IMO STATE UNIVERSITY, OWERRI

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FACULTY OF ENGINEERING

DEPARTMENT OF CIVIL ENGINEERING

CORE CURRICULUM AND MINIMUM ACADEMIC STANDARDS
AND
BENCHMARK MINIMUM ACADEMIC STANDARDS
FOR
UNDERGRADUATE PROGRAMME
AND
STUDENTS' HANDBOOK

2024/2025
ACADEMIC SESSION

IMO STATE UNIVERSITY (IMSU), OWERRI

FACULTY OF ENGINEERING (FENG)

DEPARTMENT

OF

CIVIL ENGINEERING

(CVE)

BACHELOR OF ENGINEERING (B. ENG.) DEGREE PROGRAMME

COMBINED

CORE CURRICULUM AND MINIMUM ACADEMIC STANDARDS

(CCMAS)

AND

BENCHMARK MINIMUM ACADEMIC STANDARDS

(BMAS)

STUDENTS' HANDBOOK

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IMO STATE UNIVERSITY, OWERRI NIGERIA

FACULTY OF ENGINEERING

Department of Civil Engineering (CVE)

COMBINED

CCMAS AND BMAS CURRICULUM AND STUDENTS' HANDBOOK

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FORWARD

Department of Civil Engineering, is one of the foundation departments of the faculty of Engineering, Imo state University Owerri. The department commenced her academic programme in the year 2006/2007 academic session. The Department offers a minimum of year five years and a maximum of seven academic year programme for the award of the Bachelor of engineering (B. Eng) in civil engineering. The first set of graduates of the department was in the 2010/2011 academic session. The Department has grown tremendously over the years due to the wisdom and hard work of her leaders. Besides the undergraduate programme, the Department now offers Postgraduate programme in PGD, M.ENG and Ph.D. in Civil Engineering.

Head of Department

TABLE OF CONTENTS

Table of Contents

1.0 INTRODUCTION

The Department of CIVIL ENGINEERING (CVE) offers a five – year study programme leading to the award of Bachelor of Engineering (B. Eng.) Degree in CIVIL ENGINEERING for candidates admitted through the Unified Tertiary Matriculation Examinations (UTME) mode and a four - year study programme for candidates admitted through Direct Entry (DE) for the award of the same B.Eng. Degree in CIVIL ENGINEERING.

1.1 Philosophy and Objectives

1.1.1 Philosophy

Civil Engineering is a profession in which knowledge of the mathematical and natural sciences are applied with judgement to develop ways to utilize economically the materials and forces of nature for the benefit of mankind.

The process involves lectures, tutorials, laboratories, engineering/technology workshop practice, design and studio works, industrial attachments and supervised investigations or case studies of engineering problems.

1.1.2 Objectives

The objectives of the Civil Engineering programme are to train civil engineers who are equipped with a broad-based experience, ranging from engineering analysis and design, to laboratory testing and experimentation in all areas of Civil Engineering with further concentration in several of the specialties in the later years. The trained civil engineers are to be equipped with the following:

i. Well-grounded in basic engineering courses;

ii. A good grasp of the essential application and utility courses;

iii. A thorough understanding of the experimental and practical bases for the relevant theoretical engineering principles;

iv. A good knowledge of all the various branches of civil engineering with further specialisation;

v. Construction engineering and management skills (combining engineering and management skills to complete construction projects designed by other engineers and architects);

vi. Geotechnical engineering skills (analysis of soils and rock in support of engineering projects/applications - building foundations, earthen structures, underground facilities, dams, tunnels, roads.);

vii. Structural engineering skills (design of all types of stationary structures - buildings, bridges, dams);

viii. Surveying skills (measure/map the earth's surface in support of engineering design and construction projects and for legal purposes - locating property lines.);

ix. Transportation engineering skills (design of all types of transportation facilities/systems – streets/highways, airports, railroads, other mass transit, harbours/ports);

x. Water resource skills (control and use of water, focusing on flood control, irrigation, raw water supply, and hydroelectric power applications);

xi. Environmental engineering (air pollution control, hazardous waste treatment and disposal, recycling and solid waste disposal, sanitary engineering (municipal and industrial water and wastewater treatment);

xii. Substantial practical skills for tackling real life engineering problems; and

xiii. Knowledge of entrepreneurial and management principles upon which enterprising professional careers can be built.

1.2 Programme Educational Objectives (PEOs)

The programme educational objective aimed at producing civil engineering graduates that will think globally, act locally for sustainable infrastructure environment. The PEOs are as follows:

PEO1: Graduates will show detailed technical knowledge of mathematics, sciences, and deep understanding of core civil engineering fundamental courses such as; structural analysis and designs, geotechnical engineering, transportation engineering, water resources and hydraulics etc., and apply them to solving complex engineering problems.

PEO 2: Graduates will apply critical thinking/problem solving skills in identification and formulation of research literatures for complex civil engineering problems and proffer solution for such problems through design of systems, components or process that meet the specified needs, taking into consideration, factors such as; safety, reliability and cost effectiveness.

PEO 3: Graduates will carry out investigation into developmental or complex problems using research-based knowledge and research methods including the design of experiments, analysis and interpretation of data that will lead to the provision of valid conclusions.

PEO 4: Graduates will apply reasoning informed by contextual knowledge including humanities, financial management principles and social sciences to assess societal health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practices and management of projects in multi-disciplinary environments.

PEO 5: Graduate will communicate effectively the complex engineering activities within the engineering community and the society at large through collaboration and teamwork spirit and apply modern engineering tools, software, and equipment to model, simulate and analyze civil engineering systems and to design and produce engineering documentation.

PEO 6: Graduate will recognize the need to stay up-to-date with emerging technologies and societal/environmental changes by engaging in the pursuit of lifelong professional development, including keeping strictly to professional ethical responsibilities of civil engineering practice.

1.3 List of Programme Outcomes (POs)

The Programme Outcomes of the Civil Engineering Department which are in accordance with the COREN POs, state the knowledge, skills and attributes that students of the department are

expected to have at upon graduation from the degree programme. The outcomes are presented as follows in Table 1.1.

Table 1.1: Programme Outcomes and their Descriptions

POs	DESCRIPTION
PO 1	Engineering Knowledge: Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
PO 2	Problem Analysis: Identify, formulate research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO 3	Design/Development of Solutions: Proffer solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.
PO 4	Investigation: Conduct investigation into complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
PO 5	Modern Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering and ICT tools, including prediction, modelling and optimization of complex engineering activities, with an understanding of the limitations.
PO 6	The Engineer and Society: Apply reasoning informed by contextual knowledge including Humanities and Social Sciences to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
PO 7	Environment and Sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice, including adherence to the COREN Engineers Code of Conducts.
PO 9	Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
PO 10	Communication: Communicate effectively on developmental or complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	Project Management: Demonstrate knowledge and understanding of engineering, management and financial principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.
PO 12	Lifelong Learning:

POs	DESCRIPTION
	Recognize the need for, and have the preparations and ability to engage in independent and lifelong learning in the broadest context of technological and social changes.

1.4 JOB OPPORTUNITIES

Civil Engineers are needed in several sectors, thus the CIVIL ENGINEERING graduate of Imo State University, Owerri, can find position of responsibility in any of the following employment opportunities:

i. In the building/construction companies as project manager and or project engineer.
ii. In the transportation industries, to plan and design efficient transport system for all modes of transportation.
iii. In the civil engineering department of the oil and gas industries
iv. In the Consultancy firms as design Engineer and as Project Consultants.
v. In the Academia as a Lecturer and/or Researcher
vi. In all, a Civil Engineer, as a top executive in industry is a leader of people.

2.0 ACADEMIC REGULATIONS

2. 1 Admission Requirements

Candidates are admitted into the Bachelor of Engineering (B. Eng.) programme of the Department of CIVIL ENGINEERING through any of the following:

a. Unified Tertiary Matriculation Examinations (UTME)
b. Direct Entry (DE)
c. Inter-University Transfer (IUT)

2.2 Unified Tertiary Matriculation Examinations (UTME) Mode

Candidates who have passed West African Senior Secondary School Certificate Examinations (WASSCE), the National Examination Council (NECO) or General Certificate of Education (GCE) (Ordinary Level ["O" Level]) may be admitted into the five-year program of the Department of CIVIL ENGINEERING provided they satisfy the Unified Tertiary Matriculation Examinations (UTME) cut-off score mark set by the department.

2**.2.1** Applicants for admission by UTME entrance examinations must have passed in one or two sittings either:

a. The West African Senior Secondary School Certificate examinations with at least five credits in English Language, Mathematics, Physics, Chemistry and one other Science or Technical subject.
b. The General Certificate of Education Ordinary Level examinations with at least five credits in English Language, Mathematics, Physics, Chemistry and one other Science or Technical subject.
c. The National Examination Council examinations with at least five credits in English Language, Mathematics, Physics, Chemistry and one other Science or Technical subject.

2.3 Direct Entry (DE) Mode

Candidates for admission by Direct Entry must have passed:

a. The Higher School Certificate (HSC) examinations in Pure Mathematics, Physics and Chemistry and satisfy the requirements of 2.2.1.
b. The General Certificate of Education (Advanced Level ["A" Level]) in Pure Mathematics, Physics and Chemistry and satisfy the requirements of 2.2.1.
c. National Diploma (ND) Certificate in CIVIL ENGINEERING not below Lower Credit and satisfy the requirements of 2.2.1.

Note: Holders of Higher National Diploma (HND) Certificate in CIVIL ENGINEERING could be considered for Direct Entry admission on their individual merits.

2.4 Inter University Transfer Mode

i. Students studying CIVIL ENGINEERING in IMSU-Senate-recognized universities may transfer into 200 level provided they have the relevant "O" level qualifications and their programmes are adjudged to meet the standards of the department.
ii. No candidate shall be admitted from another university unless the department is satisfied that the grades obtained by such candidates for courses in which they have had instructions are acceptable.

3.0 STAFF

The Department of CIVIL ENGINEERING has currently a total of six (6) full - time academic staff and six (6) adjunct academic staff, three of which are Professors. There are other members of the academic staff from various Science/Technical Departments that service courses and other GENERAL (GEN)- coded courses.

Almost all members of the academic staff are members of Nigerian Society of Engineers and are registered or licensed to practice engineering by the Council for the Regulation of Engineering in Nigeria (COREN). With a total enrolment of 80 undergraduate students as at 2023/2024 academic session, the staff- student ratio is about 1:7

The student population is bound to increase with time and it is hoped that more full- time and adjunct academic staff as well as other cadre of staff will be employed to keep the academic staff-student ratio within the National Universities Commission (NUC) approved ratio of 1:15.

4.0 REGISTRATION OF COURSES

All students in the department must complete the following registration process.

4.1 How to Register

i. Pay fees
ii. Present fees clearance document to the faculty officer (FO) and collect a set of registration materials.
iii. Thereafter report to the academic adviser who will plan the student's academic programmes of studies for the semester. The student completes all the registration materials

and presents them to the Academic Staff Adviser and Head of Department (HOD) for signatures.

4.2 Durations

Registration of courses for the first and second semesters normally starts at the beginning of the first semester of the academic year and lasts for two weeks from the date the registration exercise began.

Course registration is done in the students' department. The student registers his/her courses under the supervision of the academic adviser. Undergraduate students are required to ensure that the total credit units are not less than l5 units and not more than 27 units per semester.

4.3 Late Registration

Students may be permitted late registration upon payment of late registration fee.

i. Late registration shall not normally last beyond four weeks from the date lectures begin.
ii. Students who have cogent reason for late registration must notify the registrar in writing in advance, copying the Head of Department.

5.0 EXAMINATIONS

Examinations are taken seriously in the department. As a science as well as an art, Engineering is only for those who have the aptitude. Effort is therefore made to ensure that only those who are prepared for the demands of the profession are allowed to move on at the end of 200 level, students are screened and those who have accumulated more than four (4) carry-over courses or have a cumulative grade point average (CGPA) less than 2.0 are advised to repeat the 200 level or withdraw from the department and the faculty.

Examinations may take the form of written papers, oral examinations, or any other form of examination approved by Senate. The continuous assessment of course work should be included in determining the results through assignments and/or periodic tests. It is expected that before students present themselves for examinations in any course, they have duly registered the course, have attended at least 75% of lectures and other exercises as may be assigned by the department.

5.1 Semester Examination

All courses taught during a semester should be examined at the end of that semester and students shall be credited with the number of units assigned to the courses in which they have passed the requisite examinations.

5.2 Examination Time Table

The Registrar shall produce the final time table and circulate same to all departments normally not later than two weeks before the commencement of the examinations. Any suggested change shall be entertained only on the recommendation of a department through the Faculty to the Registrar who shall take such actions as deemed necessary.

5.3 Invigilation

For invigilation of examinations, the following procedures and guidelines are used:

a. The time allowed for written examination shall normally be on basis of not more than one-hour for each unit course. In any case, the time allowed for any one theory paper shall not exceed 3 hours.

b. The invigilation of examination within each department shall be the responsibility of the Departmental Academic Committee.

c. There shall be at least two invigilators to every examination hall

d. Invigilators must be at their respective examination halls not later than 20minutes before the start of the examination.

e. Examination shall normally start at the time stated on the time-table.

f. It is the duty of the invigilators under the leadership of the Chief Invigilator, to ensure that:

i. Every candidate admitted into the examination hall is in good standing as a student of Imo State University and has met the 75% attendance at lectures.

j. Every candidate is reminded of the regulations governing the conduct of examinations

k. The attendance register of the candidates is controlled during the examinations and that all students involved shall sign in.

l. No student is allowed to enter the examination hall 30 minutes after the commencement of the examinations.

m. No student may leave the hall earlier than 30 minutes to the end of the examination.

n. No student shall take examination papers out of the examination hall until the end of the examinations.

o. Invigilators shall collect the scripts of each student before he or she leaves the examination hall and ensure that he/she signs out:

5.4 Examination Misconduct

Examination malpractices are unfair practices or contravention of regulations of Imo State University examinations These contraventions include but are not limited to students copying from each other, students bringing into the examination hall, papers and books, mobile phones, smart watches or any materials relevant to the examination paper, for cheating, all forms of communication between students: during examinations; causing any form of disturbance, not observing the time regulation of the examination, and disobeying the invigilators.

5.5 Procedure for Dealing with Examination Malpractice / Misconduct

i. A student suspected or caught in a case of examination malpractice should be allowed to complete the examination but he or she will be required to sign the invigilator's report or he or she may choose to write on his/her own. A student who refuses to sign the invigilator's report or to write his/her own will be guilty of an examination malpractice.

ii. The chief invigilator shall submit a written report of the incident to the Head of Department and Dean, copying the Registrar within 24hours (for the examination, taken from Monday to Thursday) after the examinations and 48hours for examination taken on a Friday to Saturday.

iii The Head of Department and Dean shall pass on the report to the Registrar after the initial assessment within two weeks of the examination.

iv. The Registrar shall refer the report to the Vice Chancellor not later than one week after the receipt of the report.

v. The Vice Chancellor shall institute an investigation on the case. The investigation panel so initiated shall have the right to invite or request written or oral evidence from witnesses, the invigilator, the student(s) concerned and any other(s), relevant to the case.

vi. The Vice Chancellor shall thereafter, take appropriate action and report to Senate.

5.6 Disciplinary Measures

Normally, the disciplinary action for all proven cases of examination malpractice is expulsion from the University. However, all cases bordering on miscellaneous offences shall be referred to a court of law.

Whereas:

a. Introduction of relevant notes in examination hall, students copying from each other, or previous access to examination papers etc. shall attract expulsion from the University.

b. Invigilation offences such as aiding and /or abetting, cheating, assaulting or attempting to assault the invigilator, causing any form of disturbance, not observing the time regulation of the examination, shall be punishable with one-year rustication.

c. A student penalized under cases above, shall have the right to appeal to the Senate in the first instance and to the Council if not satisfied with the decision of the Senate on his appeal.

6.0 GRADING AND REVIEW OF EXAMINATION SCRIPTS

6.1 Grading

A lecturer shall normally mark all the scripts for course(s) he/she taught or participated in teaching using a marking scheme and determine the grade to be awarded to each student. The scripts shall be submitted to the departmental committee of examiners for final vetting. The same provision shall apply to oral and practical examinations. The written examination at the end of a semester shall normally constitute 70% of the grade, while the remaining 30% comes from continuous assessment. However, for studio, laboratory, workshop and design courses, continuous assessment may account for up to 60% of the grade.

6.2 Review of Scripts

i. A student aggrieved by his or her grading shall in the first instance, petition the Registrar through the Head of Department and Dean for a review of his/ her examination script on a payment of a non-refundable fee to the bursary, stating in details the ground(s) for the application. The Registrar shall refer the petition to the faculty through the Dean.

ii. On receipt of the petition, the Dean shall convene a meeting of the faculty board to consider the petition. If the board is satisfied that a prima facie case has been made, permission shall be sought from the Senate to set up a Review Panel comprising two internal Examiners not involved in the earlier marking, which shall independently review the script and report to the Dean. If the course is a final year course, the service of an external examiner specifically, appointed for the purpose shall be used. The result of the review shall be sent to senate for final determination along with the original score and the recommendation of the Faculty Board.

iii. Where the faculty board decides ii, i a prima facie case has not been made, it shall state in detail the reason(s) for its decision and shall convey same to the Senate through the Vice Chancellor for disposal action.

7.0 RESULTS, AWARDS, GRADUATION AND CONVOCATION

7.1 Grading System

A candidate raw score in an examination usually expressed as a percentage are converted into grades which are weighted by being assigned point values. The following ranges of marks and their corresponding grades and points weighting are to be used.

Table

RAW SCORE %	GRADE EQUIVALENT	PERFORMANCE RATING	POINT WEIGHT
70 – 100	A	DISTINCTION	5
60 – 69	B	VERY GOOD	4
50 – 59	C	GOOD	3
45 – 49	D	SATISFACTORY	2
40 – 44	E	PASS	1
0 – 39	F	FAIL	0

“A”, “B”, “C”, and “D” “E” are PASS grades while “F” is a FAILURE grade. It is the responsibility of the Department/Faculty Board to determine how each lecturer within the department arrives at the grades. This must be in line with the laid down procedures.

7.2 Computation of Grade Point Average (GPA)

i. All courses taken by a student shall be used in the computation of Cumulative Grade Point Average.

ii. To compute the Grade Point Average (GPA) of a candidate, the total aggregate of the Grade point is divided by the number of semester units. A Grade Point is obtained by multiplying the point scored in examination with the number of semester units to that course e.g.

COURSE	UNITS/ SEMESTER	GRADE SCORE	GRADE POINTS
GST 101	2	B	2×4 = 8.00
GST 103	2	B	2×4 = 8.00

GST 105	2	A	2×5=10.00
GEN 101	2	C	2×3 = 6.00
GEN 121	2	D	2×2 = 4.00
PHY 121	2	A	2×5= 10.00
TOTAL	12		46.00

iii. To compute the Cumulative Grade Point Average (CGPA) for a candidate at the end of the session, his total aggregate points for the two semesters are added and divided by the total number of semester units taken during the academic year, e.g.

FIRST SEMESTER

COURSES	UNIT/ SEMESTER	GRADE SCORE	GRADE POINTS
GST 101	2	D	2×2= 4.00
GST 103	2	B	2×4 = 8.00
PHY 101	3	A	3×5=15.00
CHE 101	3	D	3×2= 6.00
GEN 101	2	C	2×3= 6.00
GEN 121	2	C	2×3= 6.00
CVE 101	2	A	2×5=10.00
TOTAL	16		55

GPA for First Semester = 55 / 16 = 3.44

SECOND SEMESTER

COURSES	UNIT/ SEMESTER	GRADE SCORE	GRADE POINTS
GST 102	2	B	2×4= 8.00
GST 106	2	C	2×3= 6.00
PHY 102	3	A	3×5=15.00
CHE 102	3	B	3×4=12.00
GEN 102	2	D	2×2= 4.00
GEN 122	2	C	2×3= 6.00
CHE 102	2	A	2×5= 10.00
TOTAL	16		61.00

GPA for Second Semester = 61/ 16 =3.81

Cumulative Grade Point Average = 53 + 61 / 16 + 16 = 116 / 32 = 3.63

This cumulative Grade Point Average is for the two semesters in a session.

D. A CGPA of less than 1.00 at the end of any session shall lead to withdrawal from the University.

However, the candidate may be re-admitted into the university if he/she goes through the normal admission process as a fresh student.

7.3 Classification of Degrees

The Cumulative Grade Point Average that shall be used to classify degrees is as follows:

4.50 - 5.00 First Class (Honours)
3.50 - 4.49 Second Class (Honours) Upper Division
2.40 - 3.49 Second Class (Honours) Lower Division
1.50 - 2.39 Third Class
1.00 -1.49 Pass
0.09 - 0.99 Fail

7.4 Awards

A. For award of certificate of the Department of CIVIL ENGINEERING, a candidate must have satisfied the minimum requirements of the department for the award of that certificate. This shall include but not limited to a certain number of credit units and passing all the compulsory and required courses in the department.

B. Certificates for the award of Bachelor of Engineering shall be sealed with common seal of the University and signed by the Vice Chancellor and the Registrar. Certificates shall not be collected by proxy except with the approval of the Vice Chancellor.

C. No certificate of the Department shall be awarded to person(s) indebted to the University or concerning whom disciplinary proceedings are outstanding or in process, or found wanting in character or candidates whose admission credentials have not been verified and confirmed.

8.0 WITHDRAWALS AND DEFERRED ADMISSIONS

8.1 Voluntary Withdrawals

A. Any student who wishes to withdraw from the University shall be required to give a written notification to the Registrar, through the Dean of the Faculty and Head of Department. He shall be required to complete withdrawal forms obtainable from the office of the Registrar.

B. The period of withdrawal shall not exceed one academic year and shall be subject to approval by Senate.

C. The student shall be required to pay a reactivation fee before re-admission.

D. In the case of voluntary withdrawal, the refund of fees paid in excess of the period stayed in the University will be made on pro-rata basis by the Bursar’s office.

B. In order to be re-admitted a student who withdraws voluntarily from the University must apply to the Registrar for re-admission and receive official clearance.

8.2 Unauthorized withdrawal

In this case, such a student may not be considered for readmission until his unauthorized withdrawal has been dealt with on its individual merit by the Senate.

8.3 Withdrawal for Academic Reasons

A regular student who makes a Cumulative Grade Point Average of less than 1 00 shall be asked to withdraw from the University

8.4 Withdrawal for health Reasons

A student may withdraw or be asked to withdraw for health reasons certified by the Doctor of Health Services of the University. Such a student shall be re-admitted into the University on production of a valid medical report from an approved Medical Officer and certified by the University's Director of Medical Services.

8.5 Withdrawal for Disciplinary Reasons

A student may be asked to withdraw and be on suspension on the grounds of disciplinary action. Such a student may only be re-admitted by permission of the Vice Chancellor, provided the students submit a letter of future good behaviour written on his behalf by a personality acceptable to the University. If the student is caught again in the same act of indiscipline, he shall be asked to withdraw permanently from the University

8.6 Deferred Admission (Freshmen)

Offers of provisional admission made to a candidate may be deferred for one session only if the candidate fulfills the following conditions:

a. He must first pay an acceptance fee to the University indicating acceptance of the admission.

b. He must apply to the Registrar for deferment within one month of commencement of lectures stating reasons for seeking deferment.

c. Obtain a form for deferment from the Registrar's office on payment of a fee to the bursary and present receipts of payment to the Registrar.

d. The student must be register-able.

e. He must matriculate either in person or notionally.

f. He must pay a re-activation fee to the bursary before re-admission.

g. List of re-admitted students shall be presented to Senate for ratification.

9.0 STUDENT INDUSTRIAL WORK EXPERIENCE SCHEME (SIWES)

The **SIWES** programme is designed such that students undertake compulsory twelve (12) months industrial training exposure to complement and integrate their classroom instructions and laboratory/workshop/studio exercises. The twelve months is structured as follows:
Three (3) months at the end of 200 level examinations i.e., the long vacation at the end of their 200 level.
Three (3) months at the end of 300 level examinations i.e., the long vacation at the end of their 300 level.
Six (6) months in the second semester of their 400 level which includes the long vacation at the end of 400 level.

9.1 Aims and Objectives

Students Industrial Work Experience Scheme (SIWES) was set up as a skill training programme to prepare students to face real life work situations after graduation. Its specific objectives are:

i. To provide opportunities for students to acquire industrial experience and skill in their various disciplines.
ii. To expose students to equipment, materials and machinery and the methods and techniques of handling them.
iii. To prepare students for working condition after graduation.
iv. To enhance the opportunity of students for post-graduation job placement.

9.2 Administration

All students of CIVIL ENGINEERING are required to participate. Students shall go for three-month training at the end of the second and third year. The second semester of the fourth year including the long Vacation is also devoted to industrial training. This means that during the degree programme, students would have spent twelve months on work closely with SIWES staff of the University and their departments for serial documentation that proceed and follow their industrial attachment. In the industry, students are enjoined to be regular punctual at their places of attachment and also obey the rules and regulations of the employer and keep proper records of the training activities in their log book.

SIWES is centrally coordinated in the Faculty of Engineering through a SIWES coordinator. This office liaises between the Faculty and the University Director of SIWES. The Department appoints a SIWES supervisor for the department. At the end of final period of attachment each student writes a technical report which is submitted to the faculty SIWES coordinator.

9.3 Grading

On an appointed date, the student appears before a panel to defend his/her SIWES activities. Thereafter, the SIWES is graded as follows:

a. Technical Report	40%
b. Log Book	15%
c. Observation during visits	10%
d. Employer's Remarks	15%
e. Defense of SIWES	20%
Total	**100%**

Though the defense of the SIWES is scored only 20%, it is considered an essential aspect of the exercise and the student must defend his/her report to obtain score.

Also, the panel could order student to repeat the entire exercise, if in its opinion there is no evidence of effective participation. The SIWES defense itself is scored as follows

a. Presentation	5points
b. Evidence of effective participation	5points
c. Richness of experience	7points
d. Overall impression	3points
Total	**20points**

10.0 PROGRAMME STRUCTURE

10.1 Course Coding

The three-digit course coding system is adopted where the first digit indicates the level in which the course is offered; the second digit denotes the course stress area while the third indicates the semester in which the course is ordinarily offered. Odd numbers of the third digit indicate the first semester while even numbers signify the second semester. Any course offered by the department of CIVIL ENGINEERING is pre-fixed CVE and those for all general engineering are prefixed GEN.

10.2 Stress Area

The general engineering courses stress areas are as follows:

General Courses	Middle Digits
Fundamental	0
Mechanics/Strength of Material	1
Laboratory	2
Agricultural Engineering	3
Civil Engineering	4
Materials	5
Mechanical Engineering	6
Electrical & Electronic Engineering	7
Computer/Statistics	8
Special Topics	9

While the Civil Engineering Courses stress areas are as follows:

Departmental Courses	Middle Digits
Fundamentals	0
Soil Mechanics/Foundation Engineering	1
Laboratory	2
Structural Engineering	3
Construction Engineering	4
Materials	5
Management	6
Transpiration Engineering	7
Environmental /Water Resources Engineering	8
Special Topics/Projects	9

10.3 CCMAS COURSE LISTING

YEAR ONE: FIRST SEMESTER

S/N	Course Code	Course Title	Units	Status	LH	PH	Remarks
1	CHM 101	General Chemistry I	2	C	30	-	NUC
2	GET 101	Engineer in Society	1	C	15	-	NUC
3	MTH 101	Elementary Mathematics I	2	C	30	-	NUC
4	PHY 101	General Physics I	2	C	30	-	NUC
5	CEE 101	Introduction to Civil Engineering	2	C	30	-	NUC
6	IMSU-MTH 103	Elementary Mathematics III (Vectors, Geometry and Dynamics)	2	C	30	-	COREN
7	IMSU-PHY 103	General Physics III	2	C	30	-	IMSU
8	IMSU-GET 105	Engineering Drawing	1	C	15	30	IMSU
9	IMSU-MTH 105	Elementary Mathematics V (Linear Algebra)	2	C	30	-	IMSU
10	CHM 107	General Practical Chemistry I	1	C	-	45	NUC
11	PHY 107	General Practical Physics I	1	C	-	45	NUC
12	IMSU-IGB 107	Basic Igbo	1	C	30		IMSU
13	GST 111	Communication in English	2	C	15	45	NUC
14	IMSU-GET 121	Workshop Practice I	1	C	15	30	IMSU
SEMESTER TOTAL			**22**				

YEAR ONE: SECOND SEMESTER

S/N	Course Code	Course Title	Units	Status	LH	PH	Remarks
1	CHM 102	General Chemistry II	2	C	30	-	NUC
2	GET 102	Engineering Graphics and Solid Modelling I	2	C	15	45	NUC
3	MTH 102	Elementary Mathematics II	2	C	30	-	NUC
4	PHY 102	General Physics II	2	C	30	-	NUC
5	IMSU-CSD 102	Carrier Services Development	1	C	30		IMSU
6	IMSU-PHY104	General Physic IV (Vibration, Waves and Optics)	2	C	30	-	COREN
7	IMSU-MTH 104	Elementary Mathematics IV (Coordinate Geometry)	2	C	30	-	IMSU
8	IMSU-CHM 114	Physical Chemistry	2	C	15	30	IMSU
9	CHM 108	General Practical Chemistry II	1	C	-	45	NUC
10	PHY 108	General Practical Physics II	1	C	-	45	NUC
11	IMSU-SGB 112	Readings and Practice in Igbo	1	C	30	-	IMSU
12	GST 112	Nigerian Peoples and Culture	2	C	30	-	NUC
13	IMSU-STA 112	Probability I	3	C	30	-	COREN
14	IMSU-GET 122	Workshop Practice II	1	C	15	30	IMSU
SEMESTER TOTAL			**24**				
SESSIONAL TOTAL			**46**				

YEAR TWO: FIRST SEMESTER

S/N	Course Code	Course Title	Units	Status	LH	PH	Remarks
1	IMSU-GET 201	Applied Electricity I	3	C	45	-	COREN
2	CEE 201	Civil Engineering Drawing	2	E	15	45	COREN
3	IMSU-GET 203	Engineering Graphics and Solid Modeling II	3	C	15	45	COREN
4	GET 205	Fundamentals of Fluid Mechanics	3	C	45	-	NUC
5	IMSU-GET 207	Applied Mechanics	3	C	45	-	COREN
6	GET 209	Engineering Mathematics I	3	C	45	-	NUC
7	GET 211	Computing and Software Engineering	3	C	30	45	NUC

8	IMSU-GET 221	Engineering Laboratory I	1	C	30	45	IMSU
9	ENT 211	Entrepreneurship and Innovation	2	C	30	-	NUC
SEMESTER TOTAL			**23**				

YEAR TWO: SECOND SEMESTER

S/N	Course Code	Course Title	Units	Status	LH	PH	Remarks
1	GET 202	Engineering Materials	3	C	45	-	COREN
2	GET 204	Students Workshop Practice	2	C	15	45	NUC
3	GET 206	Fundamentals of Thermodynamics	3	C	45	-	NUC
4	GET 208	Strength of Materials	3	C	45	-	COREN
5	GET 210	Engineering Mathematics II	3	C	45	-	NUC
6	GST 212	Philosophy, Logic and Human Existence	2	C	30	-	NUC
7	IMSU-GET 222	Engineering Laboratory II	1	C	30	45	IMSU
9	**GET 299**	**SIWES I: SIWEP**	-	C	-	9wks	NUC
SEMESTER TOTAL			**17**				
SESSIONAL TOTAL			**40**				

YEAR THREE: FIRST SEMESTER

S/N	Course Code	Course Title	Units	Status	LH	PH	Remarks
1	GET 301	Engineering Mathematics III	3	C	45	-	NUC
2	CEE 301	Fluid Mechanics	2	C	15	45	NUC
3	CEE 303	Engineering Geology	2	C	15	45	NUC
4	IMSU CVE 321	Civil Engineering Laboratories I	1	C	-	45	IMSU
5	GET 305	Engineering Statistics and Data Analysis	3	C	45	-	NUC
6	CEE 305	Soil Mechanics	3	C	15	45	NUC
7	GET 307	Introduction to Artificial Intelligence, Machine Learning and Convergent Technologies	3	C	45	-	NUC
8	CEE 307	Structural Mechanics I	2	C	30	-	NUC
9	IMSU-CVE 373	Transportation /Highway Engineering I	2	C	30	15	COREN
8	IMSU-CVE 383	Introduction to Water Resources and Environmental Engineering	2	C	30	-	IMSU
SEMESTER TOTAL			**23**				

YEAR THREE: SECOND SEMESTER

S/N	Course Code	Course Title	Units	Status	LH	PH	Remarks
1	GET 302	Engineering Mathematics IV	3	C	45	-	NUC
2	CEE 302	Strength of Structural Materials	2	C	30	-	NUC
3	GET 304	Technical Writing and Communication	3	C	45	-	NUC
4	CEE 304	Civil Engineering Materials	3	C	30	45	NUC
5	GET 306	Renewable Energy Systems and Technologies	3	C	30	45	NUC
6	CEE 308	Engineering Surveying & Photogrammetry I	2	C	15	45	NUC
7	IMSU-CVE 322	Civil Engineering Laboratories II	1	C	-	45	IMSU
8	IMSU-GET 392	Engineering Economics	3	C	45	-	COREN
9	GST 312	Peace and Conflict Resolution	2	R	30	-	NUC
10	ENT 312	Venture and Creation	-	R	15	45	NUC
11	IMSU-PBL 300	Problem-based Learning I	2	C	-		COREN
12	**GET 399**	**SIWES II**	-	C	-	**12 Wks**	NUC
SEMESTER TOTAL			**24**				
SESSIONAL TOTAL			**47**				

YEAR FOUR: FIRST SEMESTER

S/N	Course Code	Course Title	Units	Status	LH	PH	Remarks
1	IMSU-CVE 431	Structural Mechanics II	2	C	30	45	IMSU
2	IMSU-CVE 411	Geotechnical Engineering, I	2	C	45	-	IMSU
3	IMSU-CVE 421	Civil Engineering Lab III	1	C	-	45	IMSU
5	IMSU- CVE 441	Civil Engineering Practice	2	C	30	-	IMSU
6	IMSU-CVE 481	Engineering Hydrology	2	C	30	-	IMSU
7	CEE 406	Engineering Surveying and Photogrammetry II	3	C	30	45	IMSU
8	IMSU-CVE 473	Transportation and Highway Engineering II	2	C	15	45	IMSU
9	IMSU-GET 481	Computer Aided Design	2	R	15	45	IMSU
10	IMSU-GET 493	Engineering Research Method	2	R	15	45	IMSU
SEMESTER TOTAL			**18**				

YEAR FOUR: SECOND SEMESTER

SIWES Courses

S/N	Course Code	Course Title	Units	Status	Duration
11	**IMSU-PBL 400**	**Problem-based Learning II**	**2**	**C**	**-**
1	**GET 299**	**SIWES I: SIWEP**	**3**	**C**	**9 Weeks**
2	**GET 399**	**SIWES II**	**4**	**C**	**12 Weeks**
3	**GET 499**	**SIWES III: Student Industrial Work Experience Scheme**	**8**	**C**	**24 Weeks**
SEMESTER TOTAL			**17**		
SESSIONAL TOTAL			**35**		

YEAR FIVE: FIRST SEMESTER

S/N	Course Code	Course Title	Units	Status	LH	PH	Remarks
1	GET 501	Engineering Project Management	3	C	45	-	NUC
2	IMSU-CVE 511	Geotechnical Engineering II	2	C	30	45	IMSU
3	IMSU-CVE 523	Civil Engineering Lab/Design	1	C	-	45	COREN
4	IMSU-CVE 531	Design of Timber and Steel Structures	2	C	45	-	COREN
5	CEE 591	Civil Engineering Seminar	1	C	15	-	COREN
6	CEE 599	Civil Engineering Research Project I	3	C	-	180	NUC
7	IMSU-CVE 581	Hydraulics and Hydraulic Structures	2	C	30	-	COREN
8	IMSU-CSD 401	Carrier Services Development	1	R	15	-	IMSU
		ELECTIVES					
9	IMSU-CVE 533	Advanced Structural Design I	3	E	45	-	COREN
10	IMSU-CVE 585	Advanced Water Resources and Environmental Engineering I	3	E	45	-	COREN
11	IMSU-CVE 573	Advanced Transportation & Highway Engineering I	3	E	45	-	COREN
12	IMSU-CVE 515	Advanced Geotechnical Engineering I	3	E	45	-	COREN
SEMESTER TOTAL			**17**				

YEAR FIVE: SECOND SEMESTER

S/N	Course Code	Course Title	Units	Status	LH	PH	Remarks
1	GET 502	Engineering Law	2	C	30	-	NUC
2	CEE 506	Construction Engineering	3	C	30	45	NUC
4	IMSU-CVE 522	Civil Engineering Lab/Design	1	C	-	15	IMSU
5	IMSU-CVE 542	Terotechnology	1	C	15	15	IMSU
6	CEE 599	Civil Engineering Research Project II	3	C	-	180	NUC

7	IMSU-CVE 572	Highway Geometric Design	2	C	30		
ELECTIVES							
8	IMSU-CVE 538	Advanced Structural Design II	3	E	45	-	COREN
9	IMSU-CVE 588	Advanced Water Resources and Environmental Engineering II	3	E	45	-	COREN
10	IMSU-CVE 574	Advanced Highway / Transportation Engineering II	3	E	45	-	COREN
11	IMSU-CVE 518	Advanced Geotechnical Engineering II	3	E	45	-	COREN
SEMESTER TOTAL			**15**				
SESSIONAL TOTAL			**32**				

10.4 CCMAS COURSE DESCRIPTION

10.4.1 Serviced Courses

CHM 101: General Chemistry I (2 Units C: LH 30)

Learning Outcomes

At the end of this course, the students should be able to:

1. Define atom, molecules and Civil reactions;
2. Discuss the modern electronic theory of atoms;
3. Write electronic configurations of elements on the periodic table;
4. Rationalise the trends of atomic radii, ionisation energies, electronegativity of the elements, based on their position in the periodic table;
5. Identify and balance oxidation–reduction equation and solve redox titration problems;
6. Draw shapes of simple molecules and hybridised orbitals;
7. Identify the characteristics of acids, bases and salts, and solve problems based on their quantitative relationship;
8. Apply the principles of equilibrium to aqueous systems using lechatelier's principle to predict the effect of concentration, pressure and temperature changes on equilibrium mixtures;
9. Analyse and perform calculations with the thermodynamic functions, enthalpy, entropy and free energy; and
10. Determine rates of reactions and its dependence on concentration, time and temperature.

Course Contents

Atoms, molecules, elements and compounds, and Civil reactions. Modern electronic theory of atoms. Electronic configuration, periodicity and building up of the periodic table. Hybridisation and shapes of simple molecules. Valence forces; Structure of solids. Civil equations and stoichiometry; Civil bonding and intermolecular forces, kinetic theory of matter. Elementary thermochemistry; rates of reaction, equilibrium and thermodynamics. Acids, bases and salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity.

MTH 101: Elementary Mathematics I (Algebra and Trigonometry) (2 Units C: LH 30)

Learning Outcomes

At the end of the course students should be able to:

1. define and explain set, subset, union, intersection, complements, and demonstrate the use of Venn diagrams;
2. solve quadratic equations;
3. solve trigonometric functions;
4. identify various types of numbers; and
5. solve some problems using binomial theorem.

Course Contents

Elementary set theory, subsets, union, intersection, complements, Venn diagrams. Real numbers, integers, rational and irrational numbers. Mathematical induction, real sequences and series, theory of quadratic equations, binomial theorem, complex numbers, algebra of complex numbers, the argand diagram. De-Moiré's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition and factor formulae.

PHY 101: General Physics I (Mechanics) (2 Units: C, LH 30)

Learning Outcomes

On completion, the students should be able to:

1. identify and deduce the physical quantities and their units;
2. differentiate between vectors and scalars;
3. describe and evaluate motion of systems on the basis of the fundamental laws of mechanics;
4. apply Newton's laws to describe and solve simple problems of motion;
5. evaluate work, energy, velocity, momentum, acceleration, and torque of moving or rotating objects;
6. explain and apply the principles of conservation of energy, linear and angular momentum;
7. describe the laws governing motion under gravity; and
8. explain motion under gravity and quantitatively determine behaviour of objects moving under gravity.

Course Contents

Space and time; units and dimension, vectors and scalars, differentiation of vectors: displacement, velocity and acceleration; kinematics; Newton's laws of motion (inertial frames, impulse, force and action at a distance, momentum conservation); relative motion; application of Newtonian mechanics; equations of motion; conservation principles in physics, conservative forces, conservation of linear momentum, kinetic energy and work, potential energy, system of particles, centre of mass; rotational motion; torque, vector product, moment, rotation of coordinate axes and angular momentum. Polar coordinates; conservation of angular momentum; circular motion; moments of inertia, gyroscopes and precession; gravitation:

Newton's law of gravitation, Kepler's laws of planetary motion, gravitational potential energy, escape velocity, satellites motion and orbits.

CHM 102: General Chemistry II (2 Units C: LH 30)

Learning Outcomes

At the end of this course, the students should be able to:

1. state the importance and development of organic chemistry;
2. define fullerenes and its applications;
3. discuss electronic theory;
4. determine the qualitative and quantitative of structures in organic chemistry;
5. state rules guiding nomenclature and functional group classes of organic chemistry;
6. determine the rate of reaction to predict mechanisms of reaction;
7. identify classes of organic functional group with brief description of their chemistry; 8. discuss comparative chemistry of group 1A, IIA and IVA elements; and
9. describe basic properties of transition metals.

Course Contents

Historical survey of the development and importance of organic chemistry; fullerenes as fourth allotrope of carbon, uses as nanotubules, nanostructures, nanochemistry. Electronic theory in organic chemistry. Isolation and purification of organic compounds; determination of structures of organic compounds including qualitative and quantitative analysis in organic chemistry; nomenclature and functional group classes of organic compounds. Introductory reaction mechanism and kinetics. Stereochemistry. The chemistry of alkanes, alkenes, alkynes, alcohols, ethers, amines, alkyl halides, nitriles, aldehydes, ketones, carboxylic acids and derivatives. The chemistry of selected metals and non-metals. Comparative chemistry of group IA, IIA and IVA elements. Introduction to transition metal chemistry.

GET 102: Engineering Graphics and Solid Modelling I (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, the students should be able to:

1. have a good grasp of design thinking and be obsessed with the determination to apply such to solving simple every day and also complex problems;
2. recognise the fundamental concepts of engineering drawing and graphics;
3. show skills to represent the world of engineering objects in actionable solid models, and put such models in a form where they can be inputs for simulation and analyses;
4. analyse such models for strength and cost;
5. prepare the objects for modern production and manufacturing techniques of additive and subtractive manufacturing;

6. recognise that engineering is multidisciplinary in the sense that mechanical, electrical and other parts of physical structures are modelled in context as opposed to the analytical nature of the courses they take; and
7. analyse and master the basics of mechanical and thermal loads in engineering systems.

Course Contents

Introduction to design thinking and engineering graphics. First and third angle orthogonal projections. Isometric projections; sectioning, conventional practices, conic sections and development. Freehand and guided sketching – pictorial and orthographic. Visualisation and solid modelling in design, prototyping and product-making. User interfaces in concrete terms. Design, drawing, animation, rendering and simulation workspaces. Sketching of 3D objects. Viewports and sectioning to shop drawings in orthographic projections and perspectives. Automated viewports. Sheet metal and surface modelling. Material selection and rendering. This course will use latest professional design tools such as fusion 360, solid works, solid edge or equivalent.

MTH 102: Elementary Mathematics II (Calculus) (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. identify the types of rules in differentiation and integration;
2. recognize and understand the meaning of function of a real variable, graphs, limits and continuity;
3. solve some applications of definite integrals in areas and volumes;
4. solve function of a real variable, plot relevant graphs, identify limits and idea of continuity;
5. identify the derivative as limit of rate of change;
6. identify techniques of differentiation and perform extreme curve sketching;
7. identify integration as an inverse of differentiation;
8. identify methods of integration and definite integrals; and
9. perform integration application to areas, volumes.

Course Contents

Functions of a real variable, graphs, limits and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation, maxima and minima. Extreme curve sketching, integration, definite integrals, reduction formulae, application to areas, volumes (including approximate integration: Trapezium and Simpson's rule).

PHY 102: General Physics II (Behaviour of Matter) (2 Units C: LH 30)

Learning Outcomes

On completion, the students should be able to:

1. explain the concepts of heat and temperature and relate the temperature scales;
2. define, derive and apply the fundamental thermodynamic relations to thermal systems;

3. describe and explain the first and second laws of thermodynamics, and the concept of entropy;
4. state the assumptions of the kinetic theory and apply techniques of describing macroscopic behaviour;
5. deduce the formalism of thermodynamics and apply it to simple systems in thermal equilibrium; and
6. describe and determine the effect of forces and deformation of materials and surfaces.

Course Contents

Heat and temperature, temperature scales; gas laws; general gas equation; thermal conductivity; first Law of thermodynamics; heat, work and internal energy, reversibility; thermodynamic processes; adiabatic, isothermal, isobaric; second law of thermodynamics; heat engines and entropy, Zero's law of thermodynamics; kinetic theory of gases; molecular collisions and mean free path; elasticity; Hooke's law, Young's shear and bulk moduli; hydrostatics; pressure, buoyancy, Archimedes' principles; Bernoullis equation and incompressible fluid flow; surface tension; adhesion, cohesion, viscosity, capillarity, drops and bubbles.

IMSU-CSD 102: Career Services Development (1 Unit C: LH 30)

Learning Outcomes

On completion, the students should be able to:

1. have knowledge of origin of career services
2. understand self-confidence and career development
3. have knowledge of independence, responsibility and early career planning
4. explain time management and productivity, personal branding and self - assessment
5. establish the relationship between leadership and mentorship
6. highlight various leadership styles/types

Course Contents

Career conversations & connections, theories of career education, Self-confidence and Career Development: definition of self-confidence, qualities of self-confidence, types of self-confidence. Independence and responsibilities: meaning of independence and responsibility, manifestation of independence for freshers, signs of responsibility in fresher, challenges to independence and responsibility, students' independence at Tertiary institution. Early Career Planning: steps in career planning, case studies in career planning. Time management and productivity: the 5Ps of time management strategies, time management techniques. Personal Branding and Self-assessment: strengths and weaknesses, importance of self-assessment, brandings and physical appearance. Interest Inventory: career interest inventory, types and essence of interest inventory. Career assessment and administration: definition, importance, purpose and types of career assessment, basic considerations for selecting career assessment

tools. Cultural factors influencing career choices among students in Nigeria. Professionalism and Ethics of Teaching (Career Services); Leadership and Mentorship Skills for Students: characteristics of leadership, types of leadership style, leadership functions, traditional perspective on mentoring and mentorship style in higher institution. Technical and Computer Skills Relevant for Career Success: definition of computer skills, types of computer skills and the importance; Decision Making for Freshers.

IMSU-ICT 100: Information & Communication Technologies and Use of Library
(1 Unit C: LH 30)

Learning Outcomes

On completion, the students should be able to:

1. understand the basics of Computer and Computer appreciation
2. have good knowledge of Computer, hardware, software and operating system
3. understand what Computer virus is all about and its impacts to computers and the society
4. understand the meaning, origin and types of libraries
5. understand library resources and services
6. the roles of ICT in library services and library ethics.

Course Contents:

Computer Basics and Appreciation: Definition of Computer, Categories of computers and their uses, Various types of computer users, Methods of Data Processing, Basic characteristics of Computer, the importance of Computers, Benefits of using a computer, Advantages of Computer Disadvantages of Computer, Computer History and Development, Early Computing Machines Classification of Computers, Classification of Computers According to Size, Classification of Computers According to functions, Classification of computers according to their purpose.
Types of Computers, Generations of computers, Summary of *Computer Generations and Their Characteristics.* Interrelationship between Binary and Decimal Numbers. The Computer System, Units for measuring computer information or speed. Ways to take care of your computer. Computer Hardware: Peripherals, Parts of a Computer, Input and Output Devices, System unit Central processing unit (CPU), Memory Unit, Primary Memory, Secondary Memory, Storage Medium, Functional Components of a Computer System.
Computer Software and Operating System: Computer Software, Types of computer Software, Word processors, spread sheets, Image Editors, Database management systems, Presentation applications, Desktop publishing software, operating system, Device Drivers Language Translators, Functions of an Operating System, Categories of an Operating System, Types of Operating Systems, Criteria for Package Acceptability, Modes of Software Acquisition, Operating System – Overview, Parts of Operating System, Elements of Graphical User Interface, Functions of An Operating System, Objectives of Operating System, Need for an Operating System (OS), Reasons for an Operating System. **Computer Virus:** Computer Virus Defined, Historical Backgrounds-Early Theoretical Development (1940-1970), The Emergence of Malicious Viruses (1980s), The Golden Age of Viruses (1990s), The New Age of Cyber Risks (2000s-Present), The Evolution of Viruses: Current Trends and Future, Focus, Current Trends, Future Predictions, Forms of Computer Virus Infection, Operational Mechanisms of Computer Worms and Viruses, Common Payload Activities: Concealment: Evading Detection, Common Concealment Techniques.

Symptoms of a Computer Virus, Spread and Prevention Virus, Methods of Disguise, Prevention, Impact of Computer Viruses on individuals, Organizations, Governments and National Security, Healthcare, Economic, Environmental, Psychological and Social Impact. Positive Advancements Emanating from Computer Virus Attacks, Prevention and Protection Against Computer Viruses. **Meaning and Origin of Libraries:** Egyptian Library, Temple Libraries, Royal Libraries, Greek Library, Aristotle Library, The Alexandrian Library,
Library at Pergamum, Roman Libraries, Private Libraries, Public Libraries, Dark Ages, The Middle or Medieval Ages, Monastic Libraries, University Libraries, Renaissance, Modern Libraries, United States of America (USA), Great Britain, France, Germany, Africa. Types of libraries: Public Library, Objectives of and functions Public Libraries, School Library, Academic Library and its functions, National Library and its functions, National Library and its functions, Special Library and its characteristics. **Library Resources and Services:** Library, Human and Financial Resources. Physical Facilities, Information /Material Resources, Types of Information Resources in the Library, Parts of a Book, Library Services, Types of Library Services, Reference Services in the Library, Typical Components of a Reference Service, ICT Services in Libraries, Definition of Concepts, Key Roles of ICT in Library Services, Emerging Trends in Library Technology, Impact of ICT on Library Services, Reprographic Services in Library, Important Aspects of Reprographic Services in Libraries, Library Orientation Services, Library Layout and Services: Library Policies and Procedures, Library Etiquette, Inter-library Loan, Online Research Tools, Importance of Library Orientation Programmes
Interlibrary Cooperation Services. **Library Ethics: Rules and Regulations.**

IMSU-PHY 103: General Physics III (Behaviour of Matter) (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. explain the concepts of heat and temperature and relate the temperature scales;
2. define, derive, and apply the fundamental thermodynamic relations to thermal systems;
3. describe and explain the first and second laws of thermodynamics, and the concept of entropy;
4. state the assumptions of the kinetic theory and apply techniques of describing macroscopic behaviour;
5. deduce the formalism of thermodynamics and apply it to simple systems in thermal equilibrium; and
6. describe and determine the effect of forces and deformation of materials and surfaces.

Course Contents

Heat and temperature (temperature scales). Gas laws. General gas equation. Thermal conductivity. First Law of thermodynamics (heat, work and internal energy, reversibility). Thermodynamic processes (adiabatic, isothermal, isobaric). Second law of thermodynamics (heat engines and entropy). Zero’s law of thermodynamics. Kinetic theory of gases. Molecular collisions and mean free path. Elasticity (Hooke's law, Young's, shear and bulk moduli). Hydrostatics (Pressure, buoyancy, Archimedes' principles). Bernoulli’s equation and

incompressible fluid flow. Surface tension (adhesion, cohesion, viscosity, capillarity, drops and bubbles).

IMSU-MTH 103: Elementary Mathematics III (Vectors, Geometry and Dynamics)

(2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. solve some vectors in addition and multiplication;
2. calculate force and momentum; and
3. solve differentiation and integration of vectors.

Course Contents

(Pre-requisite –MTH 101)

Geometric representation of vectors in 1-3 dimensions, components, direction cosines. Addition, scalar, multiplication of vectors, linear independence. Scalar and vector products of two vectors. Differentiation and integration of vectors with respect to a scalar variable. Two-dimensional co-ordinate geometry. Straight lines, circles, parabola, ellipse, hyperbola. Tangents, normals. Kinematics of a particle. Components of velocity and acceleration of a particle moving in a plane. Force, momentum, laws of motion under gravity, projectiles and resisted vertical motion. Elastic string and simple pendulum. Impulse, impact of two smooth spheres and a sphere on a smooth surface.

IMSU-PHY 104: General Physics IV (2 Units C: LH 30)

Learning Outcomes

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

1. Describe and quantitatively analyze the behaviour of vibrating systems and wave energy
2. Explain five propagation and properties of waves in sound and light;
3. Identify and apply three wave equations
4. Explain three geometrical optics and principles of optical instruments.
5. Explain Simple harmonic motion (SHM)

Course Contents

Simple harmonic motion (SHM). Energy in a vibrating system. Damped SHM. Resonance and transients. Coupled SHM. Q values and power response curves. Normal modes. Waves (types and properties of waves as applied to sound). Transverse and longitudinal waves (superposition, interference, diffraction, dispersion, polarization). Waves at interfaces (energy and power of waves. The wave equation. 2-D and 3-D wave equations. Wave energy and power. Phase and group velocities. Echo and beats. The Doppler-effect. Propagation of sound in gases, solids and liquids and their properties. Optics: Nature and propagation of light.

Reflection and refraction. Internal reflection. Scattering of light. Reflection and refraction at plane and spherical surfaces. Thin lenses and optical instruments. Wave nature of light. Dispersion. Huygens's principle (interference and diffraction).

IMSU-HPS 104: History and Philosophy of Science (1 Unit C: LH 45)

Learning Outcomes:

At the end of this course, students will be able to:

1. Make sense of the processes of scientific knowledge, technological projects and medical strategies.
2. Create an awareness of the services of science to man and the effects of science on human society.
3. See how why these enterprises exert their powers and how they are trusted, contested and changed.
4. Establish the interrelationship between all disciplines.
5. Explain the nature of man, components of the universe in which he lives and how he obtains energy for his activities.

Course Contents:

The nature of Philosophy and Philosophy's concern with other disciplines; What is science? And how it is different from Pseudo-Science; Principles and Assumptions of Science; Foundational Metaphysics and Epistemology of Science; The Methods and Features of Science; The problems with Science; The theories of Scientific Progress; Philosophy of the Social Science; Philosophy, Science and Development in Africa; Science, Technology and Inventions; Social implications of technological advancement; Man, and his Origin; Man, and his Environment; Man, and his sources of Energy; Climate Change

CHM 107: General Practical Chemistry I (1 Unit C: PH 45)

Learning Outcomes

At the end of this course, the students should be able to:

1. state the general laboratory rules and safety procedures;
2. collect scientific data and correct carry out Civil experiments;
3. identify the basic glassware and equipment in the laboratory;
4. state the differences between primary and secondary standards;
5. perform redox titration;
6. record observations and measurements in the laboratory notebooks; and
7. analyse the data to arrive at scientific conclusions.

Course Contents

Laboratory experiments designed to reflect topics presented in courses CHM 101 and CHM 102. These include acid-base titrations, qualitative analysis, redox reactions, gravimetric analysis, data analysis and presentation.

PHY 107: General Practical Physics I (1 Unit C: PH 45)

Learning Outcomes

On completion, the student should be able to:

1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors;
4. plot and analyse graphs; and
5. draw conclusions from numerical and graphical analysis of data.

Course Contents

This introductory course emphasizes quantitative measurements. Experimental techniques. The treatment of measurement errors. Graphical analysis. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity, etc. (covered in PHY 101, 102, 103 and PHY 104). However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis, and deduction.

IMSU-SGB 107: Basic Igbo (2 Units C: LH 30)

Goal of Course:

1. To engender students' communicative skills in Igbo.
2. To assist students to acquire the rules of Igbo grammar in their writing.
3. To develop students' interest in Igbo as a special, indigenous Nigerian language.
4. To encourage students' appreciation of basic literary works in Igbo.

Learning Outcomes

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

1. Read and demonstrate good comprehension of texts in the language
2. Read and write two compositions in Igbo language with standard orthography.
3. Demonstrate understanding of word formation processes in the language
4. Demonstrate proper usage of Igbo language.
5. Identify the five dramatic elements in traditional drama in the language

Course Contents

NHAZI ỌMỤMỤ

Nqm; Wiik.	**Isiqmxmx**	**Nd[niime Ọmụmụ**

1.	Ndubata; Mkpxrxab[d[[	Ozi ekele; {kpqlite mmas[gbasara mmxta asxsx Igbo. {gxpxta na idepxta Ab[[d[Igbo; Iwu Ndakqr[ta Xdaume: Nnupx Isi n'Iwu Ndakqr[ta Xdaume; Myirixdaume; Mgbochiume (Mkp[, Xdaqnx na Xdaimi); Mkpxrxab[[d[Igbo na Mkpxrxokwu; Mkpxrxab[[d[Igbo na Ah[r[okwu. Qrxnka Ab[[d[na Mkpxrxab[[d[.
2.	Nkejiasxsx: Aha na Nnqchiaha:	Nkenxxd[Aha: - Ahaaka na Ahaizugbe; - Ahaìgwè na Ahauche. - Odide Nkejiasxsx Aha n'ah[r[okwu. Nkenxd[Nnqchiaha I: - Pesin na Ngx; - Nnqchimpesin; - Nnqchiaha na Ndakqr[ta Xdaume; - Nnqchiaha na ah[r[okwu; Nkenxxd[Nnqchiaha II: - Nnqchionye - Nnqchimpesin - Nnqchinke - Nnqchionwe Odide Nnqchiaha n'ah[r[okwu. Nnqchiaha na Xdaolu. Qrxnka Aha. Qrxnka Nnqchiaha.
3.	Nkejiasxsx Mbuxzq na Njikq:	Odide Mbuxzq n'ah[r[okwu. Nkenxxd[Njikq; Njikq n'ah[r[okwu; Nd[iche d[n'etiti Mbuxzq "na" nakwa Njikq "na". Nd[iche d[n'etiti Mbuxzq "na" nakwa Nnyemaka Ngwaa "na". Qrxnka Mbuxzq. Nkenxxd[Mbuxzq;

		Qmxmaatx Mbuxzq; Odide Njikq n'ah[r[okwu; Nd[iche d[n'etiti Njikq "na" nakwa Mbuxzq "na". Nd[iche d[n'etiti Njikq "na" nakwa Nnyemaka Ngwaa "na". Qrxnka Mbuxzq; Qrxnka Njikq.
4.	Nkejiasxsx Nkqwaaha na Nkwuwa:	Nkenxxd[Nkqwaaha: - Nkqwa - Nrxaka - Mkpokqta. Odide Nkqwaaha n'ah[r[okwu. Ejirimara Nkqwaaha. Nkenxxd[Nkwuwa: - Keoge - Keqd[d[- Keuchexda - Kensokwxnye - Kengwaa - Keugboro ugboro. Odide Nkwuwa n'ah[r[okwu. Qrxnka Nkqwaaha; Qrxnka Nkwuwa.
5.	Njxajxjx, Qnxqgxgx na Ntimkpu	Nkenxxd[Njxajxjx; Odide Njxajxjx n'ah[r[okwu. {kpqpxta Qnxqgxgx: Otu ruo Ijeri; Mgbakq Qnxqgxgx: - Qnxego; - Qnxoge; - Qnxole; - Nqmba (Nqmba Nzuruoke, Nqmba na Nqmba Qnxmpekele. Nkenxd[Nqmba Qnxmpekele: - Nqmba Qnxmpe - Nqmba Qnxqgwa Nqmba Mweabxq na Nqmba Nsqabxq Ngxnke;

		Qnxafq; Ndubata Qnxqgx Sqqm. Nkenxxd[Ntimkpu; Ntimkpu n'ime ah[r[okwu. Xdaolu n'ime Njxajxjx; Xdaolu n'ime Qnxqgxgx; Xdaolu n'ime Ntimkpu. Qrxnka Njxajxjx, Qnxqgxgx, Ntimkpu.
6.	Nnwale n'ime etiti semesta:	Mkpxrxab[[d[; Aha; Nnqchiaha; Mbuxzq; Njikq; Nkqwaaha; Nkwuwa; Njxajxjx; Qnxqgxgx; Ntimkpu;
7.	Nkejiokwu na Xdaolu:	Nkenxxd[Nkejiokwu; Mmebere Nkejiokwu; Nkejiokwu n'ime mkpxrxokwu; Nkejiokwu n'ime ah[r[okwu; Nkenxxd[Xdaolu; Xdaolu n'ime Nkejiokwu; Xdaolu n'ime Mkpxrxokwu; Xdaolu n'ime ah[r[okwu; Xdachi; Xdanusoro; Xdaolu n'ime Mfinitiivu. Qrxnka Nkejiokwu; Qrxnka Xdaolu.
8.	Nkejiasxsx Ngwaa:	Isingwaa; Nsinangwaa: - Mfinitiivu - Enyemaaka Ngwaa; - Omekangwaa; - Jerqnd; - Omee. Xdaolu n'ime Ngwaa. Qrxnka Ngwaa.
9.	Mgbakwxnye:	Nganiiru; Nnqneetiti; Nsonaazu; Nsokwunye. Qrxnka Mgbakwxnye.
10.	Akaraedemede:	Kpqm; R[kqm ala maqbx kqma; R[kqm elu; Kpqr[kqm; Kpqmkpqm;

		Akara uhie; Zam; Akaramkpu; Akaraajxjx; Akara igbe; Akara nkepxta. Qrxnka Akaraedemede.
11.	Ah[r[okwu:	i) Ah[r[mfe - Ah[r[Otu Mkpxrxokwu; - Ah[r[Mkpxrxokwu Olemole; - Ah[r[nkwusa; - Ah[r[njx; - Ah[r[ajxjx; - Ah[r[ntimiwu; - Ah[r[nchq; - Ah[r[ntimkpu. ii) Ah[r[ukwu iii) Ah[r[nha. Qrxnka Ah[r[okwu.
12.	Mkpqaha, Nkebiokwu na Nkebiah[r[:	i) Nkenxd[Mkpqaha. ii) Nkenxd[Nkebiokwu: - Nkebiokwu Keaha; - Nkebiokwu Kenkqwaaha; - Nkebiokwu Kejerqndx; - Nkebiokwu Kembuxzq; - Nkebiokwu Kengwaa; - Nkebiokwu Kemfinitiivu, dgz. iii) Nkenxd[Nkebiah[r[: - Nkebiah[r[Keaha; - Nkebiah[r[Kenkqwa; - Nkebiah[r[Kenkwuwa. Qrxnka Nkebiah[r[; Qrxnka Nkebiokwu; Qrxnka Mkpqaha.
13.	Mqf[m:	Qmxmaatx Mqf[m; Nkenxxd[Mqf[m: – Nnqqrqonwe; – Ndabe: - Nganiiru; - Nnqneetiti; - Nsonaazx. Qrxnka Mqf[m.
14.	Qgxgx Igbo:	Ijiri nkenke agxmagx d[icheiche, wee gosipxta obibi ndx nd[Igbo, d[ka: – Ekele d[icheiche; – Nri d[icheiche;

		- Mmiri na Iyi d[icheiche; - {gba mbq; - Nzukq; - Uri na egwu Igbo; - Ndx qma.
15.	Mmxghar[na Ule:	- Ndepxta; - Ngxpxta; - Nch[kqta; - Ule.

CHM 108: General Practical Chemistry II (1 Unit C: PH 45)

Learning Outcomes

At the end of this course, the students should be able to:

1. state the general laboratory rules and safety procedures;
2. collect scientific data and correctly carry out Civil experiments;
3. identify the basic glassware and equipment in the laboratory;
4. identify and carry out preliminary tests which include ignition, boiling point, melting point, test on known and unknown organic compounds;
5. carry out solubility tests on known and unknown organic compounds;
6. carry out elemental tests on known and unknown compounds; and
7. carry out functional group/confirmatory test on known and unknown compounds which could be acidic/basic/ neutral organic compounds.

Course Contents

Continuation of CHM 107. Additional laboratory experiments to include functional group analysis, quantitative analysis using volumetric methods.

PHY 108: General Practical Physics II (1 Unit C: PH 45)

Learning Outcomes

On completion, the student should be able to:

1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors;
4. plot and analyse graphs;
5. draw conclusions from numerical and graphical analysis of data; and
6. prepare and present practical reports.

Course Contents

This practical course is a continuation of PHY 107 and is intended to be taught during the second semester of the 100 level to cover the practical aspect of the theoretical courses that have been covered with emphasis on quantitative measurements, the treatment of measurement

errors, and graphical analysis. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis and deduction.

GST 111: Communication in English (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. identify possible sound patterns in English Language;
2. list notable language skills;
3. classify word formation processes;
4. construct simple and fairly complex sentences in English;
5. apply logical and critical reasoning skills for meaningful presentations;
6. demonstrate an appreciable level of the art of public speaking and listening; and 7. write simple and technical reports.

Course Contents

Sounds and sound patterns in English Language (vowels and consonants, phonetics and phonology); English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations); major word formation processes; the sentence in English (types: structural and functional); grammar and usage (tense, concord and modality). Reading and types of reading, comprehension skills, 3RsQ. Logical and critical thinking; reasoning methods (logic and syllogism, inductive and deductive argument, analogy, generalisation and explanations). Ethical considerations, copyright rules and infringements. Writing activities (pre-writing (brainstorming and outlining), writing (paragraphing, punctuation and expression), post- writing (editing and proofreading). Types of writing (summary, essays, letter, curriculum vitae, report writing, note-making). etc. Mechanics of writing. Information and Communication Technology in modern language learning. Language skills for effective communication. The art of public speaking.

GST 112: Nigerian Peoples and Cultures (2 Units C: LH 30)

Learning Outcomes

At the end of this course, students should be able to:

1. Analyse the historical foundation of Nigerian cultures and arts in pre-colonial times;
2. Identify and list the major linguistic groups in Nigeria;
3. Explain the gradual evolution of Nigeria as a political entity;
4. Analyse the concepts of trade and economic self-reliance of Nigerian peoples in relation to national development;
5. Enumerate the challenges of the Nigerian state regarding nation building;
6. Analyse the role of the judiciary in upholding fundamental human rights
7. Identify the acceptable norms and values of the major ethnic groups in Nigeria; and 8. List possible solutions to identifiable Nigerian environmental, moral and value problems.

Course Contents

Nigerian history, culture and art up to 1800 (Yoruba, Hausa and Igbo peoples and cultures; peoples and cultures of the minority ethnic groups). Nigeria under colonial rule (advent of colonial rule in Nigeria; colonial administration of Nigeria). Evolution of Nigeria as a political unit (amalgamation of Nigeria in 1914; formation of political parties in Nigeria; nationalist movement and struggle for independence). Nigeria and challenges of nation building (military intervention in Nigerian politics; Nigerian Civil War). Concepts of trade and economics of self-reliance (indigenous trade and market system; indigenous apprenticeship system among Nigerian peoples; trade, skill acquisition and self-reliance). Social justice and national development (definition and classification of law); Judiciary and fundamental rights. Individuals, norms and values (basic Nigerian norms and values, patterns of citizenship acquisition; citizenship and civic responsibilities; indigenous languages, usage and development; negative attitudes and conducts [Cultism, kidnapping and other related social vices]). Re-orientation, moral and national values (The 3Rs – Reconstruction, Rehabilitation and Re-orientation; re-orientation strategies: Operation Feed the Nation (OFN), Green Revolution, Austerity Measures, War Against Indiscipline and Corruption (WAIC) Mass Mobilization for Self-Reliance, Social Justice and Economic Recovery (MAMSER), National Orientation Agency (NOA). Current socio-political and cultural developments in Nigeria.

IMSU-SGB 112: Readings and Practice in **Igbo** **(2 Units C: LH 30)**

Course Objectives

1. To expose students to different styles of writing in Igbo.
2. To encourage students' hands-on practices in one or more areas of Igbo study including poetry, prose, drama, short story, an interview session in Igbo, to mention a few.
3. To encourage students' participation in enriching Igbo vocabulary through translating new forms and terminologies into Igbo.
4. To deepen students' interest in the use of Igbo for various communicative purposes.

Course Contents

NHAZI QMXMX

Nqm. Wiik	**Isiqmxmx**	Nhazi Qmxmx
1.	Ndubata:	Ntxleghar[Isiqmxmx SGB 107 na Simesta Mbx.
2.	Edemede:	Edemede: Akxkq, Leta, Okwunqha.
3.	Atxmatx Okwu na Asxsx Nka:	Atxmatx Okwu: - Ilu; - Xkabxilu; - As[niilu; - Akpaalaokwu.

		Asxsx Nka: - Myiri; - Mbxrx; - Egbeokwu; - Kwunkwukwa; - Mmemadx; - dgz.
4.	Agxmagx Qd[naala:	Qmxmaatx nakwa [txle: - Akxkq Qd[naala; - Ejije Qd[naala; - Abx Qd[naala.
5.	Agxmagx Ederede:	Qmxmaatx nakwa [txle: - Iduaz[; - Ejije Ederede; - Abx Ederede.
6.	Ntxghar[na Qkqwaokwu:	Ntxghar[mkpxrxokwu; Ntxghar[ah[r[okwu; {txle Qkqwaokwu d[icheiche e nwere n'Igbo.
7.	Nnwale n'ime etiti semesta.	Edemede; atxmatx okwu; asxsx nka; agxmagx qd[nala; agxmagx ederede; ntxghar[; qkqwaokwu.
8.	Edemede Okwunka na okwu qhxrx:	- Qmxmaatx Okwunka d[iche iche; - Odide Okwunka; - {chqpxta Okwunka nakwa okwu qhxrx.
9.	Okwunqha:	- Nkenxxd[Okwunqha; - Itinye Atxmatx Okwu n'Okwunqha - Itinye Asxsx Nka n'Okwunqha.
10.	Edechaagxq, Qrxqha na Nkangosi:	Nduzi keesiede iduaz[, abx maqbu ejije;
11.	Edechaagxq; Qrxqha na Nkangosi:	Nkqwa na ngosi ihe nd[a: - Iheqkpx (ngwaejirimara); - Eserese; - Ngwanchara; Ijiri iheqkpx, eserese, na ngwanchara mee ngosi, site n'[gx, maqbx igosi ihe nd[a.
12.	Edemede Ajxjxqnx, Ntaakxkq na Qrxnka:	Nta mmxta maqbx ntaakxkq n'ime Mahadum. Ijiri Igbo wee dee ihe nchqpxta; Ijiri Igbo wee dee ihe e zutere na njemqrx na njem nchqpxta.
13.	Ihe Qmxmx Igbo n'me Nkanufere I:	Ijiri kqmputa dee Igbo;

		Ngwaqrx kqmputa maka Igbo; Mkpxrxasxsx Igbo n'ime kqmputa;
14.	Ihe Qmxmx Igbo n'ime Nkanufere II:	Igbo n'ime whatsapp; Igbo n'ime facebook; Igbo n'ime google.
15.	Mmxghar[na ule	Ngxpxta; Ndepxta; Ngosi; Nch[kqta; Ule

IMSU-STA 112: Probability I (3 Units C: LH 45)

Learning Outcomes

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

1. Explain three differences between permutation and combination;
2. Explain the concept of random variables and relate it to probability and distribution functions
3. Define probability laws, conditional probability, and independence;
4. Describe Bayes' theorem and explain three basic probability distribution for discrete and continuous random variables;
5. Compute expectations and moments of random variables;
6. Explain Chebyshev's inequality and apply it to real life situations;
7. Explain joint marginal, conditional distributions and moments as well as Limiting distributions;
8. Describe standard distributions, moments and moment-generating functions; and explain laws of large numbers and the central limit theorem.

Course Contents

Permutation and combination. Concepts and principles of probability. probability laws. conditional probability, independence. Bayes' theorem. Probability and distribution functions of discrete and continuous random variables: binomial, Poisson, geometric, hypergeometric, rectangular (uniform), negative exponential, binomial. Expectations and moments of random variables. Chebyshev's inequality. joint marginal and conditional distributions and moments. limiting distributions. discrete and continuous random variables, standard distributions, moments and moment-generating functions. laws of large numbers and the central limit theorem.

Probability and statistics, mutually exclusive events, independent events, the binomial probability distribution. Dependent events, mathematical expectation, permutations combinations, factorial n, Stirling's approximation to N.

ENT 211: Entrepreneurship and Innovation (2 Units C: LH 30)

Learning Outcomes

At the end of this course, students should be able to:

1. explain the concepts and theories of entrepreneurship, intrapreneurship, opportunity seeking, new value creation and risk-taking;
2. state the characteristics of an entrepreneur;
3. analyse the importance of micro and small businesses in wealth creation, employment generation and financial independence;
4. engage in entrepreneurial thinking;
5. identify key elements in innovation;
6. describe the stages in enterprise formation, partnership and networking, including business planning;
7. describe contemporary entrepreneurial issues in Nigeria, Africa and the rest of the world; and
8. state the basic principles of e-commerce.

Course Contents

The concept of entrepreneurship (entrepreneurship, intrapreneurship/corporate entrepreneurship); theories, rationale and relevance of entrepreneurship (Schumpeterian and other perspectives, risk-taking, necessity and opportunity-based entrepreneurship, and creative destruction); characteristics of entrepreneurs (opportunity seeker, risk-taker, natural and nurtured, problem solver and change agent, innovator and creative thinker); entrepreneurial thinking (critical thinking, reflective thinking and creative thinking). Innovation (The concept of innovation, dimensions of innovation, change and innovation, knowledge and innovation). Enterprise formation, partnership and networking (basics of business plan, forms of business ownership, business registration and alliance formation, and joint ventures). Contemporary entrepreneurship issues (knowledge, skills and technology, intellectual property, virtual office and networking). Entrepreneurship in Nigeria (biography of inspirational entrepreneurs, youth and women entrepreneurship, entrepreneurship support institutions, youth enterprise networks and environmental and cultural barriers to entrepreneurship). Basic principles of e-commerce.

GST 212: Philosophy, Logic and Human Existence (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. Know the basic features of philosophy as an academic discipline;
2. Identify the main branches of philosophy & the centrality of logic in philosophical discourse;
3. Know the elementary rules of reasoning;
4. Distinguish between valid and invalid arguments;
5. Think critically and assess arguments in texts, conversations and day-to-day discussions;
6. Critically asses the rationality or otherwise of human conduct under different existential conditions;
7. Develop the capacity to extrapolate and deploy expertise in logic to other areas of knowledge, and

8. Guide his or her actions, using the knowledge and expertise acquired in philosophy and logic.

Course Contents

Scope of philosophy; notions, meanings, branches and problems of philosophy. Logic as an indispensable tool of philosophy. Elements of syllogism, symbolic logic— the first nine rules of inference. Informal fallacies, laws of thought, nature of arguments. Valid and invalid arguments, logic of form and logic of content — deduction, induction and inferences. Creative and critical thinking. Impact of philosophy on human existence. Philosophy and politics, philosophy and human conduct, philosophy and religion, philosophy and human values, philosophy and character molding, etc.

ENT 312: Venture Creation (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students, through case study and practical approaches, should be able to:

1. Describe the key steps in venture creation;
2. Spot opportunities in problems and in high potential sectors, regardless of geographical location;
3. State how original products, ideas and concepts are developed;
4. Develop a business concept for further incubation or pitching for funding;
5. Identify key sources of entrepreneurial finance;
6. Implement the requirements for establishing and managing micro and small enterprises;
7. Conduct entrepreneurial marketing and e-commerce;
8. Apply a wide variety of emerging technological solutions to entrepreneurship; and 9. Appreciate why ventures fail due to lack of planning and poor implementation.

Course Contents

Opportunity identification (sources of business opportunities in Nigeria, environmental scanning, demand and supply gap/unmet needs/market gaps/market research, unutilised resources, social and climate conditions and technology adoption gap). New business development (business planning, market research). Entrepreneurial finance (venture capital, equity finance, micro-finance, personal savings, small business investment organizations and business plan competition). Entrepreneurial marketing and e-commerce (principles of marketing, customer acquisition & retention, B2B, C2C and B2C models of e-commerce, First Mover Advantage, E-commerce business models and successful e-commerce companies). Small business management/family business: Leadership & Management, basic book keeping, nature of family business and family business growth model. Negotiation and business communication (strategy and tactics of negotiation/bargaining, traditional and modern business communication methods). Opportunity discovery demonstrations (business idea generation presentations, business idea contest, brainstorming sessions, idea pitching).

Technological solutions (The concept of market/customer solution, customer solution and emerging technologies, business applications of new technologies - artificial intelligence (AI), virtual/mixed reality (VR), Internet of things (IoTs), block chain, cloud computing, renewable energy, etc. Digital business and e-commerce strategies).

GST 312: Peace and Conflict Resolution (2 Units C: LH 30)

Learning Outcomes

At the end of this Course, students should be able to:

1. Analyse the concepts of peace, conflict and security;
2. List major forms, types and root causes of conflict and violence;
3. Differentiate between conflict and terrorism;
4. Enumerate security and peace building strategies; and
5. Describe the roles of international organisations, media and traditional institutions in peace building.

Course Contents

The concepts of peace, conflict and security in a multi-ethnic nation. Types and theories of conflicts: ethnic, religious, economic, geo-political Conflicts; structural conflict theory, realist theory of conflict, frustration-aggression conflict theory; root causes of conflict and violence in Africa: indigene and settlers phenomenon, boundaries/boarder disputes, political disputes, ethnic disputes and rivalries, economic inequalities, social disputes, nationalist movements and agitations; selected conflict case studies – Tiv-Junkun, ZangoKartaf, chieftaincy and land disputes, etc. Peace building, management of conflicts and security: Peace & Human Development. Approaches to Peace & Conflict Management (religious, government, community leaders, etc.). Elements of peace studies and conflict resolution: Conflict dynamics assessment Scales: Constructive & Destructive. Justice and Legal framework: Concepts of Social Justice; The Nigeria Legal System. Insurgency and terrorism. Peace mediation and peace keeping. Peace and Security Council (international, national and local levels). Agents of conflict resolution – Conventions, Treaties Community Policing: Evolution and Imperatives. Alternative Dispute Resolution (ADR) (dialogue, arbitration, negotiation, collaboration, etc). The roles of international organizations in conflict resolution ((a) The United Nations, UN and its conflict resolution organs. (b) The African Union & Peace Security Council (c) ECOWAS in peace keeping). The media and traditional institutions in peace building. Managing post-conflict situations/crises: Refugees. Internally Displaced Persons (IDPs); the role of NGOs in post-conflict situations/crises.

IMSU-CSD 401: Career Services Development (1 Unit C: LH 15)

Learning Outcomes

At the end of this Course, students should be able to:

1. establish the difference and relationship between self-confidence and self-consciousness
2. state types of career counselling, assessment and exploration, benefits of virtual career counselling.

3. Understand job search strategies, tools and resources for job market research
4. Explain ethics, legal dimensions and contractual obligations in career services
5. Outline challenges to early career professionals
6. Understand types, benefits and challenges of internships and freelancing
7. Outline types and techniques of mentoring and roles of mentors

Course Contents

The Human Perspective in Career Development; Self-confidence Development Through Communication; Career Counseling, Assessment and Exploration; Active Job Search; Ethical and Legal Dimensions to Career Choice and Development; Early Career Professionals: Resilience and Adaptability to Career challenges; Broader Perceptives to Career Choices; Growth and Development at Work; Basics of the World of Work; Diversification of Career Choices in Agriculture; Feasibility Study for Career Planning; Resume Writing and Interview Preparation.

10.4.2 General Engineering Coded Courses

GET 101: Engineer in Society (1 Unit C: LH 15)

Learning Outcomes

At the end of this course, the students should be able to:

1. Differentiate between science, engineering and technology, and relate them to innovation;
2. Distinguish between the different cadres of engineering – engineers, technologists, technicians and craftsmen and their respective roles and competencies;
3. Identify and distinguish between the relevant professional bodies in engineering;
4. Categorise the goals of global development or sustainable development goals (sdgs); and
5. Identify and evaluate safety and risk in engineering practice.

Course Contents

History, evolution and philosophy of science. engineering and technology. The engineering profession – engineering family (engineers, technologists, technicians and craftsmen), professional bodies and societies. Engineers' code of conduct and ethics, and engineering literacy. Sustainable development goals (SDGs), innovation, infrastructures and nation building - economy, politics, business. Safety and risk analysis in engineering practice. Engineering competency skills – curriculum overview, technical, soft and digital skills. Guest seminars and invited lectures from different engineering professional associations.

IMSU-GET 105: Engineering Drawing (1 Unit C: PH 45)

Graphic Tools, Introduction of Drawing, measuring. Lettering and dimensions of objects in various positions. Sketching, Engineering geometry, fundamentals orthographic projections. Graphs, charts and presentation of data and results.

Guided sketching, freehand drawing, creative thinking and multi-view representation. Revolution and conventional practice. Sectional and auxiliary views. Spatial relationships;

basic descriptive geometry, vector geometry; developments and intersections, pictorial presentation.

IMSU-GET 121 Workshop Practice I (1 Unit C: LH 15 P 45)

Learning Outcomes

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

1. Observe safety precaution in the workshop.
2. Operate safety equipment e.g., fire extinguisher, safety water hose etc.
3. Use of personal protective equipment.
4. Observe all safety rules and regulations.
5. Use the marking out tools very well.
6. Produce simple objects by using the bench and hand tools.
7. Read the micrometer screw gauge, Vernier calipers etc.

Course Contents

Behaviour Analysis: Safety consciousness, survey of sources of accidents, general safety instructions, Use of Engineering of measuring instruments, Calipers, micrometer screw guage, sine bars, angular measuring, etc, sampling and sizing techniques of raw materials, introduction to hand tools, bench tools, power tools, and wood working tools, Bench work: marking out, cutting, filling, drilling.

Assignment: production of (i) a simple door stapler (ii) chair/table

IMSU-GET 122 Workshop Practice II (1 Unit C: LH 15; PH 45)

Learning Outcomes

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

1. Identify and draw different types of plant layout,
2. Identify and produce different types of joints, using rivets, and screws and produce internal and external thread forms,
3. Cut, slot and file straight and curved profiles.
4. Perform a range of operations on workshop machinery, e.g., Drills, Lathe, Mills, and Grinders
5. Form an internal and external threads by use of taps and dies
6. Operate equipment and tools in metal workshop and distinguish between their application
7. Participate in workshop activities individually as well as in a group
8. Turn jobs on the lathe, parallel, taper, and face turning etc
9. Select spindle speeds, feeds, and coolant.
10. Operate equipment and tools in wood workshop and distinguish between their application
11. Show the general purpose and precision colour codes resistors
12. Identify the standard symbols for some of the circuit elements

Course Contents

Sheet metal work: layout, plant layout, cutting, shaping, welding, Design of simple jigs and fixtures. Basic wood-working principle, introduction to machine shop; lathe work, shaping,

milling, grinding, drilling, and metal spinning, thread and thread cutting, power press, design of die elements, simple Automobile diagnosis and repairs, Electrical Workshop practice: Convention and application of colours, codes, and signs, etc. Use of electrical tools, machines, cables and conductors.

Projects: Safe manufacture and production of five projects involving all aspects of machine-shop applications including drilling, lathe, milling, surface grinding to the tolerances shown on drawings.

IMSU-GET 201: Applied Electricity I (3 Units C: LH 45)

Learning Outcomes

Students will be able to:

1. discuss the fundamental concepts of electricity and electrical d.c. circuits;
2. state, explain and apply the basic d.c. circuit theorems; 5. explain the basic a.c. circuit theory and
3. apply to solution of simple circuits.

Course contents

Fundamental concepts: Electric fields, charges, magnetic fields. current, B-H curves Kirchhoff's laws, superposition. Thevenin Norton theorems, Reciprocity, RL, RC, RLC circuits. DC, AC bridges, Resistance, Capacitance, Inductance measurement, Transducers, Single phase circuits, Complex j - notation, AC circuits, impedance, admittance, and susceptance.

IMSU-GET 202: Engineering Materials (3 Units C: LH 45)

Learning Outcomes

At the end of this course, the students should be able to:

1. Demonstrate the role of atoms and molecules (aggregates of atoms) in the building of solid/condensed matter known as engineering materials, the electrons quantum numbers and how the electrons are arranged in different atomic elements, and explain the role of electronic configuration and valence electrons in bonding;
2. Define metals, alloys and metalloids, demonstrate mental picture of the solid mineral resources development as a relay race among four 'athletes': geologist, mining engineer, mineral processing technologist, process metallurgical engineer, and classify metallurgical engineering into 3ps: process, physical and production;
3. Explain the relationship between structure and properties of materials, characteristics, components and compositions of phase diagrams and phase transformations of solid solutions;
4. Define ceramics, glass and constituents of glasses and understand application of ceramics in mining, building, art and craft industries;

5. Define and classify polymers as a class of engineering materials and polymeric materials, demonstrate polymerisation reactions, their types and mechanism, and applications of polymers;
6. Define properties, types and application of composite materials and fibres (synthetic and natural);
7. Define and classify nanomaterials, demonstrate applications of nanomaterials, concept, design and classification of fracture mechanics, corrosion classification, including the five principal ways of controlling corrosion and metal finishing processes such as sherardising, galvanising and anodising; and
8. Identify factors affecting the performance and service life of engineering materials/metals and metallography of metals/materials (materials anatomy), which enables metallurgical and materials engineers to prescribe appropriate solutions to test metals/materials fitness in service through structure-property-application relationships.
9. Explain the characteristics of phase diagrams and phase transformations of solid solutions (alloys);
10. Determine the components and compositions of phase diagrams and phase transformations of solid solutions (alloys);
11. Discuss the different types, causes and effects of corrosion and methods of its prevention and mitigation;

Course Contents

Basic material science; atomic structure, atomic bonding and crystal structures. Engineering materials situating metals and alloys; metals and alloys, classifications of metals, metal extraction processes using iron and steel (ferrous) and aluminium (nonferrous) as examples, phase diagrams/iron carbon diagrams, and mechanical workings of metals. Selection and applications of metals and alloys for specific applications in oil, aerospace, construction, manufacturing and transportation industries, among others. Ceramics (including glass); definition, properties, structure and classifications of ceramics. Bioactive and glass – ceramics. Toughing mechanism for ceramics. Polymers; definition of polymers as engineering materials, chemistry of polymeric materials, polymer crystallisation, polymer degradation and aging. Thermoplastic and thermosetting polymers and concepts of copolymers and homopolymers. Composites; definition, classification, characterisation, properties and composite. Applications of composites. Corrosion: types, causes and effects of corrosion, corrosion prevention and mitigation. Fabrication processes and applications. Nanomaterials; definition, classification and applications of nanomaterials as emerging technology. Processing of nanomaterials including mechanical grinding, wet Civil synthesis, gas phase synthesis, sputtered plasma processing, microwave plasma processing and laser ablation. Integrity assessment of engineering materials; effect of engineering design, engineering materials processing, selection, manufacturing and assembling on the performance and service life of engineering materials. Metallography and fractography of materials. Mechanical testing (destructive testing) of materials such as compressive test, tensile test, hardness test, impact

test, endurance limit and fatigue test. Non-destructive test (NDT) such as dye penetrant, x-ray and eddy current.

IMSU-GET 203: Engineering Graphics and Solid Modeling II (3 Units C: LH 30 PH 45)

Learning Outcomes

Students should be able to:

1. Apply mastery of the use of projections to prepare detailed working drawing of objects and designs;
2. Develop skills in parametric design to aid their ability to see design in the optimal specification of materials and systems to meet needs;
3. Be able to analyze and optimize designs on the basis of strength and material minimization;
4. Get their appetites wet in seeing the need for the theoretical perspectives that create the basis for the analysis that are possible in design and optimization, and recognize/understand the practical link to excite their creativity and ability to innovate; and
5. Be able to translate their thoughts and excitements to produce shop drawings for multiphysical, multidisciplinary design.

Course Contents

Projection of lines, auxiliary views and mixed projection. Preparation of detailed working production drawing; semi-detailed drawings, conventional presentation methods. Solid, surface and shell modeling. Faces, bodies and surface intersections. Component-based design. Component assembly and motion constraints. Constrained motions and animation. Introduction to electronics modeling. Electronics board layout preparation, Component libraries and Schematic design. Parametric modeling and adaptive design. Simulation for material optimization. Designing for manufacturing. Additive and subtractive manufacturing. Production for 3-D printing, Laser cutting and CNC machinery. Arrangement of engineering components to form a working plant (Assembly Drawing of a Plant).

GET 204: Students Workshop Practice (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, the students should be able to:

1. Identify various basic hands and machine tools, analogue and digital measurement devices and instruments, and acquire skills in their effective use and maintenance;
2. Practically apply basic engineering technologies, including metrology, casting, metal forming and joining, materials removal, machine tooling (classification, cutting tool action, cutting forces, non-cutting production) and cnc machining technology;
3. Master workshop and industrial safety practices, accident prevention and ergonomics;
4. Physically recognise different electrical & electronic components like resistances, inductances, capacitances, diodes, transistors and their ratings;
5. Connect electric circuits, understand different wiring schemes, and check ratings of common household electrical appliances and their basic maintenance; and

6. Determine household and industrial energy consumption, and understand practical energy conservation measures.

Course Contents

The course comprises general, mechanical and electrical components: supervised hands-on experience in safe usage of tools and machines for selected tasks; Use of measuring instruments (calipers, micrometers, gauges, sine bar, wood planners, saws, sanders, and pattern making). Machine shop: lathe work shaping, milling, grinding, reaming, metal spinning. Hand tools, gas and arc welding, cutting, brazing and soldering. Foundry practice. Industrial safety and accident prevention, ergonomics, metrology. Casting processes. Metal forming processes: hot-working and cold-working processes (forging, press-tool work, spinning, etc.). Metal joining processes (welding, brazing and soldering). Heat treatment. Material removal processes. machine tools and classification. Simple theory of metal cutting. Tool action and cutting forces. Introduction to CNC machines.

Supervised identification, use and care of various electrical and electronic components such as resistors, inductors, capacitors, diodes and transistors. Exposure to different electric circuits, wiring schemes, analogue and digital electrical and electronic measurements. Household and industrial energy consumption measurements. Practical energy conservation principles.

GET 205: Fundamentals of Fluid Mechanics (3 Units C: LH 45)

Learning Outcomes

1. At the end of this course, the students should be able to:
2. Explain the properties of fluids;
3. Determine forces in static fluids and fluids in motion;
4. Determine whether a floating body will be stable;
5. Determine the effect of various instruments, (valves, orifices, bends and elbows) on fluid flow in pipes;
6. Measure flow parameters with venturi meters, orifice meters, weirs and others;
7. Perform calculations based on principles of mass, momentum and energy conservation;
8. Perform dimensional analysis and simple fluid modelling problems; and
9. Specify the type and capacity of pumps and turbines for engineering applications.

Course Contents

Fluid properties, hydrostatics, fluid dynamics using principles of mass, momentum and energy conservation from a control volume approach. Flow measurements in pipes, dimensional analysis, and similitude, 2-dimensional flows. Hydropower systems.

GET 206: Fundamentals of Engineering Thermodynamics (3 Units C: LH 45)

Learning Outcomes

At the end of this course, the students should be able to:

1. Describe basic concepts of thermodynamics, quantitative relations of Zeroth, first, second and third laws;

2. Define and explain system (surrounding, closed and open system), control volume and control mass, extensive and intensive properties;
3. Calculate absolute and gage pressure, and absolute temperature, calculate changes in kinetic, potential, enthalpy and internal energy;
4. Evaluate the properties of pure substances i.e., evaluate the state of the pure substances such as compressed liquid, saturated liquid-vapour mixture and superheated vapour using property diagrams and tables; arrange the ideal and real gas equations of state,
5. Formulate the first law of thermodynamics for a closed system i.e. Organize the change in energy in the closed systems via heat and work transfer;
6. Distinguish heat transfer by conduction, convection and radiation, and calculate the amount of heat energy transferred;
7. Calculate the changes in moving boundary work, spring work, electrical work and shaft work in closed systems;
8. Apply the first law of thermodynamics for closed systems and construct conservation of mass and energy equations;
9. Formulate the first law of thermodynamics to the open systems i.e. Describe steady-flow open system, apply the first law of thermodynamics to the nozzles, diffusers, turbines, compressors, throttling valves, mixing chambers, heat exchangers, pipe and duct flow;
10. Construct energy and mass balance for unsteady-flow processes;
11. Evaluate thermodynamic applications using second law of thermodynamics;
12. Calculate thermal efficiency and coefficient of performance for heat engine, refrigerators and heat pumps; and
13. Restate perpetual-motion machines, reversible and irreversible processes.

Course Contents

Basic concepts, definitions and laws (quantitative relations of Zeroth, first, second and third laws of thermodynamics). Properties of pure substances: the two-property rule (P-V-T behaviour of pure substances and perfect gases); state diagrams. The principle of corresponding state; compressibility relations; reduced pressure; reduced volume; temperature; pseudo-critical constants. The ideal gas: specific heat, polytropic processes. Ideal gas cycles; Carnot; thermodynamic cycles, turbines, steam and gas, refrigeration. The first law of thermodynamics – heat and work, applications to open and closed systems. The steady flow energy equation (Bernoulli's equation) and application. Second law of thermodynamics, heat cycles and efficiencies.

IMSU-GET 207: Applied Mechanics (3 Units C: LH 45)

Learning Outcomes

Students will acquire the ability to:

1. Explain the fundamental principles of applied mechanics, particularly equilibrium analysis, friction, kinematics and momentum;

2. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, mathematics and applied mechanics;
3. Synthesize newtonian physics with static analysis to determine the complete load impact (net forces, shears, torques, and bending moments) on all components (members and joints) of a given structure with a load; and
4. Apply engineering design principles to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

Course Contents

Forces, moments, couples. Equilibrium of simple structures and machine parts. Friction. First and second moments of area; centroids. Kinematics of particles and rigid bodies in plane motion. Newton's laws of motion. Kinetic energy and momentum analyse

IMSU-GET 208: Strength of Materials (3 Units C: LH 45)

Learning Outcomes

At the end of this course, the students should be able to:

1. Recognize a structural system that is stable and in equilibrium;
2. Determine the stress-strain relation for single and composite members based on hooke's law;
3. Estimate the stresses and strains in single and composite members due to temperature changes;
4. Evaluate the distribution of shear forces and bending moments in beams with distributed and concentrated loads;
5. Determine bending stresses and their use in identifying slopes and deflections in beams;
6. Use mohr's circle to evaluate the normal and shear stresses in a multi-dimensional stress system and transformation of these stresses into strains;
7. Evaluate the stresses and strains due to torsion on circular members; and
8. Determine the buckling loads of columns under various fixity conditions at the ends.

Course Contents

Consideration of equilibrium; composite members, stress-strain relation. Generalised Hooke's law. Stresses and strains due to loading and temperature changes. Torsion of circular members. Shear force, bending moments and bending stresses in beams with symmetrical and combined loadings. Stress and strain transformation equations and Mohr’s circle. Elastic buckling of columns.

GET 209: Engineering Mathematics I (3 Units C: LH 45)

Learning Outcomes

At the end of the course, the students should be able to:

1. Solve qualitative problems based on vector and matrix analyses such as linear independence and dependence of vectors, rank etc;

2. Describe the concepts of limit theory and nth order differential equations and their applications to physical phenomena;
3. Solve the problems of differentiation of functions of two variables and know about the maximization and minimization of functions of several variables;
4. Describe the applications of double and triple integration in finding the area and volume of engineering solids, and explain the qualitative applications of gauss, stoke's and green's theorem;
5. Explain ordinary differential equations and applications, and develop a mathematical model of linear differential equations, as well as appreciate the necessary and sufficient conditions for total differential equations; and
6. Analyse basic engineering models through partial differential equations such as wave equation, heat conduction equation, etc., as well as fourier series, initial conditions and its applications to different engineering processes

Course Contents

Limits, continuity, differentiation, introduction to linear first order differential equations, partial and total derivatives, composite functions, matrices and determinants, vector algebra, vector calculus, directional derivatives.

GET 210: Engineering Mathematics II (3 Units C: LH 45)

Learning Outcomes

At the end of the course, the students should be able to:

1. Describe physical systems using ordinary differential equations (odes);
2. Explain the practical importance of solving odes, solution methods, and analytically solve a wide range of odes, including linear constant coefficient types;
3. Numerically solve differential equations using MATLAB and other emerging applications;
4. Perform calculus operations on vector-valued functions, including derivatives, integrals, curvature, displacement, velocity, acceleration, and torsion, as well as on functions of several variables, including directional derivatives and multiple integrals;
5. Solve problems using the fundamental theorem of line integrals, Green's theorem, the divergence theorem, and Stokes' theorem, and perform operations with complex numbers;
6. Apply the concept and consequences of analyticity and the Cauchy-Riemann equations and of results on harmonic and entire functions of complex variables, as well as the theory of conformal mapping to solve problems from various fields of engineering; and
7. Evaluate complex contour integrals directly and by the fundamental theorem, apply the Cauchy integral theorem in its various versions, and the Cauchy integral formula.

Course Contents

Introduction to ordinary differential equations (ODEs); theory, applications, methods of solution; second order differential equations. Advanced topics in calculus (vectors and vector-valued function, line integral, multiple integral and their applications). Elementary complex analysis including functions of complex variables, limits and continuity. Derivatives,

differentiation rules and differentiation of integrals. Cauchy-Riemann equation, harmonic functions, basic theory of conformal mapping, transformation and mapping and its applications to engineering problems. Special functions.

GET 211: Computing and Software Engineering (3 Units C: LH 30; PH 45)

Learning Outcomes

At the end of the course, the students should be able to:

1. Describe and apply computing, software engineering knowledge, best practices, and standards appropriate for complex engineering software systems;
2. Develop competence in designing, evaluating, and adapting software processes and software development tools to meet the needs of an advanced development project through practical object-oriented programming exposure taught in concrete terms with a specific modern language – preferable selected from python, java or c++;
3. Use widely available libraries to prepare them for machine learning, graphics and design simulations;
4. Develop skills in eliciting user needs and designing an effective software solution;
5. Recognise human, security, social, and entrepreneurial issues and responsibilities relevant to engineering software and the digitalisation of services; and
6. Acquire capabilities that can further be developed to make them productively employable by means of short internet courses in specific areas.

Course Contents

Introduction to computers and computing; computer organisation – data processing, memory, registers and addressing schemes; Boolean algebra; floating-point arithmetic; representation of non-numeric information; problem-solving and algorithm development; coding (solution design using flowcharts and pseudo codes). Data models and data structures; computer software and operating system; computer operators and operator's precedence; components of computer programs; introduction to object oriented, structured and visual programming; use of MATLAB in engineering applications. ICT fundamentals, Internet of Things (IoT). Elements of software engineering.

IMSU-GET 221 Engineering Laboratory I (1 Unit C: LH 15 PH 45)

Learning Outcomes

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

1. Practically measure the coefficient of friction between steel plane and various engineering materials.
2. Explain frictional effects using an inclined plane.
3. Practically determine the forces required to support moving and static bodies on inclined plane.
4. Use data to verify the belt friction law.
5. Determine the elasticity of a given rubber band.
6. Determine the stiffness of a specimen spring wire and modulus of rigidity of a given spring wire.

7. Practically determine the modulus of rupture of various timber beams.
8. Take required steps and determine the values of the shear modulus of elasticity for given specimens of steel, brass and aluminum.
9. Measure or estimate the toughness of a material or a test specimen by Charpy test.
10. Take practical steps and determine the endurance limit of specimen of a metal.
11. Determine the hardness of mild steel plate, carbon steel plate and aluminum plate specimens.
12. Describe the macro structure of aluminum ingot sections and state the relationship between the freezing rate of specific areas of any casting.
13. Use the magnetic particle method and detect surface cracks.
14. Describe the microstructure of metallic elements by viewing under a microscope and hence provide information on the material, its history and properties.
15. State the nature and measure the relative magnitudes of the forces in the members of the jib-crane.
16. Use the related apparatus and determine the velocity ratio for a given machine and determine the variation with load of the efforts, friction load and efficiency for the given machine.
17. Take practical steps and determine the mechanical efficiency of power transmission by a given flat belt.
18. Determine the radius of gyration about the mass-centre of a rigid body and calculate the gravitational acceleration in the locality of action.
19. Set up a solar energy scheme and use it to generate potable water from sea or river water.
20. Determine the thermal conductivities of various insulating materials.
21. Quantitatively verify the law of linear motion.

Course Contents

Assigned laboratory exercises to reflect the basic engineering courses in:

a. Engineering Mechanics

b. Materials Science

c. Engineering Thermodynamics 1

d. Basic land survey

Guidance on specific experiments and calculations will be provided by the lecturer.

IMSU-GET 222 Engineering Laboratory II (1 Unit C: LH 15 PH 45)

Learning Outcomes

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

1. Determine, in real terms, the support reactions for a simply-supported beam with point load.
2. Practically calculate the variation of deflection of a simply-supported beam with load, beam thickness and beam material.
3. Calculate the elasticity of a specimen of rubber band based on laboratory data.

4. Calculate the modulus of rupture of various timber beams specimens based on laboratory data.
5. State the relationship between torsional moment and the angle of twist of a shaft.
6. Determine the value of the shear modulus of elasticity for steel, brass and aluminium based on laboratory data.
7. Measure inductance and capacitance by Wheatstone bridge.
8. a). Measure fusing current in a circuit.

b). Know the relationship between fusing current and the length of fuse wire.

c). know relationship between fusing current and diameter of the fuse wire.

9. (a). Describe the effect of straining on fusing current.

(b). Clearly state time-current dependence of a circuit breaker.

9. Confirm experimentally, some of the basic electrical network theorems and laws such as Kirchoff's law, superposition and Thevenin theorems.
10. Confirm the maximum power transfer theorem.
11. Describe the relationship between transformer coils windings (number of turns) ratio and voltage output.
12. Confirm the validity of Hooke's law for elastic materials.
13. Determine the endurance limit of a specimen of a metal.
14. Determine the hardness of mild steel plate, carbon steel plate and aluminum plate specimens.
15. Vary the compressor speed and load of a refrigeration system and correspondingly clearly state how the compressor speed changes with the following parameters:

(i). Compressor power

(ii). Refrigerating effect

(iii). COPR

(iv). Heat reject speed condenser

(v). Compressor efficiency: volumetric, isentropic, mechanical.

16. Understand the validity of theoretical quantifications for the force exerted by a jet of fluid on targets of different shapes.
17. Understand the change in pressure drop due to liquid viscosity along a circular pipe in relation to the mean flow velocity in the pipe.

Course Contents

Assigned laboratory exercise to reflect the basic Engineering courses in:

a. Strength of materials

b. Fluid mechanics I

c. Basic Engineering materials

d. Basic Electrical Engineering

Guidance on specific experiments and calculations will be provided by the lecturer.

GET 299: Students Industrial Work Experience I (3 Units C: 9 weeks)

Learning Outcomes

SIWES I should provide opportunity for the students to:

1. acquire industrial workplace perceptions, ethics, health and safety consciousness, inter-personal skills and technical capabilities needed to give them a sound engineering foundation;
2. learn and practice basic engineering techniques and processes applicable to their specialisations;
3. build machines, devices, structures or facilities relevant to their specific engineering programmes and applications; and
4. acquire competence in technical documentation (log-book) and presentation (report) of their practical experiences.

Course Contents

Practical experience in a workshop or industrial production facility, construction site or special centres in the university environment, considered suitable for relevant practical/industrial working experience but not necessarily limited to the student's major. The students are exposed to hands-on activities on workshop safety and ethics, maintenance of tools, equipment and machines, welding, fabrication and foundry equipment, production of simple devices; electrical circuits, wiring and installation, (8-10 weeks during the long vacation following 200 level).

NOTE: Each programme to indicate additional details of programme-specific activities for their students.

GET 304: Technical Writing and Communication (3 Units C: LH 45)

Learning Outcomes

At the end of the course, the student should be able to:

1. demonstrate the concept of clear writing, common pitfalls and unambiguous language in engineering communication, including technical reporting for different applications and emotional comportment;
2. demonstrate the skills of language flexibility, formatting, logic, data presentation styles, referencing, use of available aids, intellectual property rights, their protection, and problems in engineering communication and presentation; and
3. demonstrate good interpersonal communication skills through hands-on and constant practice on real-life communication issues for engineers in different sociocultural milieu for engineering designs, structural failure scenarios and presentation of reports.

Course Contents

A brief review of common pitfalls in writing. Principles of clear writing (punctuations and capitalization). Figures of speech. Units of grammar. Tenses and verb agreement. Active and passive sentences Lexis, structure Fog and Index concept. Skills for communication and communication algorithm. Types and goals of communication; Interpersonal communication;

features and the Finger Model or A, B, C, D, E of good interpersonal communication (accuracy of technical terms, brevity of expression, clarity of purpose, directness of focus and effectiveness of the report). Language and organisation of reports. Technical report writing skills (steps, problems in writing, distinguishing technical and other reports, significance, format and styles of writing technical reports). Different formats for communication; styles of correspondences – business report and proposal, business letter, memorandum, e-mails, etc. Proposals for projects and research; format, major steps and tips of grant-oriented proposals. Research reports (competency, major steps, components and formats of research reports and publishable communication). Sources and handling of data, tables, figures, equations and references in a report. Presentation skills; overview, tips, organisation, use of visual aids and practising of presentation. Intellectual property rights in research reports. Case studies of major engineering designs, proposals and industrial failures with professional presentation of reports.

GET 306: Renewable Energy Systems and Technology (3 units C: LH 30 PH 45)

Learning Outcomes

At the end of the course, the students should be able to:

1. identify the types, uses and advantages of renewable energy in relation to climate change;
2. design for use the various renewable energy systems;
3. recognise and analyse the current energy systems in Nigeria, their impacts on development and the global energy demand and supply scenarios;
4. appreciate the environmental impact of energy exploitation and utilisation, and pursue the sustainable development of renewable energy for various applications; and
5. recognise the exploitation, excavation, production, and processing of fossil fuels such as coal, petroleum and natural gas, and discuss the sources, technology and contribution to future energy demands of renewable energy.

Course Contents

Current and potential future energy systems in Nigeria and globally - resources, extraction, concepts in energy conversion systems; parallels and differences in various conversion systems and end-use technologies, with emphasis on meeting 21st-century national, regional and global energy needs in a sustainable manner. Various energy technologies in each fuel cycle stage for fossil (oil, gas, synthetic), nuclear (fission and fusion) and renewable (solar, biomass, wind, hydro, and geothermal). Energy types, storage, transmission and conservation. Analysis of energy mixes within an engineering, economic and social context. Sustainable energy; emphasise sustainability in general and in the overall concept of sustainable development and the link this has with sustainable energy as the fundamental benefit of renewable energy.

Practical Contents

Simple measurement of solar radiation, bomb calorimeter determination of calorific value of fuels and biomass; measurement of the velocity of wind, waves and the energy that abound in

them; laboratory production of biogas and determination of energy available in it; simple conversion of solar energy to electricity; trans-esterification of edible oil into biodiesel; simulation of geothermal energy; Geiger-Muller or Scintillation Counters' determination of uranium or thorium energy; simple solid or salt storage of energy; hybrid application of renewable energy.

GET 307: Introduction to Artificial Intelligence, Machine Learning and Convergent Technologies (3 Units C: LH 45)

Learning Outcomes

At the completion of the course, the students are expected to be able:

1. explain the meaning, purpose, scope, stages, applications and effects of artificial intelligence;
2. explain the fundamental concepts of machine learning, deep learning and convergent technologies;
3. demonstrate the difference between supervised, semi-supervised and unsupervised learning;
4. demonstrate proficiency in machine learning workflow and how to implement the steps effectively;
5. explain natural languages, knowledge representation, expert systems and pattern recognition;
6. describe distributed systems, data and information security and intelligent web technologies;
7. explain the concept of big data analytics, purpose of studying it, issues that can arise with a data set and the importance of properly preparing data prior to a machine learning exercise; and
8. explain the concepts, characteristics, models and benefits, key security and compliance challenges of cloud computing.

Course Contents

Concepts of human and artificial intelligence; artificial/computational intelligence paradigms; search, logic and learning algorithms. Machine learning and nature-inspired algorithms – examples, their variants and applications to solving engineering problems; understanding natural languages; knowledge representation, knowledge elicitation, mathematical and logic foundations of AI; expert systems, automated reasoning and pattern recognition; distributed systems; data and information security; intelligent web technologies; convergent technologies – definition, significance and engineering applications. Neural networks and deep learning. Introduction to python AI libraries.

IMSU-GET 392 Engineering Economics (3 Units C: LH 45)

Learning Outcomes

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

1. Determine an equilibrium and predict changes in an equilibrium in response to market changes
2. Compare and contrast economic profits with accounting profits
3. Identify five economic indicators and utilize them to articulate the state of the economy and prescribe monetary and fiscal policy
4. Conduct and interpret a cost-benefit analysis for an engineering
5. Compare the life cycle cost of two multiple projects using present worth, annual cost, payback and break-even analysis
6. Make a quantitative decision between alternate facilities or systems using Benefit/Cost Ratio
7. Evaluate the feasibility of a project or system by estimating cash demands as a function of time and comparing these with estimated cash flows from available funding source
8. Compute the depreciation of an asset using standard depreciation
9. Communicate the results of an economic modeling process to management and other non - specialist in an informative and professional

Course Contents

Valuation. Depreciation accounting: Taxes. Equipment replacements based on deterioration and obsolesce. Dynamic equipment policy. MAPI formula. Break even analysis. Minimum cost points. Analysis based on risk and uncertainty. Introduction to micro-economics: Theory of consumer behavior, theory of demand and supply, market equilibrium, elasticities and behaviour (perfect competition, monopolistic, monopoly and oligopoly), Theory of the firm. Production functions. Introduction to macroeconomics; Level of Investment. Stocks and flows. Investment functions. Economic dynamics.

GET 399: Students Industrial Work Experience II (4 Units C: 12 weeks)

Learning Outcomes

At the end of the SIWES, students should be able to:

1. demonstrate proficiency in at least any three softwares in their chosen career choices;
2. demonstrate proficiency in some animation videos (some of which are free on YouTube) in their chosen careers;
3. carry out outdoor hands-on construction activities to sharpen their skills in their chosen careers;
4. demonstrate proficiency in generating data from laboratory analysis and develop empirical models;
5. demonstrate proficiency in how to write engineering reports from lab work;
6. fill logbooks of all experience gained in their chosen careers; and
7. write a general report at the end of the training.

The experience is to be graded and the students must pass all the modules of the attachment and shall form part of CGPA.

Course Contents

On-the-job experience in industry chosen for practical working experience but not necessarily limited to the student's major (Students are to proceed on three months of work experience i.e. 12 weeks during the long vacation following 300 level). Students are engaged in the more advanced workshops, indoor software design training similar to what they will use in the industry and outdoor construction activities to sharpen their skills. The use of relevant animation videos that mimic industrial scenarios is encouraged. Students are to write a report at the end of the training. As much as possible, students should be assisted and encouraged to secure 3 months' placement in the industry. Examples of outline of activities and experiences to which students are expected to be exposed to earn prescribed credits include:

Section A: Welding and fabrication processes, automobile repairs, · lathe machine operations: machining and turning of simple machine elements, such as screw threads, bolts, gears, etc. Simple milling machine operations, machine tool maintenance and troubleshooting, andwooden furniture making processes.

Section B: Mechanical design with computer graphics and CAD modelling and drafting. Introduction to Solid works: software capabilities, design methodologies and applications. Basics part modelling: sketching with SolidWorks, building 3D components, using extruded Bose base · Basic assembly modelling, and solid Works drawing drafting. Top-down assembly technique exploded view, exploded line sketch. Introduction to PDMS 3D design software; AutoCAD mechanical, SPSS.

A comprehensive case study design project. The student should be introduced to the concept of product/component design and innovation and then be given a comprehensive design project.

Examples of projects should include the following: a. design of machine components;

b. product design and innovation;
c. part modelling and drafting in solid works; and
d. technical report writing.

IMSU-GET 481 Computer Aided Design and Manufacturing (1 Unit C: LH 15 PH 15)

Learning Outcomes

Upon successful completion of this course, the student should be able to:

1. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
2. Use the techniques, skills, and modern engineering tools necessary for engineering practice
3. Analyse system designs using application software.
4. Realise designs within short period of time

5. Integrate computers into manufacturing processes.
6. List and explain CAD software
7. Program Robots

Course Contents

Review of computer hardware and software. CAD fundamentals: Modelling, application of CAD models, functions of CAD systems. Role of CAD in Engineering. CAD software and applications: AutoCAD, ArchiCAD, CivilCAD, Electronic workbench, Proteus, CorelDraw etc. Algorithms and software. System designs and analysis using MATLAB and Programming in C, C++. Computer integrated manufacturing (CIM) and flexible design and manufacturing system: CIM objectives, CIM systems, benefits. Barriers to CIM adoption. Computer controlled machines. Numerical control process. Applications and economics of NC. Computer Numerical control. Computer Aided Manufacturing (CAM): CAM system, design and manufacturing interface. Application of computers in planning and control in manufacturing. Types and sources of data used in manufacturing. Manufacturing automation. CAM implementation. Robots: Definition, characteristics of Robots, basic elements and types of Robots. Robot programming, operating methods and application. Introduction to geometric modelling, properties and representation of solids. Interactive computer graphics.

IMSU-GET 493 Engineering Research Methods (1 Units C: LH 15)

Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Describe and explain key research concepts, issues, types of research and the systematic process of research gap identification and documentation and use contexts;
2. Search for, assembling and critically analysing research articles, papers and reports and general literature;
3. Formulate and evaluate research objectives, questions and hypotheses;
4. Developing a research proposal or industry project plan;
5. Identify and develop appropriate data acquisition and analysis methods and instrument;
6. Design/structure and lead the research process using appropriate research designs;
7. Use appropriate tools/techniques, including computer soft- and hardware /technologies to interpret, discuss and report/present the result and conclusions derived from research data analysis in oral or written form; and
8. Prepare/format/package research results/output for academic, journal articles, technical and other reports and exhibitions/fairs (scientific, trade, etc.) as an individual or team/work group.

Course Contents

Origins and definitions of research. Problem identification and formulation. Research types/design. Qualitative, quantitative and mixed methods of research. Measurement. Experiments. Sampling. Data collection. Data presentation. Data analysis. Interpretation of data and technical report writing. Use of encyclopedia, research guides, handbooks, academic

databases for engineering disciplines. Use of tools/techniques for research production: referencing and citation formats/styles and software. Research management and reporting best practices. Plagiarism definitions, types, detection software. Basics of document analysis, systematic review and management methods. Practical documentation/presentation projects/seminars.

GET 499: Students Industrial Work Experience III (8 Units C: 24 weeks)

Learning Outcomes

Students on Industrial Work Experience Scheme (SIWES) are expected to:

1. be exposed and prepared for the Industrial work situation they are likely to meet after graduation, by developing their occupational competencies;
2. bridge the existing gap between theory and practice of programmes through exposure to real-life situations, including machines and equipment handling, professional work methods and ethics, human relations, key performance assessment methods, and ways of safeguarding the work environment – human and materials;
3. experience/simulate the transition phase of students from school to the world of work and the environment seamlessly, and expose them to contacts for eventual job placements after graduation;
4. be motivated to identify the industrial and practice engineering challenges of their place of engagement and the larger society and creatively device impactful solutions to them; and
5. exploit the opportunity to improve and utilise their acquired critical thinking and innate creativity skills, during the program and SIWES Seminar presentation respectively.

Course Contents

On the job experience in industry chosen for practical working experience but not necessarily limited to the student's major (24 weeks from the end of the first semester at 400-Level to the beginning of the first semester of the following session. Thus, the second semester at 400-Level is spent in industry). Each student is expected to work in a programme related industry, research institute or regulatory agencies etc, for a period of 6 months under the guidance of an appropriate personnel in the establishment but supervised by an academic staff of the Department. On completion of the training, the student submits the completed Log book on the experience at the establishment. Also, there will be a comprehensive report covering the whole of the student's industrial training experiences (GET 299, GET 399 and GET 499), on which a seminar will be presented to the Department for overall assessment.

GET 501: Engineering Project Management (3 Units C: LH 45)

Learning Outcomes

At the end of the course, students should be able to:

1. explain the basics of project management as it relates to the Engineering discipline;

2. demonstrate knowledge and understanding of engineering, management and financial principles and apply these to their own work, as a member and/or leader in a team, to manage projects and in multi-disciplinary environments;
3. conduct, manage and execute projects in multi-disciplinary areas;
4. possess the skills needed for project management; and
5. work within the budget when executing a project for proper management.

Course Contents

Project management fundamentals – definitions, project environment, nature and characteristics, development practice, management by objectives, and the centrality of engineering to projects, infrastructures, national and global development. The scope of project management – organisational, financial, planning and control, personnel management, labour and public relations, wages and salary administration and resource management. Identification of project stakeholders; beneficiaries and impacted persons – functions, roles, responsibilities. Project community relations, communication and change management. Project planning, control and timeliness; decision making, forecasting, scheduling, work breakdown structure (WBS), deliverables and timelines, logical frameworks (log frames), risk analysis, role of subject matter experts (SMEs), role conflicts; Gantt Chart, CPM and PERT. Optimisation, linear programming as an aid to decision making, transport and materials handling. Monitoring and Evaluation – key performance indices (KPIs); methods of economic and technical evaluation. Industrial psychology, ergonomics/human factors and environmental impact considerations in engineering project design and management. Project business case - financial, technical and sustainability considerations.

Case studies, site visits and invited industry professional seminars. General principles of management and appraisal techniques. Breakthrough and control management theory; production and maintenance management. Training and manpower development. The manager and policy formulation, objective setting, planning, organising and controlling, motivation and appraisal of results.

GET 502: Engineering Law (2 Units C: LH 30)

Learning Outcomes

Students will be able to:

1. describe and explain the basic concept, sources and aspects of law;
2. describe and explain the major differences between the various categories of law, courts and legal jurisdictions;
3. describe and explain legal principles and their application in professional engineering design and management services and their professional liability implications; and
4. develop reasoned analysis of real-life or hypothetical engineering scenarios using the legal principles undertake critical analysis of reliable information to develop, and practically present technical reports for use in varying judicial/quasi-judicial settings including as an expert witness.

Course Contents

Common Law: its history, definition, nature and division. Legislation, codification interpretation. Equity: definition and its main spheres. Law of contracts for Engineers: Forms of contract and criteria for selecting contractors; offer, acceptance, communication termination of contract. Terms of Contracts; suppliers' duties – Damages and other Remedies. Termination/cancellation of contract Liquidation and Penalties; exemption clauses, safety and risk. Health and Safety. Duties of employers towards their employees. Duties imposed on employees. Fire precautions act. Design for safety. General principles of criminal law. Law of torts: definition, classification and liabilities. Patents: requirements, application, and infringement. Registered designs: application, requirements, types and infringement. Company law. Labour law and Industrial Law. Business registration.

10.4.3 Departmental Coded Courses

100 Level

CEE 101: Introduction to Civil Engineering (2 Units C: LH 30)

Learning Outcomes

At the end of this course, the students should be able to:

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

1. explain the profession of civil engineering and
2. the roles played by civil engineers.

Course Contents

History of civil engineering. Branches of civil engineering. Roles of civil engineers in government, industry and academia. Allied professionals and their interaction with civil engineers. Career opportunities in civil engineering, professional and regulatory bodies.

200 Level

CEE 201: Civil Engineering Drawing (2 Units E: LH 15; PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. capable of drawing and detailing (by hand and using computer-aided-design skills) civil engineering structures; and
2. identify building structures, highways, pipelines, bridges, dams, foundations and so on using appropriate symbols and conventions.

Course Contents

Drawing and detailing (by hand and using computer-aided-design skills) of civil engineering structures, for example building structures, highways, pipelines, bridges, dams, foundations, etc. utilizing standard symbols and conventions, dimensions, notes, titles, etc. Relationship to specifications.

300 Level

CEE 301: Fluid Mechanics (3 Units C: LH 30; PH 45)

Learning Outcomes

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

1. distinguish laminar from transitional and turbulent flows using the concept of Reynolds Number;
2. utilise boundary layer theory to estimate Lift and Drag;
3. derive the distribution of velocity and shear stress in laminar and turbulent flows respectively past flat plates and in circular conduits, and utilisation to obtain total flow, head loss, etc;
4. undertake similitude, development of physical hydraulic models, and scaling of the results from model to prototype;
5. analyse ideal fluid flow into sources from sinks, past circular and ellipsoidal bodies concerning doublets and flow nets;
6. analyse flow in pipes in series, parallel and any network, which may include pumps; and
7. obtain simplified estimates of forces exerted by flow in pipes due to rapid closing or opening of valves, and the use of surge tanks to reduce these forces.

Course Contents

Introduction to incompressible viscous flow, laminar and turbulent flows, Reynolds number; boundary layer flow, lift and drag. Laminar flow – in pipes, between parallel plates. Turbulent flows – along a plate, in ducts and pipes. Physical hydraulic models. Interconnected pipes and pipe network analysis. Potential flows and application to flow nets. steady and unsteady flow in closed conduits; water hammer, surge tanks.

CEE 302: Strength of Structural Materials (2 Units C: LH 30)

Learning Outcomes

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

1. utilise bending theory to obtain stress distribution across a bending section, as well as the slope and deflection at a section given any bending moment and shear force distribution along the beam;
2. determine whether a point in a material subjected to multidimensional stress will fail according to any failure theory;
3. explain the concepts of creep, fatigue and their implications in the use of structural materials;
4. analyse motion and stresses in springs;
5. determine the stresses and strains due to internal pressure on thin and thick cylinder walls; and
6. determine the stresses and strains induced in rotating disks and the implications.

Course Contents

Advanced topics on axial, lateral, and torsional loading of shafts and beams; slope and deflection of beams; unsymmetrical bending and shear centre; applications. Springs. Creep, fatigue, fracture and stress concentration. Stresses in thin and thick cylinders, and rotating disks. Multi-dimensional stress systems, Mohr's circle and failure theories.

CEE 303: Engineering Geology (2 Units E: LH 15; PH 45)

Learning Outcomes

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

1. describe the engineering properties of rock and soil materials;
2. identify the geological factors affecting the performance and functioning of a facility on and in the soil and/or rock;
3. conduct engineering geological investigations; and
4. explain the importance of engineering geology-related technical issues during construction.

Course Contents

Geology structures and mapping; rocks and minerals; stratigraphy - time scale - fossils and their importance with special reference to Nigeria. Introduction to the geology of Nigeria; engineering applications - water supply, site investigations for dams, dykes and so on.

CEE 304: Civil Engineering Materials (3 Units E: LH 30; PH 45)

Learning Outcomes

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

1. explain the suitability of the use of the following as civil engineering materials: concrete, structural steel (and other important structural metals), timber, masonry;
2. conduct tests of engineering properties on civil engineering materials and utilise these for quality control;
3. explain the limitations of these materials under various uses; and
4. characterize variability and uncertainty associated with these materials.

Course Contents

Concrete Technology - types of cements, aggregates and their properties; concrete mix design, properties and their determination. Steel technology – production, fabrication and properties, corrosion and its prevention. Tests on steel and quality control. Timber technology - types of wood, properties, defects, stress grading, preservation and fire protection, timber products. Rubber, plastics, asphalt, tar, glass, lime, bricks and applications to buildings, roads and bridges.

CEE 305: Soil Mechanics I (3 Units C: LH 30; PH 45)

Learning Outcomes

Upon the completion of the course, students should be capable of:

1. measuring soil properties in the laboratory;
2. interpreting and summarising the data;
3. classifying soils;
4. determining the optimum conditions for the compaction of soils and the ultimate amount achievable; and
5. estimating the settlement of soils due to compaction and consolidation.

Course Contents

Mineralogy of soils and soil structures. Formation of soils, soil classification, engineering properties of soils. Soil in water relationships - void ratio, porosity, specific gravity, permeability and other factors. Atterberg limits, particle size distribution, Shear strength of soils and Mohr's stress circle. Compaction and soil stabilisation, settlement, theory of consolidation. Laboratory work.

CEE 306: Design of Structures I (2 Units C: LH 30)

Learning Outcomes

Upon completion of the course, students should be capable of:

1. applying fundamental mechanics to the design of reinforced concrete structural elements using elastic design and limit state principles.

Course Contents

Fundamentals of design process, materials selection, building regulations and codes of practice; design philosophy. Elastic design, limit state design, of structural elements in reinforced concrete. Fundamentals of design process, materials selection, building regulations and relevant codes of practice, design philosophy,

elastic design: limits state designs. Design of structural elements in reinforced concrete singly reinforced beans; slabs spanning in one direction, shear bond; doubly reinforced beans, T and L beans, axially loaded columns.

CEE 307: Structural Mechanics I (2 Units E: LH 45)

Learning Outcomes

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

1. explain the concept of statical determinacy of structures;
2. estimate the forces and deflections in statically determinate trusses;
3. estimate the shear forces, bending moments, slopes and deflection in statically determinate beams and portal frames; and
4. derive the influence lines for moving loads on trusses and beams.

Course Contents

Analysis of determinate structures - beams, trusses; structural analysis theorems, graphical methods; application to simple determinate trusses. Influence lines. Williot-Mohr diagram. Deflection of statically determinate structures - unit load, moment-area methods, strain energy methods. Introduction to statically indeterminate structures.

CEE 308: Engineering Surveying and Photogrammetry I (2 Units C: LH15; PH45)

Learning Outcomes

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

1. survey sites using chain surveying and compass;
2. obtain the levels at any location on a site and produce a contour map of the area;
3. conduct a traverse to establish the boundaries of a site; and
4. explain the principles of geodetic levelling and photogrammetry.

Course Contents

Chain surveying. Compass surveying methods. Contours and their uses. Traversing - methods and applications. Levelling - geodetic levelling - errors and their adjustments; applications. Tachometry- methods, substance heighting, self-adjusting and electromagnetic methods. Introduction to photogrammetry.

IMSU-CVE 321: Civil Engineering Laboratory I (1 Units C: PH 45)

Learning Outcomes

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

1. Analyze and report the results of laboratory experiments appropriately.
2. Apply safety rules in the laboratory preparation of experiments
3. Carry out soil analysis report results of the experiments appropriately
4. To apply geologic concepts and approaches on rock engineering projects as well as identify and classify rock using basic geologic classification systems.
5. To use the geologic literature to establish the geotechnical framework needed to properly design and construct heavy civil works rock projects.
6. Carry out experiments involving flow in pipes.
7. Carry out laboratory testing of pavement materials.

Course Contents

Experiments involving Soil mechanics I, Geology, Fluid mechanics and Transportation/Highway Engineering I.

IMSU-CVE 322: Civil Engineering Laboratory II (1 Units C: PH 30)
Learning Outcome

Upon completion of this course, the students should be able to
1. Properly compose a technical report
2. Conduct experiments to analyse structural elements.
3. Carry out experiments for testing of construction materials.
4. Analyze and report the results appropriately.
5. Use simple surveying tools

Course Contents
Materials testing covering the various courses taught. The areas to be covered include structural elements, construction materials. Field surveys involving Engineering Surveying and Photogrammetry.

IMSU-CVE 373: Transportation/Highway Engineering I (2 Units C: LH 30; PH 15)
Learning Outcome

At the end of the course the students should be able to

1. Identify various road classes in Nigeria
2. Understand the importance of modern highway technological and its evolution
3. Understand the effect of technology a location surveys and alignment
4. Understand the elements of geometric design
5. Identify good pavement materials.
6. Understand the application of various traffic control devices.
7. Analyse technological growth in roads, bridges, airfields design and maintenance
8. Responsibility of the Civil Engineer in highway/transportation engineering.

Course Contents
Introduction to Transportation Engineering and Components of transportation engineering, Fundamentals of the highway - Road classification. Soil engineering aspects of highways - Compaction and soil stabilization. Design controls and criteria. Elements of Geometric Design. Pavement materials and Laboratory tests. Highway planning and traffic survey, traffic control devices. Airport terminologies, planning and design.

IMSU-CVE 381: Introduction to Water Resources Engineering I (2 Units C: LH 30; PH 15)
Learning Outcomes

At the end of this course the students should be able to
1. Understand public health from engineering point of view
2. Characterize water and wastewater
3. Understand different treatment methods for various water supplies and sources
4. Estimate water demands
5. Analyse water and wastewater distribution system.
6. Understand wastewater treatment and quality controls
7. Carryout sewage system planning, design construction and maintenance
8. Explain different sewage treatment processes including various unit operation
9. Identify quality of sewage, including important parameters for the determination of quantity and qualities.

10. Manage waste stabilization ponds aerated lagoons and oxidation ditch.
11. Explain solid quantity and quality determination collection, transportation and disposal methods.
12. Explain sewage disposal methods including water-dependent and water independent methods

Course Contents

Introduction to public health engineering. The role of the environmental engineer characterizes of water and wastewater (physical, chemical and biological characteristics) basic methods of analysis, basic microbiology and ecology water related disease. Water supply, water sources, characteristic of water from different sources, estimation of population and water consumption intake homes, distribution system analysis, waste water treatment, unit of operation of air and water, quality control, solid waste management, environmental quality standard etc. Quantity and Quality of sewage including important parameter for the determination of quantity and qualities. Sewage system planning, design, construction and maintenance sewage treatment processes including various units operations. Non-conventional sewage treatment processes including sewage farming, waste stabilization ponds, aerated lagoons and oxidation ditch sewage disposal methods including water-dependent and water independent methods, water pollution control, solid waste quantity and quality determination, collection, transportation and disposal methods, institutional arrangement for management.

400 LEVEL

IMSU-CVE 411: Geotechnical Engineering (2 Units C: LH 30; PH 15)

Learning Outcome

At the end of the course, the student should be able to

1. Explain the importance of soil tests and analysis in pre-construction
2. Perform simple load analysis and design for road and bridges
3. Apply Mohr Circle to analyse stresses in soils
4. Show the relationship between Total Pressure, Effective Pressure, and Pore- water Pressure and the influence of pore-water pressure on the shear strength of soils.
5. Apply principle of site inspection phenomena to selected project.
6. Differentiate between compaction and consolidation
7. Understand the various types of settlements

Course Content

Elastic equilibrium. Pore pressure parameters. Stresses in soils. Stress distribution in soil due to boundary loads. Boussinesq's and Westergard's theories. Shear Strength of soils. Mohr Circle of stress. stress path. Stress and Displacement. Volume change and compressibility-Consolidation. Time rate of consolidation. consolidation. Prediction of total and differential settlement. Compaction and soil stabilization. settlement analysis. Site investigations. Bearing capacity of soils foundations: normal and deep foundations. Slope stability. Basic numerical solutions to typical soil mechanics problems. Introduction to critical state soil mechanics.

IMSU-CVE 431: Structural Mechanics II (2 Units C: LH 30; PH 15)

Learning Outcome

At the completion of this course, student should be able to:

1. Apply castiglano's and unit load method
2. Analyze indeterminate frames, beams and trusses

3. Apply the principle of virtual work for the analysis of deflections, and in conjunction with the flexibility method to calculate the redundant support reactions in beams and simple truss and frame structures by hand;
4. Calculate the joint displacements and internal force diagrams of non-sway and sway frames by hand;
5. Apply the matrix stiffness methods to analyze the deformations and forces in a variety of 2D structures, including beam, plane truss and plane frame, and carry out checks and interpret results in connection with basic mechanics of structures;
6. Carry out linear elastic modelling and analysis of 2D framed structures using structural analysis software

Course Contents

Indeterminate structural analysis, energy and virtual work methods slope deflection and moment distribution methods. Influence coefficient method. Second theorem of castiglano least work theorem. Plastic instability simple plastic theory of bending collapse loads. Stress grading of timber; visual mechanical and electronic stress grading of timber. Dynamics of structures of single degree of freedom.

From members and sections to structures; Fundamental structural analysis principles and indeterminacy; Analysis of deflections using Energy Methods-Principle of work and energy; Method of virtual work and applications; Basic matrix algebra and matrix operations. Analysis of statically indeterminate structures by the force method: Force method of analysis for statically indeterminate structures; Maxwell's theorem of reciprocal displacements; Application of virtual work method for displacements and flexibility coefficients; Matrix flexibility analysis. Displacement method of analysis (I): Displacement method of analysis: general procedures; Slope-Deflection equations and application on beams and frames (No Sidesway and with Sidesway). Displacement method of analysis (II): Moment distribution; General principles and definitions; Moment distribution for beams; Stiffness-factor modifications; Moment distribution for frames: No Sidesway; Moment Distribution for Frames: Sidesway. Direct stiffness method (I)-Beams: Fundamentals of the stiffness method; Beam-member stiffness matrix; Assembling of stiffness matrix; Member loads; Matrix solutions. Direct stiffness method (II) -Trusses: Local and Global axis systems; Truss member stiffness matrix; Displacement and force transformation matrices; Member global stiffness matrix; Assembling of truss stiffness matrix; Matrix solutions. Direct stiffness method (III) -Frames & Unit displacement approach: Frame-member stiffness matrix; displacement and force transformation matrices; Frame-member global stiffness matrix; Assembling of frame stiffness matrix; Matrix solutions; Unit displacement approach to formulation of stiffness matrices; Application of unit displacement method on beams& simple truss and frames. Structural modelling and computer analysis: General structural modelling; Modelling a structure and its members; Loads and load combinations; General Application of a structural analysis computer program; Verification and interpretation of results; Limitation of linear elastic analysis and what's next. Briefing of computer labs. Computer labs, Software practice and computer project

CVE 406: Engineering Surveying and Photogrammetry II (3 Units E: LH 30; PH 45)

Learning Outcomes

Students, upon completion of this course, should be able to:

1. use photogrammetry for surveying;
2. use topographical survey in preparation of contour maps;
3. use contour maps;
4. compute areas and volumes of earthwork; and
5. set out engineering works.

Course Contents

Further work on contours and contouring - methods of contouring, contour interpolation and uses of contour

plants and maps, areas and volumes. Setting out of engineering works. Elementary topographical surveying. Elements of Photogrammetry, photogrammetric equipment and errors of measurements.

IMSU-CVE 473: Highway and Transportation Engineering II

Learning Outcomes

1. Discuss transportation models and its application in transportation planning.
2. Conduct traffic studies and analyse traffic data
3. Explain Traffic flow theory
4. Carry out geometric design of super elevations and intersections.
5. Calculate traffic loads
6. Design Pavement structures.
7. Explain Parking and the types of parking using diagrams.
8. Discuss the techniques of reducing traffic congestion
9. State the function of Very High Frequency Omni Directional Range (VOR), Instrument Landing System (ILS) and Precision Approach Radar (P.A.R) in the airport.

Course Contents

Transportation Planning; Development and Operational characteristics of transportation models. Transportation planning and economics. Parking; Types and components of fixed transportation facilities. Ride function of facilities. Fundamentals of traffic Engineering. Traffic Studies and analysis - Traffic Volume studies, Data Presentation. Traffic flow theory, Travel time and Delay study. Capacity Analysis. Geometric design of highways including super-elevations, intersections. Axle load surveys and calculation of traffic loads. Pavement structures and design. Highway drainage and design, maintenance. Highway location surveys. Earthwork calculations. Railways – introduction to railway engineering, Location surveys and Alignment, Railroad structures and design. Traffic controls devices for land, air, and water transportation

IMSU-CVE 481: Engineering Hydrology

Learning Outcomes:

At the completion of this course, student should be able to:

1. Draw a schematic illustration of the hydrologic cycle and explain the different aspects of the cycle.
2. Compute the average depth of rainfall over a basin by Thiessen polygon or Isoheytal method
3. Calculate the return period of floods using any three frequency distributions: Gumbel's distribution, Log-Person type III distribution, extreme value Type I distribution.
4. Define a unit hydrograph and state five theories of unit hydrograph.
5. Obtain the ordinates of a unit hydrograph for a basin using the S-curve technique.
6. Find the outflow hydrograph and the maximum outflow when given discharge-storage data and inflow hydrograph in a reservoir
7. Calculate the outflow hydrograph by the Muskingum method when given the following inflow hydrograph in a certain channel reach
8. Compare: Confined and unconfined aquifers, water table and piezometric surface
9. Determine the aquifer parameters using the Cooper-Jacob method.
10. Derive and apply Darcy's law to a steady flow in wells in confined/unconfined aquifers

Course Contents

Hydrologic cycle, precipitation, infiltration and deep percolation, runoff, evaporation and evapotranspiration. Surface hydrology: Flood routing; Muskingum equation. Hydrograph analysis; unit hydrograph theory. Analysis of stream flow and gauging. Frequency analysis; Concept of return period, Gumbel's distribution, Log-Person type III distribution, extreme value Type I distribution. Groundwater hydrology: Confined and unconfined aquifers, water table and piezometric surface, aquifer properties, Darcy's law, derivation and

application of steady flow to a well in confined/unconfined aquifers, determination of transmissibility and storage coefficient. Flows in layered aquifer systems. Analyses of hydrographic data, land drainage and in land navigation problems. Hydrograph analysis reservoir and flood routing hydrological forecasting.

IMSU-CVE 421: Civil Engineering Laboratory III (1 Units C: PH 45)

Learning Outcomes

At the end of the course the students should be able to

1. Measure physical properties of common structural and geotechnical construction material
2. Plan an experimental programme, selecting the best configuration, selecting the test specimen and collecting raw data.
3. To properly compose a technical report.
4. Observe various types of material behaviour under similar loading conditions

Course Content

Laboratory and field work on the courses for the semester

IMSU-CVE 441: Civil Engineering Practice (2 Units C: LH 30)

Learning Outcomes

1. At the end of the course the student should be able to
2. Understand civil engineering professional practice
3. Understand the responsibility of the employers, contractor and the design team
4. Understand construction planning scheduling and control
5. Prepare Bill of engineering measurement and evaluation (BEME)
6. Understand specification writing

Course Contents

Civil engineering works standard method of measurement: Measurement process taking off, squaring, abstracting and billing measurement for civil engineering work (content, steel earthwork etc.) contracts and sub contracts forms of civil engineering contract, commissioning construction work and supervision, position and responsibilities of the client, contraction and engineer. Job planning, contract and decision programme chart, critical path method etc. construction machinery and materials handling equipment.

500 LEVEL

IMSU-CVE 511: GEOTECHNICAL ENGINEERING II (2 Units C: LH 30; PH 45)

Learning Outcomes:

At the completion of this course, student should be able to:

1. Explain in details the primary and secondary factors that can affect the choice of a foundation type for a building.
2. Plan and undertake a ground investigation
3. Highlight five objectives of site investigation before foundation design
4. Design retaining wall and the four forces keep the retaining wall in equilibrium.
5. Design deep foundations
6. Design shallow foundation
7. Describe and carryout site investigation
8. Describe barth pressures, bearing capacity of soils

9. Analyze types of foundation, such as normal and deep foundation
10. Carry out slope stability
11. Define and explain soil consolidation and settlement.

Course Contents

Site exploration and characterization; subsurface investigation: drilling, geophysical methods. Bearing capacity of soils: Ultimate bearing capacity, allowable bearing pressures. Shallow foundations: Types and uses; analysis and design of shallow foundation – strip footings, pads, mat foundations and basements. Spread foundations design: requirements for spread foundations, foundation ultimate capacity design to BS 8110. Foundation serviceability capacities to BS 8110. Deep foundations – analysis and design. Uses and general characteristics of piles. Piles in sands and clays, Negative skin friction. Pile groups, bearing capacity and settlement of pile groups. Pile axial capacity to BS 8110, Displacements and lateral capacity to BS 8110. Efficiency of pile groups. Eccentric vertical loads. Dynamic pile driving formulae. Bridge foundation. Compensated Foundations. Introduction to Unsaturated Soils: Consequences for modern foundation design- Description of unsaturated soils, the role of pore air/water interfaces and suction, effects on soil strengths, consequences for foundation design. Special foundation problems, shoring and under pinning of foundations, swelling pressure of soils dynamics and machine. Foundation design stressed is soils consolidation and settlement shear strength of soils. Barth pressures, bearing capacity of soils foundations normal and deep foundations, slope stability, site investigations.

CEE 506: Construction Engineering (3 Units C: LH 30; PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. plan construction activities incorporating the most appropriate combination of equipment and manpower;
2. manage construction to achieve quality construction at minimum cost and in least time; and
3. procure appropriate finance and insurance for construction projects at the least cost for the expected benefit.

Course Contents

Construction practices and professional relations. Earth-works. Construction equipment and techniques. Form-work design, component assembly. Improvement of productivity and construction practices. Safety. Capital outlay and operating cost, project financing, insurance and bonding, contract terms. Solutions to job site and engineering problems in buildings and heavy construction in Nigeria.

IMSU-CVE 531: Design of Timber and Steel Structures (3 Units C: LH 45)

Learning Outcomes:

At the completion of this course, student should be able to:

1. design structural elements and entire structures to meet stipulated function and performance objectives
2. use relevant British Standards and codes of practice to analyze and design structures
3. demonstrate an understanding of the behaviour of steel as a structural material
4. design connections and structural steel members in tension, compression, bending and combined actions.
5. Solve problems on Stress - grading of timber; visual mechanical and electronic stress grading of timber.
6. Carryout designs concerned with timber

7. Illustrate the growth, structure and shrinkage of timber.
8. Identify hardwood from softwood.
9. Describe suitable timber conversion methods such as slab saw, tangential sawing and quarter sawing.

Course Contents

Design concepts; Introduction of CP 449; strength properties; Use of Tables; Loading for structural systems; working stress and ultimate strength design theories. Elastic design of tension members, beams and columns; Design of riveted, bolted and welded concentric and eccentric connections. Plate girders: Combined bending and Axial loading. Truss Design. Proportions of truss, species and Grade. Lateral support of compression members. Deck Design, Stringer Design, Composite Deck, Introduction to plastic design. Design in Timber; Properties and Strength of wood; lumber grades; Design of axially and eccentrically loaded timber members and their bases; Analysis and Design of timber beams and columns. Analysis of timber trusses. Design of beam column connections; Properties of Plywood and structural use of panels; Glulam beams and columns; Design of horizontal diaphragms and shear walls; Design of nailed and bolted connections in Timber. Computer aided drawings for proper detailing of structural members. individual and group design presentations.

CVE 572: Transportation and Highway Engineering III (2 Units C: LH 30)

Learning Outcomes:

Learning Outcomes

At the end of the course the student should be able to

1. Understand administration and finance of highway procedure
2. Describe the condition of all transportation media
3. Carry out transportation planning and economics
4. Define traffic management techniques and carry out the design of traffic signals
5. Describe geometric design of highway including intersections.

Course Contents

Highway planning and traffic surveys, origin and destination studies. Purpose, joining cordon and internal surveys processing survey data. Introduction to trip generation and attraction. Trip distribution, modal split and route assignment. Transportation planning and economics traffic management and design of traffic signals, parking geometric design construction methods.

IMSU-CVE 581: Water Resources Engineering II (3 Units C: LH 45)

Learning Outcome

At the end of the course the students should be able to

1. Describe different types of water resources
2. Explain dams, dykes/levees, weirs docks and harbors, sitting basins
3. Understand how to apply engineering economy in water resources planning
4. Develop ability to tackle water resources problems
5. Implement the planning and management for single & multipurpose projects.
6. Calculate appropriate design flood magnitudes and route the design flood through a reservoir
7. Estimate the capacity of a reservoir for different purposes
8. Analyze forces acting on gravity dam its failure and carry out stability analysis of gravity dams
9. Hydrologically and hydraulically design of culverts and drainage channels
10. Hydrologically and hydraulically design of hydraulic structures such as irrigation canal, diversion headwork's, spillway, energy dissipation, flood control and water intake structures.

11. Apply numerical finite element techniques in groundwater modeling.

Course Contents

The hydraulics of open channels. Hydraulic modelling. Unsteady flow analysis; rigid and elastic column theories. Water pumps; arrangement and efficiency. Reservoirs; capacity, routing, design. Varied flow theory, and theory of the hydraulic jump; slowly varied flow involving storage; rating curves. Urban and rural run-off and erosion analysis. Design of surface and subsurface drainage systems and layout of erosion control structures. Analysis and design of surface and combined drainage systems, collectors, storages and pumps. Design of large-scale hydraulic structures: dams, dykes/ levees, docks and harbors, spillways, stilling basins, man holes and costal hydraulic structures etc. engineering economy in water resources planning. Design of culverts and channel; transitions. Introduction methods of irrigation engineering, reservoir design studies and management. Canal regulation works, cross drainage works coastal engineering: introduction, wave and current forces on a circular cylinder or pile. Mathematical techniques in ground water flow- analytical and numerical solutions and simulation. Finite difference and finite element techniques in groundwater modeling. Methods of overflow protection of large areas; drainage of tidal areas

IMSU-CVE 523: Civil Engineering Laboratory and Design I (1 Unit C: PH 45)

Learning Outcome

At the end of the course the student should be able to

1. Measure physical properties of common structural and geotechnical construction material
2. Properly compose a technical report
3. Observe various types of material behaviour under similar loading condition
4. Plan on experimental programme

Course Contents

Practical design along with the course in the semester

CVE 575: Advanced Transportation and Highway Engineering I (3 Units C: LH 45)

Learning Outcome

At the end of the course, the students should be able to

1. Understand the traffic stream flow and markings
2. The intersection gap and hydrodynamic analysis
3. Acceptance noise and acceleration

Course Contents

Study fundamental operation solution to traffic stream flow and its parameters fundamentals of high way signals and meanings: signal system types and their design and operation studies of intersection gap acceptance flow density relationships, shock wave phenomena, as following models, hydrodynamic analysis, acceleration and noise implication of analysis, acceleration and note implication of insight of flow theory for design.

IMSU-CVE 583: Advance Water Resources Engineering I (3 Units C: LH 45)

Learning Outcome

At the end of the course the students should be able to

1. Understand evolution of water quality management
2. Water and wastewater treatment processes
3. Water recycle/ reuse and industrial wastewater treatment
4. Method for environment impact analysis

Course Contents

Qualitative evaluation of water quality, management alternatives and legislations pertaining to drinking water and wastewater. Methods for environmental, impact analysis, including oxygen balance, toxicity enrichment. Entrophication advanced, water and wastewater treatment process water recycle/reuse and industrial wastewater treatment.

IMSU-CVE 515: Advanced Geotechnical Engineering (3 Units C: LH 45)

Learning Outcome

At the end of the course, the student should be able to

1. Understand the behaviour of rocks
2. Soil in building and engineering construction
3. Importance of mineral composition of earth and rock mineral
4. Design for flood control work.

Course Content

Engineering geology: the behaviour of rocks and soil in building and engineering construction foundations, tunnels, dams and flood control work with reference to the importance of mineral, their geomorphic and geological features and their stress history field investigation. Special foundation problems, shoring and under pinning of foundations, swelling pressure of soils dynamics and machine. Foundation design stressed is soils consolidation and settlement shear strength of soils. Barth pressures, bearing capacity of soils foundations normal and deep foundations, slope stability.

CEE 591: Civil Engineering Seminar (1 Unit C:)

Learning Outcomes

At the end of this course, the student should be able to

1. Identify an engineering research problem
2. Present an effective research seminar
3. Understand statement of the problem, objective of a research project
4. Understand power point presentation in a presentation seminar

Course Content

Discussion of civil engineering problems by students, united lecturers and others. Report presentation by students.

IMSU-CVE 522: Civil Engineering Laboratory and Design (1 Unit C: PH 45)

Learning Outcome

1. Upon completion of this course, the students should be able to
2. Properly compose a technical report
3. To conduct experiment in the areas of the Civil Engineering curriculum.
4. Analyse and report the results appropriately

Course Contents

Materials testing covering the various courses taught. The areas to be covered include structural elements, soil mechanics, construction materials.

IMSU-CVE 542: Terotechnology (1 Unit C: LH 15: PH 15)

Learning Outcome

At the end of the course, the student should be able to

1. Understand the procedure of handing over a completed facility
2. Salvaging a structure by underpinning
3. Calculation of the salvage value of a building
4. Understand when to renovate or demolish a structure
5. Maintenance of a structure
6. Evaluation of a structure
7. Evaluation of a structure

Course Content

Salvaging of structures, repairs and demolition. Evaluation of building performance.

IMSU-CVE 538: Advanced Structural Design II (3 Unit C: LH 45)

Learning Outcomes

At the end of the course, the students should be able to;

1. Design both deep and shallow foundations
2. Understand the principles for pre-stressed concrete design
3. Understand the load transfer nature of a pre-stressed concrete
4. Classification of bridge
5. Behaviour of materials under load.

Course Contents

Design of structural foundations pre-stressed concrete design, principle of pre-stressing, methods of pre-stressing, losses of pre-stressing. Fundamental of pre-stressed concrete design parts of a bridge structure; deck; deck piers abutment, classification of bridge based on functions, geometry, material behaviour, loadings, design moment and shears.

IMSU-CVE 588: Advanced Water Resources Engineering II (3 Unit C: LH 45)

Learning Outcome

At the completion of the course, the students should be able

1. Understand the water chemistry and microbiology in water supply
2. Waste water treatment and land control

Course Contents

Study of basic laboratory principles of water chemistry, microbiology and their application to water supply, waste water treatment, water and land control.

IMSU-CVE 576: Advanced Transportation and Highway Engineering II (3 Unit C: LH 45)

Learning Outcomes

At the end of the course, the students should be able

1. Understand public transportation state of the art system
2. Review of conventional transportation system
3. Understand demand responsive bus system
4. Review of current transportation administration

Course Contents

An in-depth study analysis of conventional and emerging public transportation state of the art system, study of

bus rapid systems. Demand responsive bus system, personal rapid transit, dual mode guild ways and automated freeway system and high-speed rail. TAC systems. Review of current transportation administration, systems research and demonstration programme.

IMSU-CVE 518 Advanced Geotechnical Engineering II (3 Unit C: LH 45)

Learning Outcome

At the end of the course, the student should be able

(i) Understand the choices of type of dam
(ii) Control of dam embarkment
(iii) understand the principles of dam design
(iv) Understand the construction procedures and equipment for ground water
(v) Understand the initial and long-term stability of earth retaining structures.

Course Contents

Earth structures (earth dams) and slope stability, the choices of type of dam design construction and control of dams embarkments and slopes. Principles of dam design explorations, ground water control, construction procedures and equipment. Foundation subjected to dynamic forces. The initial and long-term stability of earth retaining structures. Rock mechanics, mining engineering and rock excavation, drilling, blasting techniques.

CEE 599: Project (6 Units C: PH 270)

Learning Outcomes

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

(i) initiate worthwhile projects of a research or professional nature;
(ii) analyse the project problem and develop creative proposals for the solution;
(iii) execute the proposal for the solution to the problem; and
(iv) clearly and persuasively communicate solutions orally and in writing

Course Contents

For proper guidance of the students, projects will depend on the available academic staff expertise and interest but the projects should be preferably of investigatory nature. Preferably, students should be advised to choose projects in the same area as their option subjects.

10.3 BMAS COURSE LISTING

YEAR ONE - FIRST SEMESER

S/N	COURSE CODE	COURSE TITLE	UNITS L	T	P	TOTAL
1	MAT101	General Mathematics I	2	1	-	3
3	PHY 101	General Physics I	2	1	-	3
4	PHY 151	General Physics Laboratory I	-	-	1	1
5	CHE 101	General Chemistry I	2	1	-	3
6	CHE 141	General Chemistry Laboratory I	-	-	1	1
7	GEN 101	Engineering Drawing, I	1	-	1	2

8	GEN 121	Workshop Practice I	1	-	1	2
9	GST 101	Use of English I	1	1	-	2
10	GST 103	Philosophy and Logic	2	-	-	2
11	GST 105	Citizenship Education	2	-	-	2
12	GST 107	Igbo Language and Culture	2	-	-	2
	Semester Total					**23**

YEAR ONE - SECOND SEMESTER

S/N	COURSE CODE	COURSE TITLE	**UNITS**			
			L	**T**	**P**	**TOTAL**
1	MAT 102	General Mathematics II	2	1	-	3
2	PHY 102	General Physics II	2	1	-	3
4	PHY 152	General Physics Laboratory II	-	-	1	1
5	CHE 102	General Chemistry II	2	1	-	3
6	CHE 142	General Chemistry Laboratory II	-	-	1	1
7	GEN 102	Engineering Drawing II	1	-	1	2
8	GEN 122	Workshop Drawing II	1	-	1	2
9	GST 102	Use of English II	1	1	-	2
10	GST 104	History and Philosophy of Science	2	-	-	2
11	GST 106	Introduction to Computer	2	-	-	2
12	GST 108	Entrepreneurship Development I	1		1	2
13	GST 112	Igbo Readings and Practice	2	-	-	2
Semester Total						**25**
Sessional Total						**48**

YEAR TWO - FIRST SEMESTER

S/N	**COURSE CODE**	**COURSE TITLE**	**UNITS**			
			L	**T**	**P**	**TOTAL**
1	GEN 201	Engineering Mathematics I	1	1	-	2
2	GEN 203	Engineering Drawing III	1	-	1	2
3	GEN 205	Workshop Practice III	1	-	1	2
4	GEN 211	Engineering Mechanics	2	1	-	3
5	GEN 221	Engineering Laboratory I	-	-	2	2
6	GEN 241	Basic Land Surveying	1	-	1	2
7	GEN 251	Material Science	1	-	1	2
8	GEN 261	Engineering Thermodynamics I	1	1	-	2
9	GEN 291	Engineer in Society	1	-	-	1
10	GST 223	Entrepreneurship Development II	1	1	-	2
Semester Total						**20**

YEAR TWO - SECOND SEMESTER

S/N	**COURSE CODE**	**COURSE TITLE**	**UNITS**			
			L	**T**	**P**	**TOTAL**
1	GEN 202	Engineering Mathematics II	1	1	-	2
2	GEN 212	Strength of Materials	2	1	-	3
3	GEN 214	Fluid Mechanics	1	1	-	2
4	GEN 222	Engineering Laboratory II	-	-	2	2

5	GEN 242	Engineering Geology	1	-	1	2
6	GEN 252	Basic Engineering Materials	1	-	1	2
7	GEN 272	Basic Electrical Engineering	1	-	1	2
8	GEN 282	Computer for Engineers	1	-	1	2
9	GEN 292	Engineering Economy	2	-	-	2
10	CVE 202	Introduction to Civil Engineering	1	-	-	1
11	GST 222	Peace and Conflict Resolution	1	1	-	2
Semester Total						**24**
Sessional Total						**44**

YEAR THREE - FIRST SEMESTER

COURSE CODE	COURSE TITLE	UNITS				
		L	**T**	**P**		**Total**
GEN 381	Statistics for Engineers I	2	R	30	-	-
CVE 311	Soil Mechanics I	3	C	30	-	15
CVE 313	Engineering Geology	3	C	30	-	15
CVE 331	Strength of Materials	3	C	45	-	-
CVE 341	Elements of Architecture & Civil Eng. Drawing	2	C	15	-	15
CVE 351	Civil Engineering Materials	3	C	30	-	15
CVE 381	Fluid Mechanics II	3	C	30	-	15
CVE 321	Civil Engineering Laboratory	1	C	-	-	45
CVE 391	Civil Engineering Analysis I	3	C	45	-	-
SEMESTER TOTAL		**23**				

YEAR THREE - SECOND SEMESTER

COURSE CODE	COURSE TITLE	UNITS	STATUS	LH	S	PH
GEN 382	Statistics for Engineers II	2	R	30	-	-
CVE 342	Building Services Engineering	2	C	30	-	-
CVE 372	Engineering Surveying & Photogrammetry	3	C	30	-	15
CVE 374	Transportation /Highway Engineering	3	C	30	-	15
CVE 382	Water Resources and Environmental Engineering	3	C	30	-	15
CVE 392	Civil Engineering Analysis	3	C	45	-	-
CVE 322	Civil Engineering Laboratory	1	C	-	-	15
CVE 334	Structural Mechanics I	2	C	45	-	-
SEMESTER TOTAL		**19**				
SESSIONAL TOTAL		**42**				

YEAR FOUR - FIRST SEMESTER

COURSE CODE	COURSE TITLE	UNITS	STATUS	LH	S	PH
GEN 481	Computer Aided Design	2	R	15	-	15
GEN 491	Technical Report Writing	2	R	30	-	-
GEN 493	Engineering Research Methods	2	R	30	-	-
CVE 431	Structural Mechanics II	2	C	30	-	-
CVE 433	Design of Structure I (RC)	2	C	30	-	-

CVE 411	Soil Mechanics II	2	C	15	-	15
CVE 471	Engineering Surveying and Photogrammetry	2	C	15	-	15
CVE 473	Highway & Transportation Engineering	2	C	15	-	15
CVE 481	Water Resources Engineering	2	C	15	-	15
CVE421	Civil Engineering Laboratory	1	C	15		
CVE 441	Civil Engineering Practice	2	C	30	-	-
SEMESTER TOTAL		**21**				

YEAR FOUR - SECOND SEMESTER

COURSE CODE	COURSE TITLE	UNITS	STATUS	LH	S	PH
GEN 490	**SIWES (SIX MONTHS)**	**15**	**R**	**-**	**-**	**225**
SEMESTER TOTAL		**15**				
SESSIONAL TOTAL		**36**				

YEAR FIVE - FIRST SEMESTER

COURSE CODE	COURSE TITLE	UNITS	STATUS	LH	S	PH
GEN 591	Engineering Management & Law	2	R	30	-	-
CVE 523	Civil Engineering Laboratory	1	C	-	-	15
CVE 511	Geotechnical Engineering, I	3	C	-	-	45
CVE 591	Civil Engineering Seminar	1	C	-	15	-
CVE 541	Construction Engineering	2	C	-	-	30
CVE 531	Design of Structures II	2	C	30	-	15
CVE 571	Highway & Transportation Engineering	2	C	30	-	-
CVE 581	Water Resources Engineering	2	C	-	-	-
CVE 593/594	Project	3	C	-	-	45
CVE 533	Structural Mechanics III	3	E	45	-	-
CVE 583	Advanced Water Resources and Environmental Engineering II	3	E	45	-	-
CVE 575	Advanced Transportation & Highway Engineering	3	E	45	-	-
CVE 515	Special Topics in Geotechnical Engineering	3	E	45	-	-
SEMESTER TOTAL		**21**				

YEAR FIVE - SECOND SEMESTER

COURSE CODE	COURSE TITLE	UNITS	STATUS	LH	S	PH
GEN 592	Professional Practice	2	R	30	-	-
CVE 522	Civil Engineering Laboratory/ Design Practical V	1	C	-	-	15
CVE 582	Waste Management Engineering	2	C	30	-	-
CVE 512	Geotechnical Engineering	2	C	15	-	15
CVE 542	Terotechnology	2	C	15	-	15
CVE 584	Water Resources Engineering	2	C	15	-	15
CVE 536	Structural Design III	2	C	15	-	15
CVE 574	Transportation & Highway Engineering	2	C	15	-	15

CVE 594	Project II	3	C	-	-	45
CVE 538	Advanced Structural Design	3	E	45	-	-
CVE 588	Advanced Water Resources and Environmental Engineering	3	E	45	-	-
CVE 576	Advanced Highway / Transportation Engineering II	3	E	45	-	-
CVE 518	Advanced Geotechnical Engineering	3	E	45	-	-
SEMESTER TOTAL		**21**				
SESSIONAL TOTAL		**42**				

10.4 BMAS COURSE DESCRIPTION

10.4.1 Serviced Courses

CHE 101: General Chemistry I (3 Credits)
This course will examine atoms, molecules and Civil reactions, Civil equations and Stoichiometry, atomic structure, and periodicity; modern electronic theory of atoms; radioactivity, Civil bonding, properties of gases, equilibrium and thermodynamics, Civil kinetics, electrochemistry.

CHE 102: General Chemistry II (3 Credits)
This course will examine the historical survey of the development and importance of organic chemistry; nomenclature and classes of organic compounds, homologous series, and functional groups: isolation and purification of organic compounds, qualitative and quantitative organic chemistry, stereochemistry, determination of structure of organic compound; electronic theory in organic chemistry; saturated hydrocarbons, alcohols, carbonyl compounds and monocarboxylic acids, amines.

CHE 141 and 142: General Chemistry Lab I & II (1 Credit Each)
These are laboratory courses each running for 13 - 14 weeks with weekly sessions of 3 hours duration. Each course comprises a set of experiments carefully selected to illustrate principles developed in the corresponding theory course and to introduce students to various laboratory equipment and technique The theory and the corresponding laboratory courses are designed to run concurrently

PHY 101: General Physics I (3 Credits)
This course will examine units and dimensions, kinematics, static and dynamics, universal gravitation, work and energy, rotational dynamics and angular momentum, conservation laws, molecular treatment of properties of matter, elasticity, hydrostatics, pressure, buoyancy; Archimedean principles, hydrodynamic viscosity; laminar flow, surface tension, adhesion, cohesion, capillarity, drops and bubbles.

PHY 102: General Physics II (3 Credits)
This course will examine electrostatics, induction coulomb law, Gauss law, electric field, electrostatic potential, capacitance, dielectric, electric current, circuit analysis, alternating current, electromagnetic waves, modern physics; the theory of the hydrogen atom, nucleon propen.ics, radioactive decay, nuclear fission and fusion, elementary particles.

PHY 151 and PHY 152: General Physics Lab I and II (1 Credit Each)

These laboratory-based courses emphasized qualitative measurements, the treatment of error measurements and graphical analysis. A variety of experimental techniques will be employed. The experiments Will include topics covered in general Physics especially PHY 101 AND PHY 102

PHY 103: General Physics III (Behaviour of Matter) (2 Credits)
Heat and temperature, temperature scales; gas laws; general gas equation; thermal conductivity; first Law of thermodynamics; heat, work and internal energy, reversibility; thermodynamic processes; adiabatic, isothermal, isobaric; second law of thermodynamics; heat engines and entropy, Zero's law of thermodynamics; kinetic theory of gases; molecular collisions and mean free path; elasticity; Hooke's law, Young's shear and bulk moduli; hydrostatics; pressure, buoyancy, Archimedes' principles; Bernoullis equation and incompressible fluid flow; surface tension; adhesion, cohesion, viscosity, capillarity, drops and bubbles.

PHY 104: General Physics IV (2 Credits)
Simple harmonic motion (SHM). Energy in a vibrating system. Damped SHM. Resonance and transients. Coupled SHM. Q values and power response curves. Normal modes. Waves (types and properties of waves as applied to sound). Transverse and longitudinal waves (superposition, interference, diffraction, dispersion, polarization). Waves at interfaces (energy and power of waves. The wave equation. 2-D and 3-D wave equations. Wave energy and power. Phase and group velocities. Echo and beats. The Doppler-effect. Propagation of sound in gases, solids and liquids and their properties. Optics: Nature and propagation of light. Reflection and refraction. Internal reflection. Scattering of light. Reflection and refraction at plane and spherical surfaces. Thin lenses and optical instruments. Wave nature of light. Dispersion. Huygens's principle (interference and diffraction).

MAT 101: General Mathematics I (3 Credits)
This course will examine the elementary set theory (subset union, intersection), compliments, Venn diagrams, real numbers integers, rational numbers, mathematical induction, De Moivres theorem.

MAT 102: General Mathematics II (3 Credits)
This course will examine geometric representation of vectors in 1- 3 dimensions, components directions cosines, additional and scalar multiplication of vectors; differentiation arid integration of vectors with respect to scalar variables; two dimensional co — ordinate geometry, straight lines, circles, parabola, ellipse and hyperbole, tangent and normal kinematics of a particle; components of velocity and acceleration of a particle moving in a plane, force and momentum, laws of motion under gravity, projectiles, resisted vertical motion, elastic string, simple pendulum, impulse of two smooth spheres, and of a sphere on a smooth sphere.

MAT 103: Elementary Mathematics III (Vectors, Geometry and Dynamics) (2 Credits)
Geometric representation of vectors in 1-3 dimensions, components, direction cosines. Addition, scalar, multiplication of vectors, linear independence. Scalar and vector products of two vectors. Differentiation and integration of vectors with respect to a scalar variable. Two-dimensional co-ordinate geometry. Straight lines, circles, parabola, ellipse, hyperbola. Tangents, normals. Kinematics of a particle. Components of velocity and acceleration of a

particle moving in a plane. Force, momentum, laws of motion under gravity, projectiles and resisted vertical motion. Elastic string and simple pendulum. Impulse, impact of two smooth spheres and a sphere on a smooth surface. *Pre-requisite –MAT 101*

GST 101: Use of English I (2 Credits)

This course covers proficiency in the communication, and critical evaluation information and ideas through reading writing, and speech, language and communication; acquisition of information including the use of the library services and organization, library stock and holding, catalogue and classification, reference sources, reading including speed, faster reading technique, reading and comprehension, reading and précis. Note taking, communication of ideas including writing techniques, sentence Structure, grammar, punctuation, technical writing, business letter, report and organization

GST 102: Use of English II (2 Credits)

This is a continuation of GST 101, with a more intensive practice on composition, letter writing and essay techniques. The course covers essay writing including expository essay, argumentative essay, narrative, persuasive essay, description essay, term paper including choosing topic research techniques, organization of materials, demonstration of ability to apply these principles as embodied in the term paper, speech including forms of oral communication, phonetics, art of public speaking, criticism including language and literary forms, critical evaluation of given text.

GST 103: Philosophy and Logic (2 Credits)

The course is structured into two parts, namely philosophy and logic. Philosophy includes concept of philosophy, the etymological, Socratic and religious (Christian concepts), the first principles of being immediate propositions, the characteristic of philosophical knowledge compared with common knowledge, the divisions of philosophy, objective and subjective matters of philosophy, the Aristotlelian concepts of first philosophy, concepts of materialism, positivism, monism, dualism and spiritualism. The part II deals with the meaning and concept of argument, relationship between premises and conclusion in deductive and inductive logic, the character of syllogism, true or false situations, the Fallacy of ambiguity. Difference between truth and validity, the concept and character of logical necessity.

GST 105: Citizenship Education (2 Credits)

The course aims at inculcating basic training in citizenship, sense of responsibility and mutual understanding. The students are introduced to the background, meaning, scope and indices of national unity and stability, with emphasis on the normative values that uphold our African society. The course covers introduction to citizenship education I; fundamental rights of African people under traditional law, nature, meaning and purpose of citizenship, Nigerian history and culture in pre - colonial times, the origins of Nigerian people, social factors m Nigerian development, changing patterns of socialization, political dimension of societal development in Nigeria including colonization nationalism ethnicity, tribalism, government as the principal agent m fostering national unity

GST 106: Introduction to Computer (2 Credit)

This course cover number system (denary, octal, hexa, decimal floating, etc) hardware (definition and configuration, input/output system, etc), CPU, ROM, auxiliary devices and examples Bits, Kilobytes, Gigabytes, Megabytes, Terabytes; hobbies, words, operating systems, source code, types of computers, impact of computer on society.

PHY 104: General Physics IV (2 Credits) (Vibrations, Waves and Optics)
Reflection and refraction, transmission and absorption of light, dispersion, optical instrument, wave nature of light, velocity of light, electromagnetic waves, Hughen's principles, interference, diffraction and polarization, Quantum nature of light. Maxwell equations, electromagnetic oscillations and waves. The photon, Bohr's atomic theory and elementary atomic spectra, X-ray, measurement of e and e/m charges, electrostatics, magneto statics, measuring of AC currents Ampere's law, Faraday's law, Alternating current, transformers conductors, magnetic field and induction.

MAT 103: General Mathematics III, 2 Credits (Vectors, Geometry and Dynamics)
Geometric representation of vectors in 1-3 dimensions, components, direction Cosines, Addition, Scalar, multiplication of vectors, linear independence, Scalar and vector products of two vectors, differentiation and integration of vectors with respective to Scalar variable. Two- dimensional coordinate geometry, straight lines, circles, parabola, ellipse, hyperbola tangent, normal, kinematics of a particle, components of velocity and acceleration of a particle moving in a plane, momentum, laws of motion under gravity, projectiles and resisted vertical motion. Elastic string and simple pendulum, impulse, impact of two smooth spheres and a sphere on a smooth surface.

STA 112: Probability I, (2 Credits)
Probability and statistics, mutually exclusive events, independent events, the binomial probability distribution. Dependent events, mathematical expectation, permutations combinations, factorial n, Stirling's approximation to N.

GST 222: Peace and Conflict Resolution (2 Credits)
Basic concept in peace studies and conflict resolution. Peace as a vehicle and development conflict issues. Types of conflicts e.g. ethnic, religious, political, economic conflict.

Root cause of conflict in Africa, indigenes/ settlers phenomenon peace Building Management of conflict and security

Elements of peace studies and conflict resolution.

Developing a culture of peace

Alternative dispute resolution (ADR)

Role of international organizations in conflicts resolution e.g., ECOWAS, AFRICAN UNION, UNITED NATIONS etc.

GST 223: Entrepreneurship Studies (2 Credits)
Introduction of entrepreneurship and new ventures creation, to module learning objective and assessment. Description of entrepreneurship. The role of entrepreneur. Creation of new venture. Stevenson's model entrepreneurial resources.

Business plan. Case studies. Entrepreneurial opportunities. Entrepreneurial team, Entrepreneur finance. Determining capital requirements, financial strategy mid managing cashflow. Raising financial capital, venture capital and information equity, department finance and other finance instruments. Marketing new ventures, product price, place. Promotion and people cash study. New ventures workshop.

10.4.2 General Engineering Coded Courses

GEN 101: Engineering Drawing I (2 Credits)
Graphic Tools, Introduction of Drawing, measuring. Lettering and dimensions of objects in various positions. Sketching, Engineering geometry, fundamentals orthographic projections. Graphs, charts and presentation of data and results.

GEN 102: Engineering Drawing II (2 Credits)
Guided sketching, freehand drawing, creative thinking and multi-view representation. Revolution and conventional practice. Sectional and auxiliary views. Spatial relationships; basic descriptive geometry, vector geometry; developments and intersections, pictorial presentation.

GEN 121: Workshop Practice I (2 Credits)
Behaviour Analysis: Safety consciousness; Survey of sources of common. accidents. Accident prevention and control, general safety instructions.

Use of engineering measuring instruments - calipers, micrometer screw gauge, sine bars, angular measuring instruments etc, sampling and sizing techniques of raw materials. Introduction to hand tools, bench tools, power tools and wood working tools. Bench work: marking out, cutting, filing, and drilling.

Assignment: Production of (i) a sample of door staple

(ii) Chair / table

GEN 122: Workshop Practice II (1 Credit)
Sheet metal work: layout, cutting, shaping, welding, Design o simple jigs and fixtures.

Basic wood working principles

Introduction to machine shop: lathe work, shaping, milling grinding, drilling and metal spinning.

Simple automobile diagnosis and repairs:

Electrical Workshop Practice: Convention and applications of colours, codes and signs etc. use of electrical tools, machines cables and conductors.

GEN 201: Engineering Mathematics II (2 Credits)
Review of differentiation and integration methods. Applications of first order differential equations. Higher differentiation and integration. Series and tests for convergence and divergence of infinite sequences and series of numbers. Tailor's and Machavaris series; Euler series; Fourier series; Simple Laplace transformation; solutions of initial value problems by Laplace transform

method. Materials and determinants, eigenvalue and eigenfunctions. Double and triple integrals with applications.

GEN 202: Engineering Mathematics II (2 Credits)
Vectors: dot and cross products of vectors, triple products and vector functions, vector spaces, vector integration and vector integral theorems.

Equation of lines and planes. Linear dependence and independence. Second order linear equations. Solutions of second order linear differential equations by method of undetermined coefficients and variation of parameters. Matrix solution of linear algebraic equations. Computer solution of matrices. Computer solution of selected engineering problems. Excel package, partial differential equations.

GEN 203: Engineering Drawing III (2 Credits)
Design and communication drawings: Tolerance and fits detail drawings, specification of threads. Fasteners and springs, size description, machining and welding symbols, dimensions and specifications. Mechanical, Civil, Electrical and Civil Engineering drawing; machine and assembly drawings, piping drawings process models, welding drawings, electronic drawings. Structural drawing, rudimentary architectural, topographic and engineering map drawings.

GEN 205: Workshop practice III (2 Credits)
Machine — tool Practice: Lathe, Shaping, Milling, Grinding and drilling Foundry sand testing, mixing of sands, preparation of moulds. Pattern Making: Solid, Split, Sweep Patterns, hoisting gadgets and risers Melting and pouring of molten metals detection of defects.

Welding Techniques: Manual arc welding - butt. I - joints, edge preparation, surface cladding Argon arc welding - C02, MIG welding, oxy - acetylene welding.

Manufacture of simple engineering products to specifications using Machining, foundry, and welding technologies.

Inspection and testing of the manufactured products for accuracy using appropriate equipment and methods.

GEN 251: Material Science (2 Credits)
Atomic structure, molecular structure, classification of Engineering Materials (metals, ceramics, polymers, etc).

Metals: Extraction of metals, iron and steel making, aluminum smelting and. extraction of other non- ferrous metals e.g. tin.

Applications and limitation of pure metals.

Crystal structures: Latice unit, bravais lattice, symmetry, lattice planes and directions, miller indices, interplanar spacing, packing of spheres; simple cubic, face - centered, body centered cubic and hexagonal packing.

INTERSTITIAL SIZES: Sizes distribution. Imperfections in crystals, surface and boundary defects, valences and interstitial dislocation twinning. Phase diagrams and Alloy theory, Heat-

treatment of carbon steels, precipitation hardening. Non-ferrous engineering alloys, processing methods.

Mechanical properties of Materials: Plastic deformation of a single crystal, strain hardening, principles of mechanical testing: impact, tensile, hardness, fatique, creep and non-destructive tests. Mechanism of fracture, ductile — brittle transition, Electrical, Optical and magnetic properties of material: Plastic deformation of single crystal, strain hardening, principles of mechanical testing, impact, tensile, hardness, fatique, creep and non-destructive tests.

Mechanism of fracture, ductile brittle transition, Electrical, Optical and magnetic properties of metals; conduction and carriers, conductivity in metals, semi - conductors and insulators. Hall effect, Magnetic circuit and magnetic properties. Emission, absorption, reflection, transmission and refraction

Non- metallic Materials: Ceramics; structure, properties, processing and applications, plastics types, structures, processing methods and applications. Dispersion strengthened composite, fibre-reinforced composites. Wood, softwood, hardwood, structures, Nigerian timbers, strength, properties and test.

GEN 252: Basic Engineering Materials (2 Credits)

Classification of engineering materials, mechanical properties, optical thermal, and electrical properties. Viscoelastic materials. Fatique and creep of engineering materials. Heat treatment of metals and, their alloys. Importance of heat treatment: engineering plastics, the modification of properties of materials through changes in microstructure.

Laboratory: Destructive and non-destructive testing materials, ultrasonic and x - ray tests.

GEN 261: Engineering Thermodynamics I (2 Credits)

Fundamental concept History of Thermodynamics, Dimensions, Unit systems, state, property, process, beat, work, pressures, temperature, Zeroth laws. First law of thermodynamics: conversion of energy (Joules experiment). First law, internal energy, non-flow processes enthalpy, steady flow processes. Properties of pure substances, PVT relations and diagrams Cp, Cv, ideal gas. Thermodynamics charts and table. Second law of Thermodynamics and heat engine cycles - Carnot heat engine and cycle.

The second law and its corollaries. Entropy: Reversible and irreversible process. Clausius inequality, entropy, irreversibility. Heat engine and heat pump dalcylations.

Applications of second law of non-flow and steady flow process. Available and unavailable energy, availability Gibbs equations.

GEN 272: Basic Electrical Engineering (2 Credits)

Review of electrostatics and electromagnetism. Basic circuit laws and theorems, Circuit elements, (R, L, C) DC and AC circuits and signals.

Power and power factor electrical and electrical power measurement. Electrical installations, simple electrical faults and rectifications.

Transformer- principles and operation. Electrical machines- principles and operation of electrical machines, motors, generator, single and polyphase systems.

Introduction to electronic circuit, and models, conduction, mechanisms and application of chides, transistors and amplifiers, digital circuits. Analogue and digital instrumentation and systems.

GEN 282: Computer for Engineers (2 Credits)

Systems models and analogues; including mechanical, fluid, thermal electrical, Civil and eco-systems. Examples; emphasizing mechanical system components, mechanism, electroCivil transducers, pneumatic, hydraulic and Electromagnetic actuators. Overview of how computers are used to advantage in the design, manufacture, measurement and control of mechanical systems. Introduction to microprocessors and peripherals. Use of case study method to describe the elementary design of microcomputer software and hardware for real -time - on - line applications: coding of analog information, timing of digital signals, interrupts, transition diagrams, analog - digital and digital analog conversion, serial and parallel communication. Laboratory practice and projects.

GEN291: Engineering in Society (1 Credit)

Science, technology and Engineering: Definitions, Historical development of Engineering Science and Technology, the Engineering family: The Engineer, The Technologist, The Technician, The Artisans and Craftmen. Roles of the Engineer in the society. In space travel missions, in oil and gas production operations, in politics, law, medicine, education, administration, management food production utilities military service, and developing new technologies and products.

Branches of Engineering: agricultural Engineering, Aeronautical Engineering, Civil Engineering, CIVIL ENGINEERING, Materials and Metallurgical Engineering, Electrical and Electronics Engineering, Petroleum Engineering, Gas Engineering and Civil Engineering, etc. professional Qualifications:

Engineering Education qualifications, registrable as a professional Engineer with the Nigeria Society of Engineers (NSE), Council for Regulation of Engineering in Nigeria (COREN), Africa Institute of Science and Technology (AIST NIGERIAN) etc.

Other countries have their own bodies.

Professional Practice: professional ethics and conducting professional registration procedure and engineering, professional responsibilities. Management of skills, project management developing new technologies, tools machines, computers and system protecting intellectual property right and business, legal right, handing human and energy resources, fossils, geothermal, nuclear, wind and solar conversant, within Engineering practices control of accident introduction industry (oils, steel, mining etc) rules and regulations guiding pollution of the environment capable of applying appropriate technologies, information and communication Technologist (ICT) system in Engineering practice. Financial management knowledge requirement human relation management essential in developing the Engineering to promote productivity in any enterprise.

GEN 292: Engineering Economy (2 Credits)

Engineering Economy and the Engineering Process. Some Fundamental Economic Analysis. Elementary selections in Economic Analysis.

Interest and Equivalence: Computing cash flow, time value of money, simple and compound interest formulae calculations of equivalence involving interest.

Economic Analysis Alternatives:

Basis of comparison of annual increment approach, rates of return comparisons, benefit/cost comparison (MARR) Evaluating Replacement alternative - break - even analysis**.**

Accounting and Depreciation:

Accounting and cost accounting, application of computer in accounting. Basic aspects of depreciation. Depreciation and expenses, Depreciation accounting methods, straight line, sum of the year digits and decking balance methods modified accredited (MACRS) methods of accounting comparism of MACRS with other depreciation accounting methods.

Income Tax: Income tax rates, calculation of taxable income of individual, and firm financial report | statement of account of companies

GEN 381: Statistics for Engineers I (2 Credits)
Frequency distributions. Measures of location and dispersion in simple and group data. Elements of probability and probability distributions: normal, binomial, poison, geometric, negative binomial distributions.

GEN 382: Statistics for Engineers II (2 Credits)
Estimation and tests for hypothesis concerning the distributions. Regression, correlation and analysis of variance. Contingency tables. Non-parametric interference.

GEN 490: SIWES (15 Units)
A supervised student industrial work experience scheme. The course is designed to give students ample exposure to realities of engineering industry: the practical exposure of the student through direct participation in the work of an industry, to real life working conditions. During the training, the student becomes familiar with engineering organization, physical layout and the flow of information ma 1iais and operation. This exposure is expected to compliment and integrate the student's classroom instruction and laboratory workshop exercises.

GEN 481: Computer Aided Design and Manufacturing (2 Credits)
Review of computer hardware and software, methods of system analysis and applications. Use of computer to aid design and manufacturing and to link design a manufacturing functions. Introduction to geometric modeling, properties and representation of solids, algorithms and software, interactive computer graphics. Application of computers to planning or organization and control of manufacturing of discrete parts. NC and CNC programming languages and softwares aspects. Computer integrated manufacturing (CIM) and flexible manufacturing system. Industrial Robots. Software development and use of personal computer in designs. Application softwares used in Engineering to achieve designs such as Auto Card, Civil soft, Proteus, Spice, Corel Draw etc. Windows operating systems. Programming in C, C++, Pascal languages.

GEN 491: Technical Report Writing and Presentation (1 Credit)

Introduction to principles of effective communication with attention to the importance of emphasis, emotive content and style. Principles of technical writing and organization: data gathering and presentation, technical correspondence. Letters of inquiry and replies, letters of application and memoranda. Illustrating technical writing using tables, graphs, diagrams, equations and appendices.

Report writing: progress reports, proposals, student projects, thesis and dissertations. Oral and visual presentation of technical ideas, technical aids in presentation computer - aided technical report writing and presentation; word processing and word processing software packages. A student is to write a technical report on a topic chosen from a specialized area of interest in (CIVIL ENGINEERING) under the guidance of an assigned supervisor.

GEN 493 Engineering Research Methods (2 UNITS)

The course aims at giving the student an opportunity to develop relevant research techniques and writing skills. It incorporates the use of elementary statistical tools in the analysis of problems principles of technical report writing.

GEN 591: Engineering Management and Law (2 Credits)

LAW: Definition and specification, application of business law to engineering. Patents and inventions; trademarks and copyrights

ENGINEERING BUSINESS: Types, the responsibilities, professional liability, and role of engineer in lawsuits. General principles of contracts; law of contract - forms of contract, criteria for selecting contractors offer and acceptance of contracts, terms of contracts; supplier duties-damage and other remedies, termination/cancellation of contracts, liquidation and penalties., exemption clauses., safety and risk. Health and safety, duties of employers towards their employees, duties imposed on employees.

Fire precaution act, Design for safety.

MANAGEMENT: General principles of management and appraisal techniques. Break through and control management theory, personal management, labour and public relations, wages and salary administration, training and man-power development.

The manager and policy development / formulation, objective setting planning, organizing and controlling, motivation and appraisal of results.

Organizational structure, goals and functions. Cost engineering:

Capital and Operating cost estimating, contingencies and allowances.

GEN 592: PROFESSIONAL PRACTICE (1 Credit)

Principles of good practices of professional Engineers in relation Ito other sister professionals and the interest of Clients and the Public. The Rules of professional Practice; the Registration Bodies and their regulations; Joint Consultative Council; SIWES Programmes; Partnerships and Consortia design and manufacture; Role of Professional Engineers, Tendering and Bidding strategies; Consultancy practice and their regulations; etc code of ethics.

10.4.3 Departmental Coded Courses

CVE 202: Introduction to Civil Engineering (2 UNITS)
History and development of Civil Engineering; Solution to basic problems in Civil Engineering, emphasizing methodology, evaluation of alternatives and decision making with the goal of satisfying social need, based on positive ethical deliberations; Branches of Civil Engineering, their demands and functions; the Civil Engineer-attributes; etc.,

CVE 313 Engineering Geology (3 UNITS)
Important mineral and major rock types. Physical and engineering properties of rocks. Principles and mechanics of rock deformation. Geology structures and mapping, Rocks and minerals, stratigraphy- time scale fossils and their importance, special reference to Nigeria. Introduction to geology of Nigeria. Engineering Applications. Water supply, Site investigation Dams, Dykes etc.,

CVE 331: Strength of Materials (3 UNITS)
Advanced topics in bending moment and shear force diagrams in beams. Theory of bending of beams. Deflection of beams unsymmetrical bending and shear center Application strain energy and principle of work. Castiglioni's theories. Biaxial and triaxial state of stress. Transformation of stresses. Mohr's circle. Failure theories, springs creep, fatigue, fracture and stress concentration.

CVE 341: Elements of Architecture & Civil Engineering Drawing (2 UNITS)
Introduction- Dimensional awareness, Graphical communication, relation to environments. Free hand drawing-form in terms of shades, light shadow. Common curves. Orthographic, diametric, perspective projections; Application of Elementary Designs. Dimensions, notes, titles, working or construction drawing and relationship to specifications, plans floors, foundation, framing and Roof plans, sections and details, wall section, building section and sectional elevations. Drawing and detailing of civil engineering structure e.g. bridges, dams, foundations.

CVE 351: Civil Engineering Materials (2 UNITS)
Concrete Technology: Cement: manufacture, types and characteristics. Aggregate: Types and properties. Water and Admixture. Concrete mix Design, properties and their determination. Steel technology: Production, Fabrication and properties: Corrosion and prevention. Test on steel and quality control. Timber Technology: Types of wood, properties, defects, stress grading, preservation and fire protection. Timber products and uses in construction. Bituminous materials, Asphalt and tar and their properties. Other materials: Rubber, Plastics, glass lime, brick, paint, garnishee, ceramic products building stones, non-famous materials etc application to building and civil engineering works.

CVE 381: Fluid Mechanics II (3 UNITS)
Fluid statics and stability. Dynamics of fluid flow-conservation equation of mass and momentum. Euler and Bernoulli equations. Introduction to uncompressible viscous flow. Reynold's number Dimensional analysis- philosophy similitude, Buckingham PI theories-m Applications Hydraulic models. Flow measurements. Flow meters. Error in measurement.

CVE 311: Soil Mechanics 1 (3 UNITS)

Introduction: Origin and formation of soils, soils-water-air voids relationship soil grain and soils aggregate properties. Index properties including grain size distribution identification of soils, clay mineralogy, permeability and capillarity of soils. Effective stress law seepage forces and quicksand phenomenon. Compressibility and consolidation of soil. Secondary consolidation and creep failure theories and shear strength characteristics of soils. Stress history and its effects on soil behaviour.

CVE 321: Civil Engineering Laboratory (1 Unit)

Materials testing covering the various courses taught in the semester. The areas to be covered include structural elements, soil mechanics, construction materials etc.

CVE 391: Civil Engineering Analysis (2Units)

Differential Equations, definitions, types, formation of differential equation, solutions using direct integration, separable of variables, homogenous method, integrating factor method, exact equation method, application of differential equation in structural engineering, water resources engineering, transportation engineering, etc. Laplace transforms, inverse Laplace and application.

CVE 322: Civil Engineering Laboratory Practice II (1 Unit)

Continuation of CVE 321, covering the course for the second semester.

CVE 372: Engineering Surveying & Photogrammetry (2 Units)

Chain surveying compass surveying – methods: contours and their uses. Traversing – methods and applications. Leveling – Geodetic leveling –errors and their adjustments. Applications tachometry – methods: substance heightening. Self-adjusting and electromagnetic methods. Introduction to photogrammetry.

CVE 392: Civil Engineering Analysis II (2 Units)

Fourier series filter coefficient even and odd functions, sine and cosine function simple application gamma, beta and probability function. Differential equation of second order service solutions.

CVE 382: Water Resources and Environment Engineering (3 Units)

Design of hydraulic structures, dam spillways etc. design of drainage works introduction to public health engineering. The role of the environmental engineer, characterizes of water and wastewater (physical, chemical and biological characteristics) basic methods of analysis basic microbiology and ecology water related disease. Water supply water source characteristic of water from different sources estimate of population and water consumption intake homes, distribution system analysis waste water treatment. Unite of operation of air and water; quality control; solid waste management environment quality standard etc.

CVE 374: Transportation and Highway Engineering (3 Units)

Introduction - General transportation system. Design operation management and maintenance of transportation system (highway, air railway etc) layout of highway airports and railroads with

traffic flow modes capacity analysis and safety. Design of facilities and systems with life cycles costing procedure and criteria for optimization.

CVE 334: Structural Mechanics (Theory of Structures) (3 Units)

Analysis of determinate structures. Beams, Trusses: Structure theories, Graphical Methods: Application to simple determinate Trusses: Willmott Mohr-diagram. Deflection of statically determinate structures. Unit load, Moment area methods, Strain Energy Methods: Introduction to statically indeterminate Structures: geometrical redundancy, geometrically constraints, degree of geometrical redundancy. Theory of three moments and slope deflection. Symbols and conventions.

CVE 342: Building Services Engineering (2 Units)

Engineering study of the materials and equipment used on mechanical and electrical services of building. Design of building services components. Modern building operation; selection of necessary equipment, specific topics like illuminations of building, comfort, heat loss and heat gain, air conditioning and climate control, water supply and fire protection. Drainage systems, plumbing and sewage disposal, elevators, escalators, building acoustics Building & maintenance and rehabilitation, building failures, shoring, underpinning scaffolding.

400 LEVEL

CVE 433: Design of Structures I (2 Units)

Fundamentals of design process, materials selection, building regulations and relevant codes of practice, design philosophy, elastic design: limits state designs. Design of structural elements in reinforced concrete singly reinforced beans; slabs spanning in one direction, shear bond; doubly reinforced beans, T and L beans, axially loaded columns.

CVE 431: Structural Mechanics II (3 Units)

Indeterminate structural analysis. Energy and virtual work methods slope deflection and Moment Distribution Methods. Influence coefficient method. Second theorem of Castigilano least work theorem. plastic instability. Simple plastic theory of bending collapse loads. Stress - grading of timber; visual mechanical and electronic stress grading of timber. Dynamics of structures of single degree of freedom.

CVE 411: Soil Mechanics II (2 Units)

Site investigations, mineralogy of soils structures compaction and soil stabilization settlement analysis prediction of total and differential settlement, allowable theories and open cuts – slope stability analysis.

CVE 471: Engineering Surveying and Photogrammetry (2 Units)

Further work on contours and contouring. Methods of contouring contour interpolation and uses of contour plants and maps. Areas and volumes. Setting out of engineering works. elementary topographical surveying. Elements of photogrammetry. Photogrammetric equipment and errors of

measurements.

CVE473: Highway & Transportation Engineering (2 Units)

Soil engineering aspects of highways compaction and soil stabilization. Pavement materials and laboratory tests. Airport engineering classification of airports and aircraft characteristics. Airport terminology, planning and design of airport runway design. Railways introduction to railway engineering location surveys and alignment, railroad structures and design.

CVE 481: Water Resources Engineering (2 Units)

Introduction to hydrology, hydraulic and water resources planning. Laminar and turbulent flows. Boundary layer separation life and drug. Stream function velocity potential and application to flow nets. Steady and unsteady flow in closed conduits principles of surface water hydrology. Analyses of hydrographic data. Land drainage and inland navigation problems.

CVE 441: Civil Engineering Practice (2 Units)

Introduction construction economics and project management civil engineering works standard method of measurement: measurement process taking of squaring abstracting and billing measurement for civil engineering works (content, steel earthwork etc) contracts and sub – contracts form of civil engineering contract. Commissioning construction work and supervision, position and responsibilities of the client contractor and engineer. Job planning, contract and decision – programme charts – bar check critical path method etc construction machinery and equipment types of earthmoving and materials handling equipment.

CVE 421: Civil Engineering Lab/ Design (1 UNIT)

Laboratory and field work on the courses for the semester.

500 LEVEL

CVE 535: Design of Structures II (3 Units)

Fundamentals of design process: material selection, codes of practice. Limit state philosophy and design on steel; elastic and plastic moment designs. Design of structure element in steel and connections and joint. Limit state philosophy and design in timber. Design of structural elements in timber and timber members.

CVE 537: Structural Mechanics III (3 Units)

Plastic methods of structural analysis stress – strain relation, plastic moment, shape of plastic hinge collapse mechanism. Matrix methods of structural analysis, elastic instability, continuum of plane strain, elastic flat plates and torsion solution by series, finite difference, finite element: yield line analysis and strip methods for slabs.

CVE 511: Geotechnical Engineering I (3 Units)

Site investigations, field and laboratory measurement. Engineering property of "soils" for design. Plastic Equilibrium Theory. Design of footings combine footing and raft foundations, differential

settlement, earth structures excavation, shallow and deep foundations, single piles group action, coffer dams, bracing and strutting techniques. In-situ testing.

CVE 571: Highway and Transpiration Engineering (2 Units)

Highway planning and traffic surveys origin and destination studies. Purpose, joining cordon and internal surveys processing survey data. Introduction to trip generation and attraction. Trip distribution, modal split and route assignment.

CVE 581: Water Resource Engineering (2 Units)

The hydraulic of open channels and wells drainage. Hydrograph analysis reservoir and flood routing hydrological forecasting, hydraulic structures ie. Dams, dykes/levees, docks and harbours, spillways, silting basins, man holes and coastal hydraulic structures etc. engineering economy in water resources planning

CVE 541: Construction Engineering (2 Units)

Construction practices and professional relations. Earth-works, equipment, capital outlay and operating cost. Form work design, component assembly, improvement of productivity and construction practices, safety, project financing insurance and bonding control terms. Solutions to job site and engineering problems in buildings and heavy construction in Nigeria.

CVE 593 AND CVE 594: Project I and II (6 Units)

The two courses are examinable at the end of the academic session. For proper guidance of the students, projects will depend on the available academic staff expertise and interest but the projects should be preferably of investigatory nature. Students should be advised to choose projects in the same area as their option subjects.

CVE 591: Civil Engineering Seminar (1 Unit)

Discussion of civil Engineering problems by students, invited lecturers and others. Report presentation by students.

CVE 523 Engineering Laboratory/Design (I Unit)

Practicals/Design along with the courses in the semester.

CVE 575: Advanced Highway Transportation Engineering I (3 Units)

Study fundamental operation solutions to traffic streams flow and its parameters; fundamentals of highway signals and markings; signal system types and their design and operation. Studies of intersection gap acceptance flow density relationships, shock wave phenomena, car following models, hydrodynamic analysis, acceleration and noise implications of insights of flow theory for design.

CVE 583: Advanced Water Resources Engineering I (3 Units)

Qualitative Evolution of water Quality management alternatives. Legislation pertaining to drinking water and wastewater. Methods for environmental; impact analysis, including oxygen

balance, toxicity, enrichment. Eutrophication Advanced; water and wastewater treatment processes. Water recycle/reuse and industrial wastewater treatment.

CVE 515: Advanced Geotechnical Engineering I (3 Units)

Engineering geology. The behavior of rocks and soil in building and engineering construction foundations, tunnels, dams, and flood control work with reference to the importance of mineral composition of earth and rock material, their geomorphic and geological features and their stress history. Field investigation.

GEN 592: Professional Practice (2 Units)

Principles of good practices of professional Engineers in relation to other sister professionals and the interest of clients and the public. The rules of professional practice; the Registration Bodies and their regulations Joint Consultative Council. SIWES programmes; partnerships and consortia design and manufacture Role of professional Engineers, Tendering and Bidding strategies. Consultancy practices and their regulations etc. code of ethics.

CVE 536: Design of Structures III (2 Units)

Composite design and construction in steel and reinforced concrete, design of structural foundations. Pre-stressed concrete design: modern structural form: tall buildings, lift shafts and shear walls, system buildings: design projects.

CVE 512: Geotechnical Engineering (2 Units)

Special foundation prostems, shoring and under pinning of foundations, swelling pressure of soils dynamics and machine. Foundation design. Stressed in soils, consolidation and settlement shear strength of soils. Barth pressures. Bearing capacity of soils foundations: normal and deep foundations. Slope stability. Site investigations.

CVE 584: Water Resources Engineering (2 Units)

Design of large-scale hydraulic structures: dams, spillways, stilling basins. Design of culverts and channel; transitions. Introduction methods of irrigation engineering, reservoir design studies and management. Canal regulation works, cross drainage works coastal engineering: introduction, wav and current forces on a circular cylinder or pile. Mathematical techniques in ground water flow-analytical and numerical solutions and simulation. Finite difference and finite element techniques in groundwater modeling.

CVE 574: Transportation & Highway Engineering (2 Units)

Transportation planning and economics. Traffic management and design of traffic signals. parking geometric design construction methods, construction materials and laboratory tests.

CVE 586: Waste Management Engineering (2 Units)

Quantity and quality of sewage, including important parameter for the determination of quantity and qualities. Sewage system planning, design, construction and maintenance sewage treatment processes including various units' operations. Non-conventional sewage treatment processes

including sewage farming, waste stabilization ponds, aerated lagoons and oxidations ditch. Sewage disposal methods including water-dependent and water independent methods water pollution control. Solid waste quantity and quality determination, collection, transpiration and disposal methods. Institutional arrangements for management.

CVE 542: Terotechnology (2 Units)

Salvaging of structures, repairs and demolition. Evaluation of building performance.

CVE 538: Advanced Structural Design (3 Units)

Design of structural foundations. Pre-stressed concrete design. Principles of pre-stressing, methods of pre-stressing, losses of pre-stressing. Fundamentals of pre-stressed concrete design. Parts of a bridge structure; deck: deck, piers, abutment. Classification of Bridge Based on functions, geometry, material behaviour. Loadings, Design moment and shears.

CVE 588: Advanced Water Resources Engineering 11(3 Units)

Study of basic laboratory principles of water Chemistry, microbiology and their application to water supply, wastewater treatment, water and land control.

CVE 576: Advanced Highway and Transportation Engineering II (3 Units)

An in-depth study analysis of conventional and emerging public transportation state of the art system. Brief review of conventional transportation system, study of bus rapid systems. Demand responsive bus system, personal rapid transit, dual mode guild way and automated freeway system and high-speed rail. TAC systems. Review of current transportation administration, systems research and demonstration programme.

CVE 518: Advanced Geotechnical Engineering 11 (3 Units)

Earth structures (earth dams) and slope stability; the choices of type of dam design construction and control of dams embankments and slopes. Principles of dams design explorations, ground water control, construction procedures and equipment. Foundation subjected to dynamic forces. The initial and long-term stability of earth retaining structures. Rock Mechanics, mining engineering, and rock excavation, drilling, blasting techniques.

CVE 591: Technical Seminar (1 Credit)

Presentation and discussion of literature review of current topics in Civil engineering to be assigned to the 'students. It should normally be different from the students' research topic. *Pre-requisite*: Good academic standing.

CVE 593: Final Year Project I (3 Credits)

An individually supervised research project on any Civil Engineering (or related) subject chosen by the student-lecturer team. Pre-requisite: Good academic standing.

CVE 594: Final Year Project II (3 Credits)

An individually supervised research project on any Civil Engineering (or related) subject chosen by the student-lecturer team. Pre-requisite: Good academic standing.

11.1 UNDERGRADUATE PROJECT REPORTING FORMAT

Project report is classified into two which include: 1) Preliminary pages and 2) Main Body of the work.

Preliminary Pages

The followings pages make up preliminary pages. (i) The Title Page (ii) Declaration Page (iii)Approval Page (iv) Certification Page (v) Dedication Page (vi) Acknowledgement Page (vii) Abstract Page (viii) Table of Contents Pages (ix) List of Figures Page(s) (x) List of Table(s) page(s) (xi) List of Symbols Page(s) (xii) List of Abbreviation and Meanings Page(s) (xiii) List of Appendices Page(s).

Main Body of the Project

The main body of the project report is reported in five (5) chapters

CHAPTER ONE (Centralise)

INTRODUCTION (Centralise)

1.1 Background of the Study
1.2 Statement of the Problem
1.3 Aim and Objectives
1.4 Scope of the Project
1.5 Significance of the Project
1.6 Project Report Organisation
1.7 Problems Encountered.

CHAPTER TWO (Centralize)

LITTERATURE REVIEW (Centralise)

2.1 The sub titles should start with the key words of your project topic. Your supervisor will guide you appropriately etc.

CHAPTER THREE (Centralise)

MATERIALS AND METHODS (Centralise)

3.1 Materials Used
3.1.1
3.1.2 etc.
3.2 Methods

Your supervisor will guide you appropriately

CHAPTER FOUR (Centralise)

SYSTEM DESIGN, IMPLEMENTATION AND TESTING (Centralise)

4.1 System Design

4.1.2 Design Calculation

4.1.3 Software System Design (where applicable)

4.1.4 Completed Design

Etc.

4.2 System Implementation

4.3 Testing and Packaging

CHAPTER FIVE (Centralise)

BEME, CONCLUSION AND RECOMMENDATION (Centralise)

5.1 BEME

5.2 Conclusion

5.3 Recommendations

References

Appendices

NOTES

1. The wordings of the "Declaration" is as seen below

DECLARATION

I certify that this work titled "**Your Topic**" is an original investigative work done by me **Your Name, Your MAT. NO** which was executed under the supervision of **Name of Your Project Supervisor**. I affirm that all research associated with this work rests on information sourced by me, from authorized references which are acknowledged both within the body of the text and the reference section of this study.

Your Name _____ _____

Sign Date

2. The Departmental Board Agreed wordings of Approval and Certification Pages are as seen below

APPROVAL PAGE

This is to certify that the Department of Civil Engineering academic board of the Imo State University, Owerri has approved the project topic titled: **Your Project Topic** for **Your Name and MAT. No**

_____ _____

NAME OF HOD DATE
(HEAD OF DEPARTMENT)

CERTIFICATION

This is to certify that this project titled: "**Your Project Topic**" was carried out by **Your Name and MAT. No** under the supervision of **Name of Your Project Supervisor** of the Department of Civil Engineering, Imo State University, Owerri.

_____ _____

Name of Your Project Supervisor Date

(Supervisor)

_____ _____

NAME OF HOD DATE
(HEAD OF DEPARTMENT)

3. For referencing and citations, Civil Engineering Department use **APA Referencing and Citation format.**
4. Font size recommended is **12** while **Times New Romans** is the Font style recommended
5. The numbering in preliminary pages is in **Roman Numerals** while that of the Main Body is in **Arithmetic numerals**
6. **Double line spacing** is also recommended and **NOT** more than that.
7. **Abstract is one paragraph with single line spacing**