UNIVERSITY OF AGRICULTURE AND ENVIRONMENTAL SCIENCES, UMUAGWO, IMO STATE

STUDENTS' HANDBOOK

FOR
B. ENG. IN CIVIL ENGINEERING

2024

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1. Introduction

1.1 Motto of University of Agriculture and Environmental Sciences (UAES)

Nurturing Minds, Cultivating Futures

1.2 Vision Statement of Agriculture and Environmental Sciences (UAES)

To be a global leader in innovative research, education, and outreach in agriculture and environmental sciences, contributing to sustainable development."

1.3 Mission Statement of Agriculture and Environmental Sciences (UAES)

Our mission is to provide a transformative learning experience, conduct cutting-edge research, and engage with communities to address challenges in agriculture and environmental sustainability.

1.4 Philosophy and Aspiration of Agriculture and Environmental Sciences (UAES):

At UAES, we believe in fostering a culture of excellence, creativity, and sustainability in agriculture and environmental sciences to empower future generations and make a positive impact on society and the environment.

2. National Symbol

2.1 The National Anthem of Nigeria

Arise, O compatriots, Nigeria's call obey
To serve our fatherland
With love and strength and faith
The labour of our heroes past
Shall never be in vain
To serve with heart and might
One nation bound in freedom, peace, and unity.
Oh God of creation, direct our noble cause
Guide our leader’s right
Help our youth the truth to know
In love and honesty to grow
And living just and true
Great lofty heights attain
To build a nation where peace and justice shall reign.

2.2 The National Pledge

The National Pledge of Nigeria is as follows:

"I pledge to Nigeria, my country
To be faithful, loyal, and honest
To serve Nigeria with all my strength
To defend her unity
And uphold her honour and glory
So help me God."

3. University Information

3.1 University of Agriculture and Environmental Sciences (UAES) Anthem

1st Stanza

University of Agriculture and Environmental Sciences
The home of knowledge, innovation and excellence.
The pride of the eastern heartland and star of the nation
We create a better tomorrow by grooming scholars and leaders
Beyond the boundaries of race, creed and gender.

Refrain:
UAES!!! Eagles of the world
Soaring in heights of excellence.
We are Great Innovators, Yes! We are
UAES!!! Eagles of the world (twice)

2nd Stanza

Mother Nature I W e care and cherish thee, “A gift to us from the creator”
We pray for light and wisdom, to preserve, protect and sustain thee
That each day we may grow in knowledge, intuition and moral strength
And through all our efforts, innovations and discoveries,
The earth will be renewed and become a better place.

3.2 Names of the Principal Officers of UAES

Administrators

S/N	Position	Names	Qualifications
1	Ag. VICE-CHANCELLOR.	PROF. CHRISTOPHER C. EZE	B.Agric. (Hons), MSc., PhD (UNN) L.L.B., B.L., Dip. in SMES
2	REGISTRAR.	PRINCE E. E. NJEMANZE	B.A (HONS), PGDIS, MBA, FCAI

3	BURSAR.	ROBERT N. ANIKPUTA	MBA, MSC, FCA
4	UNIVERSITY LIBRARIAN.	PROF. (MRS) C. C. NWOSU	BLS, MLS, Ph.D.

Deans and Directors

Deans

S/N	Position	Name
1	Ag. Dean, Faculty of Agriculture	Dr. C. O. Osuagwu
2	Dean, Faculty of Science and Computing	Prof. Chika Ogueke
3	Dean, Faculty of Environmental Sciences	Prof. Mounmbegna Phillippe
4	Ag. Dean, Faculty of Engineering	Dr. M. M. Chukwu
5	Ag. Dean, Faculty of Arts, Social and Management Sciences	Dr. C. C. Ike

Directors

S/N	Position	Name
1	Dir Academic Planning	Prof. (Mrs) V. A. Iwueke
2	Dir. Continuous Education	Prof. Emmanuel Uttah
3	Ag. Dir. Entrepreneurship	Dr. D. O. Echeta
4	Ag. Dir. ICT / Exams	Dr. L. Orji
5	Ag. Dir. Research & Development	Engr. Dr. C. Ononogbo
6	Dep. Dir. Physical Planning	Mr. C. Osuagwu
7	Chief Medical Officer	Dr. M. C. Ogaraku

4. Department Information

4.1 Names, ranks, and qualifications of academic and non-academic staff

Academic Staff in Civil Engineering Department

S/No	Name	Qualification with dates	Rank/Designation
1.	Engr. U. G. Eziefula	B.Eng., M.Eng.	Lecturer I/Ag. HOD
2.	Engr. Dr. E. C. P. Ohaji	B.Eng., M.Eng., Ph.D.	Lecturer II
3.	Engr. M. C. Uwaezuoke	B.Eng., M.Eng.	Lecturer II
4	Engr. D. O. Uwaoma	B.Eng., M.Eng.	Assistant Lecturer
5.	Engr. L. U. Stephen	B.Eng., M.Eng.	Assistant Lecturer

Non Academic Staff in Civil Engineering Department

S/No	Name	Qualification with dates	Rank/Designation
1.	V. C. Ibeh	HND	Technologist I

Administrative Support Staff in Civil Engineering Department.

S/No	Name	Qualification with dates	Rank/Designation

4.2 Brief History of the Department

4.2.1 History and Background of the Department

The University of Agriculture and Environmental Sciences (UAES) in Umuagwo is a public university established by an Act of Imo State Parliament Law No. 4 of 2019 and Amended Law No. 7 of 2020. It is officially recognized as the 49th State University in Nigeria and the 171st in the Federation by the National Universities Commission (NUC) in 2019. The university is authorized to offer 29 programs under five faculties, including the Faculty of Engineering.

Engineering is the application of scientific knowledge to optimize the utilization of natural resources for the benefit of humanity. It involves using mathematics to solve

problems and is globally recognized as a profession. Aspiring students who wish to pursue a career in engineering must consider why they want to be an engineer and what qualities are required to become one.

Being an engineer provides an opportunity to solve significant problems faced by communities, local governments, cities, countries, and the world at large. However, not everyone is suitable for studying engineering. A genuine curiosity to solve problems, combined with a strong command of mathematics and physical sciences, is necessary to excel in this field. There are various branches of engineering to cater to different interests and nurture engineers with specialized knowledge in their chosen field.

The Faculty of Engineering at the University of Agriculture and Environmental Sciences, Umuagwo, currently offers six engineering programmes: Civil Engineering, Chemical Engineering, Petroleum Engineering, Mechanical Engineering, Electrical and Electronic Engineering, and Agricultural and Biosystems Engineering. The faculty's blueprint allows for potential growth in programs to meet emerging challenges and societal needs.

Civil Engineering was introduced with the admission of the 2021/2022 set of students. The curriculum for the Civil Engineering program includes several general and elective courses at each level of study. For example, at the 100 level in the first semester, there are 12 general courses and 1 elective course. In the second semester, there are 12 general courses and 1 elective course. The number of general courses varies across different levels, with some levels also including specific courses related to Civil Engineering, such as STW (short-term work) courses. The curriculum is designed to prepare graduates for engineering roles in the Civil Engineering industry. Elective courses are offered to provide students with a broader understanding of various disciplines.

5. Academic Overview

5.1 Overview of the Department as stated by NUC (CCMAS)

Civil engineers plan, design and supervise construction of many essential facilities and structures such as bridges, dams, roads, buildings, ports, etc. Included in the study of civil engineering are courses in water resources and environmental engineering that are directly related to the solution of hazardous waste and pollution problems, providing potable and economical water supply systems, and maintaining a safe environment.

5.2 Philosophy

The Bachelor of Engineering and Technology B.Eng/B.Tech degree programme in Civil Engineering is based on the philosophy that the rate at which a nation progresses technologically is determined to a great extent by the size, quality, motivation and orientation of its science and engineering workforce. The programme should, thus, seek to train civil engineers who can best contribute to national development. For this, they must be equipped with the tools to understand, analyse, design and construct and

maintain all possible physical facilities that can possibly promote appropriate development by conceiving and adapting techniques, processes and materials as necessary. In consequence of the above, the programme is structured in such a way that students will have opportunity to take courses that will provide a basic understanding of all areas of civil engineering practice.

5.3 Objectives

The objectives of the Civil Engineering programme is 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 the later years on, at least, several of the specialities. They would be equipped with:

1. a good grounding in basic engineering courses;
2. a good grasp of the essential application and utility courses;
3. a thorough understanding of the experimental and practical bases for the relevant theoretical engineering principles;
4. a good knowledge of all the various branches of civil engineering with further specialisation;
5. construction engineering and management skills (combining engineering and management skills to complete construction projects designed by other engineers and architects);
6. geotechnical engineering skills (analysis of soils and rock in support of engineering projects/applications - building foundations, earthen structures, underground facilities, dams, tunnels, roads.);
7. structural engineering skills (design of all types of stationary structures - buildings, bridges, dams);
8. surveying skills (measure/map the earth's surface in support of engineering design and construction projects and for legal purposes - locating property lines.);
9. transportation engineering skills (design of all types of transportation facilities/systems – streets/highways, airports, railroads, other mass transit, harbours/ports);
10. water resource skills (control and use of water, focusing on flood control, irrigation, raw water supply, and hydroelectric power applications);
11. environmental engineering (air pollution control, hazardous waste treatment and disposal, recycling and solid waste disposal, sanitary engineering (municipal and industrial water and wastewater treatment);
12. substantial practical skills for tackling real life engineering problems; and
13. knowledge of entrepreneurial and management principles upon which enterprising professional careers can be built.

5.4 Employability skills

1. ability to apply scientific and engineering principles to plan, design and supervise civil engineering projects;
2. skills to convey technical material persuasively to clients, colleagues and subordinates;
3. knowledge of contemporary issues and ability to keep up with emerging technologies relevant to executing civil engineering projects; and

4. capacity to utilise the skills acquired in government (including regulatory and executing agencies), industry (including consulting, construction organisations) and academia.

5.5 21st Century skills.

The 21st century skills includes the innovative skills:
1. creativity and innovation;
2. critical thinking/problem solving/decision making;
3. communication;
4. collaboration (team work);
5. Learning to learn/metacognition;
6. citizenship, local and global);
7. general computer literacy and mastery of relevant information technology;

5.6 **Job opportunities.**

Some of the job opportunities for civil engineers are in the following sectors:

- **Civil Services**: working for the government in various departments and agencies
- **Private Firms:** starting or joining a private company that offers civil engineering services
- **Armed Forces**: serving in the army, navy, or air force as a civil engineer.
- **Public Sector Undertakings (PSUs)**: working for state-owned enterprises that are involved in infrastructure, construction, or energy projects
- **Construction**: Planning, design, and executing various types of buildings and structures.

However, job opportunities for the Civil Engineers are booming in different areas of expertise such as Transportation Engineering, Environmental Engineering, Surveying, Structural Engineering, Estimation Executive, Site Engineers, Entrepreneurs in Civil Engineering, and Quality Experts.

The Other likely areas of job or career opportunities in Civil Engineering are listed in the table below:

(i) Costal and Ocean Engineering (ii) Geotechnical Engineering (iii) Construction Engineering (iv) Structural Engineering (v) Structural Engineering (vi) Bridge Engineering (vii) Land Development (viii) Hydraulic Engineering (ix) Transportation Engineering	(x) Environmental Engineering (xi) Fire Protection Engineering (xii) General Engineering (xiii) Irrigation Engineering (xiv) Materials Engineering (xv) Urban Engineering (xvi) Water Resources Engineering

5.7 Unique features as stated by NUC (CCMAS)

1.sound exposure to all areas of civil engineering, including environmental engineering;
2. good exposure to allied areas such as law, economics and management;
3. Familiarity with general knowledge, including philosophy, entrepreneurial skills and history;
4. ability to communicate ideas effectively using modern tools involving computers, internet and telecommunication; and
5. capacity of graduates to establish their own businesses and go into paid employment with government or in industry; or pursue further studies.

6. Academic Regulations

6.1 Academic Programmes, Duration, and Admission criteria

The CCMAS outlines the academic programs, their durations, and the admission criteria for undergraduate students. This information is crucial for universities to structure their offerings and ensure alignment with national standards.

Admission and Graduation Requirements
Admission Requirements
Candidates are admitted into the degree programme in either of the following two ways:
1. Unified Tertiary Matriculation Examination (UTME) Mode (5 Year Degree Programme)

2. Direct Entry (DE) Mode (4 Year Degree Programme)

Unified Tertiary Matriculation Examination (UTME) Mode

For the five-year degree programme, in addition to acceptable passes in the Unified Tertiary Matriculation Examination (UTME), the minimum admission requirement is credit level passes in Senior School Certificate (SSC) in at least five subjects, which must include English Language, Mathematics, Physics, Chemistry and other acceptable science subjects at not more than two sittings.

Direct Entry (DE) Mode

For four-year Direct Entry, in addition to five (5) Senior School Certificate (SSC) credit passes which must include English Language, Mathematics, Physics and Chemistry, candidates with at least two passes in relevant subjects (Mathematics, Physics and Chemistry) at the GCE Advanced Level or IJMB or JUPEB may be considered for admission. Candidates who have good National Diploma (ND) result in relevant Engineering Technology programmes may also be considered for

admission into 200 level. Holders of upper credit pass and above at Higher National Diploma (HND) level, are eligible for consideration for admission into 300 level.

Graduation Requirements

The following regulations shall govern the conditions for the award of a honours degree in Engineering and Technology:

1. Candidates admitted through the UTME mode shall have registered for a minimum of 150 and maximum of 180 units of courses during the 5–year engineering degree programme. Such candidates shall have spent a minimum of ten academic semesters.
2. Candidates admitted through the Direct entry mode shall have registered for a minimum of 120 and a maximum of 150 units of courses during a 4–year engineering degree programme. Such candidates shall have spent a minimum of eight academic semesters.
3. Candidates admitted through the Direct Entry mode at 300-Level shall have registered for a minimum of 90 and a maximum of 120 units of courses during a 3–year engineering degree programme. Such candidates shall have spent a minimum of 6 academic semesters.
4. HND holders who enter the degree programme at 300 level should register for a minimum of 90 units of courses and a maximum of 120 units of courses.
5. The minimum and maximum credit load per semester is 15 and 24 credit units respectively.
6. A student shall have completed and passed all the Courses registered for, including all compulsory courses and such elective /optional courses as may be specified by the university/faculty or department; obtained a minimum Cumulative Grade Point Average (CGPA) specified by the university but not less than 1.00.
7. A student shall also have earned the 15 credit units of Students Industrial Work Experience Scheme (SIWES), 8 credit units of University General Study courses and four credit units of Entrepreneurship courses. For the purpose of calculating a student's cumulative grade point average (CGPA) in order to determine the class of Degree to be awarded, grades obtained in ALL the courses registered, whether compulsory or optional and whether passed or failed must be included in the computation. Even when a student repeats the same course once or more before passing it or substitutes another course for a failed optional course, grades scored at each and all attempts shall be included in the computation of the GPA. Prerequisite courses must be taken and passed before a particular course at a higher level. Furthermore, if a student fails to graduate at the end of normal academic session, he or she would not be allowed to exceed a total of 15 semesters in the case of students admitted through UTME and 13 semesters in the case of Direct Entry students who entered at 200Level and 11 semesters in the case of students who entered at 300Level.

6.2 Inter-Disciplinary Transfer and Inter-University Transfer policies

Inter-disciplinary Transfer

A student may be allowed to change his/her degree programme after completing the first or second academic year in the university. The change may prolong the time the student will stay in the university.

Procedure

a) The student applying for the inter-disciplinary transfer shall have made a minimum cumulative grade point of 3.00 on a five-point scale.
b) The student must possess at the time of entry to the university the entry requirements of the new programme to which he/she wishes to transfer
c) Inter-disciplinary transfer application forms which the student must complete are obtainable from the office of the registrar on presentation of the receipt for payment of the stipulated fee.
d) The registrar shall send the completed application forms to the relevant faculty/Department for recommendation.
e) Normally, not more than 10% of the number of the students admitted into a discipline for any one year shall be allowed to change their degree programmes.
f) Successful applicants shall be credited with those courses, including General Studies courses, taken in their former disciplines which are relevant to the new disciplines.
g) The receiving HoD shall have the responsibility of deciding on the relevance or otherwise of the courses taken in a student's previous discipline.
h) The registrar shall inform the applicants in writing of the results of their application.
i) The option to transfer can only be exercised once, and is without prejudice to the length of time required for graduation in the department concerned/
j) The completed application form with respect to inter-University Transfer shall submitted to the office of the Registrar for collation and presentation to the receiving Dean, and then to the HoD, who shall make recommendation and send back to the registrar through the Dean for appropriate action.

Inter-University Transfer

a) Transfer students must come from Universities recognized by UAES and shall spend a minimum three academic sessions before graduation.
b) Students seeking transfer to UAES must have met the minimum entry requirements as well as the special entry requirements of the department to which they want to transfer
c) To be eligible for transfer, a student shall have achieved a minimum cumulative grade point average of 3.00 on a five-point scale.
d) In determining the final grade point average for the graduation of a transferred student, account shall be taken of the courses offered at both UAES and the student's former University.
e) In all cases, no transfer shall be allowed into the 100 level.

Procedure

a) Students wishing to transfer to UAES must complete the application the application form for transfer obtainable from the Registry on payment of the stipulated fee into a designated University Account with receipt daily issued by the Bursary Department.
b) The completed application forms with respect to inter-university shall be submitted to the office of the Registrar for collation and presentation to the receiving Dean, then to the HoD, who shall make a recommendation and send back to the Registrar through the Dean for appropriate action.
c) The registrar shall inform candidates of the results of their application for transfer.

d) Normally, the number of students offered admission by transfer shall not exceed 10% of the discipline/s total admission in any one year.
e) A transfer student shall register for and be examined in, or otherwise make up for, all and compulsory courses which he or she did not take or pass in his/her former University.

6.3 Registration, Matriculation, Adding/Dropping courses, Duration of

Academic Year

(i) Registration and matriculation

Registration period

a) Normal registration of courses for both the first and second semester shall be at the beginning of the first semester of the academic session, and shall last for two weeks from the date the exercise begins/

Late registration

a) Students may be given permission for late registration upon payment of the stipulated late registration fee. Late registration shall not last beyond 2 weeks from the expiration of the official registration period.
b) At the expiration of the extra 2 weeks of late register shall lose that session.

Registrable courses, coding and numbering

a) Depending on the Department, a student shall take the following categories of courses: core courses, required courses, General Studies courses and electives/
b) Each course is designated by a 3-letter code e.g., "GST" for General Studies.
c) Course numbering is according to the level of course and each course is represented with 3 digits, e.g., 101, 202, 301, 401 and 502 in a five-year programme. Odd numbers are first semester courses, while even numbers are second semester courses, but numbers with two zeros, e.g., 300, are those taken in between semesters or sessions.

Procedure for registration (Manual)

a) At confirmation of payment of school fees, the student is given the course registration form which is quadruplicate.
b) Registration commences firstly by paying all school fees.
c) The Academic Adviser guides the student in the registration of courses for the session
d) After the completion of the course registration, the course registration form must be approved and endorsed by the academic adviser and HoD respectively.
e) At the completion of course registration, the quadruplicate form is distributed as follows: (a) Registrar (b) Dean of Faculty (c) HoD (d) Academic Adviser.

Please Note: The Add and Drop form should likewise be in quadruplicate and distributed as recommended above.

Procedures for Online Registration

a) The registration commences with payment of fees by the student who is then given an access code for registration
b) The student then accesses the registration portal with the assigned code to register for the courses for the given session

c) The portal limits the students on the courses Registrable
d) The portal also closes at the expiration of deadline for registration
e) The registration portal opens again for late registration at a specified fee
f) The student is assigned an access code on the payment of late registration fee.
g) Portal for registration closes again after the expiration of the deadline for late registration.

(ii) Adding/Dropping Courses: During the semester, students can add or drop courses within specified deadlines. Adding a course allows them to join a class they initially didn't register for, while dropping a course removes it from their schedule.

(iii) Duration of Academic Year: The universities typically follow a two-semester system, with each semester lasting approximately **15 weeks**. The academic year usually begins in September and ends in June, with breaks for holidays and examinations.

6.4 Examination Misconduct and Disciplinary Measures

Within the CCMAS are provisions addressing examination misconduct and disciplinary measures to uphold academic integrity and ensure fair evaluation processes. These measures are essential for maintaining high standards of education and ethical conduct among students. Check in subsection 6.4.1 details on regulations.

6.4.1 Examination Misconduct and Disciplinary Measures

Examination misconduct is any one of a range of unfair practices or infringement of UAES examination regulations before, during and / or after conduct of an examination. These include but are not limited to:

- impersonation
- students copying each other
- students bringing in into the examination hall papers, mobile phones/phone hearing/ communication accessories, other materials (including programmable electronics or calculators, except where specifically required for the course) relevant in whatever form to the examinations
- all forms of communication between students during an examination
- causing any form of disturbance
- not obeying the invigilators
- and undue influence on or unlawful contact with examiners and other staff
- as well as aiding and abetting by non-UAES students and personnel.

Disciplinary Measures

The disciplinary measures prescribed for suspects involved in examination misconduct in UAES as approved by UAES senate are stated on the table below

S/N	NATURE OF OFFENCE	PRESCRIBED PUNISHMENT
1	Possession of a mobile phone, Smart phone or other electronic devices inside the examination hall.	Rustication for one (1) academic session
2	Second offender for all misconduct cases.	Expulsion.
3	Impersonation during examination	Rustication for two (2) sessions
4	Fighting Examination Supervisor(s), invigilators(s), etc.	Expulsion.

5	Breaking in and unofficially obtaining question papers	Expulsion.
6	Exchange of Answer booklets	Rustication for one (1) academic session
7	Exchange of materials inside examination hall.	Rustication for one (1) academic session
8	Collaborative copying	Rustication for one (1) academic session.
9	Smuggling of question paper or examination material in or out of the examination hall.	Rustication for two (2) academic sessions.
10	Refusal to appear before a panel.	Rustication for one (1} academic session in the first instance.
11	Forging/altering result grades and signature of officials	Expulsion.
12	Coming into the hall with a gun or any other dangerous weapon.	Expulsion
13	Threatening a staff or members of their families verbally or in writing	Rustication for two (2) academic sessions.
14	Procuring and altering a medical certificate in order to obtain a deferment of examination	Rustication for one (1) academic session
15	Sorting/alteration of examination grades by whatever means (e.g. writing of examinations outside the examination venue, etc.	Expulsion.
16	Submission of forged registration materials (credentials, results, affidavits, etc.).	Expulsion
17	Plagiarism (assignments, projects, thesis).	As approved by Senate
18	Destruction/obstruction of examination misconduct evidence (e.g. running away with answer booklet chewing incriminating materials, etc.).	Rustication for two (2) academic sessions. ,

6.4.2 EXPULSION FROM THE UNIVERSITY

a) Studentship may be terminated at any point through expulsion from the University on grounds of gross misconduct or intellectual inability to benefit from the academic programmes offered by the University
b) An expelled student shall not be readmitted.
c) Review of Scripts of aggrieved candidates
d) A student aggrieved by his grading may in the first instance, petition the registrar through the HoD and Dean for a review of his/her script after payment of a Senate stipulated fee, stating in detail the ground (s) for the application within one week of the release of the result. The candidate shall specifically reject the published result. The registrar shall refer the petition to the College / Faculty Board through the Provost / Dean.
e) On receipt of the petition, the Provost / Dean shall convene a meeting of the collage / Faculty Board to consider the petition. If the board is satisfied that a *prima facia* case has been made, permission is sought from the Senate for the script to be reviewed, thereafter, the Provost/Dean sets up a Review Panel comprising two internal examiners not involved in the earlier marking scheme, and report to the provost/Dean. If the course is a final year second semester

course, the result of the review is sent to Senate for final determination along with the original score and the recommendation of the college / faculty Board. If the college / Faculty Board decide that a prima facie case has not been made, it shall write in detail the reason (s) for its decision and convey same to Senate through the Vice-Chancellor for disposal action.

f) Where it is established that a student was failed because of a relationship with the lecturer involving such thing as sexual harassment, intimidation, etc. the lecturer shall face appropriate disciplinary action.

a) Where a student is established to have made false claim against a lecturer, he/she shall face disciplinary action for exam misconduct and damage of character.

7. Academic Procedures

7.1 Class Periods, Attendance requirement

The CCMAS outlines the schedule of class periods and underscores the importance of regular attendance for academic success. Class periods are typically structured to accommodate lectures, seminars, laboratory sessions, and other instructional activities essential for students' learning outcomes. Students are expected to attend all scheduled classes unless excused for valid reasons, such as illness or other extenuating circumstances.

Attendance requirements are established to ensure students actively engage with course material and participate in classroom discussions and activities. While specific attendance policies may vary across programs and courses, students are generally expected to maintain a minimum level of attendance to remain in good academic standing. Failure to meet attendance requirements may result in academic penalties, such as reduced grades or exclusion from assessments.

The CCMAS emphasizes that consistent attendance is integral to students' overall academic progress and success. It promotes a culture of responsibility and accountability among students, encouraging them to prioritize their educational commitments and actively participate in their learning experiences. Additionally, faculty members are encouraged to monitor and support students' attendance, providing necessary guidance and interventions to address any attendance-related concerns promptly.

Overall, the section on Class Periods and Attendance Requirement in the CCMAS serves to establish clear expectations and standards regarding student attendance, fostering an environment conducive to learning and academic achievement.

7.2 Withdrawal, Re-admission procedures

The CCMAS provides structured procedures for students who need to withdraw from their academic programs temporarily or permanently. Students considering withdrawal are encouraged to consult with academic advisors or designated staff

members to discuss their options and explore alternatives before making a final decision.

To initiate the withdrawal process, students are typically required to complete and submit a formal withdrawal request form to the appropriate administrative office. This form may include details such as the reason for withdrawal, expected duration (if temporary), and any outstanding obligations or responsibilities to be addressed before withdrawal can be finalized.

Upon receipt of the withdrawal request, the institution reviews the student's academic and financial status to ensure all necessary steps are taken to facilitate a smooth transition. This may involve settling outstanding tuition fees, returning borrowed materials, or completing any remaining coursework or assessments as per institutional policies.

Students who wish to return to their academic programs after a period of withdrawal must follow the re-admission procedures outlined in the CCMAS. Re-admission typically requires submitting a formal application for readmission within a specified timeframe, along with any supporting documentation or materials requested by the institution.

The re-admission process may also involve a review of the student's academic record, including previous performance and any changes in circumstances since the time of withdrawal. Depending on the duration of absence and program requirements, students may need to meet certain conditions or undergo additional assessments or interviews to ensure readiness for re-entry into their academic programs.

By providing clear guidelines and procedures for withdrawal and re-admission, the CCMAS aims to support students in making informed decisions about their academic journeys while maintaining the integrity and standards of the institution's programs. These procedures also help streamline administrative processes and ensure consistency and fairness in handling withdrawal and re-admission requests across various academic programs and disciplines.

7.3 Lectures, Examination Timetable, External/Internal Examinations

The CCMAS provides guidelines to ensure the effective delivery of lectures, the establishment of examination timetables, and the conduct of both external and internal examinations. These guidelines are designed to maintain academic rigor, fairness, and integrity throughout the assessment process.

1. Lectures:
   - The CCMAS outlines expectations for lectures, including their frequency, duration, and format. It may specify the roles and responsibilities of instructors in preparing and delivering lectures effectively.
   - Emphasis is placed on creating engaging and interactive learning experiences that facilitate student participation and understanding of course material.

- Faculty members are encouraged to incorporate diverse teaching methods and resources to accommodate different learning styles and enhance student learning outcomes.

2. Examination Timetable:
- The CCMAS establishes procedures for scheduling examinations to minimize conflicts and ensure adequate preparation time for students.
- Examination timetables are typically published well in advance to allow students to plan their study schedules accordingly.
- The timetable may include details such as the dates, times, and locations of examinations, as well as any special instructions or accommodations for students with disabilities or other needs.

3. External/Internal Examinations:
- The CCMAS outlines protocols for the conduct of both external and internal examinations to uphold academic standards and fairness.
- External examinations refer to assessments administered by external examining bodies or accrediting agencies, while internal examinations are conducted by the institution itself.
- Guidelines may include instructions for exam proctors, rules regarding exam security and integrity, and procedures for handling exam irregularities or misconduct.
- Measures to ensure the confidentiality and impartiality of exam grading processes may also be addressed.

Overall, the section on Lectures, Examination Timetable, External/Internal Examinations in the CCMAS aims to promote excellence and equity in academic assessment practices. By providing clear guidelines and procedures, the CCMAS helps to ensure consistency and transparency in the delivery and evaluation of educational programs across various disciplines and levels of study.

8. Assessment and Results

8.1 Review of scripts for aggrieved candidates

Reviewing scripts for aggrieved candidates in Civil Engineering department involves setting a formal process to address concerns or disputes regarding grades, assessments, or other academic matters. Here's a general outline of how this process might be conducted:

Submission of Grievance: Aggrieved candidates should submit a formal written grievance outlining the specific concerns or issues they have with the grading or assessment of their scripts. This submission should include any relevant evidence or documentation to support their claim.

Appointment of Review Panel: A review panel or committee, typically composed of faculty members and administrators who were not involved in the original assessment, is appointed to review the grievance. The panel should be impartial and objective.

Review of Scripts: The review panel carefully examines the scripts in question, comparing them against the grading criteria and standards established for the

assessment. They may also consider any additional evidence provided by the aggrieved candidates.
Interviews or Hearings: In some cases, the review panel may conduct interviews with the aggrieved candidates, the original assessors, or other relevant parties to gather more information or clarify any discrepancies.
Evaluation of Grievance: Based on their review, the panel evaluates the validity of the grievance and determines whether there were any errors or inconsistencies in the original assessment.
Decision and Recommendations: The review panel presents its findings and recommendations to the appropriate university authority, such as the Dean or Academic Board. This may include recommendations for grade adjustments, reassessment, or other remedial actions.

8.2 Determination of results, Transcript issuance

This process typically involves:

1. **Assessment Completion**: Once all assessments, including exams, assignments, projects, and any other required tasks, have been completed by students, instructors or grading personnel evaluate the performance of each student based on established criteria.

2. **Grading**: Grading involves assigning scores or marks to students' work based on predetermined standards and criteria. This may include numerical grades, letter grades, or other forms of assessment, depending on the educational system and institution.

3. **Calculation of Final Grades**: After all assessments have been graded and scores recorded, the final grades for each student are calculated. This may involve weighting different assessments or components of the course to determine an overall grade.

4. **Review and Verification**: Before finalizing results, there may be a review process to ensure accuracy and consistency in grading. This could involve double-checking calculations, resolving any discrepancies, and verifying that all assessments have been properly accounted for.

5. **Approval**: Once the determination of results is complete and verified, the final grades are typically reviewed and approved by relevant faculty members, department heads, or academic administrators.

6. **Notification to Students:** Students are informed of their final grades through official channels, such as an online portal or email notification. This notification typically includes details about the grades achieved in each course or assessment, as well as any additional information relevant to the student's academic progress.

7. **Appeals Process**: In some cases, students may have the opportunity to appeal their final grades if they believe there has been an error or if they have grounds for reconsideration. The university should have established procedures for handling grade appeals, which may involve a formal review process.

"Transcript issuance" refers to the process of creating and issuing official academic transcripts to students. A transcript is a comprehensive record of a student's academic history, including courses taken, grades earned, credits awarded, and any degrees or certificates conferred. The process of transcript issuance typically involves:

1. **Compilation of Academic Records:** The university gathers and compiles the academic records of each student, including all courses completed, grades earned, and other relevant information.

2. **Verification of Records:** Academic records are verified for accuracy and completeness to ensure that the transcript reflects the student's true academic history.

3. **Transcript Generation:** Using the verified academic records, official transcripts are generated by the university's registrar or academic records office. Transcripts may be issued in both electronic and paper formats, depending on the preferences of the student and the university's policies.

4. **Official Seal and Signature:** Official transcripts are typically stamped with the university's official seal and signed by the appropriate university official to authenticate the document.

5. **Distribution to Students or Designated Recipients:** Transcripts are distributed to students or designated recipients according to the university's procedures. This may involve electronic delivery, mail delivery, or in-person pickup, depending on the options available.

6. **Transcript Requests:** Students may request transcripts for various purposes, such as applying to graduate programs, seeking employment, or transferring to another institution. The university should have established procedures for processing transcript requests in a timely manner.

Overall, the determination of results and transcript issuance are critical components of the academic administration process, ensuring that students receive accurate records of their academic achievements and facilitating their progress within and beyond the university setting.

9. Student Support Services

9.1 Indebtedness to the university policies

Payment Deadlines: Universities typically set specific deadlines by which tuition fees must be paid for each academic term or semester. These deadlines are communicated to students through official channels such as the university website, student portals, or communication from the registrar's office.

Consequences for Late Payments: Consequences for late payment of tuition fees may include late fees, holds on registration or enrolment, restrictions on access to university services or facilities, and in some cases, disenrollment from classes. These

consequences are typically outlined in university policies and may vary depending on the severity of the delinquency and the discretion of university administrators.

9.2 Academic advising services

Supporting Academic Success: **Academic advisors** assist students in selecting appropriate courses, majors, and minors that align with their interests, abilities, and career aspirations. They provide guidance on academic requirements, course sequencing, and prerequisite knowledge to ensure students stay on track for graduation.

Providing Information: Advisors offer information about academic programs, degree requirements, academic policies, and university resources. They help students navigate complex academic systems and understand the implications of their choices on their academic progress.

Offering Personalized Guidance: Academic advisors work with students on an individual basis to address their unique needs, concerns, and challenges. They may provide academic coaching, study skills development, and strategies for managing academic stress and balancing coursework with other responsibilities.

Exploring Career Options: Advisors assist students in exploring potential career paths and opportunities related to their academic interests and strengths. They may offer career assessments, job search resources, and information about internships, co-op programs, and experiential learning opportunities.

Monitoring Progress: Advisors monitor students' academic progress and performance, identifying any areas of concern or potential obstacles to success. They may conduct regular check-ins with students to assess their academic goals, address any academic difficulties, and provide necessary support and resources.

Referring to Support Services: Academic advisors serve as a gateway to other support services on campus, such as tutoring centres, writing labs, counselling services, and disability accommodations offices. They refer students to these resources as needed to ensure they receive comprehensive support for their academic and personal development.

Facilitating Transitions: Advisors assist students with academic transitions, such as transferring to another institution, changing majors or academic programs, or transitioning from undergraduate to graduate studies. They help students navigate the administrative processes involved in these transitions and make informed decisions about their educational pathways.

Overall, academic advising services play a critical role in empowering students to make informed decisions, achieve their academic goals, and succeed in their educational and career pursuits. These services vary in structure and delivery across institutions but are fundamental to supporting student success and retention.

10. Course Information

10.1 Global Course Structure semester by semester for all levels of study

The CCMAS presents a global course structure, semester by semester, for all levels of study, providing a comprehensive overview of the academic progression within different programs.

10.2 Course objectives, Learning outcomes, and Course contents for all courses offered

100 LEVEL FIRST SEMESTER COURSES

Course Code	Course Title	Units	Status	LH	PH
GST 111	Communication in English	2	C	30	-
CHM 101	General Chemistry I	2	C	30	-
CHM 107	General Chemistry Practical I	1	C	-	45
PHY 101	General Physics I	2	C	30	-
PHY 107	General Physics Practical I	1	C	-	45
MTH 101	Elementary Mathematics I	2	C	30	-
GET 101	Engineer in Society	1	C	15	-
CEE 101	Introduction to Civil Engineering	1	C	15	-
UAES-PHY 103	General Physics III	2	C	30	-
UAES-MTH 103	Elementary Mathematics III	2	C	30	-
UAES-ENG 101	Introduction to Engineering Workshop Practice	1	C	-	45
UAES-AGR 101	Farm Practice I	1	C	-	45
UAES-LEP 105	Language Enhancement Programme I	1	C	15	-
	TOTAL	**19**			

100 LEVEL SECOND SEMESTER COURSES

Course Code	Course Title	Units	Status	LH	PH
GST 112	Nigerian Peoples and Culture	2	C	30	-
CHM 102	General Chemistry II	2	C	30	-
CHM 108	General Chemistry Practical II	1	C	-	45
PHY 102	General Physics II	2	C	30	-
PHY 108	General Physics Practical II	1	C	-	45
MTH 102	Elementary Mathematics II	2	C	30	-
GET 102	Engineering Graphics and Solid Modelling I	2	C	15	45
UAES-PHY 104	General Physics IV	2	C	30	-
UAES-STA 112	Probability I	3	C	45	-
UAES-AGR 102	Farm Practice II	1	C	-	45
UAES-EMT 102	Environment and Public Health	1	C	15	-
UAES-LEP 108	Language Enhancement Programme II	1	C	15	-
	TOTAL	**20**			

200 LEVEL FIRST SEMESTER COURSES

Course Code	Course Title	Units	Status	LH	PH
ENT 211	Entrepreneurship and Innovation	2	C	30	-
GET 201	Applied Electricity I	3	C	45	-
GET 205	Fundamentals of Fluid Mechanics	3	C	45	-
GET 209	Engineering Mathematics I	3	C	45	-
GET 211	Computing and Software Engineering	3	C	30	45
CEE 201	Civil Engineering Drawing	2	C	15	45
UAES-GET 207	Applied Mechanics	3	C	45	-

UAES-AGR 201	Farm Practice III	1	C	-	45
UAES-EMT 201	Occupational Safety	1	C	15	-
	TOTAL	**21**			

200 LEVEL SECOND SEMESTER COURSES

Course Code	Course Title	Units	Status	LH	PH
GST 212	Philosophy, Logic and Human Existence	2	C	30	-
GET 202	Engineering Materials	3	C	45	-
GET 204	Students Workshop Practice	2	C	15	45
GET 206	Fundamentals of Thermodynamics	3	C	45	-
GET 208	Strength of Materials	3	C	45	-
GET 210	Engineering Mathematics II	3	C	45	-
	TOTAL	**16**			

300 LEVEL FIRST SEMESTER COURSES

Course Code	Course Title	Units	Status	LH	PH
GET 301	Engineering Mathematics III	3	C	45	-
GET 305	Engineering Statistics and Data Analytics	3	C	45	-
GET 307	Introduction to Artificial Intelligence, Machine Learning and Convergent Technologies	3	C	45	-
CEE 301	Fluid Mechanics	3	C	30	45
CEE 303	Engineering Geology	2	C	15	45
CEE 307	Structural Mechanics I	2	E	30	-
UAES-CEE 305	Soil Mechanics I	3	C	30	45
	TOTAL	**19**			

300 LEVEL SECOND SEMESTER COURSES

Course Code	Course Title	Units	Status	LH	PH
ENT 312	Venture Creation	2	C	15	45
GST 312	Peace and Conflict Resolution	2	C	30	-
GET 302	Engineering Mathematics IV	3	C	45	-
GET 304	Engineering Communication, Technical Writing and Presentation	3	C	45	-
GET 306	Renewable Energy Systems and Technology	3	C	30	45
CEE 304	Civil Engineering Materials	3	C	30	45
CEE 308	Engineering Surveying and Photogrammetry I	2	E	15	45
UAES-CEE 306	Design of Structures I	2	C	30	-
	TOTAL	**20**			

400 LEVEL FIRST SEMESTER COURSES

Course Code	Course Title	Units	Status	LH	PH
CEE 406	Engineering Surveying and Photogrammetry	3	C	30	45
UAES-CEE 401	Soil Mechanics II	3	C	30	45
UAES-CEE 403	Structural Mechanics II	2	C	30	-
UAES-CEE 407	Design of Structures II	2	C	30	-
UAES-CEE 409	Strength of Structural Materials	2	C	30	-
UAES-CEE 411	Introduction to Transportation and Highway Engineering	2	C	30	-
UAES-CEE 413	Civil Engineering Hydrology	2	C	15	45
	TOTAL	**16**			

400 LEVEL SECOND SEMESTER COURSES

Course Code	Course Title	Units	Status	Duration
GET 299	SIWES I: Students Work Experience Scheme	3	C	9 weeks
GET 399	SIWES II: Students Work Experience Scheme	4	C	12 weeks
GET 499	SIWES III: Students Work Experience Scheme	8	C	24 weeks
	TOTAL	**15**		

500 LEVEL FIRST SEMESTER COURSES

Course Code	Course Title	Units	Status	LH	PH
GET 501	Engineering Project Management	3	C	45	-
UAES-CEE 501	Hydraulic Structures	2	C	30	-
UAES-CEE 503	Geotechnical Engineering	2	C	30	-
UAES-CEE 505	Environmental Engineering	2	C	30	-
UAES-CEE 507	Highway Engineering	2	C	30	-
CEE 599	Project	6	C	-	270
	TOTAL	**17**			

500 LEVEL SECOND SEMESTER COURSES

Course Code	Course Title	Units	Status	LH	PH
GET 502	Engineering Law	2	C	30	-
CEE 506	Construction Engineering	3	C	30	45
UAES-CEE 502	Water Resources Engineering	2	C	30	-
UAES-CEE 504	Foundation Engineering	2	C	30	-
UAES-CEE 508	Traffic Engineering	2	C	30	-
UAES-CEE 510	Structural Engineering	2	C	30	-
	ELECTIVE	2	E	30	-
	TOTAL	**15**			

ELECTIVES (The student selects one option from the following elective courses)

Course Code	Course Title	Units	Status	LH	PH
UAES-CEE 522	Advanced Geotechnical Engineering	2	E	30	-
UAES-CEE 524	Advanced Water Resources and Environmental Engineering	2	E	30	-
UAES-CEE 526	Advanced Structural Engineering	2	E	30	-
UAES-CEE 528	Advanced Highway and Transportation Engineering	2	E	30	-

100 LEVEL

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). 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 (WAIC), Mass Mobilization for Self Reliance, Social Justice and Economic Recovery (MAMSER), National Orientation Agency (NOA). Current socio-political and cultural developments in Nigeria.

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 chemical 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 Le Chatelier'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 chemical 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. Chemical equations and stoichiometry; chemical 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.

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.

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 chemical 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.

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 chemical 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.

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.

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. recognise 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 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.

PHY 103: General Physics III (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; Bernoulli's equation and incompressible fluid flow; surface tension; adhesion, cohesion, viscosity, capillarity, drops and bubbles.

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. (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.

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.

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.

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 everyday 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.

CEE 101: Introduction to Civil Engineering (1 Unit C: LH = 15)

Learning Outcomes
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.

UAES-AGR 101: Farm Practice I (1 Unit C: LH 0; PH 45)
Learning outcomes
It is expected that at the end of this practical course, the students will be able to:
1. identify at least three (3) tools for record keeping;
2. identify at least three (3) tools for farm inventory;
3. describe four (4) factors to consider in making a choice of farm enterprise;
4. identify and describe at least five (5) structures in the farms;
5. identify at least three (3) crops based on their life span;
6. identify at least three (3) types of fish;
7. identify at least three (3) types of livestock species;
8. describe at least four (4) common practices in livestock;
9. describe at least four (4) common practices in fish production;
10. describe at least four (4) farm machineries; and
11. State at least four (4) uses of farm machineries.

Course Contents
Meaning and types of Farm enterprise. Choice of farm enterprise and factors to consider in selecting a farm enterprise. Site selection for farm enterprise and factors to consider. Farm records and inventory. Tools used in farm record and inventory. Importance of record and inventory keeping in farm enterprise. Farm layout and design. Factors to consider in farm layout design. Farm infrastructure and their relevance in the modern farming activities. Classification of crops according to lifespan and product. Some forest plant species and the economic values. Classes of pests and their implications in crop production as well as control measures. Common

management practices in animal husbandry. Fish culture. Fishing and common fishing equipment. Farm machineries and simple equipment. Uses and maintenance of farm machineries/equipment.

UAES-LEP 105: Language Enhancement Programme (Igbo) I (1 Unit C, LH 15)
Learning Outcomes
At the end of learning this course, the students should be able to:
1. Understand, explain and list the current Igbo orthography.
2. Differentiate between Igbo orthography and speech sounds.
3. Identify Igbo terminologies peculiar to their fields of study.
4. Apply the knowledge of the terminologies in research and practice.
5. Communicate fluently in Igbo.

Course Contents
Introduction to language, Igbo language and its orthography. Outlining and understanding the word formation processes in Igbo. Learning the organs of speech and the speech sounds they produce. Outlining and understanding the spelling rules in Igbo. Learning of numbers. The concept of tone and tone marking. Punctuations marks, their importance and uses.

UAES-LEP 105: Language Enhancement Programme (French) I (1 Unit C; LH 15)
Learning Outcomes
On completion of the course, students should be able to:
1. Read French texts.
2. Speak French up to proficient level.
3. Write basic expressions in French,
4. Converse in simple everyday French,
5. Identify simple French lexis and structure.
6. Identify simple French spellings,
7. Describe people,
8. Explain French civilization and culture.

Course Contents
French alphabet and pronunciation. Greetings in French. Using the Definite and Indefinite articles. /Introducing one's self. Cardinal and ordinal numbers with age. Describe someone (physical appearance and personal traits) + adjectives. Seasons of the world (Europe and Africa). Parts of the body and saying where it hurts.

UAES-ENG 101 Introduction to Engineering Workshop Practice (1 Unit; C; LH 0; PH 45)
Learning Outcomes
At the end of this course, the students should be able to:

1. describe at least three (3) basic workshop settings;
2. state at least five (5) safety precautions/rules used in workshop environments;
3. identify at least four (4) different elementary machines used in manufacturing;
4. identify at least four (4) different basic hands tools used in manufacturing;

5. apply basic plumbing skills in installation and maintenance of at least two (2) machines;
6. apply elementary engineering skills in wood and metal works;
7. identify at least five joining operations;
8. perform at least three (3) joining operations; and
9. Identify at least four (4) types of workshop equipment.

Course Contents
Workshop setting. Safety precautions. Bench tools. Hand tools. Power tools. Introduction to workshop equipment. Marking, itching, sampling, and sizing techniques of raw materials. Introduction to woodwork. Elementary metalwork. Drilling operations. Boring and counter boring. Tapping and reaming operations. Counter sinking. Joining techniques. Gas and arc welding. Holding devices. Elementary plumbing work.

UAES-AGR 102 Farm Practice II (1 Unit; C; LH 0; PH 45)
Learning outcomes
It is expected that at the end of this practical course, students should be able to:
1. identify and describe at least four (4) horticultural crops;
2. explain at least three (3) branches of horticulture/classes of horticultural crops;
3. describe at least two (2) ways on how to establish/manage horticultural crops;
4. describe nursery practices/operations for crops;
5. describe budding and grafting;
6. describe at least four (4) tools for seedling transplanting;
7. describe at least three technics for establishing a homestead vegetable farm;
8. describe at least four (4) factors influencing crop farming in Nigeria.

Course contents
Meaning and branches of horticulture. Classification of horticultural crops. Nursery practices for horticultural crops. Establishment and management of horticultural crops. Methods of propagating horticultural crops. Budding and grafting practices. Importance of horticultural crops to micro and macro economy. Nursery practices for field crops. Establishment of field crops (transplanting technics). Economics of shrubs and tree crops in Nigeria. Climatic, biotic, edaphic and socioeconomic factors influencing the production of horticultural and field crops in different agro-ecological zones in Nigeria. Management of environmental factors for crop production for crop production. Principle of homestead farming and its relevance on household economy.

UAES - EMT 102 Environmental and Public Health (1 Unit; C; LH 15; PH 0)
Learning Outcomes
At the end of the course, students should be able to:
1. describe at least three (3) terms used in Environmental health;
2. describe the historical background of environmental and public health;
3. describe at least three (3) public health laws in Nigeria;
4. state at least three (3) principles of environmental health;
5. outline at least four (4) pillars of environmental health;
6. describe health in relation to environment;
7. state at least four (4) effects of man's activities on family health.

Course Contents
Terms used in Environmental health: Environment, health, agent, host, public health, sanitation and hygiene. History of Environmental health including Mosaic laws (Torah), Hippocrates, Sir Edwin Chadwick. Introduction of public health laws in Nigeria. Health organizations: World Health Organization (WHO). United Nations (UNDP, UNICEF). International Federation of Environmental Health (IFEH) and others. Principles of Environmental Health: protection of public health and the environment. Qualitative and quantitative risk assessment. Pillars of Environmental Health: community health, water quality, air quality. Pollution and control. Built environment, food quality and industrial hygiene, management. Health and Environment: Agent factors. Environmental factors. Host factors. Health risk assessment, environmental management, mitigation. Effects of man's domestic, industrial and other anthropogenic activities on individual and family health. Ameliorative measures to maintain environmental health. Application of recent health models and theories.

200 LEVEL

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
7. 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 moulding.

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.

GET 201: Applied Electricity I (3 Units C: LH 30; PH 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;
3. explain the basic a.c. circuit theory and
4. 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, susceptance.

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.

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. Nanomaterials; definition, classification and applications of nanomaterials as emerging technology. Processing of nanomaterials including mechanical grinding, wet chemical 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.

ENG 201: Student 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, micrometres, 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, presstool 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

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

1. explain the properties of fluids;
2. determine forces in static fluids and fluids in motion;
3. determine whether a floating body will be stable;
4. determine the effect of various pipe fittings (valves, orifices, bends and elbows) on fluid flow in pipes;
5. measure flow parameters with Venturi meters, orifice meters, weirs, etc.;

6. perform calculations based on principles of mass, momentum and energy conservation;
7. perform dimensional analysis and simple fluid modelling problems; and
8. 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.

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. recognise 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 operators 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.

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, interpersonal skills and technical capabilities needed to give them a sound engineering foundation;
2. learn and practise 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).

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.

UAES-AGR 201: Farm Practice III (1 Unit; C; LH 0; PH 45)

Learning outcomes
It is expected that at the end of this practical course, students should be able to:

1. describe landscaping and floriculture;
2. describe at least three (3) tropical ornamental plants;
3. describe propagation of ornamental plants;
4. describe the nursery practices in the production of ornamental plants;
5. describe the procedure for lawn establishment and maintenance;
6. describe landscaping as a business;
7. describe at least four (4) importance of landscaping; and
8. State three (3) differences between horticulture and floriculture.

Course contents
Meaning of landscape and types of landscapes. Landscaping and types of landscaping. Floricultural practices. Identification of plants for landscaping and floricultural significance. Design of landscapes. Best practices and landscaping. Factors to consider before landscaping a site. Nursery practices for landscaping and floricultural plants. Lawn establishment and maintenance. Sources of planting materials in floriculture. Multipurpose values in some floricultural plants. Survey and selection of lands for landscaping. Land evaluation for floriculture. Soil characteristics and soil quality for landscaping. The use soilless media for floriculture. Land improvements practices during landscaping. Landscape practices in urban and metropolitan cities. Application of cartography in floriculture. Management of pests and diseases in floriculture. Water harvesting and storage for floricultural crops. Economics of floricultural crops.

UAES-EMT 201: Occupational Safety (1 Unit; C; LH 15; PH 0)

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

1. describe at least four (4) risks associated with the work place;
2. list at least four (4) ways to mitigate work place hazards;
3. state at least three (3) key elements of a safety management system in workplace operations;
4. describe measures to reduce fatality rate at the workplace;
5. state at least five (5) benefits of compliance with safety regulations;
6. describe standards for the management of health and safety in workplace;

7. state at least four (4) importance of safety awareness in the workplace;
8. describe at least three (3) emergency measures at the workplace.

Course Contents
Creating a Culture of Safety. Specific Workplace Hazards. Risk Management. Emergency Preparedness and Business Continuity. Common Worksite Incidents and Fatalities. Fire Prevention. Exposure to Industrial Chemicals and Fumes. Blood borne Pathogens and Needle stick Prevention. Ergonomics. Preventing Workplace Violence. Safety Committees. Safety and Health Training. Safety Clothing and Apparels. Job Hazard Analysis. Incident Investigation. Noise at Workplace. Oil and Gas Industry Safety – Onshore and Offshore. Construction Industry Safety. Fibrous Minerals and Dust - Managing the Risk. International and Nigerian Regulations. Benefits of Regulatory Compliance. Workers' Compensation.

UAES-GET 207: Applied Mechanics (3 Units; C; LH 45; PH 0)

Learning Outcomes
It is expected that at the end of this practical course, the students will be able to:

1) describe at least three (3) fundamental principles of applied mechanics;
2) apply at least two (2) principles of engineering to solve complex problems;
3) identify at least three (3) complex engineering problems;
4) determine the complete load impact;
5) apply at least two (2) engineering design principles;
6) use at least two (2) computer software to solve mechanics problems;
7) Draw Shear forces and bending moments diagrams; and
8) Determine deflection of beams.

Course Contents
Forces. Moments. Couples. Equilibrium of simple structures and machine parts. Friction. First and second moments of area. Centroids. Kinematics of particles in plane motion. Kinematics of rigid bodies in plane motion. Free-body diagram. Newton's laws of motion. Kinetic energy and momentum analyses. Hooke's law. Stresses and strain due to loading and temperature changes. Shear forces. Work. Power. Energy. Torsion. Stress circle. Deflection of beams with symmetrical. Deflection of beams with combined loadings. Resultant of coplanar forces. Elastic buckling of columns. Shear forces and bending moments. Bending moment diagrams. Analytical methods for structures.

300 LEVEL

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, Zango-Kartaf, 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 postconflict situations/crises: Refugees. Internally Displaced Persons (IDPs); the role of NGOs in post-conflict situations/crises.

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), blockchain, cloud computing, renewable energy, etc. Digital business and e-commerce strategies).

GET 301: Engineering Mathematics III (3 Units C: LH 45)

Learning Outcomes
At the end of the course, the students should be able to:
1. possess an in-depth knowledge upon which a solid foundation can be built in order to demonstrate a depth of understanding in advanced mathematical topics;
2. develop simple algorithms and use computational proficiency;
3. write simple proofs for theorems and their applications; and
4. communicate the acquired mathematical knowledge effectively in speech, writing and collaborative groups.

Course Contents
Linear Algebra. Elements of Matrices, Determinants, Inverses of Matrices. Theory of Linear Equations. Eigen Values and Eigen Vectors. Analytical Geometry. Coordinate Transformation. Solid Geometry. Polar, cylindrical and spherical coordinates. Elements of functions of several variables. Surface Variables. Ordinary Integrals. Evaluation of Double Integrals, Triple Integrals, Line Integrals and Surface Integrals. Derivation and Integrals of Vectors. The
gradient of scalar quantities. Flux of Vectors. The curl of a vector field, Gauss, Greens and Stoke's theorems and applications. Singular Valued Functions. Multivalued Functions. Analytical Functions. Cauchy Riemann's Equations. Singularities and Zeroes. Contour Integration including the use of Cauchy's Integral Theorems. Bilinear transformation.

GET 302: Engineering Mathematics IV (3 Units C: LH 45)
Learning Outcomes
At the end of the course, the students should be able to:
1. solve second order differential equations;
2. solve partial differential equations;
3. solve linear integral equations;
4. relate integral transforms to solution of differential and integral equations;
5. explain and apply interpolation formulas; and
6. apply Runge-Kutta and other similar methods in solving ODE and PDEs.

Course Contents

Series solution of second order linear differential equations with variable coefficients. Bessel and Legendre equations. Equations with variable coefficients. Sturm-Liouville boundary value problems. Solutions of equations in two and three dimensions by separation of variables. Eigen value problems. Use of operations in the solution of partial differential equations and Linear integral equations. Integral transforms and their inverse including Fourier, Laplace, Mellin and Handel Transforms. Convolution integrals and Hilbert Transforms. Calculus of finite differences. Interpolation formulae. Finite difference equations. Runge-Kutta and other methods in the solutions of ODE and PDEs. Numerical integration and differentiation.

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 and structure Fog 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 305: Engineering Statistics and Data Analytics (3 Units C: LH 45)

Learning Outcomes

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

1. work with data from the point of view of knowledge convergence, machine learning, and intelligence augmentation, which significantly raises their standard for engineering analysis (the approach forces them to learn statistics in an actionable way that helps them to see the holistic importance of data analytics in modern engineering and technology);
2. anticipate the future with Artificial Intelligence while fulfilling the basic requirements of conventional engineering statistical programming consistent with their future careers;
3. perform, with proficiency, statistical inference tasks with language or programming toolboxes such as R, Python, Mathematica or MATLAB, and Design Expert to summarise analysis and interpretation of industry engineering data, and make appropriate conclusions based on such experimental and/or real-life industrial data;
4. construct appropriate graphical displays of data and highlight the roles of such displays in data analysis, particularly the use of statistical software packages;
5. plan and execute experimental programmes to determine the performance of programme relevant industrial engineering systems, and evaluate the accuracy of the measurements undertaken; and
6. demonstrate mastery of data analytics and statistical concepts by communicating the results of experimental and industry-case investigations, critically reasoned scientific and professional analysis through written and oral presentation.

Course Contents
Descriptive statistics, frequency distribution, populations and sample, central tendency, variance data sampling, mean, median, mode, mean deviation and percentiles. Probability. Binomial, Poisson hyper-geometric and normal distributions. Statistical inference intervals, test hypothesis and significance. Regression and correlation. Introduction to big data analytics and cloud computing applications. Introduction to the R language; R as a calculator; Vectors, matrices, factors, data frames and other R collections. Iteration and looping control structures.
Conditionals and other controls. Designing, using and extending functions. The Apply Family. Statistical modelling and inference in R.

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.

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 software 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, and wooden 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 Solid Works, 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 SolidWorks; and
d. Technical report writing.

CEE 301: Fluid Mechanics (3 Units C: LH 30; PH45)

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 Content
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. characterise 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.

UAES-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 summarizing 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.

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 statically 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 E: LH 15; PH 45)

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.

400 LEVEL

UAES-CEE 401: Soil Mechanics II (2 units C: LH 30, PH 45)

Learning Outcomes
At the end of this course, the students should be able to:
1. apply principles of soil mechanics to foundation designs
2. apply principles of soil mechanics to embankment designs
3. apply principles of soil mechanics to retaining structures designs
4. expatiate principles of stress distribution in soil, and slope stability
5. apply soil improvement, soil stabilization and stabilization techniques and methods
6. apply principles of soil mechanics to dam designs
7. calculate soil bearing capacity and foundation pressure

Course Content
Permeability. Stress distribution. Consolidation. Earth pressure. Bearing capacity. Slope stability. Soil stabilization. Earth dams. Deep foundations. Soil improvement. Soil dynamics. Retaining Structures. Foundations and Embankments. Retaining structures such as retaining wall, sheet pile walls, dikes, and dams. Types and design principles of foundations. Embankments. Filling and cutting.

UAES-CEE 403: Structural Mechanics II (2 units C: LH 30; PH 0)

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

1. apply the slope deflection method and moment distribution method in structural analysis.
2. apply energy methods, the method of real work, and the method of virtual work for structural analysis.
3. apply Castigliano's second theorem in structural analysis.
4. plot influence lines using the influence coefficient method in structural analysis.
5. analyse the forces, moments, and displacements continuous beams and trusses under different boundary conditions.
6. apply the simple plastic theorem and elastic instabilities of structures.

Course Content
Analysis of indeterminate structures. Slope-deflection method. Moment distribution method. Energy methods. Real and virtual work methods for indeterminate structures. Bending analysis. Castigliano's second theorem. Least-work theorem for moments. Shearing of beam structures. Influence coefficient method. Influence lines for statically determinate structures. Continuous beams. Simple beams. Trusses under various edge conditions. Elastic instability. Simple plastic theory of bending. Collapse loads.

UAES-CEE 405: Design of Structures II (2 units C: LH 30, PH 0)

Learning Outcomes
At the end of this course, the students should be able to:
1. analyse and determine structural loads and load paths.
2. design steel structures, including tension members, compression members, and beams.
3. design concrete structures, including reinforced concrete beams, columns, and slabs.
4. design timber structures, including beams, columns, and trusses.
5. design masonry structures, including walls and arches.
6. communicate the design process and results effectively through drawings and specifications
7. consider code compliance and ethics in structural design.

Course Content
Structural loads and load paths. Structural steel shapes and properties. Design of tension and compression members. Design of steel beams. Types of concrete structures. Design of reinforced concrete continuous beams. Design of reinforced concrete columns. Design of reinforced two-way spanning slabs. Design of retaining walls, footings, and foundation systems. Properties of timber and timber products. Design of timber beams. Columns and trusses. Timber shear walls and diaphragms. Types of masonry materials and systems. Design of masonry walls and arches. Design of masonry chimneys and fireplaces. Introduction to seismic design. Wind design (wind forces and loads, pressure analysis). Design of cable-supported structures. Application of course concepts to the design of a real-world structure. Preparation of structural drawings and specifications. Presentation and critique of design projects. Use of relevant structural design software.

CEE 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.

CEE 409: 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.

UAES-CEE 411: Introduction to Highway and Transportation Engineering (2 units C: LH 30, PH 0)

Learning Outcomes
At the end of this course, the students should be able to:
1. evaluate the principles and practices of transportation planning and engineering, including transportation demand analysis, traffic flow theory, and highway design.

2. describe transportation systems, including highways and other modes of transportation.
3. use relevant materials and construction methods in transportation and highway engineering.
4. identify ITS and their potential for improving transportation efficiency and safety.
5. appreciate the role of transportation in urban and regional planning and the impacts of environmental sustainability on transportation systems.

Course Content
Transportation planning. Transportation demand analysis and land use. Transportation demand management. Traffic engineering: traffic flow theory, traffic control devices, and traffic signal design. Traffic safety analysis. Highway geometry: horizontal and vertical alignment, Cross-section elements of highway pavement. Sight distances. Grade separation and interchanges. Design of flexible and rigid pavements. Pavement management systems. Materials for transportation and highway Engineering: asphalt, concrete, and aggregate. Construction and maintenance of transportation systems: Construction methods. Maintenance management. Transportation safety: road user behaviour, accident analysis, and safety improvement measures. Sustainable transportation. Alternative modes of transportation, energy efficiency, and environmental sustainability. Intelligent Transportation Systems (ITS). Transportation financing. Geometric design for transportation facilities. Transportation planning for pedestrian and bicycle facilities.

UAES-CEE 413: Civil Engineering Hydrology (2 units C: LH 30, PH 0)

Learning Outcomes
At the end of this study, the students should be able to:
1. describe the water cycle and the movement of water on the earth's surface and in the atmosphere.
2. explain the factors that influence the distribution and availability of water, such as precipitation, evaporation, and transpiration.
3. describe the processes that govern the movement of water in the soil and subsurface, including infiltration, percolation, and groundwater flow.
4. explain the concepts and techniques used for measuring and analysing water resources, such as stream flow measurement, hydrologic modelling, and remote sensing.
5. assess the impacts of human activities on water resources, such as land use change, pollution, and climate change.
6. explain the principles and methods for managing water resources, including water allocation, water conservation, and flood management.

Course Content
Definition, scope, and importance of hydrology. Water cycle and its components. Precipitation: types, measurement techniques, and estimation. Evaporation and transpiration: Influencing factors, measurement, and estimation of potential evapotranspiration. Runoff processes. Overland flow. Infiltration. Subsurface flow. Stream flow measurement and flow regions. Flood frequency analysis. Groundwater hydrology. Groundwater recharge, groundwater flow, and aquifer systems. Watershed

hydrology. Hydrologic budget. Unit hydrograph. Rainfall-runoff modelling. Drought analysis. Flood frequency analysis, flood routing, and floodplain management. Environmental hydrology. Climate change and hydrology: impact, adaptation, and mitigation strategies. Applications of hydrology to hydropower, irrigation, and water supply.

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.

500 LEVEL

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.

UAES-CEE 501: Hydraulic Structures (2 Units C: LH 30, PH 0)

Learning Outcomes

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

1. apply the principles of hydraulics and hydrology to hydraulic structures.
2. analyse the behaviour of various hydraulic structures under various types of loads.
3. design different hydraulic structures, such as dams, spillways, channels, culverts, and weirs.
4. describe the concepts of open channel flow, including the design and analysis of channels, and their different types.
5. analyse the forces that act on hydraulic structures, such as buoyancy, drag, and lift.
6. explain the different types of gates and valves used in hydraulic structures, their functions, and how to select them.
7. explain the environmental, economic, and social impacts of hydraulic structures and how to mitigate them through adequate design, operation, and maintenance.

Course Content

Design principles and philosophy. Design of culverts and channel transitions. Reservoir design. Design of irrigation structures. Infrastructure development in watersheds and coastal regions. Hydraulic engineering principles. Design for water quantity management. Flood control. Water demand. Hydropower. Environmental impact and analysis. Selection of dam type. Spillways and energy dissipation. Outlet works. Tunnels and large-diameter pipes. Levees and by-pass channels. Bridge waterways. Pump stations. Design for water-quality management. Diffuser manifolds. Marine outfall systems. Cooling towers. Inland navigation. Gates and valves. Hydraulic modelling (laboratory and numerical).

UAES-CEE 502: Water Resources Engineering (2 Units C: LH 30, PH 0)

Learning Outcomes

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

1. describe the water cycle.
2. design of water supply systems, including source selection, treatment, distribution, and storage
3. design of wastewater treatment systems
4. apply the principles of water quality management and manage the impacts of water pollution.
5. apply different techniques used in flood management, such as floodplain zoning, structural and non-structural flood control measures, and flood warning systems.

6. apply different techniques used in groundwater management, such as aquifer recharge, well field management, and groundwater modelling.
7. conduct environmental impact assessments for water resources projects.

Course Content
Hydraulics of open channels and wells. Drainage. Hydrograph analysis. Reservoir and flooding routing. Hydrological forecasting. Hydraulic structures e.g. dams, dykes, levees, weirs, etc. Engineering economy in water resources planning. Application of principles of hydraulic and hydrology to problems in the control, conservation and usage of water. Flood control. Water supply. Irrigation. Navigation. Basic river planning. Basic concepts of systems and economic analysis as applied to water resources. Erosion problems (types, occurrence, factors affecting occurrence, erosion mitigation methods). Urban drainage problems. Hydraulics of open channels and well. Urban water management and flood routing. Warning and control.

UAES-CEE 503: Geotechnical Engineering (2 Units C: LH 15, PH 45)

Learning Outcomes
At the end of this course, the students should be able to:
1. analyse the physical, mechanical, and hydraulic properties of soil, including soil classification, compaction, permeability, and consolidation
2. evaluate soil behaviour under different loading conditions, including stress–strain relationships, shear strength, and deformation
3. design of shallow foundations
4. analyse slopes and retaining structures, including stability analysis, reinforcement design, and seepage analysis
5. describe soil improvement techniques such as compaction, grouting, soil stabilization, and soil reinforcement
6. perform geotechnical investigation including geotechnical investigation methods, including site exploration, sampling, testing, and interpretation of results
7. apply geotechnical engineering principles to real-world problems, including the design of foundations, retaining walls, slope stabilization, dams and other civil engineering structures

Course Content
Analysis and design of foundations for buildings. Bridges and other structures including excavation. Piling. Retaining walls. Sheet pile bulkheads. Tunnels. Fills. Embankments. Earth-fill and rock dams including seepage dewatering and grouting. Field measurements and controls. Foundations subjected to dynamic forces. Stresses in soils. Consolidation and settlement. Shear strength of soils. Earth pressures. Bearing capacity of soils. Shallow foundations. Slope stability. Site investigations. Use of analysis and design software in geotechnical engineering.

UAES-CEE 504: Foundation Engineering (2 Units C: LH 30, PH 0)

Learning Outcomes
At the end of this study, the students should be able to:
1. explain the concept and principles of pile foundations

2. design the pile foundations on soils
3. design the slopes of earth materials
4. determine properties of lateral earth pressure
5. design retaining walls and retaining structures
6. design shallow and deep foundations

Course Content
Design of shallow foundations. Design of deep foundation. Types and choice of foundations: spread footing, combined footing, and mat/raft foundations. Basements. Caissons. Cofferdams. Footings under eccentric and inclined loads. Types of piles. Soil properties for pile foundations. Use of general characteristics of pile both in sand and clay. Negative skin friction. Pile groups. Piles in cohesive soils. Piles in cohesionless soils. Single piles and pile groups. Bearing capacity and settlement of pile groups. Negative skin friction. Structural design of footings and retaining walls. Case studies and practical applications in tall buildings, bridges, etc. Use of foundation design software.

UAES-CEE 505: Environmental Engineering (2 Units E: LH 30, PH 0)

Learning Outcomes
At the end of this course, the students should be able to:
1. state the characteristics of wastewater
2. identify water treatment processes
3. undertake plant design with emphasis on low-cost options
4. explain environmental aspects and plant operation
5. recognise the different types of environmental pollution, techniques for their monitoring and control
6. identify the effect of the pollutants on the environment: atmosphere, water and soil
7. analyse an industrial activity and identify the environmental problems
8. explain the design of control systems for different types of pollution
9. plan strategies to control, reduce and monitor pollution
10. select the most appropriate technique to purify and/or control the emission of pollutants
11. discuss the effects of solid waste on water sources

Course Content
Principles of wastewater treatment (wastewater characteristics, why treat wastewater, wastewater treatment philosophy, preliminary & primary, secondary & tertiary treatment units). Reactions and reactors in wastewater treatment. Overview of biological wastewater treatment systems (activated sludge process, trickling filters, ponds, overland treatment, and constructed wetland systems). Ventilated improved pit latrines (VIPs), septic tank, and baffled septic tank systems. Wastewater stabilization ponds. Basic activated sludge. Trickling filter systems of treatment. Sludge treatment and disposal. Sources of wastewater, industrial and domestic wastewater surveys. Elements of wastewater, microbiology; waste -water collection, treatment and disposal and their designs. Wastewater re-use-option and alternatives. Effluent standards. Air pollution: monitoring and control, air pollutants, characteristics, sources, dispersion of pollutants in air. Dispersion models, equations, and design of air pollution control systems. Water pollution: types, point and non-point sources,

effects of pollutants on water. Control and management of water pollution. Solid waste management: classification, quantification and composition of solid waste disposal methods. Environmental protection regulations. Design of processes for water and wastewater treatment. Unit operations.

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. Earthwork. Construction equipment and techniques. Formwork 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.

UAES-CEE 507: Highway Engineering (2 Units C: LH 30, PH 0)

Learning Outcomes

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

1. describe the guiding principles of highway pavement structural design and how it affects urban transportation system
2. conceptualize railway modelling, design, and construction of highways
3. design flexible and rigid pavements
4. perform geometric design and vertical alignment
5. expatiate methods of effective maintenance of road, rail, and runway facilities
6. identify road pavement failure modes from crack patterns
7. select and use of different codes of practice for highway design
8. use modern software for analysis and design of highways

Course Content

Highway planning and traffic surveys. Comparison between highway and airport pavements. Road pavement characteristics. Construction materials. Flexible pavements. Methods of bituminous mix design. Rigid pavements. Simple design method. Highway geometrics. Highway pavement structure. Highway designs: vertical profile, horizontal alignment, super-elevation, etc. Kerbs and footway pavements. Pavement design. Nigerian highway design policies, codes, and specifications. Comparison of Nigerian codes with international standards. Administration and finance of road construction. Pavement distresses and failures. Construction of roads. Evaluation of pavement conditions using non-destructive

assessment methods. General road maintenance. Relevant software for highway design. Case studies.

UAES-CEE 508: Traffic Engineering (2 Units C: LH 30, PH 0)

Learning outcome

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

1. plan transportation systems for road transportation
2. analyse road traffic systems
3. design transportation engineering systems for rail and water transportation
4. describe traffic flow theory, highway capacity analysis, geometric design, intelligent transportation systems, travel demand forecasting methods, and safety analysis.
5. appreciate the need for transportation rules and safety

Course Content

Design and operating principles and procedures for surface transportation systems, including vehicle motion and performance. Vehicle flow and capacity. Traffic control. Traffic demand and supply. Cost concepts. Driver, vehicle and traffic flow characteristics. Origin-destination studies. Traffic studies and analysis. Queuing theory applications. Microsimulation. Highway design and capacity analysis. Non-motorized facility design. HOV lane design, public transportation priority design, parking analysis, traffic signal design and control, traffic microsimulation with relevant software. Railway design. Railway construction. Railway maintenance. Airport design. Airport construction. Airport maintenance. Coordination of all transportation media. Transportation planning and economics. Traffic management and design of traffic signals. Parking. Geometric design. Construction principles and methods.

UAES-CEE 510: Structural Engineering (2 Units C: LH 15, PH 45)

Learning Outcomes

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

1. analyse statically indeterminate structures using force and displacement methods
2. conduct yield line analysis and strip methods for slabs
3. make empirical assumptions made for civil engineering structural analysis and designs
4. distinguish between plastic methods and matrix methods of structural analysis
5. evaluate the structure integrity of structures in terms of failure criteria
6. analyse reinforced concrete failure modes from crack patterns
7. use modern software for analysis and design of civil engineering structures

Course Content

Plastic methods of structural analysis. Matrix methods of structural analysis. Buckling analysis. Solution by series. Introduction to finite difference and finite element methods. Yield line analysis and strip methods for slabs. Composite design and construction in steel and reinforced concrete. Design of structural foundations.

Prestressed concrete design. Modern structural form. Lift shafts and shear walls. System buildings. Design projects. Continuous slab-beam-girder and concrete joist floor systems. Monolithic beam-to-column joints. Retaining walls, members in compression and bending. Deflection, Footings, length effects on columns, Design of two-way systems-slabs supported on beams. Design of two-way systems. Flat-slab and flat-plate floor.

UAES-CEE 522: Advanced Geotechnical Engineering (2 Units E: LH 30, PH 0)

Learning Outcomes

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

1. describe various soil stabilization techniques
2. analyse the dynamic behaviour of soils, including soils subjected to vibrations, earthquake-induced soil response, and dynamic soil–structure interactions
3. design and analysis of deep foundations, including driven piles, drilled shafts, and pile groups.
4. design and analysis of retaining structures, such as retaining walls and slopes
5. various instruments used for monitoring geotechnical structures and soils
6. use modern software for geotechnical engineering

Course Content

Dynamic behaviour of soils, including soil vibrations, earthquake-induced soil response, and dynamic soil–structure interaction. Principles of wave propagation through soils. Analysis of dynamic loads on geotechnical structures.
Soil improvement techniques: compaction, preloading, vertical drains, soil reinforcement, and soil stabilization. Principles, design considerations, and applications of these techniques to enhance the engineering properties of soils. Design and analysis of deep foundations, including driven piles, drilled shafts, and pile groups. Load transfer mechanisms, settlement analysis, pile capacity estimation, and field monitoring techniques. Retaining structures: types of retaining structures, stability analysis, and methods for controlling soil movements. Excavations and earth-retention systems. Design considerations and analysis of excavations, including braced excavations, anchored walls, and sheet pile walls. Topics may include earth pressure theories, stability analysis, and shoring system design. Geotechnical instrumentation and monitoring. Measurement of soil properties, groundwater levels, settlement, and stress distribution. Interpretation and analysis of monitoring data.

UAES-CEE 524: Advanced Water Resources and Environmental Engineering (3 units E: LH 30, PH 0)

Learning Outcomes

Upon completion of this course, the student should be able to:
1. apply advanced skills in the management and conservation of water resources.
2. prepare environmental impact statements.
3. develop skills in the design of water supply and distribution scheme.
4. operate and manage treatment plant
5. use computer software for solving water resources and environmental engineering problems.

6. apply critical thinking and problem-solving skills in solving challenging water resources and environmental engineering problems.

Course Content
Advanced topics related to the management and conservation of water resources. Environmental impact assessment and mitigation associated with water-related projects. Environmental legislation and regulations. Environmental impact statement preparation. Principles and techniques used in the planning, development, and sustainable management of water resources. Water supply systems, water allocation, hydrological modelling, water demand analysis, and water resource economics. Integrated management of watersheds. Protection and restoration of water quality. Land use planning. Soil conservation. Erosion control. Preservation of aquatic ecosystems. Water quality and treatment. Water quality monitoring. Water conservation techniques. Rainwater harvesting. Water reuse systems. Integration of green infrastructure in water projects. Principles of wastewater treatment (wastewater characteristics, reasons for treating wastewater, wastewater treatment philosophy, preliminary & primary, secondary & tertiary treatment units). Reactions and reactors in wastewater treatment. Case studies and practical exercises.

UAES-CEE 526: Advanced Structural Engineering (3 units E: LH 30, PH 0)

Learning Outcomes
Upon completion of this course, the student should be able to:
1. apply advanced structural analysis techniques.
2. analyse structural behaviour and the factors influencing structural performance.
3. design of complex structural systems, considering various loadings and constraints.
4. use advanced computational tools and software for structural analysis and design.
5. apply critical thinking and problem-solving skills in solving challenging structural engineering problems.

Course Contents
Matrix analysis methods. Finite element analysis. Dynamic analysis. Design considerations for tall and long-span structures. Design for wind and seismic loads. Nonlinear material models. Rehabilitation and retrofitting of existing structures. Composite materials in structural engineering. Advanced computational tools and software. Numerical modelling techniques. Bridge design. Advanced theory of elasticity. Thin plates and shells. Optimization methods in structural engineering. Case studies and real-world applications:

UAES-CEE 528: Advanced Highway and Transportation Engineering (2 units E: LH 30, PH 0)

Learning Outcomes
Upon completion of this course, the student should be able to:
1. analyse traffic patterns and operations.
2. design effective traffic management strategies.
3. evaluate the impact of transportation policies.
4. develop sustainable transportation plans.

4. utilise computer software for traffic planning and highway design.
5. apply critical thinking and problem-solving skills in solving challenging highway and transportation engineering problems.

Course Content
Cross-section design and intersection design with emphasis on safety, capacity, and efficiency considerations. Traffic engineering and management. Traffic flow theory. traffic simulation models. Traffic signal optimization. Intelligent transportation systems. Analysis of traffic patterns and traffic operations. Design effective traffic management strategies. Advanced transportation planning techniques, including travel demand forecasting, transportation system modelling, and transportation policy analysis. Multimodal transportation systems, including the integration of various modes such as highways, railways, airports, and public transit. Intermodal connectivity. Multimodal network design and transportation system integration. Highway materials and pavement design. Properties and behaviour of various pavement materials. Pavement design methodologies. Performance evaluation techniques. Emerging technologies and their applications in the transportation field. Connected and autonomous vehicles, transportation data analytics, transportation electrification, and smart transportation systems.

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

Learning Outcomes

Upon completion of this course, students should be able to:
1. initiate worthwhile projects of a research or professional nature;
2. analyse the project problem and develop creative proposals for the solution;
3. execute the proposal for the solution to the problem; and
4. 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.

11 Appendix

11.1 Undergraduate degree programmes offered in the Department.

The CCMAS includes an appendix listing undergraduate degree programs offered in various departments, providing a comprehensive overview of the academic offerings within Nigerian universities.

The list of undergraduate degree programs offered in Civil Engineering according to the CCMAS includes:

1. Construction Engineering and Project Management

2. Architectural Engineering
3. Infrastructure Materials Engineering
4. Environmental Engineering
5. Geotechnical Engineering
6. Structural Engineering
7. Transportation Engineering
8. Water Resources Engineering

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