DEPARTMENT OF AUTOMOTIVE ENGINEERING

FACULTY OF ENGINEERING

ELIZADE UNIVERSITY, ILARA-MOKIN, ONDO STATE

Handbook for Undergraduate Programme

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Department of Automotive Engineering

FACULTY OF ENGINEERING

Elizade University, Ilara - Mokin

Ondo STATE, Nigeria.

Note: The Information contained in this handbook is accurate and up-to-date at the time of publication. However, the matters covered are subject to change from time to time. The Department will publish such changes, if there are any, in the next edition of the handbook.

Preface

This Departmental Handbook provides information to prospective, or registered students on programme of studies offered by the Department of Automotive Engineering, Elizade University, Ilara – Mokin, Ondo State, Nigeria. It is hoped that the information would assist the students to derive maximum benefits from the opportunities and facilities available in the Department and the University, in planning their academic programmes.

The currently available five-year engineering degree programme is built on a common foundation of basic studies, comprising Mathematics, Basic Sciences, Engineering Sciences and General Studies. The programme is designed to facilitate specialization while allowing opportunities for taking approved courses from other areas. The programme is also fashioned to allow the prospective engineering graduate have appropriate technical expertise and human perspective.

The Department of Automotive Engineering, Elizade University, Ilara – Mokin, Ondo State, Nigeria issues this Handbook as a general guide to its courses and facilities. It forms no part of a contract. The Department reserves the right to modify or alter without prior notice any of the contents herein, subject to the substantive regulations of the University.

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1.0 VISION AND MISSION OF THE PROGRAMME

1.1 Vision of the Programme

1.1.1 Vision of the University

To be a globally competitive institution that produces entrepreneurial, innovative and ethical graduates.

1.1.2 Vision of the Faculty

To deliver world-class research and innovative engineering solutions coupled with entrepreneurial prowess to meet modern-day challenges.

1.1.3 Vision of the Department

To deliver world-class sound and innovative automotive engineering solutions to meet local and global demands for technically and economically viable transport systems.

1.2 Mission of the Programme

1.2.1 Mission of the University

To produce graduates with the appropriate skills and knowledge for the development of the nation and global competitiveness.

1.2.2 Mission of the Faculty

To produce thoroughly-baked and entrepreneurial-oriented graduates who are research-savvy and highly innovative, ready to apply critical thinking aimed at generating creative ideas in solving problems.

1.2.3 Mission of the Department

To produce highly competent and entrepreneurial-oriented automotive engineering graduates who are sound and highly innovative, ready to apply critical thinking aimed at generating creative ideas in solving automotive engineering problems.

1.3 The University's Strategic Objectives

The strategic objectives of the University (Elizade University, Ilara- Mokin) are to:

a. produce graduates of international standard, with appropriate knowledge and skills in their field of study, who will be highly employable and also self-reliant;
b. provide high quality research and development activities that will promote the development of the Nation and enhance the image of the University and the researchers;
c. harness modern technology especially ICT and modern social, economic and financial strategies

to run a cost-efficient and effective academic programme and institutional management;

d. provide services that have relevance to and impact on the local community and the Nation;
e. provide conditions of study, work and living in the University Community that are of appropriate standards;
f. expand access to tertiary education in the face of unmet demand; and
g. operate as an equal-opportunity educational institution, sensitive to the principle of gender equity and is non-discriminatory based on race, ethnicity, religion or physical disability.

2.0 PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The Automotive Engineering Programme Educational Objectives describe the expectations of our graduates after a few years of work experience by contributing to the society through modern technologies and practices.

a) **PEO1** - Be established and recognized as a valued engineering professional and an effective communicator in industries related to automotive engineering, as well as related engineering technologies.
b) **PEO2** - Practice their profession and apply scientific principles to the design and maintenance

of automotive systems and devices in a collaborative team-oriented manner that embraces the multidisciplinary & multicultural environment of today's world.

c) **PEO3** - Engage in lifelong learning and professional development with proficient soft skills, creative, innovative, and readily develop entrepreneurial skills and technical competence, to be self-employed in consultancy, manufacturing or service industry.

d) **PEO4** - Function as a socially, morally and legally responsible member of society with willingness to mentor fellow employees and understand the ethical, social and economic impact of their work in a global context.

3.0 PROGRAMME OUTCOMES/LEARNING OUTCOMES (POs)

According to the Washington Accord Graduate Attributes adopted by the Washington Accord signatories, an engineer who is trained based on these attributes listed, can design solutions for complex problems based on the development of engineering activities that involve some or all the programme learning outcomes detailed below. These POs are the measurable statements that describe knowledge or skills that our students would achieve upon completion of

their 5 Years Academic Program. All 12 POs defined in COREN Manual are embodied in the POs of the Department.

PO1 - Engineering Knowledge

Apply knowledge of mathematics, natural and engineering, sciences, mechanical engineering fundamentals, and engineering principles to solve complex engineering problems.

PO2 - Problem Analysis

Identify, formulate, conduct research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural and engineering sciences and principles.

PO3 - Design/Development of Solutions

Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

PO4 – Investigation

Conduct investigation of complex engineering problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.

PO5 - Modern Tool Usage

Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations.

PO6 - The Engineer and Society

Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems.

PO7 - Environment and Sustainability

Understand and evaluate the sustainability and impact of professional engineering work in the solutions of complex engineering problems in societal and environmental contexts.

PO8 - Ethics

Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO9 - Individual and Teamwork

Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

PO10 - Communication

Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11 - Project Management

Demonstrate knowledge and understanding of engineering management principles and economic decision making and apply these to one's own work, as a member and leader in a team, to manage projects in multidisciplinary environments.

PO12 - Life Long Learning

Recognise the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

4.0 GENERAL INFORMATION TO STUDENTS

4.1 Roll of Honours for Students

Senate decided that Roll of Honours for Students be instituted in the University to enhance discipline and good performance among students. All students are enjoined to strive to be on the Honours Roll. The Details of the honours roll are as follows:

The beneficiaries must have the minimum required Cumulative Grade Point Average, and must maintain this grade annually to continue to enjoy the award. The recommendations must be processed along with results of Second Semester Examinations. The student must be of good conduct. He or she must not have outstanding or carry-over courses and must not be repeating the year. No student on Leave of Absence shall enjoy the Annual Roll of Honours Award. No student that has a disciplinary problem shall enjoy the award. The award shall be based on the recommendation of the Department Board of Examiners and the Faculty Board of Examiners. Each beneficiary shall be given a certificate and scholarship.

The Honours Roll shall be at three levels as follows:

a. Founder's list: for suitably qualified candidate with a minimum CGPA of 4.50 on a basis of 5.00
b. Vice Chancellor's list: for suitably qualified candidate with a minimum CGPA of 4.20 on a basis of 5.00, and

c. Dean’s list: for suitably qualified candidate with a minimum CGPA of 4.00 on a basis of 5.00

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

4.2 Information on Division of Students' Affairs

Information on students’ welfare can be summarized as follows:

a. Guidance and Counselling Unit: The Division of Student Affairs has Professional Counsellors who are committed to helping students grow in self-understanding in the process of integrating their personal and academic experiences. The services are free to students and are confidential (not used as part of his/her other University records). The services include personal counselling, group counselling, study skills improvement, tests anxiety reduction, personal crisis intervention, psychological testing, career and occupational counselling and settlement of grievances between students, where necessary. Consultations are made with campus organizations, sound academic Departments, to ensure that students' problems are resolved satisfactorily. The Counsellors can be contacted on the ground floor of the Senate Building;

b. Scholarship and Financial Assistance: The Division of Students' Affairs serves as a link

between students and sponsoring authorities, both within and outside Nigeria. Students are to check the Notice Boards in their respective faculties as well as those at the Division of Student Affairs Building for advertisements and other relevant information. Liaison is also maintained between students and governments at various **l**evels for scholarship and bursaries.

4.3 Information on the University Library

Membership of the Library is available, on completion of a registration card, to all students, members of the senior staff of the University and such other persons as may be determined by the Library Committee or the University Librarian on behalf of it. Students are required to renew their registration at the beginning of each academic year. Library Cards and Borrower's Tickets are not transferable; books issued on them remain the responsibility of the person whose name appears on them. A lost Library Card or Borrower's Ticket may be replaced on submission of a written application.

4.4 History and Location of the University and the Programme

Elizade University is located in lIara-Mokin in Ondo State of Nigeria. Ondo State was created on 3 February 1976 from the former Western State. It originally included what is now Ekiti State, which was split off in 1996. Akure is

the State capital. The State lies between Longitudes 4° 30' 6" East of the Greenwich Meridian, and between 5° 45' and 8° 15' North of the Equator. This means that the State lies' entirely in the tropics. Ondo State is bounded in the North by Ekiti and Kogi States; in the East by Edo State; in the West by Oyo and Ogun States; and in the South by the Atlantic Ocean. The State has a land area of 14,788.723 Square Kilometres. The State has a population of 3,441,024 comprising 1,761,263 males and 1,679,761 females.

The Elizade University emphasizes learning, research and development. Having completed all due processes, approval for the establishment of the Elizade University was given by the Federal Government on 22 February 2012. The approval was conveyed vide the Provisional Licence to Operate as a Private University No. 46 dated 28 February 2012 issued by the National Universities Commission. The Elizade University aims to attract the best and the brightest students in Nigeria and beyond. The main aim is to provide them with practical-oriented scientific, technological and arts education which shall make them self-reliant while preparing them for future leadership and success in their chosen careers in the highly competitive new knowledge society. Academic activities of the Elizade University for the 2012/2013 session commenced on 6th January 2013. The Engineering Faculty at the Elizade University came into existence in September, 2013, during the 2013/2014 academic session.

The Department of Automotive Engineering, took off in the 2013/2014 academic year with 5 students. The Department currently has 9 academic staff members, comprising two (2) Lecturers on Professorial cadre, three (3) Senior Lecturers and four (4) other Lecturers. Currently, the Department has 59 students.

4.5 Disciplinary Measures

(i) Examination Offences

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

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

disciplinary action by the appropriate authority of the University. The candidate impersonated shall be also be liable to an infraction of this regulation where it is established directly from circumstantial evidence that the impersonation is with his knowledge or connivance.

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

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

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

(f) Candidates shall comply with all "direction to candidates' set out on an examination answer book or other examination materials supplied to them. They shall also comply with direction given to them by an Invigilator.

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

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

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

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

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

session. The candidate concerned shall be allowed to continue with the examination.

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

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

(n) Where the Vice-Chancellor is satisfied on the basis of the reports forwarded to him that any candidate has a case to answer, he shall refer the case to the Central Committee on Examination Malpractice.

(ii) Penalties for Examination Malpractice and other Offences

(a) Any examination offence would attract appropriate penalty including outright dismissal from the university.

(b) Where the Vice-Chancellor has reason to believe that the nature of any question or the content of any paper may have become known before the date and time of the examination to any persons other than examiners of the paper, the Board of Examiners, and any official of the University authorized to handle the paper, he may order the suspension of the examination or the cancellation of the paper or setting of a new paper and shall report the matter to the Senate. The Vice-Chancellor shall also take any disciplinary measure against any student or students involved as he may deem appropriate.

(c) If in the opinion of an invigilator, circumstances arise which render the examination unfair to any candidate he must report the matter to the Vice-Chancellor within 24 hours after the examination. Where such matter is reported to the Vice-Chancellor, he may take such action as he deems fit. If he directs that another examination be held, that examination shall be the examination for the purpose of this regulation.

(d) Any candidate or member of staff may complain to the Vice-Chancellor that an examination has been improperly conducted. The Vice-Chancellor shall investigate the complaint and report the result of his investigations to the Senate which

shall take such action as it may deem appropriate, including with-holding a result or deprivation of the award of a degree, diploma etc. as laid down in her Statues. However, where it is shown to the satisfaction of the Committee of Deans that any alteration or amendment of a University regulation involving a change in a course of study or in examination requirements has caused hardship to a candidate in any examination, the Committee of Deans shall make such provisions as it thinks fit for the relief of such hardship and report same to Senate.

DEPARTMENT OF AUTOMOTIVE ENGINEERING

5.0 DEGREE PROGRAMME

Bachelor of Engineering in Automotive Engineering (B. Eng. Automotive Engineering)

6.0 DEPARTMENTAL STAFF LIST

(a) Academic Staff

Sr. No.	Name	Rank	Qualifications and membership of professional association	Area of Specialisation	Phone Number & Email Address
1	Engr. Dr. Oluranti A. Abiola	Senior Lecturer & Ag. HOD	B.Sc. (OAU), M.Sc. (OAU), Ph.D. (OAU), MNSE, COREN Regd.	Ergonomics, Materials and Production Engineering	07065573777 oluranti.abiola@elizadeuniversity.edu.ng

2	Engr. Prof. Abraham A. ASERE	Professor	B.Sc. Honours (University of Leeds, UK), Ph.D. (University of Leeds, UK), AMIE, AMIP, MSAN, MCREN, LMNSE, FSESN, FNIMechE, FAutoEI, COREN Regd.	Energy Engineering, Thermofluid and Combustion Engineering	08035989056 abraham.aserekan@elizadeuniversity.edu.ng
3	Engr. Prof. Sunday B. Adeyemo	Professor	M.Sc. (Philipines), Ph.D. (Nsukka), FNSE, FNIMechE, COREN Regd., AMASME, SAE	Thermofluid /Air-Conditioning, Energy, and Heat Power Engineering	08033940485 sunday.adeyemo@elizadeuniversity.edu.ng
4	Engr. Dr. Olusola	Senior Lecturer	Ph.D. Energy and Power (Cranfield	Thermofluid, Multiphase	07035099033 olusola.oloruntoba@elizadeuniversity.edu.ng

	Oloruntoba		University) M.Sc. Cranfield University M.Eng. Federal University of Technology, Minna B.Sc. University of Lagos MNSE, COREN Regd.	Flow, Theoretical and Computational Analysis, Engineering Design	
5	Engr. Ojotu I. Joseph	Lecturer I	B.Eng. (Makurdi), M.Eng. (FUTA)	Computer Aided Engineering/ Design and Solid Mechanics	07032957625 ojotu.joseph@elizadeuniversity.edu.ng
6	Engr. Adegbola A. Adeniran	Lecturer II	B.Tech. (LAUTECH), M.Eng. (OAU), MNSE, COREN Regd	Production	08032297144 adegbola.adeniran@elizadeuniversity.edu.ng

(b) Technical Staff

S/N	TECHNICAL STAFF			
	Name	**Designation**	**Qualification, Membership of Professional Association**	**Area of Specialisation**
1	Engr A. A. Ita	Senior Technologist	ND, HND, PGD, COREN Regd.	Manufacturing Engineering
2	Engr. Asiru F. A.	Technologist I	HND, PGD, COREN Regd.	Production Engineering
3	Mr. O. F. Fakinlede	Technologist II	ND, HND	Manufacturing Engineering
4	Mr. Oni A.	Laboratory Assistant	ND	Agric & Bio-Environmental Engineering

(c) Administrative Staff

Name of Staff	**Rank/Designation**	**Qualification and Dates Obtained**	**Duties**
Mrs. Hellen Ibo	Confidential Secretary	HND Secretarial Studies (Ekiti, 2009)	Secretarial Duties and
Mr. Tosin Orimolade	Clerical Officer	NCE Economics/Mathematics	Administrative Duties

7.0 LABORATORIES AND WORKSHOPS

The Department possesses standard laboratories and workshops equipped with state-of-the-art instruments and rugged production equipment. There is an **engineering drawing studio** with a seating capacity of 50 students. It is equipped with tables, multimedia projector and large screen, public address system. There are 40 computers on which are installed CAD software such as AUTOCAD and SOLIDWORKS through which students are introduced to computer-aided drawing. The engineering drawing courses include GNE106, GNE251, MEE202, MEE354 & ATE551.

Other facilities in the Department of Automotive engineering include the under-listed. Some are used exclusively by the Department, while others are shared with sister departments.

Laboratory and Workshop	**Category**
Automobile Maintenance Workshop	Departmental
Automobile Laboratory	Departmental

Welding and Fabrication Workshop	Departmental
Metrology	Shared
Thermo-fluids Laboratory	Shared
Woodwork Workshop	Shared
Mechatronics / Computer Aided Manufacturing Laboratory	Shared
Metallurgy / Material Testing and Strength of Materials Laboratory	Shared
Hydraulic/Waste and Wastewater Laboratories	Shared
Computer Laboratory	Shared
Machine Shop	Shared
Engineering Drawing and Design Studio	Shared

8.0 PROGRAMME PHILOSOPHY

In the Department of Automotive Engineering, students are trained for the award of B. Eng. degree in Automotive Engineering. The teaching and research are based on sound academic foundation as well as practical orientation that

will be sufficient to make them employable in the industries.

The philosophy of the programme is to produce graduates that combine sound theoretical background with practical skills to enable them take up challenging positions in the automotive and manufacturing industries, public service and the academia directly and also to reach a level of practical sufficiency that would enable them to be self-employed.

8.1 Career Opportunities

The Automotive Industry is the second largest industrial sector and is technology intensive. The automobile provides services for industry and commerce, and it is responsible for the movements of bulk of industrial goods from the factory to the market place. It is responsible for the movement of over 90% of passengers in Nigeria. The car is not only required for mobility, it is a status symbol and a cherished prize of every family. The role of the automobile is not likely to change drastically in the foreseeable future hence the long-term employment prospect is good.

A graduate of the programme can work in any of the following areas of employment:

(i) motor vehicle sales and service companies;
(ii) automotive design, research and development;

(iii) operation and maintenance in mass transit companies;
(iv) the civil service;
(v) education and training in secondary and tertiary institutions;
(vi) spare parts manufacturing and motor assembly plants;
(vii) aircraft maintenance;
(viii) marine engine maintenance
(ix) power generating plants; and,
(x) railway, and metro-lines services.

9.0 PROGRAMME OBJECTIVES

The objectives of the programme are to produce Engineering Graduates;

(i) With broad based knowledge of automotive engineering and in-depth knowledge of its specialties (options selected by the student)
(ii) that can apply scientific principles to the design and maintenance of automotive systems and devices
(iii) that are socially, morally and legally responsible;
(iv) with good understanding of economics, management and marketing principles that are essential for the automotive industry; and
(v) who are creative and innovative, and readily develop their entrepreneural skills and

technical competence, to be self-employed in consultancy, manufacturing or service industry.

(vi) that are sufficiently practical-oriented to be self-employed.

10.0 ADMISSION REQUIREMENTS

The minimum entry requirements for admission into Elizade University are Ordinary Level GCE/SSCE/NECO/NABTEB Credit level passes in five (5) subjects. For Engineering, the five subjects must include English Language, Mathematics, Physics, Chemistry and any other science subjects. The five credits requirements shall **NOT** be more than two sittings.

Candidates applying to Elizade University are expected to sit for the respective JAMB Examinations and attain the prescribed cut-off marks. This is a statutory requirement for entry into Nigerian Universities. However, Elizade University sometimes require a candidate to undertake and fulfill the demands of a screening exercise prior to admission into the University

10.1 Entry Requirements

Admission into the Bachelor of Engineering (B. Eng), Automotive Engineering programme, is either through University Matriculation Examination (UME) into 100 level or direct entry into 200 level:

(a) Universal Tertiary Matriculation Examination (UTME)

Admission to 100 level is through Universal Tertiary Matriculation Examination (UTME) in English Language, Mathematics, Physics and Chemistry.

To be eligible for admission, candidates must have the Ordinary level of General Certificate of Education (GCE) or Senior Secondary School Certificate Examination (SSSCE) with at least five credit passes including Chemistry, Physics, Mathematics and English Language at **NOT** more than two (2) sittings. The process is made responsive to directives from NUC through the Senate of the University.

(b) Direct Entry Admission

In addition to the requirements specified above in (a), candidates seeking admission to 200 level must possess

i. ND at Upper Credit Level or equivalent in Automotive/Mechanical Engineering or related discipline from recognised institutions, or Good

passes at the General Certificate of Education (Advanced Level) or its equivalent in Chemistry, Physics and Mathematics.

11.0 PROGRAMME DURATION

The minimum duration of the programme is five academic sessions for students admitted into 100 level and four academic sessions for those admitted into 200 Level, under the course unit system. Students may take longer than the minimum number of sessions to complete the requirements for graduation but NOT more than 15 semesters for 100 level entrants and 12 semesters for Direct Entry students. Longer duration is subject to the approval of the University.

11.1 Transferred Candidates

If a student transfers from one Faculty to another, the transfer would be treated as if he/she is just being admitted into the University since as part of the requirement for graduation the student has to take all the foundation/compulsory courses in the new Faculty or Department. In that case his/her stay in the new Faculty or Department should be 1.5 times the number of semesters required to complete a programme. Where student transfers from a science-based Faculty to another, the computation of his result in the new Faculty shall take cognizance of his previous CGPA in the new Department. The duration of the stay in the University will be what remains of the 1.5 times the number of semesters required to complete the

programme as approved by Senate. Where a student is transferring from an engineering or a science-based to a Humanities, Arts-based Faculty or vice-versa, the transfer should be treated as if the student is just being admitted into the University. The GPA of the student will not be transferred to the new Department. He or She will however be required to take all the foundation or compulsory courses in the new Department.

12.0 GRADUATION REQUIREMENTS

To be eligible for a degree of B.Eng. in Automotive Engineering of Elizade University Ilara-Mokin, a candidate must:

(a) pass all prescribed core courses as well as University and Faculty Required Courses;

(b) complete a minimum of 194 units if admitted through UTME and a minimum of 164 units if by Direct Entry and obtain a CGPA of not less than 1.5; and

(c) complete successfully all field projects, laboratory practical and industrial attachments. Direct Entry students are expected to register and pass General Studies Courses required by the University- GST 101, 102, 111, 109, 210, 215, and 216 and in the event that they fail these courses, they must offer them formally as credit courses.

13.0 THE COURSE UNIT SYSTEM, EXAMINATION REGULATION AND COMPUTATION OF CUMULATIVE GRADE POINT AVERAGE

The course units in the Department are organized on the course credit system per semester. A semester lasts for approximately 17 weeks, including the periods of registration and examinations provided that not less than 14 weeks are devoted to actual teaching (Appendix A). One credit unit is the equivalent of 15 contact hours of classroom teaching or 30 hours of laboratory work. Most of the course units in the Department carry the weight of 3 or 2 credit units, suggesting that they are taught for 45 or 30 hours in the semester or 3 or 2 one-hour periods per week. In courses with practical component, this means that there are 15 hours of teaching and 45 hours of practical to qualify for 2 credit units or 30 hours of teaching and 45 hours of practical for 3 credit unit courses. However, there are fewer 3 credit unit courses which suggest that more work is required to be done in 45 contact hours per semester or the equivalent in terms of practical and classroom teaching. At the end of each semester, a final examination is given to bring the course to final conclusion. The final examination in each course unit is weighted 60% of the component, usually 2 per course unit, carries the weight of 40% of total marks for the course. No student can pass in a course unit if he/she fails to submit the Continuous Assignment (CA) assignments.

13.1 Pattern of Examination

Each course shall be examined at the end of the course. The examination shall be conducted as prescribed by Senate. Each examination shall be 1-3 hours in duration. In addition, there may be a practical paper and/or an oral examination. There shall be continuous assessment of each course and this shall constitute a percentage of the formal grade.

13.2 Eligibility for Participation in Examination

All students who are registered for courses in a given semester are eligible to sit for examination in those courses EXCEPT for students in the following categories:

a. A student who fails to attend up to 75% of lectures or practical in any course.
b. A student who is absent from the University for one (1) semester without official notification" and permission. Such a student is deemed by Senate to have withdrawn from the University.

The implementation of cases listed above is normally subject to Senate approval on the recommendation of the Faculty Board.

13.3 Measurement of Performance

Performance in a course shall be measured in terms of:

a. The results of prescribed theory and practical examination;
b. Continuous assessment which shall constitute 40% of measured performance; and
c. Assessment of such essay, practical exercises and reports prescribed for each course.

13.4 Level of Performance

A student shall be recorded as having attained in a course a level of achievement graded as follows:

Level of Performance	**Rating Credit**	**Points Per Unit**	**Remark**
A	70% - 100%	5	Excellent
B	60% - 69%	4	Very Good
C	50% - 59%	3	Good
D	45% - 49%	2	Satisfactory
E	44% - 40%	1	Adequate
F	0% - 39%	0	Failure

13.5 Release of Examination Results

a. At the end of each semester, a provisional list of successful candidates in course examination shall be published by the Chief Examiner soon after the ratification of the recommendation of the Board of Examiners by the Faculty Board.

b. The proceedings of Boards of Examiners are confidential and are in no circumstances to be disclosed at any time to any candidate or to any other unauthorized person.

c. However, without prejudice to Regulation (b) above, a student contesting a given grade after the release of results can appeal to the Vice-Chancellor, who shall cause the Head of Department to call for the affected paper of the candidate for re-marking. This shall be done after payment of the prescribed fee.

The final results of candidates for the award of a degree shall be published by the Registrar after they have been approved by Senate.

13.6 Calculation of Grade Point Average [GPA]

The overall performance of each candidate during an entire semester shall be determined by means of a weighted grade point average, obtained by awarding credit points in respect of each course multiplied by the numeral value of the grade obtained as follows:

Level of Performance	**Rating Credit**	**Points per Unit**
A	70% - 100%	5
B	60% - 69%	4
C	50% - 59%	3
D	45% - 49%	2
E	44% - 40%	1
F	0% - 39%	0

Definition of Terms.

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

b. **Total Number of Units (TNU):** This is the total number of course units carried by a student in a particular semester. It is the summation of the load Units on all courses carried during the semester. For example, A student who is carrying 6 courses

of 3 units each has a TNU of 18 for that semester. No student shall be allowed to carry (i.e. register for) or be examined in more than 24 units in any particular semester.

c. Cumulative Number of Units (CNU): This is the summation of total number of Units over all the semesters from the beginning to date. A student who is prone to repeating courses will finish (if he does not drop out) with a higher CNU than his non-repeating colleagues and will most likely require a longer time to complete requirements for the award of Degrees.

d. **Level of Performance Rating:** This is the rating of grades obtained in terms of Credit points per load unit. Based on the above, a student who obtained a grade of "A" in a 4-unit course has scored 20 Credit points, and one who obtained a grade of C in that course has scored 12 Credit points.

e. Total Credit Point (TCP): This is the sum of the products of the course units and rating in each course, for the entire semester period. For example, consider a student who took 4 courses of 5 units each. Let's say the grade obtained in the four courses were C.B.F.D. respectively. The TCP of this student is obtained as 5 x 3 + 5 x 4 + 5 x 0 + 5 x 2 = 45

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

g. **Grade Point Average (GPA):** This is the total credit points (TCP) divided by the total units (TNU). For example, consider the student's scores referred to above. His TCP is 45, and of course, his TNU is 20 (4 courses at 5 units each, for the semester). The highest GPA that can be earned is 5.0 and that is when a student has earned a grade of "A" in every course during the semester. The lowest GPA obtainable is 0.0 and this would happen if the student has F all round during the semester

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

13.6.1 GPA and CGPA Sample Computations

Sample Computations: Consider a student who has enrolled for his/ her 100level courses, and has just completed 2 full semesters in the University, His/ Her GPA and CGPA could be computed as follows (Table 1).

13.6.2 Withdrawal from the University

Students are considered withdrawn from the University when their case falls under any of the followings:

a. **Termination of Studentship:** A student that fails to register for courses in two consecutive semesters is credited with 2 “No Registration

Information" (NRI) and **is** subsequently withdrawn from the University.

b. **Poor Academic Performance: S**tudent is considered to have automatically withdrawn from the university if he/she scores a Cumulative Grade Point Average [CGPA] that is less than one in two consecutive semesters.
c. **Voluntary Withdrawal:** A student is also considered withdrawn when his/her application for voluntary withdrawal has been processed through all the statutorily meetings for such a case.
d. **Gross Misconduct:** A student can also be considered for withdrawal through expulsion from the University when found guilty of a gross misconduct by the University Administration. Offences leading to such misconduct includes: examination malpractice disobedience to the University Authority through one of several misdemeanours.

Table 1a: Example of CGPA Computation for First Semester

100-LEVEL: 1ST SEMESTER										
Course Code	**Course Title**	**Units**	**Lecture**	**Tutorial**	**Practical**	**Examination Score**	**Rating**	**CP**	**TCP**	**TNU**
GST 101	Use of English I	2	1	1	-	75 (A)	5	10	10	2
GST 103	Use of Library and Information Literacy	1	1	-	-	35 (F)	0	0	10	3
GST 105	Citizenship and Leadership Education	1	2	-	-	60 (B)	4	4	14	4
MTH 101	General Mathematics I	3	2	1	-	87(A)	5	15	29	7

MTH 103	General Mathematics III	3	2	1	-	67(B)	4	12	41	10
PHY 101	General Physics I	3	2	-	3	78(A)	5	15	56	13
CHM 101	General Chemistry I	3	2	1	-	45 (D)	2	6	62	16
CSC 101	Introduction to Computer Science I	3	2	-	3	88(A)	5	15	77	19
						Previous		Current		
						GPA	0	GPA	4.05	
						CGPA	0	CGPA	4.05	

Table 1b: Example of CGPA Computation for Second Semester

100-LEVEL: 2ND SEMESTER										
Course Code	Course Title	Units	Lecture	Tutorial	Practical	Examination Score	Rating	CP	TCP	TNU
GST 102	Use of English II	2	1	1	-	75 (A)	5	10	10	2
GST 104	History and Philosophy of Science and Technology	1	1	-	-	75 (A)	5	5	15	3
GST 106	Philosophy and Logic	2	2	-	-	60 (B)	4	8	23	5
MTH 102	General Mathematics II (Calculus)	3	2	1	-	87(A)	5	15	38	8

PHY 102	General Physics II	3	2	1	-	88(A)	5	15	53	11
CHM 102	General Chemistry I	3	2	1	-	67(B)	4	12	65	14
PHY 106	Properties of Matter	1	1	-	-			0	65	15
CSC 102	Introduction to Computer Science II	3	2	-	3	78(A)	5	15	80	18
GNE 102	Engineer –in– Society	1	1	-	-	45 (D	2	2	82	19
						Previous		Current		
Total		19				GPA	4.05	GPA	4.32	
						CGPA	4.05	CGPA	4.18	

13.7 Final Assessment and Classification

Final assessment of the student can be summarized as follows:

a. A student's workload is defined in terms of course units. One unit represents one hour of lecture or one hour of tutorial, or 24 hours of practical work per week throughout a semester. All courses shall run for one semester or a full session of two semesters.

b. The final award and the class of the degree shall be based on the Cumulative Grade Point Average [CGPA] obtained by each candidate in all prescribed courses approved by the University. The final cumulative grade point average shall be calculated-on the basis of the total number of credit points and the total number of course units registered for during the course of the student's programme. In the case of a failed course, the candidate must repeat the course at the next available opportunity. If the course is an elective, the candidate may substitute another course which is an elective, and shall not be required to pass the failed elective course. If the course is a restricted elective, substitution can only be made from the list of restricted electives. The failed grade would however be reflected in the transcript.

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

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

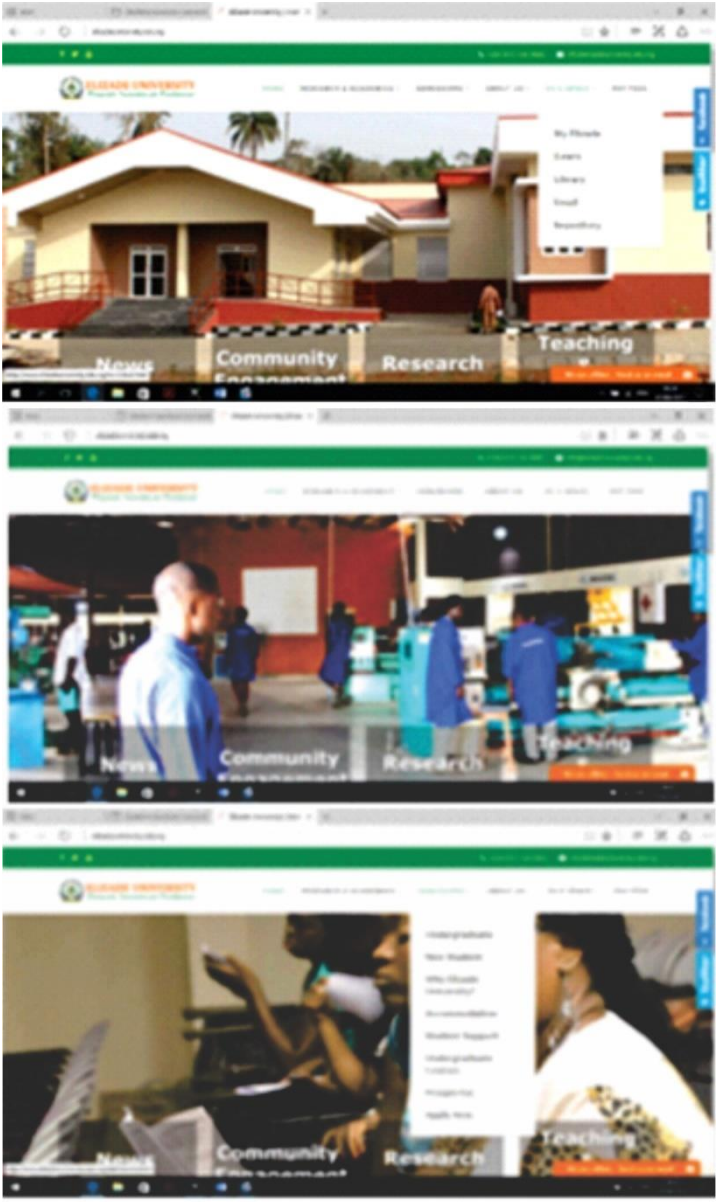
First Class	**4.50 - 5.00**
Second Class (Upper Division)	**3.50 - 4.49**
Second Class (Lower Division)	**2.40 - 3.49**

Third Class Honours	**1.50 - 2.39**
Pass	**1.00 - 1.49**

Passes in required units of Special electives is a requirement for graduation.

13.8 Student Registration on E-Portal

Visit the university URL directly with https://my.elizadeuniversity.edu.ng/ (Figure 1). Follow the instruction. Pay the school fee (Figure 2) and registered all the necessary courses from course list for the programme through my.elizade (Figure 3).


News
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14.0 LIST OF COURSES

100-LEVEL **1st Semester**

Course Code	Course Title	U	ST	Contact hours per week			Total Week Load
				L	T	P	
CHM 101	General Chemistry I	3	C	2	1	0	3
CHM 103	Practical Chemistry I	1	C	0	0	3	3
MTH 101	General Mathematics I	3	C	2	1	0	3
PHY 101	General Physics I	3	C	2	1	0	3
PHY 103	Practical Physics I	1	C	0	0	3	3
GST 101	Communication in English I	2	C	1	1	0	2
GST 109	Use of Library, Study Skills & ICT	1	C	1	0	0	1
GST 111	Citizenship and Leadership Education	1	E	1	0	0	1
GNE 101	Introduction to Computer Technology	3	C	2	0	3	5
Total		**18**					**24**

**U - Unit, ST – Status, L – Lecture Hour(s), T – Tutorial Hour(s),P – Practical Hour(s)*

100 Level **2nd Semester**

Course Code	Course Title	U	ST	Contact hours per week			Total Week Load
				L	T	P	
CHM 102	General Chemistry II	3	C	2	1	0	3
CHM 104	Practical Chemistry II	1	C	0	0	3	3
MTH 102	General Mathematics II	3	C	2	1	0	3
MTH 104	General Mathematics IV	3	C	2	1	0	3
PHY 102	General Physics II	3	C	2	1	0	3
PHY 104	Practical Physics II	1	C	0	0	3	3
PHY 106	Properties of Matter	1	C	1	0	0	1
GNE 102	Engineer –in– Society	1	C	1	0	0	1
GNE 104	Intro. to Computational Software	1	C	1	0	0	1

GNE 106	Introduction to Engineering Drawing	1	C	0	0	3	3
GST 102	Communication in English II	2	C	1	1	0	2
Total		**20**					**26**

**U - Unit, ST – Status, L – Lecture Hour(s), T – Tutorial Hour(s), P – Practical Hour(s)*

200 – LEVEL **1st Semester**

Course Code	**Course Title**	**U**	**ST**	**Contact hours per week**			**Total Week Load**	**Preq.**
				L	**T**	**P**		
CSC 201	Computer Programming I	3	C	2	0	3	5	
GNE 251	Engineering Drawing I	3	C	1	0	6	7	
GNE 253	Engineering Mathematics I	3	C	2	1	0	3	MTH 101
GNE 255	Applied Mechanics	3	C	2	1	0	3	
GNE 257	Fundamentals of Electrical Engineering I	2	C	2	0	0	2	
GNE 259	Materials Science	3	C	2	0	3	5	

GNE 297	Fundamentals of Electrical Engineering Lab. I	1	C	0	0	3	3	
GST 215	Entrepreneurship I	2	C	2	0	0	2	
GST 205	Nigerian Peoples and Cultures	1	E	1	0	0	1	
Total		**21**					**31**	

**U - Unit, ST – Status, L – Lecture Hour(s), T – Tutorial Hour(s), P – Practical Hour(s)*

200 Level **2nd Semester**

Course Code	**Course Title**	**U**	**ST**	**Contact hours per week**			**Total Week Load**	**Preq.**
				L	**T**	**P**		
GNE 252	Workshop Practice	2	C	1	0	3	4	
GNE 254	Engineering Mathematics II	3	C	2	1	0	3	MTH 102
GNE 256	Fundamentals of Fluid Mechanics	2	C	2	0	0	2	PHY 106
GNE 258	Fundamentals of Electrical Engineering II	2	C	2	0	0	2	
GNE 260	Strength of Materials I	3	C	2	0	3	5	

GNE 262	Fundamentals of Thermodynamics	2	C	2	0	0	2	
GNE 296	Fundamentals of Fluid Mechanics Lab.	1	C	0	0	3	3	
GNE 298	Fundamentals of Electrical Engineering Lab. II	1	C	0	0	3	3	
MEE 202	Engineering Drawing II	2	C	1	0	3	4	
GST 210	Introduction to Musicology	1	C	1	0	0	1	
GST 216	Entrepreneurship II	2	C	0	0	6	6	
Total		**21**					**35**	

**U - Unit, ST – Status, L – Lecture Hour(s), T – Tutorial Hour(s), P – Practical Hour(s)*

300 – LEVEL **1st Semester**

Course Code	Course Title	U	ST	Contact hours per week			Total Week Load	Preq.
				L	T	P		
GNE 351	Engineering Mathematics III	3	C	2	1	0	3	GNE 253
ATE 353	Dynamics & Control I	2	C	2	0	0	2	
ATE 355	Automotive Laboratory	2	C	0	0	6	6	
MEE 353	Theory of Machines I	2	C	2	0	0	2	GNE 255
MEE 355	Workshop Practice II	2	C	1	0	3	4	
MEE 363	Mechanical Engineering Design I	3	C	2	1	0	3	
MEE 365	Strength of Materials II	3	C	2	0	3	5	GNE 260
MEE 393	Theory of Machine Lab. I	1	C	0	0	3	3	
	Elective (1 course)	2	E	1	0	3	4	
Total		**20**					**32**	

MEE 359	Manufacturing Technology	2	E	1	0	3	4	GNE 252
MEE 361	Fundamentals of Physical Metallurgy	2	E	1	0	3	4	GNE 259

**U - Unit, ST – Status, L – Lecture Hour(s), T – Tutorial Hour(s), P – Practical Hour(s)*

300 Level **2nd Semester**

Course Code	**Course Title**	**U**	**ST**	**Contact hours per week**			**Total Week Load**	**Preq.**
				L	**T**	**P**		
GNE 352	Engineering Mathematics IV	3	C	2	1	0	3	GNE 254
GNE 354	Engineering Communication	2	C	2	0	0	2	
EEE 352	Electrical Machines	3	C	2	0	3	5	
ATE 352	Automotive Combustion, Power Train & Noise, Vibrations and Harshness	3	C	2	1	0	3	
ATE 356	Automotive Mechatronics I	2	C	2	0	0	2	

MEE 354	Engineering Drawing III	2	C	1	0	3	4	MEE 202
MEE 356	Fluid Mechanics I	2	C	1	0	3	4	
MEE 362	Thermodynamics	2	C	2	0	0	2	GNE 262
MEE 392	Thermodynamics & Fluid Mechanics Lab.	1	C	0	0	3	3	
MEE 358	Metrology	2	E	1	0	3	4	
Total		**22**					**32**	

**U - Unit, ST – Status, L – Lecture Hour(s), T – Tutorial Hour(s), P – Practical Hour(s)*

400 Level **1st Semester**

Course Code	Course Title	U	S T	Contact hours per week			Total Week Load	Preq.
				L	T	P		
GNE 451	Engineering Statistics	3	C	2	1	0	3	
ATE 451	Automotive System Design	3	C	2	0	3	5	
ATE 453	Finite Element Analysis of Structures	3	C	2	1	0	3	
ATE 457	Dynamics & Control II	3	C	2	1	0	3	ATE 353
ATE 459	Automotive Maintenance & Testing	2	C	1	0	3	4	
MEE 455	Fluid Mechanics II	3	C	2	0	3	5	MEE 356
MEE 459	Thermodynamics & Basic Heat Transfer	3	C	2	1	0	3	MEE 352

MEE 461	Research Methodology	1	C	1	0	0	1	
	Elective (1 course)	3	E	2	1	0	3	
Total		**24**					**30**	

ELECTIVES

ATE 455	Applied Aerodynamics	3	E	2	0	3	5	
MEE 453	Theory of Machines II	3	E	2	1	0	3	MEE 353

**U - Unit, ST – Status, L – Lecture Hour(s), T – Tutorial Hour(s), P – Practical Hour(s)*

400 Level **2nd Semester**

Course Code	**Course Title**	**U**	**ST**	**L**	**T**	**P**
ATE 200	Student Work Experience Programme (SWEP)	3	C	0	0	9
ATE 300	Student Industrial Work Experience Scheme (SIWES I)	3	C	0	0	9
ATE 400	Student Industrial Work Experience Scheme (SIWES II)	9	C	0	0	27
Total		**15**				

**U - Unit, ST – Status, L – Lecture Hour(s), T – Tutorial Hour(s) P – Practical Hour(s)*

500 Level **1st Semester**

Course Code	Course Title	U	ST	Contact hours per week			Total Week Load	Preq.
				L	T	P		
GNE 551	Engineering Law and Management	3	C	3	0	0	3	
ATE 551	Advanced Computer Aided Engineering	2	C	1	0	3	4	MEE 202
ATE 553	Computational Fluid Dynamics for Engineering Applications	2	C	2	0	0	2	MEE 455
ATE 555	Automobile Vehicle Dynamics & Safety	2	C	2	0	0	2	ATE 451
ATE 591	Final Year Project I	3	C	0	0	9	9	

MEE 451	Engineering Design Process	2	C	2	0	0	2	
MEE 557	Heat Transfer	3	C	2	0	3	5	MEE 459
	Elective (1 course)	2	E	2	0	0	2	
Total		**19**					**29**	

ELECTIVES

ATE 559	Micro Electro Systems Devices and Technologies	2	E	2	0	0	2
ATE 561	Fatigue of Structures	2	E	2	0	0	2
ATE 563	Energy Generation and Storage Using Modern Materials	2	E	2	0	0	2
MEE 555	Tribology	2	E	2	0	0	2

**U - Unit, ST – Status, L – Lecture Hour(s), T – Tutorial Hour(s),*
P – Practical Hour(s)

500 Level **2nd Semester**

Course Code	Course Title	U	ST	Contact hours per week			Total Week Load	Preq.
				L	T	P		
GNE 552	Engineering Economics and Valuation	3	C	2	1	0	3	
ATE 552	Automotive Materials & Structures	2	C	2	0	0	2	ATE 351
ATE 592	Final Year Project II	3	C	0	0	9	9	
MEE 552	Fluid Dynamics	3	C	2	1	0	3	MEE 455
MEE 554	Plasticity, Fracture of Structures and Materials	3	E	2	1	0	3	
MEE 556	Applied Thermodynamics	3	C	2	1	0	3	MEE 459
	Elective (1 course)	3	E	2	1	0	3	
Total		**20**					**26**	

ELECTIVES

ATE 554	Internal Combustion Engines Design	3	E	2	1	0	3	ATE 352
ATE 556	Vehicle Design	3	E	2	1	0	3	
ATE 558	Machining Processes	3	E	2	1	0	3	

**U - Unit, ST – Status, L – Lecture Hour(s), T – Tutorial Hour(s), P – Practical Hour(s)*

15.0 DESCRIPTION OF GENERAL ENGINEERING COURSES

15.1 BASIC SCIENCES AND GENERAL STUDIES

MTH 101 General Mathematics I 3 Units

Elementary set theory, subsets, union, intersections, complement, Venn diagrams. Real numbers; integers, rational and irrational numbers, mathematical induction, real sequences and series, theory of quadratic equations, binominal theorem. Complex numbers; algebra of complex numbers; the Argand Diagram. De Moivre's theorem, n^{th} roots of unity. Circular measure trigonometric functions of angles of any magnitude, addition and factor formulae.

MTH 102 General Mathematics I 3 Units

Calculus: Function of a real variable, graphs, limits and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation. Extreme curve sketching, Integration as an inverse of differentiation. Methods of integration, Definite integral. Application to areas. Volumes etc.

MTH 104 General Mathematics IV 3 Units

Vectors in Euclidean spaces, vector products, equation of lines and planes, element of vector calculus. General kinematics: momentum, angular momentum, fundamental equations of motion, energy and conservative laws. Dynamics of a particle and of a rigid body.

CHM 101 General Chemistry I 3 Units

Atoms, atomic structures, atomic theory, atomic spectra, Aufbau method, Hund’s rule, Pauli Exclusion principles, Periodicity and periodic table, molecules, chemical equation and stoichiometry Rates of

chemical reaction, energetics Thermochemistry and simple calculations involving Hess's law, Bonding and intermolecular forces, Hybridisation and shapes of molecules (Valence Forces; structure of Solids; molecular and ionic forces). Metals and extraction of metals, The Chemistry of selected metals and non- metals Chemical equilibrium reactions, Properties of gases, solutions, Redox reactions, Introduction to Electro chemistry, -, electrolytic and galvanic cells, Fuel cells, electrode potential, half-cell equation. Faraday laws of electrolysis, Corrosion. Colligative properties, corrosion, Acid, Bases and salts, Introduction to Radioactivity.

CHM 102 General Chemistry II 3 Units

Historical survey of the development and importance of organic chemistry, nomenclature and classes of organic compounds, Homologous series; isolation and purification of organic compounds; qualitative and quantitative- determination of empirical and molecular formulae, percentage purity, yield, organic chemistry; stereochemistry; determination of structure of organic compounds; Electronic theory in organic chemistry; Saturated hydrocarbons and Unsaturated hydrocarbons; alkenes, alkynes and aromatics. Functional group; carbonyls, halides, carboxylic acids and hydroxyl, Valence Forces; structure of Solids; molecular and ionic forces. The Chemistry of selected metals and non- metals–relative abundance

CHM 103: Practical Chemistry I 1 Unit

Calibration of Measuring Instrument; Standardization of HCl with Standard Sodium carbonate; Standardization of alkali with standard potassium hydrogen phthalate. Determination concentrations of commercial (H2SO+, HNO3, NaOH); Preparation of Sulphide of

Copper and determination of its Empirical Formula.; Determination of the atomic weight of a metal by forming its Oxides; Determination of atomic weight of a metal from the volume of Hydrogen it displaced from an acid; preparation of double salts; determination of heat of neutralization; determination of Faraday's constant. Introduction of scientific techniques to local science in the environment

CHM 104: Practical Chemistry II 1 Unit

Identification of elements in an organic compound Lassaigne: sodium fusion Test; Ignition Tests; Separation of mixtures, determination of Melting points; Re-crystallisation; Simple experiment reactions of Urea (carbamide); Test for aldehydes; Detection of carbonyl] group. Ignition test, Estimation of iron in ferrous ammonium sulphate using standardized potassium permanganate, Qualitative inorganic analysis.

PHY 101: General Physics I 3 Units

Space and Time, frames of reference, Invariance of physical laws, relativity of simultaneity, relativity of time intervals, relativity of length, units and dimension; standards and units, unit consistency and conversions. Kinematics vectors and vector addition, components of vectors, unit vectors, products of vectors. Displacement, Time and average velocity, instantaneous velocity, average acceleration, motion with constant acceleration, freely falling bodies, position and velocity vectors, acceleration vector, projectile motion. Motion in a circle and relative velocity. Fundamental laws of mechanics: forces and interactions, Newton's first law, Newton's second law, mass and weight, Newton's third law. Statics and dynamics: application of Newton's laws, dynamics of particles, frictional forces, dynamics of circular motion. Galilean invariance, universal gravitation, gravitational

potential energy, elastic potential energy, conservative and non-conservative forces. Work and energy, kinetic energy and the work-energy theorem, power, momentum and impulse, conservation of momentum, collisions and momentum conservation, elastic collisions, centre of mass. Rotational dynamics and angular momentum angular velocity and acceleration, energy in rotational motion, parallel axis theorem, torque, torque and rotation about a moving axis, simple harmonic motion and its applications. The simple pendulum, damped oscillations, forced oscillations and resonance.

PHY 102: General Physics II 2 Units

Electrostatics: Conservation law of electric charges, electrons and electrostatics, Coulomb's law, electric field and forces, electric field line, electric dipoles charged particles in an electric field, charge and electric flux, Gauss's law and its applications, electric potential, electric potential due to a single charge, electric potential due to a dipole, electric potential due to continuous charge distribution equipotential surfaces. Conductors and currents: electric current, resistors and resistance, electric power, capacitors in series and parallel, energy storage in capacitors and electric field energy, Gauss's law in dielectrics. Magnetism: magnetic field, magnetic field lines and magnetic flux, motion of a charged particles in a magnetic field, magnetic force on a current carrying conductor, Ampere's law, Biot-Savart law, electromagnetic induction, inductance, self-inductance, mutual inductance, Maxwell's equation, electromagnetic waves and oscillations.

PHY 106 Properties of Matter 2 Units

Prerequisite PHY 101

Molecular treatment of properties of matter, elasticity; Hooke's law. Young's shear and bulk moduli. Hydrostatics; Pressure; buoyancy. Archimedes principles. Hydrodynamics; Streamlines Bernoulli and continuity equations. Turbulence, Reynolds number. Viscosity; Laminar flow, Poiseuilles's equation. Surface tension; adhesion, cohesion, capillarity, drops and bubbles. Temperature; zeroth law of thermodynamics; heat; gas laws of thermodynamics; kinetic theory of gases. Application.

PHY 103 Practical Physics I 1 Unit

This introductory course emphasizes quantitative measurements, the treatment of measurement errors and graphical analysis. A variety of experimental techniques will be employed. The experiments include: Mechanics: timing experiments, simple pendulum, compound pendulum, measurement of g, moments, determination of moment of inertia, measurement of viscosity, use of force board, law of momentum. Optics: reflection using plane mirror, convex/concave mirror, concave/convex lens, refraction using a prism, critical angle, apparent depth/real depth, simple microscope, compound microscope.

PHY 104 Practical Physics II 1 Unit

Electricity: Ohm's law, heating effect of a current internal resistance of a cell, Metre/Wheatstone bridge, potentiometer measurement of ece, plotting of magnetic field. Heat: measurement of specific capacity of water, and a solid, expansion of gas experiment using a long capillary tube, Joule's law. Sound: resonance tube, Sonometer.

GST 101 Communication in English I 2 units

Introduction: the nature and functions of language, varieties and styles of English usage. Time Management. Study Skills; contemporary definition of literacy, introduction to the language skills. Vocabulary development: word formation, meaning relationships, register. Listening and Lecture Comprehension. Note -taking/note-making. Introduction to reading for Academic Purposes. Revision and test-taking skills

GST 102 Communication in English II 2 units

Awareness raising: sources and types of writing errors. Grammatical structures: element of the sentence. Word, Phrase and Clause. Sentence types: classification by structure and function. The paragraph: definition and characteristics, patterns of development. Varieties of writing: discourse types, writing formats. The Mechanics of writing. The academic writing process.

GST 109 Use of the Library and Information Literacy 2 units

Definition and types of library. Example of a library set up (introduction to the EUIM library). Organisation of a library. Forms of recorded information: print, non-print and electronic forms. Reference sources and services. Serials and periodicals. Use of ICT in the library. Internet applications: e-resources, social media networks, databases. Virtual libraries. Organization and retrieval of knowledge. The library catalogue. Classification schemes. Introduction to report writing. Search strategies, referencing. Referencing styles.

GST 111 Citizenship and Leadership Education 2 units

Citizenship, qualities of a good citizen. Human rights, limitations to citizen's rights, protection of citizens' rights, duties and obligations: duties of citizens, obligations of citizens to the state. Moral principles and moral obligations, Drugs and medicines, drug abuse and its effects, drugs and health care, prescription and compliance, natural medicines and ethno therapy. Family life education: reproductive health, harmful health, practice safe motherhood, relationships and sexual behavior. Concepts of health and disease: concepts of well-being and disease, disease causation, HIV/AIDS, transition, prevention and control, stigmatization of responsibility, types of leadership, leadership and political power; Goal setting, vision and mission, Delegation of duties.

GST 114 Philosophy and Logic 2 units

Philosophy as a rational enquiry, branches of philosophy, school of thought in western philosophy, African philosophy. The nature of logic, basic symbolic logic, types of argument. Fallacies. Ethics. Metaphysics, metaphysical problems. Socio-political philosophy. justice and the state.

GST 118: Basic Communication in French 1 Unit

Introduction to French, Alphabets and numeracy for effective communication (written and oral), Conjugation and simple sentence construction based on communication approach, Sentence construction, Comprehension and reading of simple texts.

CSC 201 Computer Programming I 3 Units
Prerequisite: CSC 101

An introduction to computer programming with emphasis on mathematical problems using python programming language or any other scientific programming language. Introduce students to computers, compilers and editors, and they are expected to write medium-sized programs. Implementation of concepts such as binding, scope, looping, branching, subprograms and parameter parsing, tasks and concurrency, heap management, exception handling, templates, inheritance and overloading.

GST 205 Nigerian People and Cultures 1 units
Introduction to Nigerian history, Introduction to Nigerian culture. Sources of Nigerian history. Culture and socialization. Primitive science and technology. Traditional religion and belief systems, Penetration of Christianity and Islam. Traditional political structures and administration. Modern day politics and culture. Culture and economic development. Traditional financial institutions. Festival and ritual in Nigerian culture. Festival as drama. Understanding the People/Cultures of Nigeria through their Art. The role of museums. Nigeria literature. The quest for appropriate technology. Cultural revival.

GST 206 Environment and Sustainable Development 1 Unit
Man – his origin and nature; Man and his cosmic environment; Scientific methodology, Science and technology in the society and service of man. Renewable and non-renewable resources – man and his energy resources. Environmental effects of chemical plastics, Textiles, Wastes and other materials, Chemical and radiochemical hazards,

Introduction to the various areas of science and technology. Elements of environmental studies.

GST 208 Peace and Conflict Resolution 1 Unit

Basic Concepts in peace studies and conflict resolution; Peace as vehicle of unity and development; Conflict issues; Types of conflict, e. g. Ethnic/religious/political/ economic conflicts; Root causes of conflicts and violence in Africa; Indigene/settler phenomenon; Peace – building; Management of conflict and security. Elements of peace studies and conflict resolution; Developing a culture of peace; Peace mediation and peace-keeping; Alternative Dispute Resolution (ADR). Dialogue/arbitration in conflict resolution; Role of international organizations in conflict resolution, e.g., ECOWAS, African Union, United Nations, etc.

GST 210 Introduction to Musicology 1 Unit

Elements of music; rhythm combination and extension. Choral singing, ensemble work and special instrument (including voice).

GST 215 Entrepreneurship I 2 units

Introduction to entrepreneurship and new venture creation. Theory of entrepreneurship. Types of business organization. Initiating enterprises. Sources of finance/raising capital cost. Budgeting techniques and financial planning. Managerial functions with special emphasis on staffing. Marketing and the new venture. Accounting and special tax problems. Insurance issues in business. Environmental impact considerations. Student's business proposal.

GST 216 Entrepreneurship II 2 Units

Photography, 2D & 3D animation & motion graphics, Bead making, event planning and management, Fashion designing, Tying and Dyeing/Adire Fabrics, Shoe & Bag making, Make-up and gele.

15.2 GENERAL ENGINEERING COURSES (GNE)

GNE 101 Introduction to Computer Technology 3 units

History of Computers; functional components of a computer; characteristics of a computer system. Definition of computer science. History of computer science and their generations, Computer Hardware; Modern I/O units. Software: Operating Systems, Application Packages Program: Development; Flowcharts and Algorithms; Program Object; VISUAL BASIC programming language serves as the vehicle to illustrate the many concepts.

GNE 102 Engineering in Society 1 Unit

Philosophy of Science and Engineering. History of Engineering and Technology. The Engineering profession - engineering - engineering literacy professional bodies and engineering societies. Engineers' code of conduct and ethics. Engineers and Nation Building - economy, politics, business, safety in Engineering and introduction to Risk analysis. Case studies from invited professionals

GNE 104: Introduction to Computational Software 1 Unit

This course covers the introduction and applications of commonly used computational software packages. Overview of Computational Software. Evolution and trends in Computational Software development. Using MATLAB as an example of computational

Software. Introduction to MATLAB. Basic features of MATLAB. Creating MATLAB variables; managing MATLAB workspace; MATLAB mathematical functions. Basic plotting; Matrix generation; Array operations and Linear equations. Introduction to programming in MATLAB. Control flow and operators. Debugging M-files. Introduction to other computational software packages: overview of GNU Octave and Scilab.

GNE 106 Introduction to Engineering Drawing 1 Unit

Introduction to drawing instruments, scales, draughting aids and their proper use. Size of paper and drawing layout. Dimensioning, line work, layout and lettering. Geometrical constructions and Engineering graphics. Graphical calculus and Applications. Circles and Tangents. Conic sections, various methods of their construction. Cycloid, epi and hypocycloids. Involute. Archimedes spiral. Loci: the helix (cylindrical and conical) single and multi-start threads. Introduction to projections.

GNE 251 Engineering Drawing I 3 Units

Development of geometrical figures and intersection of solids and curves. Projections – lines, planes and simple solids. Orthographic projections in first and third angles. Isometric Projection; sections and sectioning, auxiliary views and staggered sectioning. Pictorial/Freehand Sketching. Conventional practices with Simple examples, including threads and threaded fasteners, cam profiles and Assembly drawing from detailed components. Introduction to Computer Aided Drafting: Electronic draughting packages: principle and use in engineering design. Simulation packages: principle and use in engineering.

GNE 252 Workshop Practice 2 Units

Safety procedure in workshop and Workshop setting; Types of workshop equipment, machines and materials; Use of instruments and tools (hand and machine tools), Measurement and marking out; Bench work and fitting; Machine operation practice. Carpentry: Hand tools and working principles; Joints and fastenings: bolt, rivet, welding, brazing, soldering. Invited lectures from Professionals.

GNE 253 Engineering Mathematics I 3 Units

Complex analysis – Elements of complex algebra, trigonometric, exponential and logarithmic functions. Real number, sequences and series. Composite functions, matrices and determinants. Vectors – Elements, differentiation and integration, Elements of linear algebra, Calculus – Elementary differentiation. Relevant theorems.

GNE 254 Engineering Mathematics II 3 Units

Differential equations – Exact Equations. Methods for second order equations. Partial differential equation. Simple cases – Applications, Numerical Analysis – linear equations, non-linear equations. Transformation and mapping: special functions. Finite difference operators: Introduction to linear programming.

GNE 255 Applied Mechanics 3 Units

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

GNE 256 Fundamental of Fluid Mechanics 2 Units

Nature and types of fluids; Physical properties of fluids; Fluid statics, stability of submerged and floating bodies; Fluid flow concept; conservation of mass, momentum energy; Simple applications of conservation laws; Flow measurement.

GNE 257 Fundamental of Electrical Engineering I 2 Units

Fundamental theory of electric circuit. Direct current (DC) circuit elements. Basic circuit laws and theorems—Ohms Law, Kirchoff's Laws; Superposition, Thevenin and Norton's theorems. Nodal and loop analysis of circuits, single time-constant circuits. Steady state response of circuit elements and network. Complex impedance and admittance. Alternating current (AC) circuits impedance, admittance, susceptance, and phasor diagrams. Introduction to electronics, an overview of tubes (vacuum diode, triode and pentode). Elementary discussion of semiconductors PN junction diode and bipolar Junction Transistor. Small signal equivalent circuits.

GNE 258 Fundamental of Electrical Engineering II 2 Units

Periodic waveforms and their average and effective values. Characteristics and use of non-linear elements in simple circuits. Magnetic circuits, single-phase alternating current (AC) circuits. Series and parallel resonance. Power factor correction, magnetic circuit, mutual inductance. Introduction to electric machines, machine designs, and polyphase systems; DC generators and motors. Electrical and electronic power measuring instruments and equipment, AC and DC bridges. Basic control system, span/closed loop system. Introduction to basic communication fundaments.

GNE 259 Materials Science 3 Units

Review of properties of matter, relationships between structure and properties of metals, alloys, ceramics and plastics. Atomic and molecular structure, crystals, Metallic states, Defects in crystals, conductors, semi-conductors and insulators. Alloy theory – Application to industrial alloys – steel in particular. Engineering Properties – Their control, Hot and cold working, heat treatment, etc. Creep, fatigue and fracture. Corrosion and corrosion control. Non-metallic materials – glass, rubber, concrete, plastics, wood and ceramics. Elastic and plastic deformations: Defects in metals.

GNE 260 Strength of Materials I 3 Units

Hooke's law; Method of superposition; Stress and deformation resulting from temperature changes; Elastic Constants; Stress in thin cylinders and spheres; Stresses on inclined planes. Principal stresses, Mohr's circle. Structural mechanics of statistically determinate rigid body systems and plane pin-jointed frames; Bending moment and shear force in beams, Simple beam and deflection of beam, truss and elastic buckling of columns; Simple torsion and application; Stress and strain transformation equations.

GNE 262 Fundamentals of Thermodynamics 2 Units

Basic concepts, quantitative relations of Zeroth, first (applications to open and closed systems; The steady State flow/ Bernoulli's equation and applications), second and third laws of thermodynamics. Behaviour of pure substances and perfect gases; Ideal gas cycles.

GNE 296 – Fundamentals of Fluid Mechanics Laboratory I 1 Unit
Determination of Fluid properties. Pressure measurement. Hydrostatic force on plane surface. Determination of metacentric height. Determination of stability of floating bodies. Verification of Bernoulli's theorem.

GNE 297 – Fundamentals of Electrical Engineering Laboratory I 1 Unit

Identification of resistors and resistor colour coding, Series connections, Parallel connections, Verification of Ohm's law, Verification of Kirchhoff's Voltage Law, Verification of Kirchhoff's Current Law, Loop analysis, Verification of Thevennin's Theorem, Experiment to verify Norton's theorem, Superposition Theorem

GNE 298 – Fundamentals of Electrical Engineering Laboratory II 1 Unit

Alternating current waveforms: Sine wave, square wave and triangular wave forms**,** RLC Series Circuits**,** RLC Parallel Circuits**,** Half wave rectification Circuit**,** Full wave rectification Circuit**,** Design and Construction of Monostable Multivibrator**,** Design and Construction of Astable Multivibrator**,** Design and Construction of Bistable Multivibrator**,** Series and parallel Resonant Circuits**,** Design and Construction of filters

GNE 351 Engineering Mathematics III 3 units
Fourier series – Euler coefficients, even and odd functions, Sine and Cosine, functions, simple applications, Gamma, Beta and probability functions. Differential equation of second order– series solutions. Legendre and Bessel functions and their properties. Vector Theory –

Dot product, cross product, divergence, curl and Del operators. Gradient. Line, Surface and volume integrals and related theorems.

GNE 352 Engineering Mathematics IV 3 units

Complex variables – advanced topics, differentiation and integration of complex functions. Cauchy – Riemann equations: Related theorems. Laplace and Fourier transforms – Applications. Introduction to non-linear differential equations – stability and Applications.

GNE 354 Engineering Communication 2 Units

Oral communication: Public speaking skills with effective use of visual aids and statistical and technical information. Principles of effective communication in interpersonal and mass communication process. Effective reading skills- extracting main ideas and reading for specific information through speed reading. Written communication: principles of technical writing. Planning and experimental design; data collection and analysis; scientific writing and presentation. Grant writing and funding sources. Ethics and intellectual property. Professional use of English Language for letters, specification descriptions, presentation of charts, graphs, tables, writing of proposals in reports. Case studies of major engineering designs and construction/fabrication as well industrial failures; seminar presentation of reports and proposals. Project report presentation.

GNE 451 Engineering Statistics 3 Units

Elements of statistics; Descriptive statistics, frequency distribution, populations and sample, central tendency, variance data sampling, mean, median, mode, mean deviation, percentiles etc. Probability. Binomial, poison hyper- geometric, normal distributions, etc. Statistical inference intervals, tests hypothesis and significance. Estimating Engineering Quantities: Estimators Methods, Confidence Limits and Tolerance. Hypothesis testing; Statistical Inference and Engineering decision situations, operating characteristics curves, parametric and non-parametric tests of engineering data. Introduction to analysis of variance, regression. ANOVA, R-estimates, confidence intervals, correlation analysis. Statistical computer routines.

GNE 551 Engineering Law and Management 3 Units

Law of contracts for Engineers: offer, acceptance, communication termination. 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

Principles of organization; elements of organization; management by objectives. Financial management, accounting methods, financial statements, cost planning and control, budget and budgetary control. Depreciation accounting and valuation of assets. Personnel management, selection, recruitment and training, job evaluation and merit rating. Industrial psychology. Resource management; contracts, interest formulae, rate of return. Methods of economic evaluation. Planning decision making; forecasting, scheduling. Production control. Gantt Chart, CPM and PERT. Optimization, linear programming as an

aid to decision making, transport and materials handling. Raw materials and equipment. Facility layout and location. Basic principles of work study. Principles of motion economy. Ergonomics in the design of equipment and process.

GNE 552 Engineering Economics and Valuation 3 Units

Economics of business settings, costing of production systems. Objectives of cost analysis and control. Sources of finance, money and credit for projects. Investment Appraisals. Resource Allocation. Interest rates. Interest formulas and problems. Annual costs. Present worth, rates of return. Cost reducing. Depreciation accounting. Valuation of assets. Financial management; accounting methods, financial statement, elements of costing. Budget and budgeting control. Dwelling with multiple alternatives, uncertainties, planning, and Decision-making procedures. Macroeconomics, Economic growth, National Income. Economic of technological change. Economic analysis of engineering projects; value systems economic decisions on capital investments and choice of engineering alternatives; new projects, replacement and abandonment policies, risky decisions; corporate financial practices. Analysis of tender and project feasibility valuation.

GNE 501 Engineering Economics 3 Units

Management: Organizational structure and behaviour; engineer to engineer manager transition; Managerial functions, principles and techniques of planning, forecasting, organizing technical activities; project selection and management; leadership, styles of leadership and management.

Techniques in engineering management – motivated, appraisal, participative and control techniques.

GNE 502 Engineering Management 3 Units

Management of engineering project environment. Formation of company, sources of finance, money and credit. Insurance, National policies, GNP growth a rate and prediction. Organizational management. Management by objectives. Personnel management – selection, recruitment and training. Job evaluation. Industrial psychology- individual and group behavior. The learning process, and motivation factors. Resources Management. Planning and decision making. Forecasting scheduling. Production control. Gantt chart. CPM and pert. Optimization methods. Transport and materials handling. Work study and production processes.

EEE 352 Electrical Machines I 3 Units

Electromechanical energy conversion concepts, rotating magnetic fields, magnetic circuits, magnetic coupling, mutual inductance, principle of machine winding, concentrated and distributed windings, lap and wave windings. DC machines: generators, motors, shunt and series and compound wound DC machines – design, construction, flash-over, sparking, performance characteristics. Transformers: Phasor diagrams, equivalent circuits, regulation, efficiency, characteristics, design, construction, open-circuit, short-circuit test, and polarity tests. Auto-transformers, instrument transformers, single-phase, three-phase transformers, and connections. Parallel operation of transformers. Faults on machines, methods of starting and protection of machines. Basic principles of selection of motors, generators and transformers for practical applications.

15.3 AUTOMOTIVE ENGINEERING COURSES (ATE)

ATE 200. Student Work Experience Programme (SWEP) 3 Units

This will be graded by the industry-based supervisors and the grade returned to the University for processing/ computing the student's result

ATE 300. Student Industrial Work Experience Scheme I (SIWES I) 3 Units

This will be graded by the industry-based supervisors and the grade returned to the University for processing/ computing the student's result.

ATE 352 Automotive Combustion, Power Train & Noise, Vibrations and Harshness 3Units

This course has two components and is taught by two lecturers. The first part introduces students to internal combustion engines, their efficiency and pollutants emission. It looks at the various emerging power technologies in the automotive industry and the current and alternative fuels and combustion processes. Choice of fuel and the design of efficient engine operating parameters and their byproducts will also be discussed. The second part covers an introduction to vehicle refinement, characteristics of sound, exterior noise and control and interior noise and control.

ATE 353 Dynamics and Control 1 2 Units

Students will be introduced to various applications of feedback control systems and develop fundamentals associated with modelling, analysis, design and simulation of automatic control systems. This course also

aims to introduce the basic concepts of machine dynamics and their engineering applications, and deals with the analysis, design and application of a variety of mechanisms.

ATE 355. Automotive Laboratory 2Units

Weekly lectures and experiments designed to introduce the student to the basics of experimentation, instrumentation, data collection and analysis, error analysis and reporting. Topics will include fluid mechanics, thermodynamics, mechanics, materials and dynamical systems. Emphasis is placed on report writing and team-building skills.

ATE 356 Automotive Mechatronics 2 Units

Introduction to mechatronics. To provide an introduction to the application of electronic control systems in mechanical and electrical engineering. To give framework of knowledge that allows students to develop an interdisciplinary understanding and integrated approach to mechatronics engineering.

ATE 400 SIWES II 9 units
Industrial Training Assessed by University Supervisors

This will be graded by staff and the grade would be used to compute the student's result.

ATE 451 Automotive System Design 3 Units

Auto Engine design; Design of steering systems; Design of transmission systems.

ATE 453 Finite Element Analysis of Structures 3 Units

The course will equip the students with the necessary knowledge to use finite element analysis to solve problems related to solid mechanics, dynamics and heat transfer. In particular, the students will have hands-on experience in using finite element analysis software ANSYS and MSC Nastran to solve realistic engineering problems.

ATE 455 Applied Aerodynamics 3 Units

The aim of this course is to introduce students to the fundamentals and practical aspects of incompressible and compressible flows and the design and operation of flow systems, including pipe networks, automobiles and flight vehicles. The course content includes: flow of inviscid and viscous fluids; laminar and turbulent flow in pipes and boundary layers; losses in pipe systems; lift and drag forces on moving bodies, airfoil theory; incompressible-flow machines; fundamentals of compressible flow; 1-D pipe flow; compressible flow nozzles; Rayleigh flow; Fanno flow; external compressible flow around bodies including transonic and supersonic vehicles; design considerations; experimental techniques.

ATE 457. Dynamics & Control II 3 Units

Prerequisite: ATE 303

Dynamic systems are found everywhere, from musical instruments to transportation vehicles such as automobiles and aircraft. Even static civil structures such as bridges and buildings exhibit a dynamic response, which must be considered during design and construction of such systems. This course introduces the fundamental concepts of vibrating dynamical systems, from single degree of freedom systems through to continuous and multi-degree of freedom systems. Design of

vibration control devices, such as vibration isolators and vibration absorbers, is also considered. Concurrently with the introduction to vibratory systems described above, this course also addresses how to control such dynamic systems using modern state-space control. This involves time domain descriptions of dynamic systems using state-space system models. The characteristics responsible for the dynamic response (poles, zeros, eigenvalues) are presented. Control laws using state-space are introduced, including specification of controller characteristics, controller design using. pole placement and optimal (LQR) control (introduction). State observers are presented, including observer design using both pole placement and optimal (Kalman) observers (introduction). Finally, a computer aided control system design methodology is applied to a real MIMO Aerospace platform and several other unstable MIMO systems.

ATE 459 Automotive Maintenance & Testing 2 Units

Maintenance theory and practice, practical works on engines and other auto. Systems, Bodywork techniques, wheel-balancing and alignment, routine maintenance, fault finding techniques and rectification procedures, test and performance analysis of auto. Parts and systems

ATE 551 Advanced Computer Aided Engineering 2 Units

This course introduces the student to a variety of CAD, CAM and CAE packages that are currently available and in common use by the automotive industry. There will be hands on opportunities and the function and theories behind of each piece of software reviewed. Students will be encouraged to familiarize themselves with the operation of the software through problem-based assignments.

ATE 552. Automotive Materials & Structures 2 Units.

The course examines the different types of materials used in the automotive industry, including metals, ceramics and composites. Selection of the appropriate material for a variety of applications will be discussed in terms of the material properties, ease of manufacture and performance in the anticipated service environment. Case studies will be used to demonstrate the design principles used when using each of these materials for automotive applications. The course develops an understanding of the mechanics of complex practical situations through the establishment and solution of an appropriate boundary value problem

ATE 553 CFD for Engineering Applications 2 Units

Introduction; Prediction; Typical problems; Basic equations of fluid flow & levels of approximation: the Navier-stoke equation, turbulent flow and its modelling, inviscid flow, boundary layer approximation; Basic computational technique: descritisation, descritisation method. Operation of software in CFD and applications in automotive engineering.

ATE 555 Automobile Vehicle Dynamics and Safety 2-Units

This course will educate students in automotive vehicle dynamics and safety. The course will cover the dynamics of vehicles on the road during normal operation as well as during impact and other crash scenarios. Specific topics include vehicle handling, stability and control, tyre dynamics, suspension design, braking performance, automotive safety, impact dynamics, road safety engineering and safety regulations.

ATE 591 Final Year Project I 3 Units

Students are required to come up with a project proposal which is a detailed description of a series of activities aimed at solving a certain problem. In order to be successful, the document should: provide a logical presentation of a research idea, illustrate the significance of the idea, show the idea's relationship to past actions and articulate the activities for the proposed project.

Designing a project is a process consisting of two elements, which are equally important and thus essential to forming a solid project proposal: project planning (formulation of project elements) and proposal writing (converting the plan into a project document). The project proposal should be a detailed and directed manifestation of the project design. It is a means of presenting the project to the outside world in a format that is immediately recognised and accepted.

ATE 592 Final Year Project II 3 Units

Final year students' individual or group projects in one of the several areas of Automotive Engineering, under the supervision of the academic staff of the Department or School. These independent projects may involve literature research, design, elementary fabrication construction, or feasibility studies. The student is required to plan and carry out the project under the supervision of academic member of staff. A formal report of the project is required at the end of the second semester. The student is required to present his/her results orally before a panel of examiners.

ATE 502. Automotive Materials & Structures 3 Units.
Stress and strain relationship in engineering materials. Deformation mechanism. Selection of materials: Criteria of selecting materials for automotive components viz Cylinder block, Cylinder head etc. Application of non-metallic materials such as composite, ceramic and polymers in automobile. Heat treatment of steel. Coating and corrosion resistance. Electroplating, phosphating, anodizing, hot dipping, thermal spraying, hard-facing and thin film coatings.

ATE 503 CFD for Engineering Applications 3 Units
Introduction; Prediction; Typical problems; Basic equations of fluid flow & levels of approximation: the Navier-stoke equation, turbulent flow and its modelling, inviscid flow, boundary layer approximation; Basic computational technique: descritisation, descritisation method. Operation of software in CFD and apllications in automotive engineering.

ATE 591 Project I 3 Units

ATE 592 Project II 3 Units
Final year students' individual or group projects in one of the several areas of Automotive Engineering, under the supervision of the academic staff of the Department or School. These independent projects may involve literature research, design, elementary fabrication construction, or feasibility studies. The student is required to plan and carry out the project under the supervision of academic member of staff. A formal report of the project is required at the end of the second semester. The student is required to present his/her results orally before a panel of examiners.

15.4 DEPARTMENTAL ELECTIVES

ATE 554. Internal Combustion Engines Design 3 Units
Design of all types of Internal Combustion Engines: Diesel, gasoline etc. for applications in motorcycles, cars Engines for ship or power generation. Design of ICE parts.

ATE 556 Vehicle Design 2 Units
Emphasizes systems approach to automotive design. Specific topics include automotive structures, suspension steering, brakes and driveline. Basic vehicle dynamics in the performance and handling modes are discussed. A semester team-based design project is required.

ATE 558 Machining Processes 3 Units
Introduction to machining operations, cutting tools and tool wear mechanisms. Cutting forces and mechanisms of machining. Machining process simulation. Surface generation. Temperatures of tool and work piece. Machine Dynamics. Not-traditional machining. Two hours' lecture and one laboratory session.

ATE 559. Micro Electro Systems Devices and Technologies 3 Units
Advanced Micro Electro Mechanical Systems (MEMS) devices and technologies. Transduction techniques, including piezoelectric, electro-thermal, and resonant techniques. Chemical biological sensors, micro-fluidic and biomedical devices. Micromachining technologies such as laser machining and micro-drilling. EDM, materials such as SiC and diamond. Sensor and actuator analysis and design through CAD.

ATE 561 Fatigue of Structures 3 Units

Fundamental concepts associated with fatigue damage and failure in engineering structures and contemporary design and analysis procedures with an emphasis on fatigue of welded structures, including most recent developments in finite element-based fatigue design and analysis procedures, e.g., mesh-insensitive structural stress method and master S-N curve approach.

ATE 563 Energy Generation and Storage Using Modern Materials 3 Units Prerequisite: Good Standing.

Energy and power densities previously unattainable in environmentally-friendly energy technologies have been achieved through use of novel materials. Insertion of new materials into power supplies has changed the landscape of options. Design strategies for power systems are described, in the context of growing global demand for power and energy.

15.5 MECHANICAL ENGINEERING COURSES (MEE) – taken in ATE Programme

MEE 202 Engineering Drawing II 2 Units

Auxiliary projections, True lengths, sizes and shapes, Development of surfaces. Cams. Interpretation of solids. Detail drawing. Belts, Chains, Gears. Bearing and lubrication arrangements. Couplings brakes, Flexible shafts, Universal joints, etc. Assembly drawings. Revisions.

MEE 353 Theory of Machines I 2 Units

Simple mechanisms and their analysis; Vector diagrams; Simple harmonic motion; Newton's Laws of motion; Force analysis of mechanism; friction effect; analysis and applications; Theory of Structures; Dynamics of linear systems; Balancing; Gear systems and Gear trains; Rigid body; Introduction to tribology.

MEE 354 Engineering Drawing III 2 Units

Introduction to computer aided design (AutoCAD), Installing a CAD system. CAD hardware: workstation, seats, mouse and tablets, plotter, printer. Using AutoCAD to produce 2-D and 3-D, drawing information generation, retrieval, analysis and use. Simulation: Modeling, verification and validation. Descriptive geometry. Limits and fits. Geometric tolerancing. Welding drawing and design. Redesigning of casts components using welded joints. Harder examples on exploded assembly drawing (e.g. a complete gear box in exploded assembly drawing). Pipe joints. Arrangement of engineering components to form a working plant (Assembly Drawing of a Plant). Revision.

MEE 355 Workshop Practice II 2 Units

Workshop setting; Types of workshop equipment, machines and materials; Use of instruments and tools, Machine operation practice; Safety procedures in workshops.

MEE 356 Fluid Mechanics I 2 Units

Flow measurements; Friction effects and losses in laminar and turbulent flows in ducts and pipes. momentum equation; Introduction to boundary layer flow; Introduction to dimensional analysis and dynamic

similitude; fluid operated machines; Rotodynamic machines; Fluid Power transmission; Pumps and pump design.

MEE 358 Metrology 2 Units
Theory and practice of high precision. Mechanical measurements under strict control conditions. Super micrometry, comparator, profilometry, collimators application in machine installations, etc. Tolerances and quality. Fits: Clearance, transition and interference fits.

MEE 359 Manufacturing Technology 2 Units (Prerequisite: GNE 252)
Fabrication methods; Casting and pattern design; Forging and extrusion; Welding methods; Use of drilling, boring, grinding and other material processing machines; Foundry work.

MEE 361 Fundamentals of Physical Metallurgy 2 Units
Introduction to the electric structure of atom and matter. Solid state crystallography. Relationship between structure and composition and the mechanical and thermal properties of materials of metals, alloys, plastics, ceramics, and natural products. Heat treatment: Annealing, normalizing, tempering and hardening. Metallic corrosion and protection. Manufacture and properties of high polymers. Thermoplastic and thermosetting resins.

MEE 362 Thermodynamics (Prerequisite: GNE 262) 2 Units
Ideal air cycles. Introduction of Internal Combustion Engines; Reciprocating air compressors and other positive displacement compressors. Gas and vapour power cycles, refrigeration cycles, vapour compression units, principles of absorption refrigeration.

MEE 363 Mechanical Engineering Design I 2 Units

Design of standard components, Fasteners (bolts, nut and rivets, circlips, and keys) Shaft design. Brackets, Riveted and bolted joints. Preferred numbers. The concept of surface finish, limits and fits using ISO, B.S. and DIN and other standards. Theory of lubrication. Bearing Design; rolling element - plain and journals, etc. Power transmission elements: belts, pulleys, chain, gears and sprockets. Design of simple mechanical systems and machines. Material selection in design; Design; Design and production matching; Optimization in design; Failure analysis; Design project.

MEE 365 Strength of Materials II 3 units

Advanced topics in bending moments and shear force in beams. Use of unit load method. Combined loading. Theory of bending of beams. Deflection of beams. Unsymmetrical bending and shear center. Plastic bending of beams, buckling. Statically indeterminate problems, thermal and assembly problems. Application of strain energy. Biaxial and Triaxial states of stress. Transformation of stresses. Thin-walled sections. Mohr's circle. Failure theories. Creep, fatigue, fracture and stress concentration. Helical and leaf springs.

MEE 392 – Thermodynamics & Fluid Mechanics Laboratory 1 Unit

Laboratory practical based on the theoretical course content of Thermodynamics (MEE 302) and Fluid Mechanics I (MEE 306)

MEE 393 - Theory of Machine Laboratory I 1 Unit

Laboratory practical based on the theoretical course content of Theory of Machine I (MEE 303)

MEE 451 Engineering Design Process 3 units

Introduction to elements of design process including strategic planning, project management, modelling, material selection, engineering economics, safety, environmental issues and ethics.

The system life cycle, functional analysis, and allocation of design requirements, specification practice, life cycle costs, design for financial viability, design for the Nigeria conditions. Ergonomic considerations in design. Use of anthropometric data. Finite element methods of stress analysis. Computer aided design and solids modeling. Use of common design packages such as AutoCAD. Design of systems and machines. Design projects.

MEE 453 Theory of Machine II 3 Units

Vibration of mechanical systems. The general nature of free, forced and self-excited vibrations. Lumped one and two degree-of-freedom linear systems; free motion, natural mode, viscous damping. Electrical analogy. Forces transmitted to supports; transmissibility, energy input and absorption. Elements of the analysis of multi-body and distributed – mass linear systems. Raleigh's principle. Holzer's method; application to torsional vibration. Flexural vibration of beams, whirling of a single disc on a shaft.

Laboratory work.

MEE 455 Fluid Mechanics II 3 Units

Prerequisite: MEE 356

Unsteady flow; Oscillation in U-tube; Surge tank; Water hammer; Open channel flows. Introductory concepts of boundary layer and re-circulating flows, Mathematical derivation of Navier-stokes, equations and application.

MEE 459 Thermodynamics and Basic Heat Transfer 3 Units

General thermodynamics relations. Kinetic theory of gas. Mixture of gases, psychometry, air-conditioning and cooling towers. Introduction to heat transfer.

MEE 461 Research Methodology 2 Units

Project proposal – Aims, objectives, scope and methodology. Desk research work – Review of previous works and justification for the project. Main investigation – theoretical consideration, experimental works, field works and data collection and designs. Analysis of data/results – collation of findings, assessment of accuracy, further investigations, results consideration and objective appraisal. Documentation – Format of write-up, major headings and sub-headings, citing of references, tables, figures, listing of references, appendices etc. Phraseology.

MEE 552 Fluid Dynamics 3Units

Prerequisite: MEE 455

Mathematical theory of motion in inviscid fluids. Steady compressible flow. Laminar and turbulent boundary layers, and wakes. Theory of turbulence models, isotropic wall and free turbulence. Isentropic flow in ducts, normal shock waves, etc.

MEE 554 Plasticity, Fracture of Structural Materials (2 Units: LH 30)

Fundamentals of Plasticity; Stress and strain relations; Yield criteria. Various approximate methods applied to elastoplastic problems of bending of beams and torsion and bars. Plastic limit design. Conventional design concepts in relation to fractures; the mechanics of fracture. Designing and testing for fracture resistance. Microscopic aspect of fracture. Fracture of specific materials. Fatigue.

MEE 555 Tribology 2 Units

Theories of friction between metallic and non-metallic, dry and lubricated surfaces. Testing and properties of materials, solid and liquid lubricants. Theory of self-acting and pressurized bearing including Reynolds equations and solutions, dynamic loading, temperature, and pressure effects on viscosity. Elastohydrodynamic lubrication, gears and rolling contact bearings. Design of journal and thrust bearings.

MEE 556 Applied Thermodynamics (3 Units)

Chemical reactions. Gibbs functions. Chemical equilibrium. Combustion and product analysis; Compressor- Classification, efficiency, P-V and velocity diagrams, performance characteristics and working regimes. Boiler- Classification and configuration, applications, efficiency, heat balance sheet. Steam nozzles, steam engine and steam turbine, impulse, efficiency, reheat factor

MEE 557 Heat Transfer 3 Units

Prerequisite: MEE 459

Conduction: Steady and unsteady conduction; Numerical methods. Heat transfer by convection. Fundamentals of heat transfer by convection, patterns of flow and the boundary layer, heat transfer coefficient. Differential equations of heat transfer. Reduction of differential equations of convective heat transfer and conduction of unambiguity to dimensionless form; criterion equations. Free and forced convention for laminar, turbulent and transition flows in tubes. Nucleate boiling; Mass transfer processes. Thermal radiation heat transfer. General data on thermal radiation: Basic law of absorption, basic laws of thermal radiation heat transfer. Plank's law, Stefan - Boltzmann law, Kirchhoff's law, Lambert's law, Cosine law. Radiation heat transfer between solids: parallel plates, bodies one of which is situated inside the other, bodies arbitrarily arranged in space. Heat Exchangers; Types of heat exchanger. Basic heat calculations: Calculation of outlet temperatures of hot fluid in parallel flow, counter-flow and across-flow arrangements.

Laboratory work.