i. Head of Department

ii All Coordinators of programme options

iii. All full-time lecturers of the Department

iv. Departmental Administrative Officer –Secretary

2.4 List of Technical Staff

S/N	NAME	RANK	QUALIFICATION	FIELD OF SPECIALISATION
1	MR. M.D. GWOTMUT	Chief Medical Lab, Scientist	B.Sc. Biology (M.Sc. (E.d), Ph.D. (In View), AMLSCN. FISLT	Biomedical Tech niques
2	MR. J.N. GBARALE	Chief Tech nologist	HND, AISLT	Ind. Chem./Petr ochem. Techniques
3	Mr. H. O. ERUOTOR	Assistant Chief Med. Scientist	HND (Physio-Pharm), AISLT FMLSCN, M.Sc. (in view)	Biomedical Tech niques
4	MRS. E.C. UWAJINGBA	Assist. Chief Technologist	HND, AISLT	Ind. Chem./Petroche m. Techniques

5	MR. P.O. UGWUANYI	Asst. Chief Technologist	FIN. DIP (HND) INTERMEDIA E DIP (OND)	Physics with Electronics Techniques
6	MRS. F. OSAKUADE	Chief Medical Scientist		Microbiology Tech niques
7	MRS. S. HORSFALL	Chief Medical Scientist		Microbiology Tech niques
8	MR. KINGSLEY WORDU	Principal Technologist		Geology/Mining Techniques
9	MRS. O.F. UKONU	Technologist II		Biochemistry/Che mistry Techniques
10	MR. P.T.N.C. TAKIRO	Technologist II		Biochemistry/Che mistry Techniques
11	MR. M. CHRISTOPHER	Senior Laboratory Supervisor		Geology/Mining
12	MRS. O.P. ELENWO	Principal Technologist	INTERMEDIATE DIP (OND) HND, B. Tech. (UPH)	Physics/Electronics Techniques

3.0 GENERAL INFORMATION

3.1 ADMISSION REQUIREMENTS

3.1.1 DEGREE PROGRAMME (Bachelor of Technology in Science Laboratory Technology)

The minimum duration of this programme is five years. For admission into the degree programme in Science Laboratory Technology, a candidate must have the Senior Secondary School Certificate (SSCE) or its equivalents with credit level passes in five (5) subjects: English Language, Mathematics, Physics, Chemistry and Biology. The candidate must also earn an acceptable score in the Unified Tertiary Matriculation Examination (UTME).

The degree programme is full-time at the end of which the candidate is awarded Bachelor of Technology in Science Laboratory Technology with specialization in any of the following options:

* Biochemistry and Chemistry Technology
* Biomedical Technology
* Geology and Mining Technology
* Industrial Chemistry and Petrochemical Technology
* Microbiology Technology
* Physics with Electronics Technology

3.2 DEFERMENT OF ADMISSION

A candidate who is offered admission and is qualified at the time, but is unable to take up the offer at the required time may have the admission deferred. Note that the only way the University can certify that the candidate is qualified is for the candidate to have gone through the registration exercise before applying for deferment. In all cases, request for the deferment must be made by completing the application form online and processing the hard copy of the form obtained from the Admission Office.

3.3 ACCOMMODATION

There are students hostels located in the three main campuses of the University: Choba, Delta and University Parks. The hostels at Delta Park and the Dan Etete hall are for female undergraduates, while those at Choba and University Parks are for male undergraduates. There is accommodation for Post-graduate students in the University Park also. Allocation of spaces in the halls of residence is the direct responsibility of Students' Affairs Department which is located in Choba Park. Hostel allocation is based on the Students' Affairs own guidelines.

Only first year students are accommodated in these hostels. In any case, the physically challenged and students who engage in sports and represent the University in sporting outings are considered first in the remaining available space allocations.

As a rule, squatting is prohibited and an allotee may lose his/her space if found guilty of squatting any student.

Off-campus accommodation is available within the vicinity of the University through private arrangements between the candidates and the landlords.

3.4 REGISTRATION

3.4.1 University Registration

Registration of both fresh and returning students is online. The initial stages of registration for in-coming first year students are normally conducted by the Admissions Office. It is located in Delta Park. Registration goes through stages there and directives are normally circulated as to what to do at each stage. Registration of students by various Faculties started from 1993/94 academic year.

3.4.2 Faculty Registration

On completion of the University registration above, students are required to go to their respective Faculties where further registration is done. It is therefore mandatory for each student to be registered into the Faculty where a file will be opened for him/her. The prospective students are therefore expected to report to the Administrative Office with all the documents generated from on line registration.

3.4.3. Departmental Registration

At the end of the Faculty registration, the student is required to go to his/her Department to complete the registration exercise by registering courses for the session.

3.4.4 Registration of Courses

Course registration must be promptly completed online and course forms generated are submitted to the programme Coordinators on time. Contact your Coordinator of programme option for the list of approved courses to be registered.

3.4.5 Student Workload

Every student is required to register a minimum of 15 Credit Units per semester and a maximum of 24 Credit Units. Under no circumstance should a student register more than 48 Credit Units per session.

3.4.6 Registration Period

Students are further required to register for all courses during the time stipulated, which is usually at the beginning of the session (first week of the academic year). Students who cannot register during the specified time, however, can register later on payment of late registration fee. All registration

procedures must be completed within the time allowed for late registration (second week of the Academic year).

ANY REGISTRATION COMPLETED AFTER THE TIME SPECIFIED WILL BE NULL AND VOID AND WILL NOT BE CREDITED TO THE STUDENT EVEN WHEN HE/SHE HAS TAKEN AND PASSED THE SPECIFIED EXAMINATION IN THE COURSES.
For further information on registration, please refer to the current Statement of Academic Policy.

3.5 Lectures
Attendance to lectures is mandatory and every course shall be continuously assessed and examined at the end of semester in which it is given. Failure to obtain a minimum of 75% attendance to lectures denies the student the entitlement to take examination in such courses.

3.6 Timetable
A timetable for lectures is provided by the University Timetable Committee and is adhered to for minimal clashes. However, students are requested to report any such clashes to their Coordinators for appropriate action to be taken.

3.7 Continuation Requirement
Students must obtain a minimum Cumulative Grade Point Average (CGPA) of 1.00 at the end of an academic year to remain in the programme. A student whose CGPA is below 1.00 at the end of a particular period of probation shall be required to withdraw from the programme.

Similarly, a student who, after the maximum length of time allowed for a degree programme, has not obtained a degree shall be asked to withdraw from the programme. The maximum length of time that a student shall be permitted to spend on a standard 5-year degree programme is 7 years.

3.8 REPEATING FAILED COURSES/UNITS
Subject to the conditions for withdrawal and probation stipulated earlier, a student may be allowed to repeat failed courses at the next available opportunity provided that the total number of credit units carried during that semester does not exceed 24, and the grade points earned at all attempts shall count towards the CGPA.

3.9 GENERAL REQUIREMENT FOR A DEGREE (B.Tech.)
To obtain a degree in the University of Port Harcourt, a student must complete the approved programme of study in his/her Department. Every student is urged to familiarize himself/herself with the specific requirements for a Bachelor's degree in his/her Department

Year I	General Studies Course Foundation Courses
Year II	Foundation Courses Major Courses Community Service Electives
Year III	Major Courses Electives
Year IV	Major Courses Industrial Training

Year v Major Courses
Seminar Project

3.10 AUDITING OF COURSES

A student may attend a course outside his prescribed programme. The course(s) shall be recorded in his/her transcript only if he/she registered for it with the approval of the Coordinator of his/her option and the Head of Department and had taken the prescribed examination. However, the course(s) shall not be used in calculating the CGPA.

3.11 EXAMINATIONS

It is normal that one week is provided for revision before examinations start. A University-wide examination timetable is provided and it is the responsibility of the student to be present at an examination for a registered course. Examinations are scheduled for the last three weeks of the semester, with the first week of examination reserved for the University-wide and Faculty-wide large classes.

If no satisfactory reasons are provided for failure to sit for an examination, the grade of F is recorded for the affected course.

ABSENCE FROM EXAMINATION DUE TO ILL HEALTH SHOULD BE SUPPORTED WITH A MEDICAL CERTIFICATE AND REPORTED TO THE COORDINATOR OF OPTION ON TIME.

Examination Misconduct: The penalty for any form of examination misconduct is EXPULSION. It may even lead to refusal of admission into other Nigerian Universities. Any student found guilty of forging certificates, transcripts and other admission documents shall be expelled from the University

3.12 COURSE ASSESSMENT AND COMPUTATION OF CGPA

Each and every course is continuously assessed using practical (experimental) reports, quizzes, tests assignments, etc. Normally, continuous assessment constitutes 30% of the marks for the course and is administered during the lecture period (i.e. not preceding the semester examination.

The entire semester's work is further assessed by semester examinations which constitute 70% of the course grade. Therefore, the final grade of the student in each course is the combination of the continuous assessment and the result of the semester examination.

All registered courses other than those audited are to be passed by the student except waiver is granted by senate. Forty percent (40%) is the pass mark for undergraduate students. Grade points earned at all attempts (including failure in a particular course are used for computation of the CGPA (see more details in Table 3.12.1 below). Students are not permitted to repeat any course which they have passed.

The following table, provided in the NUC Approved Minimum Standard (Science) for all Nigerian Universities, is applicable:

3.12.1 SCORING AND GRADING SYSTEM

(I) Credit units vary according to contact hour assigned to each course per week per semester and according to work load carried by student	(II) % Scores	(III) Letter Grades	(IV) Grade Point
	70-100	A	5
	60-69	B	4
	50-59	C	3
	45-49	D	2
	40 -44	E	1
	0-39	F	0

(V) Grade Point Ave. (GPA)	(VI) Cumulative Grade Point Ave. (CGPA)	(VII) Class of Degree
Derived by multiplying i & iv	4.50-500	1st Class
	3.50-4.49	2nd Class (upper)
	2.40-3.49	2nd Class (lower)
	1.50-2.39	3rd Class
	1.00-1.49	Pass
	0-0.99	Fail

Cumulative Grade Point Average (CGPA) is derived by the sum of quality points covered divided by the total credit units of courses for which examinations have been taken. An example is as shown:

YEAR 1 FIRST SEMESTER

COURSE CODE	SCORE	CREDIT UNITS	LETTER GRADES	POINT	QUALITY POINT (QP)	GRADE POINT AVERAGE (GPA)
SLT 101.1	60	3	B	4	12	Tot al Quality Point (TQP):
FSB 101.1	70	3	A	5	15	12+15+9+3+0=39
	50	3			9	
ENG 101.1			C	3		TOTAL CREDIT UNITS (TCU):
PHY 101.1	40	3	E	1	3	3+3+3+3+4=16
CHM 130.1	30	4	F	0	0	GPA=
						TOP/TCU=39/16= =2.43

YEAR 1 SECOND SEMESTER

COURSE CODE	SCORE	CREDIT UNITS	LETTER GRADES	POINT	QUALITY POINT (QP)	GRADE POINT AVERAGE (GPA)
FSB 102.2	61	3	B	4	12	Total Quality Point (TQP):
CHM 131.2	48	3	D	2	6	12+6+9+3+15=45
MTH101.2	50	3	C	3	9	TOTAL CREDIT UNITS (TCU):
PHY112.2	42	3	E	1	3	3+3+3+3+3=15
SLT 102.2	74	3	A	5	15	GPA= TOP/TCU=45/15= =3.0

CUMULATIVE GRADE POINT AVERAGE (YEAR ONE) =
TQP 1ST & 2ND SEMESTER/TCU 1ST & 2ND SEMESTER

$$\frac{39 + 45}{16+15} = \mathbf{2.27}$$

3.13 CHANGE OF PROGRAMME

A student who has been admitted for a degree programme, upon satisfying the minimum requirement for entry into the University and relevant Department, shall not normally be allowed to change to another programme within the University or Faculty until after completion of the first academic year in the degree programme. There may also be some Departmental restrictions even after the completion of the first year of study.

3.13.1 APPLICATION FOR A CHANGE OF PROGRAMME

Application for change of programme of study shall normally be made by the student through the Coordinator of programme option and the HOD. The application form can be obtained from the Registry (Academic Division).

3.13a Intra-Faculty & Inter-Faculty Transfer

Intra-Faculty & Inter-Faculty Transfer is acceptable. Transfer to professional programmes in Medicine, Engineering and Management Sciences require the intending student to have obtained a minimum CGPA of 4.0 at the time of application. A minimum CGPA of 3.0 is required for transfer to other programmes.

3.13.1b Inter-University Transfer

A student from another University may seek a transfer to any of the programmes of the University of Port Harcourt. Such applicants must write, enclosing relevant credentials and transcripts of academic record to the Registrar. All applicants for inter-University transfer shall be of good standing in their various universities. The CGPA shall not be less than 3.0

3.14 Expulsion/Suspension

A student who was expelled or suspended from his/her University for misconduct shall not be eligible for transfer to the University of Port Harcourt. A residency requirement of at least two years is required, for all cases of inter-University transfers.

3.15 DURATION OF PROGRAMMES

The Department's degree programmes run for a minimum of 5 and a maximum of 7 academic years. A student whose CGPA is below 1.00 at the end of a particular probation period shall be required to withdraw from the programme. After the maximum length of a degree programme (7 years), a student who has not obtained a degree shall be asked to withdraw from the programme.

3.16 ACADEMIC ADVISER

It is the practice that Academic Advisers are appointed for students at the level of the Programme options. These Advisers provide academic and other relevant guidance to the students. It is very important that you contact your Academic Adviser for counseling on academic issues.

3.17 LEAVE OF ABSENCE

A student can apply for temporary withdrawal from studies for one year from the 2nd year which can be renewed up to a maximum of 2 years. The application, stating reasons, should be made in advance through the Coordinator of programme option and the Head of Department for consideration by Senate.

3.18 MATRICULATION/ CONVOCATION

All registered students are expected to take part in the Matriculation Ceremony which is held as stipulated in the University Calendar. It is following such ceremony that Matriculation numbers are issued to students. For all intents and purposes, the number is the identification mark for students

throughout the duration of their stay in the University. It must be used to identify assignments, term papers, answer booklets, etc. where relevant.
Degrees are conferred on successful candidates at the University's Convocation Ceremony which normally holds in February/March each year.

3.19 REVIEW OF EXAMINATION SCRIPTS OF AGGRIEVED STUDENTS

Students are entitled to see their marked examination scripts if they wish. Any student who feels aggrieved about the grading of a course examination may petition his/her Coordinator in the first instance. The Coordinator shall refer the petition to the Head of the Department who shall make necessary arrangements for the re-assessment and presentation of the scores to the Departmental Board for determination. No group appeal (petition) by candidates involved in the examination in question (or any other group of persons) shall be entertained.

EXAMINATION MALPRACTICES

Various forms of examination malpractices are recognized by the University. These include the following:

Cheating within an Examination Hall/Room- Many forms of cheating are in this category, e.g. copying from one another, bringing in prepared materials, oral/written communication amongst students, impersonation, use of cell phones, non-submission of answer scripts, refusal to stop writing at the end (within ½ min.) of the examination and illegal removal of answer scripts from the examination hall/room.

Cheating outside the Examination Hall Room- The offences are numerous and they include: Plagiarism (i.e. using another person's work without appropriate acknowledgement both in the text and in the references). This is of particular concern in writing of project/theses/dissertations. Colluding with a member of staff to modify (alter) questions, scores/grades, etc. Colluding with a member of staff to submit a new prepared answer scripts as a substitute for the original script. Soliciting for help after an examination.

Related Offences

These are pertinent to the ones indicated above. Among these are (a) manipulation of registration forms in order to sit for an examination for which the student is not qualified, (b) colluding with a medical doctor in order to obtain an excused duty/medical certificate on grounds of feigned illness, (c) assault and intimidation of the invigilator within or outside the examination hall/room, etc.

PUNISHMENT FOR EXAMINATION MALPRACTICE

Any student found guilty of examination malpractice after due process shall be expelled from the University. The decision is given wide publicity and it takes immediate effect.

3.20 CURRICULA FOR DEGREE PROGRAMME IN SCIENCE LABORATORY TECHNOLOGY

ALL OPTIONS

YEAR ONE

FIRST SEMESTER

Course Code	Course Title	Units
CHM 130.1	General Chemistry I	3
ENG 101.1	Engineering Drawing I	1
FSB 101.1	General Biology I	3
GES 100.1	Communication Studies	3
GES 102.1	Introduction to Logic and Philosophy	2
MTH 110.1	Algebra and Trigonometry	3
MTH 120.1	Calculus	3
PHY 101.1	Mechanics and Properties of Matter	3
PHY 102.1	Laboratory Practice I	1
		22

SECOND SEMESTER

Course Code	Course Title	Units
CHM 131.1	General Chemistry II	3
CHM 132.2	Introduction to Principles of Organi c Chemistry	3
ECO 102.2	Principles of Economics	2
FSB 102.2	General Biology II	3
GES 101.2	Computer Appreciation and Application	2
GES 103.2	Nigerian People and Culture	2
PHY 103.2	Laboratory Practice II	1
PHY 112.2	Electricity and Magnetism	3
SLT 102.2	General Laboratory techniques	3
SLT 103.2	Basic Instrumentation	1
		23

BIOCHEMISTRY/CHEMISTRY TECHNOLOGY OPTION

YEAR TWO

FIRST SEMESTER

Course Code	Course Title	Units
BCH 210.1	General Biochemistry 1	3
BCH 214.1	General Biochemistry 11	3
CHM 235.1	Analytical Chemistry I	3
CHM 250.1	Inorganic Chemistry 1	3
CHM 260.1	Organic Chemistry I	3
CSC 280.1	Introduction to Computer Programming	3
SLT 201.1	Information Retrieval	1
SLT 210.2	Workshop Technology 1 (Woodwork)	2
		21

SECOND SEMESTER

Course Code	Course Title	Units
CHM 240.2	Physical Chemistry I	3
CHM 261.2	Organic Chemistry II	3
FSB 202.2	Genetics	3
FSB 203.2	Biological Techniques	2
SLT 2C1.2	Community Service	1
STA 264.2	Statistics for Biological and Agric . Sciences	3
SLT 213.2	Workshop Technology II	2
		17

YEAR THREE

FIRST SEMESTER

Course Code	Course Title	Units
BCH 312.1	Tissue and Organ Biochemistry	3
CHM 335.1	Analytical Chemistry II	3
CHM 350.1	Inorganic Chemistry II	3

GES 300.1	Fundamental of Entrepreneurship	2
ICH 371.1	Process Chemistry I	3
CHM 362.1	Applied Spectroscopy	3
CHM 340.1	Physical Chemistry II	3
		20

SECOND SEMESTER

Course Code	**Course Title**	**Units**
SLT 310.1	Workshop Technology III (Glassblowing)	2
SLT 312.1	Scientific Instrumentation II	2
SLT 211.1	Hazards and Safety in the Laboratory	2
SLT 315.2	Equipment Reliability	3
MTH 224.2	Mathematical Methods	3
MTH 250.2	Basic Differential Equations	3
		15

YEAR FOUR

FIRST SEMESTER

Course Code	**Course Title**	**Units**
BCH 410.1	Endocrine Biochemistry/ Biochemical regulation	3
CHM 436.1	Environmental Chemistry	2
BCH 424.1	Techniques in Biochemistry and Immunochemistry	3
BCH 426.1	Enzymology	3
SLT 410.1	Laboratory Management and Administration I	2
CHM 435.1	Analytical Chemistry III	3
GES 400.1	Entrepreneurship Project	2
ICH 477.1	Mineral Processing and Metallurgy	3
		21

SECOND SEMESTER

Course Code	**Course Title**	**Units**
SLT 402.2	Industrial Trai ning (SIWES)	9
		9

YEAR FIVE		
FIRST SEMESTER		
Course Code	**Course Title**	**Units**
BCH 422.1	Environmental Biochemistry	3
BCH 501.1	Pharmacological Biochemistry	3
BCH 507.1	Biochemical Methods	2
CHM 502.1	Spectrochemical Analysis	2
CHM 505.1	Natural Products Chemistry	2
CHM 514.1	Dye and Textile Chemistry Technology, Wood and Pulp Chemistry I	3
ICH 511.1	Petrochemistry II	3
SLT 509.1	Photography and Illustrations	3
		21
SECOND SEMESTER		
Course Code	**Course Title**	**Units**
BCH 430.2	Biophysical Chemistry	3
BCH 511.2	Industrial Biochemistry	2
BCH 525.2	Food Chemistry and Analysis	2
CHM 562.2	Pharmaceutical Chemistry	2
SLT 508.2	Laboratory Organization & Management	3
SLT 510.2	Seminar	2
SLT 511.2	Research Project	6
		20

BIOMEDICAL TECHNOLOGY OPTION

YEAR TWO		
FIRST SEMESTER		
Course Code	**Course Title**	**Units**
ANA 210.1	Introduction to Anatomy and Histology Techniques	3
BCH 210.1	Introduction to Biochemistry	3
BCH 214.1	General Biochemistry	3
CSC 280.1	Computer Programming	3

CHM 235.1	Analytical Chemistry 1	3
CHM 250.1	Inorganic Chemistry	3
SLT 201.1	Information Retrieval	1
SLT 210.1	Workshop Technology 1 (Woodwork)	2
		21

SECOND SEMESTER

Course Code	**Course Title**	**Units**
BCH 211.2	Medical Biochemistry I	3
MTH 224.2	Mathematics Methods	3
PHS 221.2	Cardiovascular Physiology	3
PHS 222.2	Gastrointestinal Physiology and Nutrition	2
SLT 211.2	Hazards and Safety in the Laboratory	2
SLT 213.2	Workshop Technology and Practice II	2
SLT 2C1.2	Community Services	1
STA 264.2	Statistics for Biomedical Sciences	3
		21

YEAR THREE

FIRST SEMESTER

Course Code	**Course Title**	**Units**
ANA 301.1	Neuroscience	3
ANA 311.1	Gross Anatomy Techniques	3
BCH 311.1	Medical Biochemistry II	3
GES 300.1	Fundamental of Entrepreneurship	2
PHS 322.1	Endocrine and Reproductive System	3
PHY 306.1	Thermal Physics	3
PHY 351.1	Basic Electronics	3
		20

SECOND SEMESTER

Course Code	**Course Title**	**Units**
PHS 323.1	Respiratory and Renal Physiology	3
PHS 321.2	Blood and Body Fluid Physiology	3

SLT 315.2	Equipment Reliability	2
SLT 316.2	Animal Management (Animal Home)	2
SLT 318.2	Store Management	2
SLT 310.1	Workshop Tec hnology III (Glassblowing)	2
SLT 312.1	Scientific Instrumentation II	2
		16

YEAR FOUR		
FIRST SEMESTER		
Course Code	**Course Title**	**Units**
GES 400.1	Entrepreneurship Project	2
PHS 401.1	Introduction to Pharmacology	3
PHS 421.1	Special Senses and Sensory System/Special Sense Technique	3
PHS 424.1	Biomedical Research Methods	3
PHS 425.1	Nervous System	3
SLT 411.1	Experimental Methods and Handling of Laboratory Animals	2
SLT 412.1	Preparation, Storage of Solution and samples/Drugs in Biomedical Technolog y	2
SLT 410.1	Laboratory Organization and Management I	2
		20
SECOND SEMESTER		
Course Code	**Course Title**	**Units**
SLT 402.2	Industrial Training (SIWES)	9
		9

YEAR FIVE

FIRST SEMESTER

Course Code	Course Title	Units
PHAR 501.1	Principles of Drug Action/Pharmacology of Pain	3
PHAR 502.1	Principles of Chemotherapy/Acute Poisoning and Antidotal (Treatment)	2
PHAR 505.1	Antidepressant Drug and Antiepileptic Drug	2
PHAR 509.1	Toxicology/ Drugs Metals/ Trypanocides	3
PHS 523.2	Seminars in Bioinstrumentation	3
PHAR 509.1	Toxicology/ Drugs Metals/ Trypanocides	3
SLT 509.1	Photography and Illustrations	3
		16

SECOND SEMESTER

Course Code	Course Title	Units
PHAR 504.2	Statistics and Physical Parameters in Toxicology and	2
PHAR 506.2	Estimation of LD50, ED50 and Relations between Doses and Responses	2
SLT 508.2	Laboratory Organization and Management I	3
SLT 510.2	Seminar	2
SLT 511.2	Research Project	6
SLT 512.2	Vacuum Technology	2
		16

GEOLOGY/MINING TECHNOLOGY OPTION

YEAR TWO

FIRST SEMESTER

Course Code	Course Title	Units
CHM 235.1	Analytical Chemistry I	3
CHM 250.1	Inorganic Chemistry	3
CHM 260.1	Organic Chemistry	3
CSC 280.1	Introductions to Computer Programming	3

GLY 200.1	History of Geology and Stratigraphy	2
GLY 202.1	Physical Geology	2
GLY 203.1	Crystallography & Mineralogy	2
SLT 201.1	Information Retrieval	1
SLT 210.1	Workshop Technology 1 (Woodwork)	2
STA 260.1	Statistics for Physical Sciences and Engineering	2
		23

SECOND SEMESTER

Course Code	**Course Title**	**Units**
CHM 240.2	Physical Chemistry I	3
GLY 204.2	Field Geology & Map Interpretation	2
GLY 205.2	Optical & Determinative Mineralogy	2
GLY 206.2	Sedimentology	2
PHY 205.2	Heat, Thermodynamics and Geometrical Optics	3
SLT 211.2	Hazards and Safety in the Laboratory	2
SLT 213.2	Workshop Technology and Practice II	2
SLT 2C1.2	Community Service	1
		17

YEAR THREE

FIRST SEMESTER

Course Code	**Course Title**	**Units**
GES 300.1	Fundamental of Entrepreneurship	2
GLY 301.1	Sedimentary Petrology	2
GLY 302.1	Igneous Petrology	2
GLY 303.1	Structural Geology II	2
PHY 306.1	Thermal Physics	3
GLY 304.1	Systematic Paleontology	3
GLY 307.1	Metamorphic Petrology	2
GLY 308.1	Introductory Geochemistry	3
GLY 305.1	Practice Geology mapping	2
GLY 313.1	Principles of Geophysics	2
		23

SECOND SEMESTER

Course Code	Course Title	Units
GLY 314.2	Exploration & Mining Geology	2
SLT 305.2	Geological Techniques I	3
SLT 315.2	Equipment Reliability	3
SLT 310.2	Workshop Techn ology III (Glassblowing)	3
SLT 312.2	Scientific Instrumentation III	3
MIN 301.2	Introduction to Mining Technology	2
		16

YEAR FOUR

FIRST SEMESTER

Course Code	Course Title	Units
GES 400.1	Entrepreneurship Project	2
GLY 402.1	Global Tectonics	2
GLY 401.1	Petroleum Geology	2
GLY 403.1	Micropaleontology and Palynology	2
GLY 404.1	Economic Geology	2
GLY 405.1	Hydrogeology	2
GLY 406.1	Marine Geology	2
GLY 405.1	Hydrogeology	2
GLY 406.1	Marine Geology	2
GLY 414.1	Independent Field Mapping	2
GLY 407.1	Engineering Geology & Construction Technology	2
GLY 408.1	Photogeology and Remote Sensing I	2
GLY 409.1	Regional Geology of Africa and Nigeria	2
SLT 405.1	Geological Techniques II	2
		24

SECOND SEMESTER

Course Code	Course Title	Units
SLT 402.2	Industrial Training (SIWES)	9
		9

YEAR FIVE

FIRST SEMESTER

Course Code	Course Title	Units
PHAR 501.1	Principles of Drug Action/Pharmacology of Pain	3
PHAR 502.1	Principles of Chemotherapy/Acute Poisoning and Antidotal (Treatment)	2
PHAR 505.1	Antidepressant Drug and Antiepileptic Drug	2
PHAR 509.1	Toxicology/ Drugs Metals/ Trypanocides	3
PHS 523.2	Seminars in Bioinstrumentation	3
PHAR 509.1	Toxicology/ Drugs Metals/ Trypanocides	3
SLT 509.1	Photography and Illustrations	3
		16
	SECOND SEMESTER	
Course Code	**Course Title**	**Units**
PHAR 504.2	Statistics and Physical Parameters in Toxicology and	2
PHAR 506.2	Estimation of LD50, ED50 and Relations between	2
SLT 508.2	Laboratory Organization and Management I	3
SLT 510.2	Seminar	2
SLT 511.2	Research Project	6
SLT 512.2	Vacuum Technology	2
		16

INDUSTRIAL CHEMISTRY/PETROCHEMICAL TECHNOLOGY

YEAR TWO		
FIRST SEMESTER		
Course Code	**Course Title**	**Units**
CHM 235.1	Analytical Chemistry 1	3
CHM 250.1	Inorganic Chemistry 1	3
CHM 260.1	Organic Chemistry 1	3
CSC 280.1	Introductions to Computer Programming	3

ENG 201.1	Engineering Mathematics 1	3
ENG 203.1	Engineering Mechanics	3
SLT 201.1	Information Retrieval	1
SLT 202.1	Engineering Drawing II	1
SLT 210.1	Workshop Technology 1 (Woodwork)	2
		21

SECOND SEMESTER

Course Code	**Course Title**	**Units**
CHE 212.2	Chemical Engineering Process Analysis	3
ENG 202.2	Engineering Mathematics II	3
ENG 209.2	Basic Thermodynamics and Heat Transfer	3
PHY 222.2	Fluid Mechanics	2
SLT 211.2	Hazards and Safety in the Laboratory	2
SLT 213.2	Workshop Technology II	2
SLT 2C1.2	Community Service	1
STA 260.2	Statistics for Physical Sciences and Engineering	2
		18

YEAR THREE

FIRST SEMESTER

Course Code	**Course Title**	**Units**
CHE 311.1	Chemical Technology I	2
CHE 313.1	Chemical Thermodynamics	3
CHE 320.1	Chemical Technology Laboratory I	2
CHE 335.1	Analytical Chemistry II	3
GES 300.1	Fundamental of Entrepreneurship	2
PHY 303.1	Technology of Materials	3
		15

SECOND SEMESTER

Course Code	**Course Title**	**Units**
CHE 306.2	Mass transfer	2
CHE 308.2	Heat Transfer	2

CHE 315.2	Transport Phenomena	3
CHE 318.2	Chemical Reaction Technology	3
MEG 314.2	Strength OF materials	2
PNG 311.2	Chemical Technology of Petroleum	3
SLT 315.2	Equipment Reliability	2
SLT 310.1	Workshop Technology III (Glassblowing)	2
SLT 312.1	Scientific Instrumentation II	2
		21

YEAR FOUR

FIRST SEMESTER

Course Code	**Course Title**	**Units**
CHE 421.1	Chemical Technology Laboratory II	3
PHY 401.1	Particulate Mechanics	3
PNG 308.2	Petroleum Production Technology	3
GES 400.1	Entrepreneurship Project	2
GNG 402.1	Technology of Fossil Fuel Processing	3
ICH 477.1	Mineral Processing and Metallurgy	3
SLT 410.1	Laboratory Organization and Management I	2
		19

SECOND SEMESTER

Course Code	**Course Title**	**Units**
SLT 402.2	Industrial Work Experience (SIWES)	9
		9

YEAR FIVE

FIRST SEMESTER

Course Code	**Course Title**	**Units**
CHM 501.1	Environmental Technology	2
CHE 503.1	Process Control	2
CHE 505.1	Process Optimization	2
ICH 511.1	Petrochemistry	3
SLT 509.1	Photography and Illustration	3

SLT 511.2	Research Project	6
		18

SECOND SEMESTER

Course Code	**Course Title**	**Units**
CHE 514.2	Biochemical Technology	3
CHE 518.2	Process Design	2
PNG 506.2	Chemical Laboratory Technology III	3
MEG501.2	Industrial Management	2
SLT 508.2	Laboratory Organization and Management	3
SLT 510.2	Seminar	2
		15

MICROBIOLOGY TECHNOLOGY OPTION

YEAR TWO

FIRST SEMESTER

Course Code	**Course Title**	**Units**
BCH 210.1	General Biochemistry I	3
CHM 235.1	Analytical Chemistry I	3
CHM 250.1	Inorganic Chemistry	3
CHM 260.1	Organic Chemistry I	3
CSC 280.1	Introduction to Computer Programming	3
MCB 200.1	General Microbiology I	3
SLT 201.1	Information Retrieval	1
SLT 210.1	Workshop Technology 1 (Woodwork)	2
		21

SECOND SEMESTER

Course Code	**Course Title**	**Units**
FSB 202.2	Genetic I	3
FSB 203.2	Biological Techniques	2
MCB 201.2	General Microbiology II	3
SLT 211.2	Hazards and Safety in the Laboratory	3

SLT 214.2	Microbiological Techniques I	2
SLT 2C1.2	Community Service	1
STA 264.2	Statistics for Biology and Agric	3
SLT 213.2	Workshop Technology II	2
		19

YEAR THREE

FIRST SEMESTER

Course Code	**Course Title**	**Units**
AEB 301.1	General Parasitology	3
GES 300.1	Fundamental of Entrepreneurship	2
CHM 362.1	Applied Spectroscopy	2
MCB 300.1	Bacteriology	3
MCB 305.1	General Virology	3
PSB 300.1	Mycology	3
MCB 304.1	Microbial Physiology and Biochemistry	3
MCB 311.1	Medical Microbiology	3
MCB 310.1	Immunology and Immunochemistry	2
		24

SECOND SEMESTER

Course Code	**Course Title**	**Units**
	General Parasitology	
MCB 404.2	Analytical Microbiology and Quality Control	3
SLT 303.2	Disease Vectors and Management	3
SLT 312.2	Scientific Instrumentation II	2
SLT 310.2	Workshop Technology III (Glassblowing)	2
SLT 314.2	Microbiological Techniques II	2
SLT 315.2	Equipment Reliability	3
		15

YEAR FOUR		
FIRST SEMESTER		
Course Code	**Course Title**	**Units**
GES 400.1	Entrepreneurship Project	2
MCB 301.1	Environmental Microbiology	3
MCB 400.1	Microbial Genetics and Molecular Biology	3
MCB 401.1	Industrial Microbiology	3
MCB 403.1	Pharmaceutical Microbiology	3
MCB 409.1	Food Microbiology	3
SLT 414.1	Microbiological Techniques III	3
SLT 410.1	Laboratory Organization and Management I	2
		20
SECOND SEMESTER		
Course Code	**Course Title**	**Units**
SLT 402.2	Industrial Training (SIWES)	9
		9

YEAR FIVE		
FIRST SEMESTER		
Course Code	**Course Title**	**Units**
BCH 501.1	Pharmacological Biochemistry	3
BCH 507.1	Biochemical Methods	2
MCB 500.1	Petroleum Microbiology	3
MCB 501.1	Fermentation Technology	3
PSB 501.1	Plant Pathology	3
SLT 509.1	Photography & Bio-illustration	3
		17
SECOND SEMESTER		
Course Code	**Course Title**	**Units**
MCB 505.2	Principle of Epidemiology& Public Health	3
MCB 507.2	Biotechnology	3
SLT 508.2	Laboratory Organization & Management II	3
SLT 510.2	Seminar	2
SLT 511.2	Research Project	6
		17

PHYSICS WITH ELECTRONICS TECHNOLOGY OPTION

YEAR TWO

FIRST SEMESTER

Course Code	Course Title	Units
CSC 280.1	Introductions to Computer Programming	3
MTH 201.1	Mathematical Methods	3
MTH 240.1	Vector Analysis	3
PHY 200.1	Energy and Environment	2
PHY 206.1	Physics Laboratory Techniques and Practical III	1
PHY 216.1	Vibration and Waves	3
SLT 201.1	Information Retrieval	1
SLT 210.1	Workshop Technology 1 (Woodwork)	2
		18

SECOND SEMESTER

Course Code	Course Title	Units
EEE 222.2	Electrical Engineering Drawing Installation	1
MEG 210.2	Engineering Material Laboratory	1
MTH 222.2	Statistics for Physical Sciences	3
MTH 250.2	Basic Differential Equations	3
SLT 211.2	Hazards and Safety in the Laboratory	2
SLT 213.2	Workshop Technology II	2
SLT 2C1.2	Community Service	1
PHY 205.2	Heat, Thermodynamics and Geometrical Optics	3
PHY 211.2	Quantum Physics	3
		19

YEAR THREE

FIRST SEMESTER

Course Code	Course Title	Units
EEE 309.1	Telecommunication Principles	2
GES 300.1	Fundamental of Entrepreneurship	2
PHY 300.1	Mathematical Physics II	2
PHY 306.1	Statistical and Thermal Physics	3
PHY 313.1	Electromagnetism	3
PHY 315.1	Electronic Instrumentation I	2
PHY345.2	Electronics	2
PHY 351.1	Advanced Electronic Workshop	2
PHY 353.2	Electrical Circuit Theory	3
PHY 356.2	Material Science I (Metal and Alloys)	1
		22

SECOND SEMESTER

Course Code	Course Title	Units
EEE 307.2	Electromagnetic waves and Sound	3
EEE 310.2	Electrical and Electronic Engineering laboratory	1
EEE 318.2	Radio Communication Principles	2
SLT 310.1	Workshop Technology III (Glassblowing)	2
SLT 315.2	Equipment Reliability	2
		16

YEAR FOUR

FIRST SEMESTER

Course Code	Course Title	Units
PHY342.1	Solid State Physics	2
EEE 415.1	Digital Electronics	3
GES 400.1	Entrepreneurship Project	2
PHY 405.1	Computational Physics	2
PHY 407.1	Instrumentation II and Control	3
PHY 413.1	Acoustics	2
PHY 417.1	Atomic and Molecular Spectroscopy	2
SLT 401.1	Radiation Safety Techniques	3
SLT 410.1	Laboratory Organization and Management I	2
		21

SECOND SEMESTER		
Course Code	**Course Title**	**Units**
SLT 402.2	Industrial Training (SIWES)	9
		9

YEAR FIVE		
FIRST SEMESTER		
Course Code	**Course Title**	**Units**
EEE 503.1	Semiconductor Technology	3
EEE 507.1	Electronics devices: designs and Fabrication	3
PHY 504.1	Solar Energy	2
PHY 505.1	Material Science II (Polymer and Ceramics)	2
PHY 507.1	Electronic Instrumentation II and Control	3
PHY 520.1	Fundamentals of Energy Processes	3
SLT 509.1	Photography and Illustrations	3
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SECOND SEMESTER		
Course Code	**Course Title**	**Units**
PHY 531.2	Basic Modern Physics	3
PHY 552.2	Electronics II	3
SLT 508.2	Laboratory organization and Management I	3
SLT 510.2	Seminar	2
SLT 511.2	Research Projects	6
SLT 512.2	Vacuum Technology	2
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3.20.1 SUMMARY

PROGRAMME OPTION	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL CU
Biochemistry/Chemistry Technology	45	40	38	26	35	184
Biomedical Technology	45	40	36	29	32	182
Geology/Mining Technology	45	39	35	30	35	184
Industrial Chemistry/ Petrochemical Technology	45	39	34	28	33	179
Microbiology Tec hnology	45	41	37	29	37	189
Physics with Electronics Technology	45	37	35	28	38	183

3.21 COURSE DESCRIPTION

DEPARTMENTAL COURSES

SLT 102.2: General Laboratory Techniques

1. Biology Techniques

Essential services in a biological science laboratory, their correct uses and care. Types, uses, care, maintenance and storage of: microscopes, centrifuge, autoclave, incubator etc. Botanical and zoological techniques fixatives, types, functions and presentation techniques for plant and animal tissues, whole organisms including dried specimens for herbarium and museum. Preparation of animal skeletons. Micro toning type, use of microtomes for butting of different types of sections. Care of microtomes. Preparation of slides of specimens. Histochemical Techniques, Microbiological Techniques, Hematological Techniques, Physio-pharmacological Techniques

2. Chemistry Techniques

Essential services in a chemistry laboratory, their correct use and care. Heading sources and constant level devices. Drying agents. Methods of production of purified water in the laboratory. Cleaning of laboratory vessels. Maintenance of laboratory Apparatus e.g. Experimental Technique of quantitative inorganic analysis. The analytical balance use care and maintenance. Methods of weighing. Laboratory vessels and their preparation for analysis. Assembly of glassware apparatus. (Types of joint and fittings. Lubrications of joints). Preparation of substances for analysis. Sampling of materials. Sampling scheme. Apparatus for sampling and sampling techniques. Computations involved in expressing concentrations in physical and chemical units. Preparation of laboratory reagents for inorganic and organic analysis. Calculations in preparation and dilution of solutions. Techniques of volumetric analysis calibration of volumetric measuring vessels preparation, preservation and storage of solutions for all classes of volumetric analysis. Operations of classical gravimetric analysis. Chromatographic techniques involving the different classes of chromatography. Technique of melting point and boiling point determination. Techniques for the purification of organic compounds. Spectrophotometric technique involving the use, care and maintenance of analytical instruments. (3 UNITS)

SLT 103.2: Basic Instrumentation

Electrical and Electronic Components – Electrical quantities, Ohm's Law in circuitry, resistors, capacitors, semi-conductors; transducers, photo emissive, photo-multipliers and photodiodes. Measuring instruments – Analytical, Audio-Visual, and diagnostics. Care and safety; practical use of measuring instruments. Study of components Layout: Circuit training, referring to manufacturer's data. Reading circuit diagrams, repair differential electronic devices. Maintenance, services, and repair procedures of electric devices, electrical and electronic circuits, circuit diagrams and designs, types of maintenance. Factors affecting maintenance. Corrective maintenance. Power supplies. (1 UNIT)

SLT 201.1: Information Retrieval

Libraries and organization of knowledge. Types of libraries and the various forms of recorded knowledge. Organization and retrieval of knowledge catalogues, classification schemes etc. Practical use of the catalogues. Information retrieval methods and techniques. Use and evaluation of information courses and tools, dictionaries, encyclopedias, etc serial publications, abstracts and indexes, guide to the literature of specific subjects. Information gathering methods and project writing. Practical use of Information sources and tools. (1 UNIT)

SLT 202.1: Engineering Drawing II
Orthographic projections in first and third angles. Isometric projection: sections and sectioning: auxiliary views and staggered sectioning. Freehand sketching. Conventional practice with simple examples including threads and threaded fasteners, cam profiles and assembly drawings from detailed components. (1 UNIT)

SLT 210.1: Workshop Technology 1 (Woodwork)
Tree- Related properties and structure of wood, Composition and variability of wood, Wood – moisture relations. Strength and elasticity of wood Lumber, Glulanus and Veneer, Wood- Based Panels, Thermal Properties and fire performance of structural wood. Wood deterioration and its prevention. Wood finishing and wood construction Wood adhesives, preservatives and protective coatings. Bench tools- hammers, bench vice, files, chisels, punches, drifts, scrapes and hacksaws etc. Sowing machines, cutting machines, and planning machines used in wood work. Construction of science apparatus to acquaint students with methods of planning, sawing, shaping, joining wood, polishing and painting etc. Safety in the wood workshop. (2 UNITS)

SLT 211.2: Hazards and Safety in the Laboratory
Laboratory Hazards: types of laboratory hazards; electrical, chemical, fire, biological and mechanical. Nature and causes of hazards. Basic laboratory safety rules, (safety symbols and rule charts), Treatment of acid burns. Treatment of Inhalation and swallowing of toxic gases and liquids in the laboratory, Microbial contamination of laboratory worker; First aid measures during microbial contamination of lab workers. Electric shocks; precautions and treatment of electric shocks. First aid box. Artificial respiration. Radiation; types of radiation (e.g. α, β, X-ray, etc.), various types of radioactive sources (e.g. uranium, and thorium), sealed and unsealed – radioactive sources, basic radiation terms (e.g. radiation absorbed dose, maximum permissible level, etc.) radiation hazards; exposure and contamination, shielding and properties of shielding materials, Personal protection; film budges, personnel dosimeter, glove boxes, over-shoes etc. Disposal of radioactive wastes. (2 UNITS)

SLT 213.2: Workshop Technology and Practice II
1. Conditions and synthesis of Accuracy. Interchangeability and limit systems. Identification and use of common work materials – metals, alloys ferrous and non-ferrous metal and their characteristic utilization for the construction of tool bits. Measurement and precision work slip gauges. Comparator vernier height gauge making out – vernier micrometer. Examples of measurement. Sine bar. Angular testing: use of rollers – Tapers projection. Hand tools, power operated hand tools and machine tools. Drills and drilling machines. Drilling and Boring Techniques countersinking. Grinding, off hand grinding and precision grinding. Sawing and cutting machines. Techniques in metal cutting and sheet metal forming. Hard and soft soldering, gracing and ways joints. Welding techniques. The lathe machine, planning machines and the milling machines. Surfacing, taper turning and thread cutting on the lathe. Shaping, planning and slotting. Metal characteristics, heat treatment of metals. Metal finishes. High energy rate forming, Chipless machining. Electro machining processes. Powder metallurgy. Cryogenic Applications. Jigs and fixtures. Hydraulic powder transmission Workshop practice should focus on the construction and graduation of a variety of teaching, research and industrial tools, standard weight of mass, lever system, meter rules and calorimeters. (2 UNITS)

SLT 214.2: Microbiological Techniques I
Staining techniques, sterilization techniques, preparation and uses of buffer and dilution fluids, cell suspension, centrifugation and diluting fluids. Microbiology and Photo microscopy; Preparation of Microscope slides; Photometry, Colorimetry; chromatography, Conductorimetry, Centrifugation, Experimental Design and Data Interpretation; Preparation of report. (2 UNITS)

SLT 2C1.2: Community Service
This course affords the students the opportunity to render selfless practical service to the immediate and neighboring communities. The activities include grass cutting, flower planting, road works, cleaning of offices and environment. General repair of facilities where possible. (1 UNIT)

SLT 303.2: Disease Vectors and Management
Insects, arachnids and other arthropods of medical importance; orders, families, species of major and minor importance, biology, behavior and mode of life of arthropods that act as direct agents of diseases or discomfort (entomophobia allergies, dermatism, mycosis, carthariasis and sclerociasis) and vectors or intermediate hosts of disease pathogens (malaria, onchocerciasis, filariasis, yellow fever, trypanosomiasis and dracuniasis) Epidemiology of vector borne diseases phonetic carriers of offending arthropods and natural enemies of medically harm. (3 UNITS)

SLT 305.2: Geological Techniques I
Explain the origin of rocks. Classify rocks under the following: (i) Igneous (ii) Metamorphic (iii) Sedimentary Explain the origin of soil. Classify soil based on grain size (e.g. sand, silt, clay). Classify soil bated on other factors (e.g. plasticity, colour and swelling). Describe soil profile Explain particle size distribution in soils. Explain porosity, void ratio, specific gravity, density, water content, degree of saturation. Explain consistency limits (liquid limit, plastic limit, plasticity index, shrinkage limit). Explain moisture density relationship (compaction) and the variables (volume of mould, size of hammer and height of fall). Explain shear strength in soils and rocks. Identify equipment used to determine shear strength in the field and laboratory (e.g. uniaxial compression equipment, direct shear equipment, triaxial equipment, pocket paratrometer etc. Explain the difference between disturbed and undisturbed sample. Collect and preserve undisturbed and disturbed sample by using liquid paraffin, solid wax, and gauze. Carryout laboratory tests for moisture density relationship (compaction tests). Determine shear strength in the field and laboratory. (2 UNITS)

SLT 310.1: Workshop Technology III (Glassblowing)
The course focuses on glass blowing practice with application in the teaching and research institutions. Brief history of manufacture of glass, Type of glasses, the composition of glass. Typical glass blowing tools and accessories Fuel gases and fuel lines, Dimension tolerances in tubing and rods. Basic operation in soda glass Pulling points, Makings test-tube ends joining two glasses – straight joints, Spotting, T-joins, Y-pieces. Making seals – ring, multiple and internal seal Glass to metal seals Design, maintenance, repairs and construction of some basic and essential glass wares, e.g. burette, pipette, condensers manometers, viscometers, drying tubes, grinding, flame polishing and annealing, vacuum lines and accessories. (2 UNITS)

SLT 312.1: Scientific Instrumentation II
1. Transducers as input elements to instrumentation system. Classification of transducers, selecting a Transducer Strain gauges, Temperature Measurements, Displacement Transducers. Photosensitive Devices. Thermocouple, Thermostat, Quarts. 2. Feed Backs and Operational Amplifiers: Introduction of feedback, Operational Amplifiers. The golden rules, Basic OPAMP circuits inverting all non-inverting Amplifiers, Selected OPAMP circuits-logarithmic Amplifier, Active peak detector, sample and hold, Active clamp, Absolute value circuit, Integrators, differentiators Operation with a single power supply Comparators and Schmitt trigger Feedback Amplifier freaking compensation Feedback with finite gain amplifiers. Analog and Digital Data Acquisition: Instrumentation systems, magnetic tape Recorders self-biasing potentiometer, Digital to Analog conversation, Multiplexing, Special Encoders. 4.Computer Controlled Test: Testing an Audio Amplifier, Testing a radio receiver, Instruments used in Computer Controlled Instrumentation. 5.Spectrophotometer Instrumentation: Special features, instrument design general performance

characteristics wavelength calibration, Adjustment Procedure. Resolution dynamic range, accuracy, linearity sensitivity, detection limit. Information acquisition rate. Stability sample presentation conditions. Equipment Maintenance and trouble shooting. 6. Optimization of Performance of Chromatographic Systems: Types of chromatography and applications of the various techniques. Simple mathematical treatment of the chromatographic process, Definitions of efficiency and resolution. 7. Instrumentation for RPLC: Pumps, injection systems, detectors including UV/VIS, diode array detectors, refractive index and fluorescence detectors. Types of column and separation mechanism. Adsorption chromatography and reversed phase separations on bonded phase columns. Factors affecting separation. Solvent strength and the Snyder solvent selectively triangle. 8. Optimization Strategies: The chromatographic response function. Step search optimization mixture design statistical techniques. The sequential Simplex optimization method. Hardware necessary for totally automated solvent optimization 9. Laboratory Work: Instrumentation Workshop Practice Design Construction of simple electronic circuits/systems. Repair/serving of teaching and research equipment, Coil winding. (2 UNITS)

SLT 314.2: Microbiological Techniques II
Preparation of culture media, and cells for tissue and organ culture; Preparation and preservation of stock cultures; Care and management of experimental animals, safety in microbiology laboratory. Preparation and use of stains for bacteriology, parasitology, mycology and virology. Bioassay: symptomatology on original host and test plants. (2 UNITS)

SLT 315.2: Equipment Reliability
Basic concept of reliability. Reliability production causes and remedies of component failure. Maintainability. Specifications. (2 UNITS)

SLT 316.2: Animal Management (Animal Home)
Design of animal house for various colonies of laboratory animals and their breeding methods. Diseases and control of infections. Handling of laboratory animals. Environmental Hazards of laboratory animals. (2 UNITS)

SLT 401.1: Radiation Safety Techniques.
Basic concepts, Natural radioactivity. Properties of α, β, x-rays and neutrons, concepts of radiation units and dose determination, shielding. Biological effects of radiation. Protection standards. Internal dose calculations. Radiation detection principles. Instruments operations, characteristics and counting statistics. Health physics instruments. Personnel monitoring devices. Air sampling rectors. Hot cells. Particle accelerators. (3 UNITS)

SLT 402.2: Industrial Attachment (SIWES)
At least six months of supervised training must be spent by the student in a clinical/industrial/agricultural establishment. A post attachment seminar session shall be addressed by the student and graded before presenting their report in written form. The seminar and the written report shall attract 50 marks each. (9 UNITS)

SLT 404.1: Mechanical Engineering Design III
Methods of systems analysis and synthesis applied to complete machines and systems of interest to the mechanical engineer. Algorithms, computer programs for mechanical systems design. System design projects taken from the local industry, mechanical Engineering case studies and applications of lecture material.

Laboratory: Laboratory sessions are individual/group projects on design of mechanical Engineering systems using computer and manual drafting facilities. Completed design projects are properly presented and assessed. (3UNITS)

SLT 410.1: Laboratory Organization and Management I

1. Laboratory Planning: Various types of laboratories – industrial, research, hospital, teaching. Location, design, cost an acceptability of laboratories. Layout, organization and installation of suitable essential services and physical facilities, fixtures and fittings to achieve the desired and specialized rooms. The lecture theatre.

2. Staffing the Laboratory: Recruiting personnel – technicians, professionals, temporary employees. Desirable personal characteristics. Reviewing job applications. Interviewing candidates. Preparing for the interview. Conducting the interview. Conclusion of the interview and Decision. Orientation of the new employee.

3. Managing Laboratory Personnel: Motivating Employees. Delegation communicating with Employees. Handling personnel problems. Managerial power and control. Performance valuations. Handling marginal employees. Training and continuing education. Promotion of a subordinate.

4. Work Management: Cooperative planning. Handling rush samples. Overload and underload. Absenteeism. Use of outside laboratory. Work management by cost benefit analysis.

5. Laboratory Records and Information Management: Types and nature of laboratory records. Methods for according of procedures, observations and results obtained from experiment. Filling methods. Indexing of catalogues and technical literature. Document copying. Inventories and equipment movement records. (LIMS). Justification for a LIMS. Cost of a LIMS. Planning for a LIMS.

6. Store Management: Types and design of stores. Purchase and receipts of goods – ordinary and issuing of foods. Store- keeping procedures; physical management of stock and materials storage of animals, radioactive sources. Explosives and corrosive materials. Inventories and stock-taking. Storage and preservation of apparatus, chemicals.

7. Budgeting the Cost Control: The Expense Budget. Cost estimating standard testing service. Non-standard analytical service charging costs. Relating costs to Budget. Cost control of supplies and materials. Evaluating standard test productivity.

8. Laws Affecting Laboratory Practice:

9. General Laboratory Maintenance: Good Housekeeping and periodic maintenance of the physical plant. Periodic maintenance of the physical plant. Periodic inspection and replacement of workpants of installations. Modification of existing structures to achieve increased productivity and for efficiency. (2 UNITS)

SLT 411.1: Experimental Methods of Handling of Laboratory Animals

The use of animals for Research and Teaching. Laws governing the use of laboratory animals: Humane killing methods. General anesthesia and theories of anesthesia. Various available anesthetics and sites of action. Volatile and gaseous anesthetics. Methods of preparation and handling of animals for anesthesia. Routes of drug administration: i.v., i.p., oral, subcutaneous, etc. Signs and different stages of anesthesia. (2 UNITS)

SLT 412.1: Preparation, Storage of Solutions and Samples/ Drugs in Biomedical Technology

Preparation/composition of physiological salt solutions and drugs: Tyroide, Kreb, De Jallon, Acetylcholine, Atropine, etc. estimation of the active substances in them in the laboratory e.g. drug concentration expressed in mEq or molarity. Instrumentation methods and handling/operation of physiological/pharmacology equipment. Methods of storage of drugs in the laboratory. (2 UNITS)

SLT 414.1: Microbiological Techniques III

Principles and techniques of sera diagnosis of infections: immunological assays- Agglutination reactions, ELISA, CFT, FAI tests, etc. bacteriophage assays, Bioassay, Hyper immune sera preparation, Blood grouping, Rh typing, cross-matching. HLA typing. Estimation of antibodies, Tests for hypersensitivity reactions, Tests for autoimmune diseases. Biological standardization. Principles and techniques of Anaerobic Cultivation, Maintenance of equipment – Microscopes, centrifuges and autoclave. (2 UNITS)

SLT 504.2: Industrial Ventilation and Air Pollution Control Systems

The role air pollution in modern society. Scope and nature of industrial ventilation and air-pollution control. Dynamics of particles in fluids, Pollutant distribution and collection efficiencies. Design of industrial ventilation systems. Settling chambers. Electrostatic precipitators. Particulate scrubbers and Filters. Absorption and adsorption devices. Combustion and condensation devices. Computer algorithms and programs for design and analysis of ventilation and pollution control systems. (3 UNITS)

SLT 506.1: Power Plant Engineering

The World and Nigeria's energy demands. Methods of electrical power generation. Steam power generation cycles, steam generators and generation cycles, gas turbines combustors and auxiliary equipment. Nuclear power generation. Hydropower generation. Alternative energy sources and their power cycles. Energy storage. Economics of power generation. Computer aided power engineering. Industrial visits to at least one each of the hydro, steam-and gas-turbine power stations in the country. (3 UNITS)

SLT 508.1: Automatic Engineering

The cooling, lubricating, ignition and fuel supply systems. Valves and valve train design, operating mechanism and valve timing. Engine cylinder block and head design. Pistons and connecting rods. Crankshaft and engine balancing. The automobile, body, chassis and engine design. Frame and suspension systems. Steering, braking and transmission systems. Drive shafts, differentials and axles. Analysis and design algorithms and programs for computer treatment of automotive Engineering problems. (3 UNITS)

SLT 508.2: Laboratory Organization and Management II

Management Techniques and Functions: The concept and relevance of management to laboratory practice. Meaning of organization. Supervisory skills and management functions: planning; organizing; forecasting; motivating; coordination; controlling and communicating etc. Purchasing of laboratory materials; sources of funds and different methods of purchasing. Preparation of purchasing orders. Receipt and storage ordered materials. Issuing of materials. Stock control management. Record keeping in the laboratory. Design and execution of scientific and projects. Different types of scientific experiments. Scientific measurements and data collections. Literature search and retrieval. Factors affecting accuracy of experimental measurement. Preparation and presentation of experimental data – thesis/dissertation. Ways of presenting seminars.

Selection and Management of Staff: Job description; the advertisement; application forms – references; interviewing and selection – final selection; contracts and conditions of service;

induction; training and further education – motivation in technical education, recent developments in technical training and education, laboratory discipline: termination of employment

Organization of Laboratory Practice: Elements of Law. Common and statutory laws and relevance to laboratory practice such as health and safety, welfare of employees, and cruelty to animals. Import and exercise duties. Nature of contract. Elements of contract. Contract in relation to purchasing of laboratory materials, employment etc. Legislation regulation regulating at the science laboratory practice in Nigeria (NISLT Act No. 12 of 2003). Structure of NISLT and functions. Legal and professional responsibilities of technologists. Organization of Laboratory services in Nigeria – public and private laboratories, Professional code of ethics. Types of Business Organization. Small business management. Production, Entrepreneurship and business development. Industrial relations.

Health and Safety: The basic approach – The health and safety at work etc. Act of 1974; organization of laboratory safety – line management, safety officers, safety committees, codes of practice, general attitude to laboratory safety, accident books and records, notable accidents; the hazards – fire, fire prevention, fire-fighting equipment, fire drills, fire escapes, fire prevention advice, electrical and electronic equipment, radiation and the use of radioactive substances; cylinders of compressed gas; centrifuges; cryogenic substances; physical injuries; chemical; occupational hygiene; dermatitis and skin reactions, toxic substance and threshold limit values, carcinogens; bacterial, viruses and other biohazards. (3 UNITS)

SLT 509.1: Photography and Illustrations

Concepts and Fundamentals of Photography: Cameras: The general principles, manipulation and care of different types of cameras in common use, their advantages and disadvantages. Photomicrography: Techniques and application. Lighting System: Daylight, "Photoflood", exposure meters, depth of field, background. Printing Process: Projection and contact printing, choice and grades of paper, local control, finishing. Colour Photography: Colour photography principles f reversal and of negative-positive processes. Types of materials; colour temperature, filters, exposure. Cine Photography: Cine photography, use of 8mm cameral, video camera splicing and editing of commercially processed film. Safety: Hazards in the use of photographic reagents. Darkroom management. (3 UNITS)

SLT 510.2: Seminar

Library/Literature project on any topic of the candidates' choice approved by the institute. The seminar will be typed, bound and properly documented and submitted to the institute after the oral presentation.

SLT 511.1: Quality Assurance and Control

The history and connect status of quality control. The difference between quality's control, quality control and total quality control. The benefits of QC in teaching, research and the industry. Controlling Quality. The Basis of QC. Control of Raw Materials and subcontracting. Equipment control, Working methods and standardization. Measurement control. Training for Quality. Quality and Process Improvement. Philosophy and Basic conditions of control and improvement. The steps in improvement. Investigation and analysis for revealing problem. Deciding problem. Targets and deadlines. Quality performance: choosing test methods. In house methods. Statistical methods used in Quality Control. Types, preparation and use of control charts in teaching, research and the industry. Process Analysis and Improvement. Process Control. The Benefits of control charts and the controlled state.

The Principles, Philosophies, standard procedures of quality assurance, the penalties of inadequate Quality Assurance Procedure. Management Responsibility. Setting up and developing the

appropriate QA programme. The Organization for quality, responsibility and authority. The Policy statement. The quality manual. The QA procedure. The Quality Plan and Management responsibility. Quality Assurance and Inspection, Test and Measurement. Inspection standards. The role of Quality circles. Complaints handling and special acceptance. Design Control. Procurement Control. Manufacturing and services Control. Installation Control. Computer software control. Quality Assurance Audit. Structuring the Audit Programme. Essential ingredients of a Quality Audit Programme. Planning and performing Audits on Activities. Human Relations in Auditing. Audit Reporting. (2 UNITS)

SLT 511.2: Research Project
This is the final year research project. It is aimed at investigating microbiological problems in any area of microbiology and biotechnology with well-defined objectives. The work is written up as a project report (thesis) and is examined by a panel of external and internal examiners during an oral defense (examination). (6 UNITS)

SLT 512.1: Vacuum Technology
Nature of vacuum. Scope of vacuum science and technology. Uses and applications of vacuum technology. Production of vacuum. Properties of gases. Fluid flow and pumping concepts. Vacuum measurement. Oil sealed mechanical rotary pumps. Oil-free mechanical primary pumps. Diffusion pumps and accessories, integrated vapour pumping groups and vapour boosters. Molecular pumps. Cryogenic pumps. Sorption and getter pumps.

Ultra-high vacuum pumps. Emphasis on design features, operational aspects, performance. Applications, maintenance and Trouble shooting. Vacuum system connections, components and assembly considerations in system design. Vacuum lack detection. Safe use of vacuum equipment. (1 UNITS)

SLT 536.1: Power Metallurgy and Ceramics
Characteristics of metals powders. Basic principles of compacting and powder processing. Porous and dense products as they relate to microstructures of materials. Factors affecting physical and mechanical properties of powder blending, compacting, sintering, etc. Sources of mineral raw materials, introduction to ceramics. Ceramic processing techniques. Forming and thermal treatment to obtain ceramic product. Glasses, glazes and enamels on metals. Equilibria and reactions between ceramics. Recrystallization, grain growth and microstructure of ceramics than make them unique. (2 UNITS)

NON-DEPARTMENTAL COURSES

AEB 301.1: General Parasitology
The nature of parasitism. History of parasitology. Types of parasites and hosts, evolution of parasitism. Host specificity. Ecology, life cycles, pathology and control of protozoal and helminthes parasites. Parasitic diseases of man and animals. Host parasite interaction. (3 UNITS)

ANA 210.1: Introduction to Anatomy and Histology Techniques
This is a course in microscopic anatomy; the branch of anatomy that deals with cells and minute structure of the tissues and organs. The general goals of this course will include an overview of both fast and concept of microscopic anatomy sufficient to serve as a meaningful background for subsequent basic and clinical science in which the functional aspects are taken up in greater details. The course will include both lectures and laboratory work, Specific objectives will include: A. The proper use of the light microscope in order to gather enough information to recognize cells, tissues and organs; B. Interpretation of basic cellular structure as seen by electron microscopy; C. The

ability to correlate subject material given in histology with the other disciplines of anatomy; and D. The ability to use the vocabulary of this subject. (3 UNITS)

ANA 301.1: Neuroscience
This integrated course would seek to study the central nervous system from anatomical, physiological cell clinical perspectives cell would provide a good background to neurology. (3 UNITS)
ANA 311.1: Gross Anatomy Techniques

The head, neck and the back will be studied as revealed by dissection. Membranes fossil and sinuses in the cronical cavity are emphasized. The mastery of the human skull is required. The brain and nervous system would also be studied and other aids. The study of all the cronical nerves, lobes suki, gyri, nudes and path rays cell their clinical significance are emphasized. (3 UNITS)

BCH 210.1: Introduction to Biochemistry
Acids, bases and buffers. Chemistry of Amino acids, protein and their derivatives. Methods of isolation and identification. Primary, secondary, tertiary and quaternary structures of proteins. Determination and biochemical importance of the structures. Chemistry and structure of carbohydrates; their nomenclature chirality vitamins and minerals. Enzymes. (3 UNITS)

BCH 214.1: General Biochemistry
Chemistry, structure and functions of lipids. Chemistry structure and functions of nucleic acids, Viruses. Nomenclature of nucleosides and nucleotides; effects of acids and alkali on hydrolysis of nucleic acids. Structures and functions of cells and organism, eukaryotic and prokaryotic cells. Transport processes (passive and active), Basic concepts of biochemical energetics. (3 UNITS)

BCH 211.2: Medical Biochemistry I
Carbohydrate metabolism Lipid metabolism proteins- structure and function. Amino acid metabolism. Nucleosides, Nucleotides and nucleic acid. Classification of viruses based on the manner of gene expression (TMV), TH phage tumour viruses). Enzymes; structure and function. Simple kinetics of enzyme catalyzed reactions clinical Applications of enzymes. Water and mineral metabolism. Acid base control Disturbance of acid base control. Renal function and the composition of urine. (3 UNITS)

BCH 311.1: Medical Biochemistry II
Nature of hormone, definition, target tissues, endocrine/exocrine, glands. Sites of hormone action (unclear level, ribosomal level, enzyme level, membrane level and cyclic AMP level) Mechanism of hormone action: Peptic hormone, Steroid hormone, Thyroid catecholamine, and growth. Brief treatment, chemistry and function of one/ some hormone s from each organ or tissue. Thyroid, pancreases adrenals, gastrointestinal treat pituitary, and hypothalamus Abnormal hormone production (e.g.) dwarfism, gigantism, goiter, hyperthyroidism and diabetes mellitus. Methods of hormone assay. (3 UNITS)

BCH 312.1: Tissue and Organ Biochemistry
The biochemistry of muscles – structures and mechanism of contraction. Biochemistry of liver-structure and metabolism of biomolecules. Detoxification mechanisms. Liver function test. Biochemistry of the kidneys – structure, urine formation, Osmoregulation and abnormal constituents of urine and renal failure. The Biochemistry of Brain structure, composition and metabolism of biomolecules in the brain. Conduction of nervous impulse. Neurotransmitters. Biochemistry of adipose tissues. Biochemistry of vision. Constituents and functions of the body fluid. Structural proteins – collagen, elastin and keratins. Biochemistry of reproductive tissues. (3 UNITS)

BCH 318.2: Techniques in Biochemistry and Immunochemistry
Principles of instrumentation, paper, thin-layer and high performance liquid chromatographic techniques. Membrane transport system (active and passive). Lonophores. Chemical work of biosynthesis. Mechanism of contraction, action and applications. Gel filtration techniques and applications. Spectrophotometric methods and application. Centrifugation techniques and applications. Fluorimetry and applications. Electrophoresis and application. Radioimmunoassay and fluoroimmunoassay techniques and application. Nuclear magnetic resonance and electron spin resonance and applications in biochemistry and immunochemistry. Qualitative analysis. X-ray fluorescence method. Immunology, immunochemistry and immunochemical reactions and specificity. Humoral and cellular immunity. Classes, structures and properties of immunoglobulins. Toxoids, vaccination. (3 UNITS)

BCH 320.2: Enzyme Biochemistry
Enzymes as proteins. Enzymes isolation and purification. Enzyme kinetics-single substrate (Michaelis-Menten and Briggs Haldane Steady state treatments) and Bisubstrates (Ping-pong, Theorell-Chance mechanisms. Kinetics of various inhibition patterns. Factors affecting enzyme catalyzed reaction (pH, temperature etc.) Methods for plotting enzyme. Enzyme active site and identification of amino acid residues. Basis of enzyme catalysis. Catalytic mechanism of some enzymes (ribonuclease, chymotrypsin, Aspartate transcarbamylase). Multi-enzyme complexes. Coenzymes and cofactors. Isoenzymes (LDH, alkaline phosphatase). Protein-Ligand interaction. Substrate and product inhibitions. Kinetics of fast reactions. Co-operative binding processes. MWC model of allostrery. Adaor-Koahland sequential model. (3 UNITS)

BCH 325.2: Biophysical Chemistry
Application of chemical thermodynamics to biological systems. Biochemical energetic, Oxidative phosphorylation. High energy compound, ATP generation. Photosynthesis. Molecular organization of cellular components – natural and artificial membrane bilayers. The unit membrane hypothesis. Membrane transport system (active and passive). Lonophores. Chemical work of biosynthesis. Mechanism of contraction and action. (3 UNITS)

BCH 410.1: Endocrine Biochemistry/ Biochemical Regulation
The endocrine system. Reproduction and morphogenesis. Regulation and interrelationship of metabolic pathways. The relationship of Krebs cycle to protein, carbohydrate, lipid and nucleic acids metabolism. Turnover and metabolic pools. Regulation of enzymes of metabolic pathways-feedback inhibition versus enzyme synthesis. Catabolite repression and product repression. The lactose operon and arabinose operon. Identification of different regulatory mechanism in metabolic pathways. (3 UNITS)

BCH 422.1: Environmental Biochemistry
Pollutants of air, land, water and foods (e.g. fishes, etc) effects of pollutants on environment. Effect of refrigerants, automobile exhausts and industrial song on health and environment. Effects of industrial discharges (untreated) in streams, rivers and lakes, role of governmental organizations and nongovernmental organizations in environmental pollution. Policies, rules and regulations on drugs, food and environmental management. Use of chemicals and biologicals in fishing industry. Indiscriminate use of fertilizers and effects on environment. Biochemical consequences of pollution and oil spillage. (3 UNITS)

BCH 501.1: Pharmacological Biochemistry
Fats of foreign substances in the body. Detoxification mechanisms, principles of drug metabolism. Role of gut bacteria, bile and nutritional state in drug metabolism. Food additives, pesticides and storage of chemicals in the body. (3 UNITS)

BCH 507.1: Biochemical Methods
Chromatographic methods: Definition, principle, types and terminologies, Absorbent, ion exchanges and methods of development of chromatograms, Processes of TLC, gel-permeation, chromatography and bases for biological significance, Matrices for gel-affinity/linkage of ligand, GLC and different types of detectors, LLC determination of column efficiency and RF value, kovat indices and mcReynold constants. Electrophoresis: Definition, principle, theory, effect of the mobility particles (pH, osmotic flow and diffusion), Methods of sampling application, detection and estimation of sample components, also types of support media, List application of electrophoresis. Potentiometric methods: Nevst equation, Eref = E – RT/F Inc, Description and theory of pH meter and the setup of potentiometric measurements, List of applications. Spectrophotometry: Explain electromagnetic emission spectrum, beer lambert law, UV/visible spectrophotometer; sections of spectrophotometer, Describe the operation of the spectrophotometer, and explain the relationship E %/cm = A (2 UNITS)

BCH 511.2: Industrial Biochemistry
Introduction to industrial processes. Central overview of available raw materials for biochemistry-oriented industries. The food industry-production of starches and protein rich food; confectionaries etc. Drinks, milk production, fruit juice production. Starch for industrial uses. Yeast multiplication for baking and brewing industries. Sugar production form tubers and canes etc. Production and medical enzymes. Production and diagnostic kits and reagents. Commercial extraction of aromas and pigments from raw materials. Production of activated charcoal, coke production from coal. Soap and candle making. Biodegradation production of natural composts as fertilizers, utilization of urban waste materials. Biotechnology in biochemical industry. Commercialization of biochemical information-genetical, nutritional and general health counseling. Student's seminar presentation. (2 UNITS)

BCH 525.2: Food Chemistry and Food Analysis
Occurrence, structure and function of carbohydrates, protein, fats and oil, physical and chemical properties, Starch behavior during baking and stalling of bread Glucose syrup-chemistry of enzymatic and non-enzymatic production, Ripening and maturing of fruits – pectin substance and their uses, The chemistry of fermentation process in the food industry, Effects of enzymes in foods, Enzymatic and non-enzymatic browning. Sampling and treatment of analysis – proximate analysis of: i. Sugar and fruits products ii. Milk and dairy products Fresh food iv. Fermented products (bear, wine, vinegar) v. Flour and confectionary vi. Oil. (2 UNITS)

CHM 130.1: General Chemistry I
Basic principle of matter and energy from the chemist point of view. Atomic theory and molecular structure, stoichiometry. The periodic classification of the elements. Atomic structure chemical bonding properties of Gases sounds, liquids and solution. Chemical equilibrium. Chemical Thermodynamics, Electrochemistry and chemical kinetics. (3 UNITS)

CHM 131.2: General Chemistry II
Application of the principles of chemical and physical change to the study of the behavior of matter and the interaction between matters. The chemistry of representative elements and their commission compounds with emphasis on the gradation of their properties – brief chemistry of the first series of transition elements, general principles of extraction of metals; introductory nuclear chemistry. (3 UNITS)

CHM 132.2: Introduction to Principles of Organic Chemistry
A survey of carbon compounds including an overview of the common functional groups in aliphatic and benzenoid compounds. Introduction to reactants and reactions in organic chemistry. (3 UNITS)

CHM 235.1: Analytical Chemistry I
Introduction to Basic analytical Chemistry. The theory of errors, statistical treatment of data, sampling, gravimetric analysis and volumetric methods of analysis. (3 UNITS)

CHM 240.2: Physical Chemistry 1
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. (3 UNITS)

CHM 250.1: Inorganic Chemistry
The physical principles of inorganic chemistry are treated. Topics include chemistry of non-transition elements and alloy chemistry. (3 UNITS)

CHM 260.1: General Organic Chemistry
Fundamental theories and principles of chemical reactivity; chemical reactions and synthesis of non-functional compounds. Reactions and mechanism of common reactions, stereochemistry. (3 UNITS)

CHM 261.2: Organic Chemistry II
Chemistry and spectroscopic properties of difunctional compounds – dienes, alkenes, diols, diketons and dialdehydes etc. Chemistry of aromatic compounds. Aromaticity and routes to polynuclear aromatic compound. (3 UNITS)

CHM 335.1: Analytical Chemistry II
Introduction to the basic instrumental methods of analysis. Sufficient material concerned with instrumental methods for completion of analysis such as potentiometric. Conductumetrics, electro gravimetric/colormetric, polarographic titrations will be covered. (3 UNITS)

CHM 340.2: Physical Chemistry II
Chemical thermodynamics including treatment of partial molar quantities and chemical potentials. Brief introduction to quantum mechanics limitation of New to man mechanics and derivation/Application of Schrödinger equation for hydrogen atom. Quantum numbers and their physical significance. Atomic structure. (3 UNITS)

CHM 350.1: Inorganic Chemistry II
The noble gases/hydrogen, Electronic structure and general properties and comparative study group elements, Chemistry of Boron, Carbon, Silicon, Nitrogen and Phosphorus, oxygen and Sulphur, The Halogens, The transition elements, Polar Bonding, polarization, Two hydrolysis mechanisms, Concept of amphoterism in inorganic chemistry, Theory of solution and electrolytic dissolution, Hydrogen compounds of chemical elements, Oxygen compound of chemical elements, Carbonyls. (3 UNITS)

CHM 362.2: Environmental Chemistry
Concepts of elementary cycle, Characteristics of the atmosphere. Sources, types and effects of environmental pollution, Water and waste water treatment, Background, sample water analysis, flow, dispersion, degradation, Amount and composition of water, biological aspects, particles, Transport in soil and ground water sinks for water treatment: Conventional processes in handling sewage, water treatment, plant waste, advanced waste treatment; Effect of water pollution. Composition of domestic water, Chemical and physical instrumentation in environmental sciences, Land pollution. (3 UNITS)

CHM 363.2: Applied Spectroscopy
Principles and application of U.V., IR, NMR and Mass Spectroscopy. The determination and elucidation of structures of organic compounds. (3 UNITS)

CHM 435.1: Analytical Chemistry III
Separation Techniques–the different types of chromatography, instrumental methods of analysis, theories and applications. Mass spectrometry, NMR (1H cd 13C), x-ray methods, electron spin resonance spectroscopy, Radio Chemical Method. (3 UNITS)

CHM 501.1: Environmental Technology
Pollution and the environment-definitions and inter-relationships, natural and man-made pollution, the economics of pollution. Air pollution-gaseous and particulate pollutant and their sources. Effects on weather, vegetation materials and human health. Legislation relating to air pollution. Methods of control of gaseous emission and destruction, cyclones, inertial, separators, electrostatic precipitators, bag filters, wet washers, etc. dispersal from chimneys and method of calculating chimney height. Flare stacks. Water pollution-river pollution by industrial effluents Legislation and standards for effluents on the ecosystems. Treatment processes including precipitation, flocculation, coagulation sedimentation, clarification and colour removal. Principles of biological treatment processes. Cost treatment. Treatment of water re-use, on exchange. Cooling water treatment. Land pollution- disposal of solid wastes by incinerator and dumping. Possible future trends including conversion of solid waste into useful materials or energy. Treatment of other types of pollution-noise. Thermal and Nuclear pollutions. (2 UNITS)

CHM 502.1: Spectrochemical Analysis
1. ARC and spark emission spectrometry, 2. Atomic absorption spectrophotometry 3. Atomic fluorescence spectrometry 4. Introduction to molecular spectroscopy 5. Ultraviolet and visible molecular absorption spectrophotometry 6. Infrared spectrometry 7. Molecular luminescence spectrometry 8. Molecular scattering methods 9. Spectrochemical techniques: i. Statistical concepts ii. Properties of optical materials. iii. Characteristics of optical filters. iv. Photomultiplier tube specification v. Sample preparation methods vi. Atomic and molecular transitions. (2 UNITS)

CHM 505.1: Natural Products Chemistry
Classifications and Chemistry of terpenoids, steroids and alkaloids, antibiotics, Flavonoids, Prostaglandins and chlorophylls, Other natural products of pharmaceutical importance, General methods of isolations, separation, purification and structural, determination of the natural products. Discussion of chemistry of important members: Biogenesis. (2 UNITS)

CHM 514.1: Dye and Textile Chemistry Technology, Wood and Pulp Chemistry
Principle of yarn manufacture both natural and manmade, Basic machine processes involved, Textile processing, bleaching, dying theory and printing, Surface activity, Colour fastness and factors affecting it, Colour matters, Management problems in textile industries, Forestry- conservation, exploitation and afforestation, Species, anatomy, physical properties and classification of wood, Preparation of wood for pulping, Physical and chemical methods of pulping, Bleaching reagents and pulp bleaching, Pulp-properties and uses. (3 UNITS)

CHM 562.2: Pharmaceutical Chemistry
General synthetic methods including biosynthesis and degradation. Natural products of pharmaceutical importance. Physical pharmaceutics – solids, disperse system and powders including stability of solid state pharmaceutical analysis pharmacopeias, quality control procedures. (2 UNITS)

CHE 212.2: Chemical Engineering Process Analysis
Introduction to Engineering calculations Process and Process variables. Processes and process descriptions. Process data representation and analysis industrial stoichiometry (counting reactant excess reacted, degree of completion, percentage conversion). Material of Energy balances on batch, semi batch and continuous systems, in steady and (or unsteady state. Gases vapours liquids and solids. Their mixtures vapours liquid equilibrium (Raoult's law, relative and percent saturation, condensation due point). Steam (enthalpy temperature chart and steam table). Combustion calculations (solid, liquid and gaseous fuels, excess air, waste gas analysis. Applications to the chemical process industries. Sources of data. Dimensional analysis. (3 UNITS)

CHE 306.2: Mass transfer
Review of theories for prediction of mass coefficients. Application of distillation (Mccabe Thiele and Ponolion Savan't method) extractive azeotixpic distillation. Multicomponent distillation gas absorption, liquid/liquid extraction drying, leaching and humidification. (2 UNITS)

CHE 308.2: Heat transfer
Nature of processes of conduction, convention and radiation. Definition of thermal conductivity and heat transfer coefficients. Conducting through materials with constant and varying heat-transfer areas. Unsteady-state conduction: solution of equations for simple cases. Schmid's method. Reynolds analogy and its developments. Heat exchangers. Calculation of heat transfer coefficient. Optimum design. Finned tubes lagging effectiveness and economic thickness. Radiation Kirchhoff's and Stefan's laws. Emissivity. Calculation of net heat exchange between bodies- multiple reflection and net radiation methods. Radiation from gases. Heat transfer during condensation of vapours. Derivation of Nusself equation. Drop-wise and firm-wise condensation. Effect of non-condensable gases. Heat transfer to boiling liquids. Types of boiling and influence conditions on heat fluxes and transfer coefficients. (2 UNITS)

CHE 311.1: Chemical Technology I
Review of fundamentals of Chemical Thermodynamics and of Chemical kinetics as would be relevant to reactor design. Homogeneous reactions: analysis of constant-volume batch reactor. Design of single homogenous ideal batch, ideas flow and ideal back-mix flow reactors. Temperature effects on yield and selectivity resistance timer distribution. (2 UNITS)

CHE 313.1: Chemical Engineering Thermodynamics
Fundamental concepts of chemical thermodynamics; Second law of thermodynamics and entropy; Reversibility and entropy; Thermodynamics diagrams; Heat effects of thermodynamic processes; Definition of thermodynamic potentials of internal energy, enthalpy, Helmoholtz free energy and Gibbs free energy; Chemical potentials. (3 UNITS)

CHE 315.2: Transport Phenomena I
Fundamentals of transport phenomena (fields, flux density, filed intensity, rate equation, conservation laws- Newton's Fourier's and Fick's); laminar and turbulent flow of incompressible viscous fluids (isothermal flow over a flat plate, in tubes, non-isothermal flow; Flow in non-circular tubes; Non-conduction. Molecular diffusion in fluids in fluids; Interphase mass transfer; Diffusion in solids. (3 UNITS)

CHE 318.2: Chemical reaction Technology
Heterogeneous reactions: fluid-solids interacting systems. Norcatalytic, and solid catalysed gas-phase reaction. Tubular reactors-design equation based on plug flow for isothermal and adiabatic cases. Transport effects, packed bed design. Fluidized and slurry-phase reactors and their uses. Factors affecting choice of reactor. Optimization-output and yield problems. Conditions of stability

of reactors. Rate-controlled regime in gas-solid reactions catalysed by porous catalysts. Scale-up procedure-batch and continuous flow reactors. Economic evaluation and comparison of reactor types. (3 UNITS)

CHE 320.1: Chemical Engineering Laboratory
Laboratory experiments in transport phenomena, kinetics and separation processes. (3 UNITS)
CHE 503.1: Process control
Classical control theory. Transfer function. Time and frequency response. Stability theory. Root locus method. Control system designs. Instrumentation modern control theory. Observability and controllability modern reachability. State – space analysis. Introductory sampled data analysis. Control of distillation columns, reactors and heat exchangers. (3 UNITS)

CHE 505.1: Process Optimization
Stationary Optimization: differential approach Numerical Approach, linear and nonlinear programming. Trajectory optimization including dynamic programming, calculus of variation and pontryagin optimum principle. Numerical computational techniques including first and second order methods. (2 UNITS)

CHE 514.2: Biochemical Technology
Aspect of living processes. Microbiology and control of microorganisms. Microbial kinetics. The Biochemistry and physic-chemical properties of biological compounds. Biochemical pathways and metabolism of simple substrates. Fermentations. Enzymes and enzymes kinetics. Biochemical reactors. Design of microbial culture processes in the manufacture of pharmaceuticals, commercial enzymes and alcoholic beverages. Batch and continuous culture. Biological waste disposal. (3 UNITS)

CHE 518.2: Process Design
Presentation and discussion of real process design problems. Block diagrams, process and engineering flow diagrams, process outline charts incorporating method study, and critical examination. Specification of vessels, examples include distillation towers and ancillaries, heat exchangers vaporizer, knock-out vessel. Emphasis on conception and invention of processes as well as analysis and economic balance, to specify optimum design and operating conditions. Discussion of a variety of cases throughout the course. (2 UNITS)

ECO 102.2: Principles of Economics
Scope and methodology of Economic study. Price mechanism. Demand and Supply. Theory of Production. Forms and Business Organization. Markets structures. Money and Banking. The national income. International Trade. Economic Trade. Economic growth and development. The role of government in the economy. (2 UNITS)

ENG 101.1: Engineering Drawing I
Introduction to drawing instruments, scales, draughting aids and their proper use. Size of paper and drawing layout Dimensioning, line work and lettering. Geometrical construction and Engineering graphics. Development of geometrical figures and intersections of solids and curves. Introduction to projections. (1 UNIT)

ENG 201.1: Engineering Mathematics I (Mathematical Analysis)
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, integrals dependent on parameters, improper integrals, line integrals, Green's formula, condition for independence of line integral on path, application to problem of mechanics and thermodynamics. Surface integrals, fluid flux across a surface, properties. Stroke's formula. Field theory, vector filed and vector lines. Applied 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, Lagrange's and hypergeometric functions. Introduction to analytic functions, Cuschy-Riemann equations, conformal mappings. (3 UNITS)

ENG 202.2: Engineering Mathematics II (Linear Algebra and Analytic Geometry
Surface and curves in space, cylinders, cones, and surfaces of revolution. First and second-order algebraic surface, 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, Eigen values of a matrix. Linear mappings, symmetric matrices, bilinear and quadratic forms. Differentiation and integration of matches. Applications of matrix algebra. (3 UNITS)

ENG 203.1: Engineering Mechanics (Statics and Dynamics)
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 structures – beams, trusses, frames and machines. Linear and curvilinear motions, acceleration, Kinetics of particles, Newton's Second law, impulse, momentum, impact and restitution, work, energy, power and efficiency. (3 UNITS)

ENG 209.2: Basic Thermodynamics and Heat Transfer
Engineering thermodynamics. Basic concepts definitions, thermodynamics properties; the thermodynamic system units; equations of state for perfect and real gases and gas mixtures; thermodynamic work and heat; the first law of thermodynamics; energy equations and analysis; basic thermodynamic processes and cycles for ideal gas, pure substances ad mixtures; reactive systems; thermodynamic relations; the second law of thermodynamic 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. (3 UNITS)

EEE 222.2: Electrical Engineering Drawing Installation
Design of simple domestic and industrial installations. Design of simple alarm circuits. Safety and wiring regulation. Drafting equipment instruments, symbols and notations. Electrical layouts and connection diagrams. Production of “as built drawings” wiring of discharge lamp fittings and energy meters. Earthling Techniques. Simple tests on installation and circuits. (1 UNIT)

EEE 307.2: Electromagnetic Fields and Waves
Maxwell's equation (in rectangular coordinates and vector-calculus notation); Derivation of Maxwell's equations, electromagnetic potential and waves, pointing vector, boundary conditions; waves propagation in good conductors skin effects; plane waves in unbounded di-electric media, fundamentals of transmission lines, waves-guides and antenna. (3 UNITS)

EEE 309.1: Telecommunication Principles
Amplitude modulation; spectrum, transmitted bound width, AM radiated power, carriers, side-band, modulation index, DBS, SSB, DSBSC and SSBSC transmissions and their advantages and disadvantages, SSB pilot carrier. Frequency modulation; waveform, frequency deviation, radiated power swing, bandwidth; spectrum of FM; advantages and disadvantages of FM over AM; production FM (using varactor diode and reactance valve), pre-emphasis circuit. AM and FM detection; envelope detections, square law detector, Fuster- seeley and radio detection of FM, de-emphasis circuit. Digital modulation; importance of digital modulation, types of digital communication systems, sampling theorem, sampling frequency, operation of PAM transmitter and receiver, disadvantages of PAM transmission, transmission methods (time division multiplexing (TDM), and frequency division multiplexing (FDM), areas of application of TDM and FDM. Telecommunication system; types of telecommunication systems; Radio broadcasting system ii Television and broadcasting system iii Satellite communication system. iv Close-circuit television system v. Radar system vi. Telephone system vii Telegraphic system. Principles of operation of each system. (2 UNITS)

EEE 310.2: Electrical/Electronic Engineering Laboratory II
Digital circuits: Number systems, Combinational logic circuits; Sequential logic circuits. Control Systems and Power Electronics: Multistage Amplifier circuits; signal generations; AM, FM modulation techniques Measurement and Instrumentation: Application of Transducers in: Temperature, Pressure, Fluid flow and Strain gauges. (1 UNITS)

EEE 318.2: Radio Communication Principles
Radio frequency spectrum; Electromagnetic wave radiation and aerials; Radio waves propagation, modulation and demodulation; radio transmitter; Radio receivers. (2 UNITS)

EEE 404.1: Electrical Machines
Review of electromechanically energy conversion rotating magnetic fields. Performance and methods of speed control of DC machines, induction motors linear induction motors, circuits diagram, power transformers, and parallel operation of 3-phase transformers. Performance of synchronous generators, fractional horse-power motors, single-phase induction motors, universal motors. Reluctance motors. Hysteresis motors. Faults on machines; methods of starting and protection of machines. (3 UNITS)

EEE 415.1: Digital Electronics
The transistor of a switch, power dissipation based over drive storage, drive and switching speed, logic gates; NAND, OR with close logic, the TTL and gate, Truth table, noise margins, television pole, open collector and triastate, Bolean Algebra, identities, Dc-Morgan's law, Kanaugh Mapsquin Mc Chuksy minimization by computer aided techniques. The half and fuel adder. Flip-flop; R-S, J.K, and D types, edge and level trigger, master slave types, the shift register, circuit techniques, oscillation sine wave amplitude control, sequencing frequenting stability, wave discrimination, practical ramp generations, conversion techniques; frequency to voltage, stairs case generators, analogue to digital, digital to analogues. Termination of pulse lines, Beargon diagram, low noise amplifier design, use of discrete components for minimum noise. (3 UNITS)

EEE 503.1: Semiconductor Technology
The chemical physics of semiconductors, purification, growth of simple crystals, evaluation of chemical structure properties, doping effects, mechanical and metallurgical properties. Thermodynamic and kinetic consideration in crystal growth from metal and by chemical vapour transport techniques, scanning and transmission electron microscopy, x-ray photograph. Photominiscience and mass spectroscopy, Si, Ge, As and measurements of electrical properties.

Processing of semi-conductor materials for device fabrication of p.n. junction luminescent material. Materials for IC's and their fabrication. (3 UNITS)

EEE 507.1: Electronic Devices: Design and Fabrication
Relevant items/devices of commercial interest to be handled by individual units. (3 UNITS)

FSB 101.1: General Biology I
Characteristics of life. Investigation in biology. The scientific substance of life; the unit of life (including methods of study); activities of cells, the control of metabolic activities, cell division Basic principles of inheritance, Genetics cell plant groups. (3 UNITS)

FSB 102.2: General Biology II
Variety of organism viruses, Bacterium Protozoa, FUNGI Animals and Plants. Principle of classification of macro and macro organisms systemic study of selected animals and plant groups. Analysis of microflora, macro flora, micro fauna and macro fauna of assigned habitats. (3 UNITS)

FSB 202.2: Genetics
Heritable and non-heritable characteristics. Mendelian genetics. Cone interactions, quantitative genetics. Extra Chromosomal inheritance. Sex determination. Elementary probability in genetics. Gene structure and function. Linkage and recombination in eukaryotes. Introduction to recombination in prokaryotes. Chromosome morphology variations in ploidy level and chromosome behaviour. (3 UNITS)

FSB 203.2: Biological Techniques
Plant collection, identification and storage collection and preservation of plant specimens. Identification of plants and animals procedure for the observation of living tissues. Procedure for the observation of dead tissues (Microtomy). The microscope–its structure, use and care. Cytological techniques. Electrophoretic techniques chromatographic techniques. Principles of colorimetry/spectrophotometry. Preparation of simple reagents and stains. Simple Histochemical techniques. Basic Microbiological techniques. Palynology. Photographic techniques, Laboratory hazards and safety measures. Experimental designs. Population sampling: Transects, quadrants sampling in the lab. Collection and preservation of animal specimens 9a) Collection apparatus (b) Soil organisms killing and preservation of animal specimens. Introductory experimental design and analysis: (a) completely randomized (b) randomized complete block (c) factorial. (2 UNITS)

GES 100.1: Communication Skills in English
The course seeks to develop in the students a well-informed attitude towards the English language and to equip them with a knowledge of English communication and study, skills that will facilitate their work in the university. Lecturers and tutorial will cover the use of the library, study methods, grammar, punctuation and mechanics, principle of effective writing, word use, reading and comprehension. (3 UNITS)

GES 102.1: Introduction to Logic and Philosophy
Survey of scope notions, branches and problems of philosophy, symbolic logic, special symbols in symbolic logic. Conjunction, affirmation, negation, disjunction equivalence and conditional statements laws of thought. The method of deduction using rules of inference and biconditional Quantification theory. (2 UNITS)

GES 101.2: Computer Appreciation and Application
History of Computers. Generalization and classification of computers. IPO model of a computer. Components of computer system – hardware and software. Software and its application.

Programming language, organization of data. Data computer techniques. Introduction to computer networks. Use of the key board as our input device. DOS windows, Word Processing Spread sheets. Application of computers in Medicine, Social Sciences, Humanities Education and Management Science. (2 UNITS)

GES 103.2: Nigerian People & Culture
A study of Nigerian History and Culture in Pre-colonial times. Nigerian perception of his world. Culture areas of Nigeria and their characteristics. Obligations of the citizens. Environmental sanitation. (2 UNITS)

GES 300.1: Fundamentals of Entrepreneurship
The Course Discusses the Concepts, History and the Development of Entrepreneurship; The Entrepreneur Qualities and characteristics; The Entrepreneur and Business Environment; Identify Business Opportunities, Starting and Developing New Business Ventures; Legal Forms of Business Ownership; Feasibility Studies; Roles of Small And Medium Scale Enterprise (SME) in the Economy; role of government on Entrepreneurship; Business Location and Layout; Accounting for SME; Managing of SME; Marketing in SME; Risk Management of SME; Success and Failure Factors of SME; Prospects and Challenges of Entrepreneurship and Intrapreneurship, Ethical Behaviour in Small Business. (2 UNITS)

GES 400.1: Entrepreneurship Project
The entrepreneurship project in Science Laboratory Technology aims to afford the fourth year students of the program the opportunity to, individually or in a group, select a product(s) or service(s), conduct a feasibility study, design and develop the product, design its manufacturing system and marketing strategies, and determine the modalities for establishing and operating an enterprise based on the product. (2 UNITS)

GNG 402.1: Technology of fossil fuel processing
Source, availability and characterization of fossil fuel (petroleum, natural gas, tar sands, coal). Modern processing technology choice of product lines and products, alternative product lines and product specifications will be emphasized. (3 UNITS)

GLY 200.1: History of Geology and Stratigraphy
The geology time scale and its methods of measurement. Origin and chemical evolution of the atmosphere, hydrosphere and biosphere- the history of life bacteria to man. Concepts of paleoclimate, paleoceanography, paleomagnetism. Basic principles of stratigraphy. Practical identification of common fossils. Sedimentation – Principles and processes. Internal processes on earth. Igneous and Metamorphic. (2 UNITS)

GLY 202.1: Physical Geology I
Planet Earth. Its composition from core to crust. Minerals, rocks and weathering. Surface processes and landforms, major earth structures. Plastic identification of common rock forming minerals and rocks; interpretation of topography and simple geologic maps. Deformation processes– joints, faults and folds. Metamorphism and metamorphic rocks minerals and rocks – origin, distribution, identification and classification. (2 UNITS)

GLY 203.1: Crystallography and Mineralogy
Morphological, structural and geometric crystallography. Crystal chemistry, stereographic projections. Systematic classification and description of rock forming mineral groups. Minerals chemistry and genesis. Principles of the polarizing and binocular microscopes. Basic physical and optical characteristics of common rock forming minerals. Practical to include: crystals projections,

the binocular and polarizing microscopes, petrology and petrography of common minerals and rock. (2 UNITS)

GLY 204.2: Field Geology and Map Interpretation
The compass-clinometer and other geological mapping instruments and techniques. Field measurement of distance, strike (bearing and azimuth) and dip. Concepts of scale and the globe. Outcrop descriptions. Mapping styles for sedimentary, igneous and metamorphic terrains and simple geologic structures. The use of hand lens, field identification of minerals and rocks. Methods of collecting rock samples in the field. Geologic symbols. Field note taking, and Geologic report preparation. Practical to include preparation of a simples geologic maps. (2 UNITS)

GLY 205.2: Optical and Determinative Mineralogy
Principles of crystal and mineral optics. Michel Levy colour chart, Uniaxial and biaxial figures, extinction angles, interference colours. Identification of rock forming minerals in parallel and convergent light under the polarizing microscope. X-ray methods in crystallography and mineralogy. Practical to include petrography of some rock types, XRD identification of mineral, photomicrography. (2 UNITS)

GLY 301.1: Sedimentary Petrology
Major controls on sedimentation (sea level changes, climatic changes, tectonics and other secular variations). Quantitative measurements and geostatistical treatment of sedimentological data. Depositional models (alluvial fan, braided and meandering fluvial deposits, beaches and barrier islands, intertidal flats, storm and tidal sand ridges, turbidites, reefs and other carbonate deposits). Application of depositional models to the exploration and exploitation of strata bound mineral resources. Practical should include: petrography of sandstones and carbonates; histogram. Cumulative frequency, paleocurrent and bivariate plots, exercises on other geostatistical techniques and the reconstruction of paleo depositional environments from outcrop and subsurface data. (3 UNITS)

GLY 302.1: Igneous Petrology
Intrusive and extrusive processes and their textural, mineralogical and structural characteristics. Magmatic crystallization, differentiation and magma types. Phase equilibria and genesis of selected igneous rocks. Association of igneous rocks in time and space. Major, minor and trace element geochemistry of common igneous rocks. Mineralogical and chemical classification of igneous rocks Petrogenesis and tectonic setting of igneous rocks. Plate tectonics and igneous rock provinces. Igneous rock provinces of Nigeria and West Africa. Geostatistical treatment of quantitative data from igneous rocks. Practical should include: petrography and geochemical measurements, analysis and interpretation of igneous rocks. (2 UNITS)

GLY 303.2: Structural Geology II
Stresses and strain analysis; and the stress ellipsoid stress component and trajectories; experimental deformation behavior of rock minerals; rheology in the earth's crust; fold mechanics; brittle fracture and failure, use of Mohe's circle; brittle and ductile shear zones, small scale geological structures. Salt domes and diaprism. Elements of physical metallurgy – crystal defects and dislocations, work hardened annealing, recovery, recrystallization, deformation mechanisms and development of textures and preferred orientations by plastic flow and recrystallization, solution of structural problems by stereographic projection. (3 UNITS)

GLY 304.1: Systematic Palaeontology
Morphology and classification of the animal phyla (protozoa, porifera, Coelentera, Bryozoa, Brachiopoda .Mollusca, Arthropoda, Echinodermata, Graptolithma) as well as vertebrates, plant and

trace fossils. Stratigraphic paleontology and evolution of the various fossils groups. Paleo-environmental and Tertiary magma fossils of Nigeria and West Africa. Practical to include collection and identification. (2 UNITS)

GLY 307.2: Metamorphic Petrology
Physico-chemical processes in metamorphism; agents and controls of metamorphic processes: metamorphic differentiation. Classification of metamorphic rocks, metamorphic tectures. Metamorphic Facies and Facies series, Facies of contact and regional metamorphism. Regrograde metamorphism, poly metamorphism and Orogeny. The carbonatite problem; eclogites. Evolution of gneisses and migmatites; Anataxis, metasomatism and granitisation. (3 UNITS)

GLY 308.1: Introductory Geochemistry
Abundance, classification and distribution of elements in the cosmic system, lithosphere; hydrosphere and atmosphere and atmosphere, geochemistry of different rock types and mineral deposits, weathering and soil formation, principles and methods of exploration geochemistry and geochemical analysis. (3 UNITS)

GLY 313.2: Principles of Geophysics
Introduction to geophysical techniques (seismic, gravity, magnetics, resistivity). Geophysical data acquisition, processing and interpretation and interpretation in petroleum geology and economic minerals. Borehole logging and analysis. Elements of basin analysis. (3 UNITS)

GLY 401.1: Petroleum Geology
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. (3 UNITS)

GLY 403.1: Micropaleontology and Palentology
Morphology, evolution and identification of major animal phyla, viz: Protozoa, Porifera, Coelenterate, Bryoozoa, Brachiopoda, Mollusca, Arthropoda, Echinodermata, Graptolithina, stratigraphic and paleocologic distributions, vertebrates and plant fossils; trace fossils. Sample preparations methods in Paleontology: Washing of ditch cuttings, Identification of fossils, Picking of fossils, Storage of microfossils, Duplication of fossils (2 UNITS)

GLY 404.1: Economic Geology
Genesis and classification of ore deposits. Concepts of paragenesis, zoning and geothermometry. Occurrences and distribution of minerals in time and space. Plate tectonics and mineral genesis. Prospecting methods and mine development strategies and mineral treatment methods, mineral economics. Reserve calculations. Mine hazards and control methods. (2 UNITS)

GLY 405.1: Hydrogeology
The hydrologic cycle, hydrogeologic properties of rocks. Occurrence, distribution and flow patterns of groundwater. Types of aquifers and characteristics. Fundamental hydrodynamic laws, groundwater and well hydraulics. Physical, chemical and biological properties of groundwater. Groundwater resource development, management and inventory. Pump and aquifer tests. Ground, exploration method. Borehole designing and drilling. Groundwater regimes in Nigeria. Environmental problems of groundwater exploration and exploitation and controls. (2 UNITS)

GLY 406.1: Independent Field Mapping
Engineering properties of rocks; concrete aggregates and quarrying techniques; elements of soil mechanics; geological site investigations, foundations; dams; influence of groundwater on engineering project slopes, roads, rail roads, dams and reservoirs. Method of ground improvement – grouting, compaction, anchoring, drainage. (2 UNITS)

GLY 407.1: Engineering Geology & Construction Technology
THE Engineering properties of rocks and the engineering classification of rocks, soils and construction materials. Quarrying techniques. Elements of soil mechanics, geological site investigation, methods for building roads, bridges, dams and engineering structures types of foundations for engineering structures, influence of surface an d groundwater on some engineering structures. (2 UNITS)

GLY 408.1: Photogeology and Remote Sensing 1
Concepts and Foundation of Remote Sensing: types of sensors, Elements of photographic systems. Aerial photography-types; principles of stereoscopic vision. Measuring and plotting instruments in photography. Principle of aerial photo interpretation; mapping. Introduction to non-reconnaissance mapping economic mineral prospecting and hydrogeology. (2 UNITS)

GLY 503.1: Exploration Geochemistry
Principles of major trace elements analysis; preparation and analytical procedures, geochemical surveys, field operations – sample collection and processing; surveying-techniques, map preparation and interpretation of data. Geochemical methods in mineral prospecting and exploration. Case histories of geochemical surveys and integrated exploration programmes. The future of geochemistry in mineral exploration. (3 UNITS)

GLY 504.1: Energy Resources
Introduction to energy resources. Primary resources; external sources, the earth's internal heat. Secondary resources. Photosynthesis and fossil fuel, the fossil fuel bank. Global perspective of energy resources, the growth of energy demand, global requirement and distribution. Fossil Energy: Coal: its geology – origins, stages of formation, properties and ages, world coal resources, petroleum; nature, origin and generation. World resources of petroleum. Side effects of fossil fuel conversion. Nuclear Energy: Nuclear reactions and reactors, fuel requirement for reactors; uranium – geology and geochemistry, its occurrence in pegmatites and magnetic deposits; vein – type deposits e.g. in fissures, fault zones, unconformities, sandstone and quartz pebble conglomerate deposits. Uranium production and economics its reverse and resources. Side effects of nuclear industry, radioactive waste disposal. Geothermal Energy: Hyper-thermal resources; zones with low conductive shallow strata, hot rocks. Surface Energy Resources: Solar energy – its thermal collection, photovoltaic conversion, biomass conversion via photosynthesis. Wind energy, hydro-electric power – its contribution to global power supplies. Tidal power, Wave energy. Energy supply and demand in Nigeria – present and future scenes. (2 UNITS)

GLY 505.1: Regional Geology of Africa & Geology of Nigeria
Major geomorphic and structural elements in Nigeria. The basement complex; origin structure and evolution of early – middle Proterozoic rocks in Nigeria; the Nigeria Schist belt and problems late. Proterozoic Lithostratigraphy; Schist belt mineralization; the Pan African Orogeny and the evolution of the older Granites. The Jurassic of Nigeria – Young granites. Post-Paleozoic drifts and the emergence of sedimentary basins; stratigraphy and fossil records. A working excursion round the basement complex and sedimentary parts of Nigeria. (2 UNITS)

GLY 507.1: Structural Geology and Global Tectonics
Analysis of large-scale regional structure; continental drift. Sea-floor reading and plate tectonics, plate tectonic regimes in the geologic palinspastic reconstructions of fold belts. (3 UNITS)

GLY 509.1: Gemstone Technology
Case Histories: Applied geology methods exploration, systematic study of economic mineral deposits; ferrous metals and their alloys (iron, manganese, columbite, tantalite, tungsten, molybdenum, nickel, cobalt, Chronum, titaqnium); non-ferrous metals (copper, lead, zinc, aluminium, tin); precious metals (gold, silver, platinum); radioactive elements (uranium, thorium). Mineral deposits in Nigeria – metallic, non-metallic, radioactive, industrial rocks and minerals in Nigeria (talc, clay, limestone, marble, asbestos and serpentine), their possible uses in industry. Basement complex metallogeny – spatial distribution; prospects for future. Methods of acquisition and exploitation on mineral deposits in Nigeria. (3 UNITS)

GLY 510.2: Environmental Geology
Geology hazards (erosion, flood, desertification, subsidence, landslides, earthquakes, storms and pollution sources): their original, characteristics and geological/geographic distributions. Controls and predictions. Effects on land use and urban planning. Environmental impact of the exploration and exploitation of the earth's mineral resources. Civil Engineering structures and land reclamation. Domestic and industrial water (radiation, etc.) disposal methods, various environmental monitoring methods. Pollution and health hazard. (2 UNITS)

GLY 512.2: Applied Geophysics
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. (2 UNITS)

ICH 371.1: Process Chemistry II
Conservation of mass, energy and momentum in ideal reactors. Materials in isothermal reactors for homogenous reactions. Conversion in single isothermal reactors. Multiple isothermal reactor system. Non-isothermal reactors autocatalytic reactions. (3 UNITS)

ICH 476.1: Mineral Processing and Metallurgy
Importance of mineral processing and metallurgy. Mineral concentration including chemical ore processing, Iron makings, steel making, foundry technology, fabrication technique. (3 UNITS)

ICH 477.1: Mineral Processing Metallurgy
Solidification of liquid metals. Heat treatment processes. Metallographic techniques. Metallurgical microscopes and foundry practices for technologies. (3 UNITS)

ICH 511.1: Petrochemistry
Introduction; brief chronological histology of oil and gas. The origin of petroleum. Nature of oil and gas: definition of crude oil. Composition of crude oil. Analysis and properties of crude oil. Classification of crude oil. Gaseous petroleum (natural gas). Composition of natural gas. Chemical used for oil drilling. Environmental implications of oil and gas production. Oil refinery processes. Separation processes: crude oil distillation. Catalytic reforming. Catalytic isomerization. Hydrocracking. Dehydrosulphurization. Lubricating oils. Basic test for petroleum products and quality control. (3 UNITS)

MIN 301.2: Mineral Exploration and Mining Engineering

Definition of the term prospecting and exploration for mineral deposits. Definition of mineral deposits. Types of mineral deposits and their geological conditions. The object of exploration activities. Paul Baily's full sequence exploration programme. Exploration indicators; dispersion haloes, mechanical and botanical indicators etc. Grid system in exploration. Borehole drilling for delineation of ore bodies. Reserve calculation and mineral evaluation. Cut-off grade estimation. The definition of mining and a mine. The place of mining in Nigerian Economy. Types of mining and mines. Parameters of surface mines. Unit operation in surface mining. Equipment used in unit operation in surface mines. Parameters of underground mines. Unit operations in underground mines. Equipment used in unit operations in underground mines. Definition of mineral processing. Mineral processing for metallic minerals and stones respectively. Brief explanation of equipment used in mineral processing. (3 UNITS)

MIN 401.1: DRILLING AND BLASTING TECHNOLOGY

Drilling and blasting techniques. Blast hole diameter estimation. Spacing and burden calculation in surface mines, Types of explosives and accessories. Explosive applicability, and charging techniques. Safety in handling and charging explosives. Different types of blasting round design. Drilling rigs and bits; their applicability. Selection of drilling rigs. Types of lading and haulage equipment and their applicability. Equipment matching techniques. Selection of loading and haulage equipment. Auxiliary equipment in loading and haulage. (2 UNITS)

MIN 501.1: Mining Methods and Mineral Processing

Surface and underground mining methods and system. Surface mining methods. Open pit and open-cast and quarry. Underground mining methods e. g. room and pillar methods, stope and pillar methods sublevel-stopping methods and shrinkage methods. Mining systems design for surface and underground mining. Haul road design for surface mines. Definition of basic terms. Beneficiation as aspect of mineral processing. Basic communication stages. Crushing milling etc. Milling and crushing machines. Magnetic and gravity methods in mineral beneficiation. Mineral processing circuit design. (2 UNITS)

MIN 502.2: Mine Planning and Design

Mine limit estimation. The application of economic limit stripping ratio in mine limit estimation. Selection of safe final pit wall slope interpolation method in pit limit estimation. Production rate estimate. Analytical and statistical models. Detailed production rate estimation and production scheduling. Mine life estimation. Application of discounted cash flow methods in evaluating the profitability of pits. The use of net present value (NPV) and internal rate of return criteria. (2 UNITS)

MTH 110.1: Algebra and Trigonometry

Elementary notions of sets, subsets union, intersection, complements, Venn diagrams, Real numbers, Integers, rational and irrationals, mappings of set. Real functions and their compositions. Quadratic functions. Partial functions. Cubic functions, Roots of quadratic and cubic functions. Partial functions. Equation with complex roots. Complex numbers. Principles of mathematical Induction. Binomial Theorem. Trigonometric functions of angles, circular function. Addition theorem. Double and half angle. (3 UNITS)

MTH 120.1: Calculus

Function of a real variable, grams units and ideas of continuity. The derivative as unit of rate change method of integration. Define integrals: Application to areas, volumes. (3 UNITS)

MTH 201.1: Mathematical methods
Sequence and series: Limits, continuity, Differentiability, implicit functions, sequence, series, test for convergence, sequence and series of function. Numerical Methods: Introduction to interactive methods, Newton's methods applied to finding roots, Trapezium and Simpson's rules of integration. Differential equation: Introduction, equation to first order and first degree separable equations, homogenous equations, exact equation, linear equation, Bernoulli's and Riecati equation, application to mechanics and electricity-orthogonal and oblique trajectories second order equation with constant co-efficient. General theory of the order linear equation. Laplace transform, solution of initial-value problems by Laplace transform method. Simple treatment of partial differential equations in two independent variables. (3 UNITS)

MTH 210.1: Linear Algebra
Vector space over the real field. Subspaces, linear independence, basis and dimension. Linear transformations and their representation by matrix – range, null space, rank. Singular and non-singular transformations and matrices. Systems of linear equation and change of basis, equivalence and similarity. Eigenvalues and eigenvectors. Minimum and characteristic polynomials of a linear transformation (Matrix). Caley-Hamilton Theorem. Bilinear and quadratic. (3 UNITS)

MTH 220.1: Introduction to Real Analysis
Real numbers: order – upper and lower bounds. Least upper bounds axiom for real numbers and its consequences. Basic properties of convergent sequences. Upper and lower limits. Monotonic sequences. Cauchy's principles of convergence. Series (of positive terms): Integral test. Euler's constant. Index and ration tests. Comparison test for series. Alternating series test for series. Series in General Absolute and conditional convergence. Atel and Dirichlet test. Rearrangement properties. Power series – circle of convergence and multiplication of series. Functions of a Real Variable: Continuity o f a set. Elementary properties of continuous functions, uniform continuity. Monotonic functions. Differentiation of functions of a real variable: Mean value theorem Rolle's Theorem, etc. and its applications. De L'Hopital's theorem. Tailors series with remainder. Maxima and minima. (3 UNITS)

MTH 224.2: Mathematical Methods
Review of differentiation and integration and their applications and mean value theorem. Taylor series. Real-valued functions or two or three variables. Partial derivatives, chain rule, extreme Lagrange multipliers. Increments, differentials and linear approximations. Evaluation of line integral, multiple integral, integral transforms and applications. (3 UNITS)

MTH 240.1: Vector Analysis
Review of vectors. Equation of curries and surfaces. Vector differentiation and applications. Gradient divergence and curl. Vector integrals. Green's, Stoke's and Tensor algebra. Symmetry, Cartesian Tensors. (3 UNITS)

MTH 250.2: Basic Differential Equation
First order ordinary differential equation; existence and uniqueness. Second order differential equations with constant coefficients. General theory of the nth order linear equations. Laplace transform solution of initial value problem. Sturn Lioville problem and application. Simple treatment of partial differential equation in two independent variables. Application of C.D.C of PDE physical life and social sciences. (3 UNITS)

MCB 200.1: General Microbiology I
History and development of Microbiology. Characteristics of microorganisms: growth and reproduction. Principles of sterilization and disinfections. Friends and foes. Antimicrobial agents and sensitivity tests. (3 UNITS)

MCB 201.2: General Microbiology II
Systematic classification of microorganisms. Microbial variation and hereditary. Biological and biochemical reactions of microorganism. Cycles of elements. Staining technique for identification. Microbiology of air, food, milk and water. Immunological methods for the study of microbial infections. (3 UNITS)

MCB 300.1: Pathogenic Bacteriology
Host-parasite relationship. Pathogenic microorganisms and disease. Virulence, spectrum and symptoms of infection, treatment and control. Methods of isolation of pathogens. Bacterial infections. (3 UNITS)

MCB 301.1: Environmental Microbiology
Microorganisms and other organism's importance in aquatic systems and disposals. Ecology of microorganisms in fresh water. Pollution and salt-purification of water. Brief studies of marine microbiology. Disease transmission by water. Microbiological examination of water. Microbiology of waste disposal. Biochemical oxygen demand (BOD) and chemical oxygen demand (COD). (3 UNITS)

MCB 302.2: Soil Microbiology
The characteristics of soil environment. Microbial flora, and fauna of soil. Microbial activities in soil. Nitrogen cycle; carbon cycle; mineral transformation y microorganisms. Biodegradation and biofuels generation. (2 UNITS)

MCB 304.2: Microbial Physiology and Biochemistry
Scope and purpose of physiology. Brief review of cytology and bacterial anatomy. Growth and bacterial nutrition. Chemical toxicity. Physiological consequences of carbohydrates. Metabolism of fates, steroids and aromatic rings. Amino acids and proteins. Nucleic acids, purines and pyrimidines. Photosynthetic/autotrophic bacteria. Adaptation. Mechanism of survival. (3 UNITS)

MCB 305.1: General Virology
History, scope, nature and structure of viruses; functional consequences at cellular level of viral infections. Criteria for viral taxonomy. Replication of viruses. Effect of physical and chemical agents on viruses. Important terms in viral pathogenesis. Rates of spread of viruses in a community. Patterns of diseases, causes of infection. Viral pathogenesis and the host deference. Cell culture, microscopy and serology. (3 UNITS)

MCB 310.2: Immunology and Immunochemistry
Paper and thin layer chromatography, Gel filtration techniques and applications, Spectrophotometer methods and applications, Centrifugation techniques and applications, Atomic absorption spectrophotometry and applications, Immunology, immunochemistry and immunochemical methods, Humoral and cellular immunity, Immunoglobulin; Classes, Structures and Properties, Toxoids, Vaccines and Vaccination, Serological techniques and applications, Flourimetry and applications, Electrophoresis and applications, Radioimmunoassay (RIA) and Fluoro Immunoassay (FIA), Techniques and applications, Nuclear Magnetic Resonance and application. (2 UNITS)

MCB 311.2: Medical Microbiology
Concept of pathogenicity and virulence, with respect to infection and disease development. The normal human flora. Principles of infection, immunity and serology. Host – parasites relations; aetiology, Epidemiology, pathogenic mechanism; spectrum of infection clinical symptoms, laboratory diagnosis and procedures, using clinical samples such as pus, sputum, faeces, and body fluids. Prophylactic and therapeutic procedures, control and prevention of selected bacterial, fungal, viral, and protozoan diseases of animals including man especially those prevalent in Africa. (3 UNITS)

MCB 400.1: Microbial Genetics & molecular Biology
A survey of the current status of microbial genetics (Bacteria, viruses, protozoa and fungi), including methods and findings in the areas of mutagenesis, induction, isolation and biochemical characterization of mutants. Adaptation, transformation, transduction, conversion and conjugation. General and specialized methods in microbial genetics. Experiments with virulent phages temperate phages and Lysogenic bacteria. Fungal and other lower eukaryotic genetics. (3 UNITS)

MCB 401.1: Industrial Microbiology
Nature of industrial microbiology. Microorganisms of industrial importance. Aspects of the biology of industrial culture techniques and maintenance. Strain development and improvement, Media formulation and economics. Optimization of fermentation processes. Fermented design and operations. Patents and patent laws. (3 UNITS)

MCB 403.1: Pharmaceutical Microbiology
The chemistry and mode of actions of synthetic chemotherapeutics agents and antibiotics. Production and synthesis of antibiotics and antimicrobial agents. Quality control of pharmaceutical products/Concepts of growth and death in microorganism. The mode of action and assay of antimicrobial agents. Concepts of antibiotic sensitivity and resistance a s related to microbial physiology. An overview of antimicrobial substances and disease control. Chemical nature and mode of action of disinfectants. Antimicrobial substances of microbial origin and their industrial production. In vitro and in vivo evaluation of antimicrobial activity. Pharmacological considerations in the administration of antimicrobial agents. Antimicrobial substances from traditional medicinal plants. Problems associated with use of chemotherapeutic agents including drug resistance and allergy. (3 UNITS)

MCB 404.1: Analytical Microbiology and Quality Control
Microorganisms as reagents in quantitative analysis. Selection of test organisms for assay (antibiotics amino acids and Vitamins). Responses of microorganisms in assays. Obtaining and measuring responses. Preparation of assay samples. Methods of assays. Interpretation of results. Aspects of quality control and safety. Plant and equipment sanitation. Microbiological standards and specifications. Predictive microbiology. (3 UNITS)

MCB 409.1: Food Microbiology
Food medicated diseases. Microbial spoilage of foods. Mechanisms of microbial spoilage/food ecosystems. Intrinsic, extrinsic factors influencing spoilage and food borne diseases. Microbiological quality of foods, indices of sanitary quality. Quality assurance, hazard assessment. Control of contamination, inhibition of the growth of microorganisms. Microbiological reference values for foods. Diseases of animals transmissible to man via animal food products. (2 UNITS)

MCB 500.1: Petroleum Microbiology
Origin and chemical evolution of the atmosphere, hydrosphere and biosphere, biological oceanography. Morphology and biostratigraphy of major groups of microfossil. Biological origin and accumulation of petroleum and sedimentary basis. Hydrobiology, petroleum pollution and its

sources and biological control. Oil spillage. Petroleum degrading microorganisms, hydrocarbonoclastic bacteria. Metallomonas bacteria that cause rusting of oil pipes. (3 UNITS)

MCB 501.1: Fermentation Technology
Basic concepts of fermentation, alcohol fermentation resulting in production of bread, beer wine and vinegar acid, fermentation leading to production of cheese, butter, yoghurt, etc; malolactic fermentation. (3 UNITS)

MCB 505.2: Principles of Epidemiology & Public Health
Nature of epidemiological; spectrum of infection; herd immunity and latency of infection; multifactorial system in epidemics; zoonoses, Antigenic drifts; Biological products for recommended immunization schedules; International control of infectious diseases; statistical application to epidemiology. (3 UNITS)

MCB 507.2: Biotechnology
Features of biotechnology and its scientific basis. Fermentation and biotechnology. Primary and secondary metabolites in biotechnology. Control mechanism in microorganisms and manipulations in vitro and in vivo. Applications of DNA and gene cloning. Safety aspects of biotechnology and gene manipulations. Scale-up in biotechnology. (3 UNITS)

MEG 210.2: Engineering Materials Laboratory
Mechanical tests, impact tests, hardness tests, fatigue tests, creep and nondestructive tests of engineering materials. Testing of magnetic materials e.g. transformer cares. Testing of insulators, cables and transformer oils. Electricity: 1. Making of dry cell boxes. 2. Connection of dry cell in series and parallel. 3. Practical use of ammeters and voltmeters (a.c. and d.c.). 4. Constructions of shunts and multipliers for the modification of A.C. and A.C. meters. 5. Constructions of small resistance with standard wire gauges and comparison of the resistances with standard resistance. 6. Construction of resistances boxes. 7. Introduction to post office box. 8. Construction of Potentiometer Bridge. 9. Construction of Meter Bridge. 10. Application of bridges to experiments. 11. Electrical wiring techniques. 12. Introduction to the use of different types of galvanometers in common use in the laboratories. 13. Construction and use of jockeys. 14. Fuses – Connections. 15. Colour conducing for resistors and capacitors. 16. Fault finding techniques. (1 UNIT)

STA 260.2: Statistics for Physical Sciences and Engineering
Measures of location and dispersion in simple and grouped data exponentials. Element of probability distributions. Estimation and test of hypotheses concerning the parameters of distribution. Regression, correlation and analysis of variance contingency table. Non parametric inference. (2 UNITS)

STA 264.2: Statistics for Biological and Agricultural Sciences
Use of statistical methods in biology and agriculture. Frequency distributions. Law of probability. The binomial, Poisson and normal probability distributions. Estimation and test of hypothesis. The binomial design of simple agricultural and biological experiments. Analysis of variance and covariance, simple regression and correlation, contingency tables. Some non-parametric tests. (3 UNITS)

PHY 101.1: Mechanics and Properties of Matter
Motion in one dimensional plane. Work and energy, conservation, laws, oscillation, solid friction, rotational kinematics and rotational dynamics, equilibrium of rigid bodies, gravitation Galilean invariance, surface tension elasticity and viscosity. (3 UNITS)

PHY 102.1: Laboratory Practice I
The course emphasizes experimented verifications and quantitative measures of physical law, treatment of measurement errors, and graphical analysis. The experiments include studies of mechanical systems, static and rotational dynamics of rigid bodies, viscosity, elasticity, surface tension and hydrostatics. (1 UNIT)

PHY 103.2: Laboratory Physics II
Experiments involving verifications of laws of current, electricity, measurement of the electrical properties of conductors, dc and ac circuit properties, series and parallel resonant circuits, transformer characteristics. (1 UNIT)

PHY 112.2: Introduction to Electricity & Magnetism
Introduction to electricity and magnetism. The elastic filed. Gauss law. Electric. Potential, capacitors and dielectric, current and resistant, electromotive force and circuits, the magnetic field, Ampere's law, Faraday's law of induction and other electrical circuit problems. (3 UNITS)

PHY 200.1: Energy and Environment
The principles, demands and outlook for power and energy. Transformation of energy, its cost and pollution. Principles and problems of electrical energy form fossil and hydroelectric generation; their cost, capacity, storage, reserves, efficiency and consequent environmental effects. Electrical energy from nuclear reactors, energy from the future breeder reactors, fusion power, water power, geothermal power, tidal power and wind power. Promise and problems of such unconventional energy sources. Excursions. (2 UNITS)

PHY 205.2: Heat Thermodynamics and Geometrical Optics
The three parts of this course are heat, (under which thermometry, calorimetry and heat transfer are discussed), Thermodynamics – treats the kinetic theory of an ideal gas, equation of state, reversible adiabatic and isothermal processes, the first and second laws of thermodynamics including their consequences; and geometrical optics which discusses the fundamental principles of reflection and refraction at plane and curved surfaces, emission and absorption spectra and optical instruments. (3 UNITS)

PHY 206.1: Physics Laboratory Techniques and Practical III
The laboratory courses consist of experiments drawn from electromagnetism and modern physics. Such experiments will include measurement of specific change verification of the Hall Effect, electron motion is electric and magnetic fields, experiments with Geiger Mueller tube; the Frank-Hertz experiment and the photo-electric effect. (1 UNIT)

PHY 211.2: Quantum Physics
Inadequacies of classical mechanics wave particles properties Schrödinger's equation and simple application; operation formalism, Quantum mechanics of solved simple systems. (3 UNITS)

PHY 216.1: Vibration & Waves
This course is an introduction to oscillations and wave phenomena. Topics covered will include vibrations and waves, types of waves, sound waves and wave optics, electromagnetic waves. (3 UNITS)

PHY 221.2: Mathematical Physics I
This is an introductory mathematical methods course which is of particular interest to theoretical physics. Topics to be treated include introductory vector analysis; coordinate systems and their transformations. Motion in the various coordinate systems. Differential equations in two and three

dimensions. Application of differential equations (Partial and whole) in mechanics, electric circuits, atomic and nuclear physics, and boundary value problems. (2 UNITS)

PHY 222.2: Theoretical and Fluid Mechanics I
Newtonian mechanics; motion of a particle in one, two and three dimensions system of particles and collision theory, Newtonian gravitation, conservative forces and potentials, oscillations, central force problems, accelerated frames of reference, rigid body dynamics, generated motions, mechanics of continuum media. Fluids statics and dynamics. (2 UNITS)

PHY 300.1: Mathematical Physics II
Review of engineering applications of differential equations. Partial differential equations; Laplace Transformation and other transform methods. Series solutions and special functions such as Bessel's functions. Fourier series and Fourier Transformation. 2-Transform and its inverse Non-Linear differential equation; phase plane analysis stability and limit circles, describing function analysis. Lagrange's functions and polynomials; Hermite function and polynomials; Lagrange's equations and polynomials. (2 UNITS)

PHY 306.1: Statistical and Thermal Physics
Basic concept of statistical mechanics; microscopic basics of thermodynamics and applications of microscopic systems, condensed statistics; phase transformations, quantum distribution; elementary kinetic theory of transport processes, fluctuation phenomena. Applications. (3 UNITS)

PHY 306.2: Thermal Physics
This course aims at presenting Topics include quantum states, entropy, temperature, pressure, chemical potential, thermodynamic potential, grand sum and partition functions, distribution functions, relationship of statistical variables to thermodynamic variables applications. Transport processes and fluctuation phenomenon. Maxwell-Boltzmann velocity distribution law. (3 UNITS)

PHY 315.1: Electronic Instrumentation I
Introduction to the principles of measurement and control. Generalized approach to measuring systems. (Functional description, input-output configuration). Performance characteristics of instruments. Analysis of errors, units of measurements. Analytical techniques for system analysis. (Different domain, Review of Laplace transform, transfer function). Frequency response analysis, Rouith-Huwite stability criteria, Poles-zero plots. Bode plots and polar plots. Nyquist stability criteria, Poles-zero plots. Bode plots and polar plots. Nyquist stability and principles and properties of feedback systems as applied to measurement systems. Control systems characteristics – open and closed loop control system. (2 UNITS)

PHY 322.1: Theoretical Fluid Mechanics II
Degrees of freedom, generalized coordinates, Lagrange's formulation of mechanics, application. The calculus of variations and the action principle Hamiltonian formulation of mechanics application. Invariance and conservation laws. Oscillatory systems including damped, forced and coupled oscillation, normal modes. (2 UNITS)

PHY 342.2: Solid State Physics 1
Crystal structure and x-ray crystallography and its experimental methods. Theory of solids, classical free electron theory, quantum theory of electron gas and the band theory of solids electrical & thermal properties of solids. (2 UNITS)

PHY 344.1: Engineering Materials

Introduction of Material Science with emphasis on physical metallurgy, Classes of Materials, Polymers, ceramics, woods, metals and composite materials. Structure, properties and applications of polymers, ceramics and metals. Effects of crystal structures, defects and heat-treatment on materials. Relation of properties (Electrical, optical and mechanical) to microstructure. Recovery, recrystallization and grain growth. Phase diagrams, solidification. Use of iron-carbon alloy system and ferrous alloys as examples. Nonferrous allows and Elementary alloy theory. Diffusion-controlled and Distortion controlled phase transformations. (2 UNITS)

PHY 345.2: Material Science I (Metals and Alloys)
Introduction to material based on properties of solids, microstructure forming and shaping. This should illustrate the importance of the range of currently available engineering materials and to show that technology development depends on (1) introducing new materials and new processes, (2) Awareness of limitations of existing materials and processes. (2 UNITS)

PHY 351.1: Electronics
To introduce students to the techniques of electronic measurements and applications of relevant electronic instruments and components. Electron emission and tube devices (Schottky, Zener, Tunnel and LED etc.) Semiconductor devices (FET, MSFET and Tunnel Diodes), Oscillators, Different types of amplifiers, e.g. transistor amplifiers, operational amplifiers, Power amplifiers and differential amplifiers. Filters and rectification process – half and full wave rectification – smoothing, three phase rectifier network. Analysis and design of multistage amplifier network, Junction diodes, light emitting diode, photo-cell. (3 UNITS)

PHY 353.2: Electrical Circuit Theory
Phases, complex algebra and complex notation. Application of Laplace transformation to transient analysis of RLC circuits, transfer function concepts. Types of response: transient, and steady-state response. Frequency response. Foster and Cauer's methods of synthesis, -port network synthesis, active filters. Approximation to non-linear characteristic analysis and synthesis of non-linear resistive circuits, harmonic analysis of non-linear dynamic circuits applications of computers in the analysis of linear and non-line circuits. (3 UNITS)

PHY 356.2: Advanced Electronics Workshop
This course is designed to introduce the students with specialization in Electronics to basic principles of electronic experimentation. Simple experiments that show how electricity is controlled by using devices called compound and IC's would be applied to illustrate he principles of circuit designing. Other topics to be covered will include testing and designing of circuits, trouble shooting analysis, how to solder, case study and a mini designed and tested circuit. (1 UNIT)

PHY 405.1: Computational Physics
Use of numerical methods in physics; various methods of numerical integration, differentiation, numerical solutions of some differential equations in physics, statistical analysis of experimental data. (2 UNITS)

PHY 407.1: Instrumentation II and Control
Analogue and digital instruments; definitions, classification of analogue instrument; pointer type, graphical type; Analogue (pointer), instruments; moving coil instruments, moving iron instruments, principles and operational of analogue painter instruments. Analogue graphical instruments, moving coil recorder, potentiometer, X-y/T recorder, C.R.O. Digital instruments; digital counter, frequency, period and time measurements using digital counter, conversion of analogue to digital signal, and digital your meter. (3 UNITS)

PHY 413.1: Acoustics
Sound energy; Propagation of sound water through a medium, sound intensity, Bel, decibel, properties of sound, resonance, concepts of vibration air column in an enclosure. Architectural Acoustics; Production of standing waves within enclosures, concepts of "dead zones" in halls and auditoria, origin of reverberation in halls and auditoria. Musical Acoustics; noise and musical sound, octave, common musical scales, fundamental frequency of sound, principle of operation of wind instruments, principle of operation of string instruments. Physiological Acoustics; production of sound by human larynx (sound box), ability of the human to alter pitch, essential features of human ear, process of hearing, peculiar character of human hearing (e.g. frequency limits, increased sensitivity of higher frequencies for louder sounds. Sound storage and reproduction; the working principles of microphone, earphone and loud speakers, types of speaker box, (e.g. tweeter, mid-range and bass) essential features of speaker box, principle of sound separation into different frequency ranges in a loudspeaker, the principle of production of phonogram with; mono recording and stereo recording; process of sound reproduction from phonogram record, process of tape recording and reproduction. (2 UNITS)

PHY 417.1: Atomic and Molecular Spectroscopy
The hygrogram atom. Relative effect and spin identical particles and symmetry. Many electron atoms. Coupling schemes and vectors models. Zeeman effects. Hyperfine structure. The diatomic molecule. The frank-condon principle. X-ray diffraction. Microwave methods. Resonance Phenomena; ES, MMR and optical pumping and Mossbaner scattering. (2 UNITS)

PHY 435.1: Mechanical Properties of Materials
Behaviour of different types of materials under stress. Mechanical properties in tension, compression, direct shear, torsion flexure. True stress-strain. Cold work, hardness, impact and fatigue characteristics of materials. Creep and stress rupture. Effect of temperature/environment on mechanical behaviour of materials, Mechanism of slip, slip systems. Critical resolved shear stress and mechanical twinning, Deformation in polycrystalline materials. Impurity effects and yield point phenomena. Introduction to elements of dislocation theory. Dislocation reactions. Multiplication movement under force. Dislocation interaction with impurities and point defects. (1 UNIT)

PHY 504.1: Solar Energy
Solar radiation: Celestial valict, solar declination, hour angle, apparent solar time, clock time, structure of the sun, motion of the earth in respect of incident solar energy on earth atmosphere, direct radiation, diffused radiation, total radiation (global) solar constant air mass, methods of estimating total, direct and diffused radiation, distribution curves for solar radiation collection iso-radiation map (solar map), pyranometer, pyheliometer. Fundamentals of heat transfer; heat conduction through flat plate, the wall of a cylinder, lamberts laws. Properties of collectors; structure of flat plate collector, structure and uses of concentrators, liquid heating by solar energy, porous and non- porous solar air- heaters, solar pond, solar furnace, application of solar pond. Solar storage: Mechanical solar energy storage, thermal energy storage and chemical energy storage and chemical energy storage. Solar energy utilization; solar cells, solar powered refrigerators and air conditioner. Solar energy conversions techniques; solar energy to electrical energy (using fuel cells), device that convert thermal energy to electrical energy, natural conversion of solar energy to chemical energy in plants, conversion of solar to electrical energy in photovoltaic cells. Application of various solar energy conversion techniques. . (2 UNITS)

PHY 505.1: Material Science II (Polymer and Ceramics)
Polymer and relevant properties of polymers: Monomers, polymers, steps involved in polymerization, addition polymerization and condensation. Polymerization inertness of polymers, susceptibility of monomers, functional groups, number average, weight average, molecular weight

and degree of polymerization. Polymer types and uses: thermosets, thermoplastics, rubbers, vulcanization. Compounds of plastics; additives, processes involved in compounding (e.g. injection moulding, compression moulding, Extension moulding, casting, drawing and blowing).

Stability of polymers (plastics): Alteration of physical and chemical structure of polymer exposed to radiations, minimizing radiation damage in polymer, relationship between the number of carbon atoms and degradation of radiation, Ceramics materials; classification of ceramics materials, commonly occurring ceramics materials; additives in ceramic bodies, glazing, making of glass, thermo plasticity of glass production of pottery ceramics, factors involved in selecting materials for ceramics. (2 UNITS)

PHY 531.2: Basic Modern Physics
Modern physics. Topics in atomic structure, photoelectric effect, black body radiation, relativity, radioactivity nuclear structure, mass spectrometers. (3 UNITS)

PHY 548.1: Atomic and Nuclear Physics
Nuclear structure and properties. Nuclear models and nuclear reactions; vector model of the atom. Nuclear spectroscopy; X-ray spectra; alkali spectra. Zeeman and Stark effect, Fundamental particles, strong and weak electromagnetic interactions. Resonance. (2 UNITS)

PHY 552.2: Electronics II
This course introduces students to the application of feedback theory in measurements and digital electronics. Feedback theory, type's networks and applications. The concept of small, medium, large and very large integration and their consequences. Boolean algebra and the nature of two-value variables. Boolean functions and production methods. Logic gates and switching devices, logic design and minimization techniques, rehabilitee design, synchronous sequential and combination logic circuits. Analysis of logic gates of various families. Some digital building blocks. Flop-flop counters, latch registers and decoders diode logic RTL, DECL, Moss and MOSIC. Introduction of D/A and A/D conversion principles. Microprocessors, microprocessor control, flow charts, programs, simple instruction set and control and programs. (3 UNITS)

PHS 221.2: Respiratory/ Cardiovascular Physiology
The course details the physiology of the cardiovascular system, including illustrative practical exercise. The cardiac impulse and the electrocardiogram. Cardiac cycle. Heart sounds and murmurs. Cardiac output Hacinodynamics of the circulation. Cardiovascular reflexes and control of blood vessels. Blood pressure and hypertension. Circulation through special organs. Posture and circulation. Hemorrhage and shock. (3 UNITS)

PHS 222.2: Gastrointestinal Physiology and Nutrition
Physiological anatomy of the gastrointestinal tract. Gastrointestinal motility and secretion. Regulation of secretion and motility. Physiology of defecation. Gastrointestinal hormones. Biliary system Digestion and absorption of food. Carbohydrate, protein, fats, vitamins handling of water and vitamins Liver function. (2 UNITS)

PHS 321.2: Blood and Body Fluid Physiology
Blood and body fluids, composition of blood and lymph, Chemistry of blood plasma. Plasma and serum proteins. Red and white blood cell functions. Defense mechanism, antibody – antigen interactions. Mechanism of blood coagulation. Blood disorders (anemias and leukemia) and treatment. (3 UNITS)

PHS 322.1: Endocrine Reproductive System
Retune of physiology control mechanism rhythm control of endocrine glands and effects of hormone or other system or organs of the body. Anterior pituitary hormone. Parathyroid hormone and throcalcitonin adrenocorticoidal steroid. Adrenal modularly. Hormones production and spermatogenesis. Hypothalamic pituitary relations and the neurohypophysis. Major metabolic cellular and physiological actions of each hormone. Elements of reproductive physiology and lactation. (3 UNITS)

PHS 323.1: Respiratory & Renal Physiology
Determination of respiratory function lung volumes and capacities spirometry. Ventilation. Reffusion relationship, Gas Transport to and from the Periphery. Mechanics of breathing. Control of breathing-Respiratory Respiration at high Altitudes and in Renal diving Artificial Respiration. Renal physiology and anatomy. Mechanism of urine formation filtration, reabsorption and chluting mechanism. Renal clearance Tubular maximum hormones and the Kidney. Renin- Angiotensin system. Diuresis and Diuretic. (3 UNITS)

PHS 401.1: Introduction to Pharmacology
The link between physiology and pharmacology. Anatomy and physiology of the gastro-intestinal tracts (GIT). The smooth muscles, digestion, absorption and excretion of rough substances. Absorption, distribution and fate of drugs. Secretory functions of the alimentary tract and the methods of identification of r=enzymes and their properties. Denaturation of enzymes and their life span. Principles of gastro-intestinal motility. (3 UNITS)

PHS 421.1: Special Senses and Sensory System/ Special Sense Techniques
Vision, electroretinogram, ear, taste buds, cutaneous sensation and receptors (Touch, Pressure, Pain, Temperature, receptor sites). Olfactory and gestation: taste and smell receptors. Hearing: watch, speech and speaker tick test for auditory activity. Localization of sound. Tuning fork tests. Audiometry and evaluation of hearing impairment. Vision: the anatomy of the eye. Accommodation reflexes. Near and far points. Blind spot. Test for color blindness, Snellen's chart, visual fields of vision – perimetry. Drugs that affect these systems. (3 UNITS)

PHS 424.1: Biomedical Research Methods (3 UNITS)
This course studies the basic concepts of scientific research/designs in biomedical studies. Historical perspectives, the need for research, including research direction for human experimentation as well as laboratory animals (including in vivo and in vitro preparation), the animal house, the international regulations/jurisprudence in biomedical experimentation / phytochemical analysis; Choice of animals and/or isolated tissues; Data collection, statistical analysis of results – such as the use of SPSS and presentation; ANOVA, Student's T test, Scientific / medical writing

PHS 425.1: Peripheral Nervous System
Anatomical function al organization of A.N.S sympathetic and parasympathetic systems. Sympathetic transmission – synthesis, storage, release and distribution of Noradrenaline. Evidence of noradrenaline as a neurotransmitter. Parasympathetic transmission – synthesis, storage, release and distribution of Acetylcholine. Pharmacology of drugs affecting cholinergic nerve transmission. Sites of action – cholinergic receptors and classification. Cholinesterase and anticholinesterases. Pharmacology of drugs affecting adrenergic nerve transmission, storage, uptake and release of catecholamine, structure – activity relationships in sypathomimetic amines. (3 UNITS)

PHS 523.2: Seminars in Bioinstrumentation (3 UNITS)
Introduction to the apparatus and instruments used for experimental physiology and biophysics. Thermal and energy measurements of physiology. Electronics physiology with emphasis on special

problems of Biological amplification. Microscopy and Cinephotography of physiological processes. Basic Instruments used in basic medical and clinical sciences studies and procedures. Applications of nuclear and imaging techniques in biomedical sciences.

PHAR 501.1: Principles of Drug Action/ Pharmacology of Pain
Pharmacology principles of identifying and quantifying drugs: Using isolated and intact preparations. Pharmacological studies on various types of drugs that affect circulation, homeostasis sympathometics, heart cardiac glycosides, kidney respiration and bronchi, gastro-intestinal tract, reproduction and the mechanism of action of the drugs. Bioassay techniques and methods. Routes of drug administration, factors determining absorption, distribution and excretion of drugs. Drug dosage regimen. Introduction to pharmacokinetics. Aspirin, morphine, mechanism of anti-pyretic, anti-inflammatory, analgesics, sedatives and hypnotics. Antipsychotic drug. (3 UNITS)

PHAR 502.1: Principles of Chemotherapy/Acute Poisoning and Antidotal (Treatment)
The chemistry of mechanics of action of anti –parasitic, antimicrobial and antineoplastic agents. Antimalarial and antiviral agents. (2 UNITS)

PHAR 504.2 STATISTICAL AND PHYSICAL PARAMETERS IN TOXICOLOGY AND PHARMACOLOGY
Methods of data collection, Sampling procedures, Data presentation, Measures of central tendency, Student's "t" test, Chi square distribution, Pharmacokinetic and Toxicokinetic estimation models, Differences in Graphical and Arithmetic LD50 methods. (2 UNITS)

PHAR 505.1: Antidepressant Drug and Antiepileptic Drug
Types of antidepressant drugs – tricyclics – typical and atypical. Modes of action and side effects. Epilepsy – Types of seizures and drugs used in each case. (2 UNITS)

PHAR 506.2 ESTIMATION OF LD50, ED50 AND RELATIONS BETWEEN DOSES AND RESPONSES
Dose–Response Relationship, Risk Assessment, Spectrum of Toxic Effects and Toxicity Classifications, Conventional LD50 methods: Arithmetic Method of Reed and Muench, Arithmetic Method of Karber, Graphical method of Miller and Tainter, Lorke's method…etc, New OECD approved methods for Oral LD50 Determination: Up and down Procedure (UDP), Fixed Dose Procedure (FDP) and Acute Toxic Class (ATC)

PHAR 509.1: Toxicology/Drugs Metals/Trypanocides
Schistomicides and ameobicides. Resistance to chemotherapeutic agents- antimalarial and antibiotics. (3 UNITS)

PNG 311.2: Chemical Technology of Petroleum
Desalination processes. Atmospheric and vacuum distillation of petroleum. True boiling point and equilibrium flash vaporization curves for petroleum and petroleum fractions. Gasoline stabilization and sweetening. Properties of fuels octane number, octane number etc. hydrocarbon gas purification and separation. LPG Production. Gas processing-alkylation and polymerization. Thermal processes- cooking, thermal cracking and pyrolysis. Catalytic reforming and isomerization. (3 UNITS)

PNG 407.1: Petroleum Production Technology
Origin of oil, conditions necessary for the accumulation of oil. Drilling, drilling fluids, hole control. Basic petro physics, measurement of resistivity, porosity and other petro physical properties. Reserves, measurement and production. Models of oil reservoirs. Materials balances for Gas drive, solution drive and water drive fields. Elementary oil production engineering. (3 UNITS)

PNG 506.2: Chemical Technology Laboratory III
Laboratory experiments in transport phenomena, kinetics and separation processes. (3 UNITS)
PSB 300.1: Mycology
Morphology, taxonomy, physiology, reproduction and ecological characteristics of various groups of fungi. (3 UNITS)

PSB 501.1: Plant Pathology
Introduction- Definitions to concepts of Disease, History of plant pathology, Diagnosis of Diseases and Disease symptoms. Characteristics of disease causing agents. Development of plant disease. Loss assessment. Role of enzymes toxins and Growth Regulators. Host plant response to pathogenic attack. General principles of Disease control. (3 UNITS).