ONDO STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY (OSUSTECH), OKITIPUPA

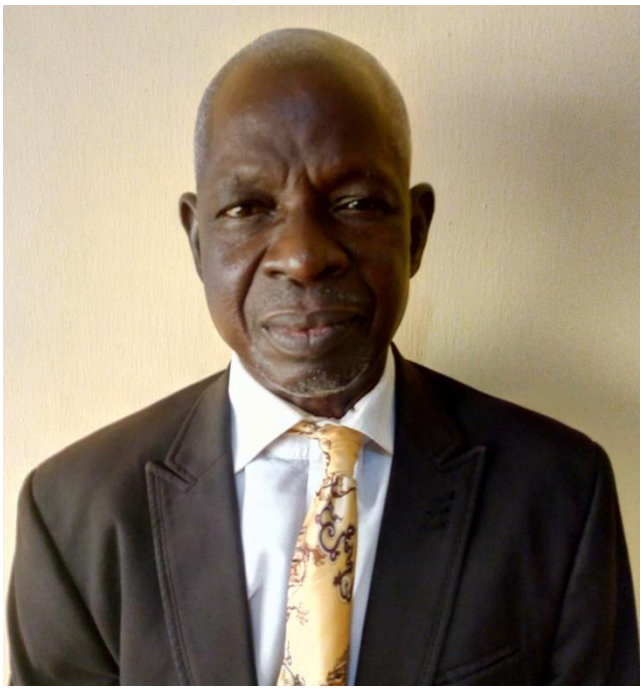
FACULTY OF ENGINEERING AND ENGINEERING TECHNOLOGY

STUDENTS HANDBOOK

FOR UNDERGRADUATE PROGRAMMES

2019 - 2024

DEAN 'S WELCOME NOTE



It is a great pleasure for me to welcome you to the Faculty of Engineering and Engineering Technology, one of the three Faculties in Ondo State University of Science and Technology (OSUSTECH), Okitipupa. The Faculty aims at providing sound engineering education, through innovative teaching and research, so as to produce a new generation of highly competent, skillful and innovative professionals and academics in engineering with the goal of identifying and providing solution to Africa 's developmental challenges.

OSUSTECH is located at Okitipupa, in the southern senatorial District, and is the ancient historic headquarters of the oil-producing part of Ondo State with typical coastal/marine environment.

The Faculty currently offers three programmes, namely Civil Engineering, Electrical and Electronics Engineering and Mechanical Engineering. This handbook is intended to provide you with the basic information that will guide you in the course of study at the University.

You are indeed welcome, and I wish you good success as you study at OSUSTECH.

Dr. Israel O. Megbowon
Ag. Dean

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CHAPTER ONE: GENERAL INFORMATION

1.1 Brief History of the Faculty of Engineering and Engineering Technology

Consequent upon the approval of the Senate to prepare for the commencement of Engineering programmes in the University, Dr. (Engr.) Isaac O. Olaniyan of the Department of Physical Sciences was saddled with the responsibility of coordinating the preparation of the Curricula for the proposed engineering programmes with the support of a team of Engineers led by Dr. Aiyewalehinmi and Prof. P.O. Fapetu from the Federal University of Technology, Akure. Following the successful Resource Verification visit of the National Universities Commission (NUC) to the University in November 2018, the NUC Management thereafter met on the 16th and 17th November 2018 and approved the establishment of three engineering programmes in the Faculty of Engineering and Engineering Technology, namely Civil Engineering, Electrical and Electronics Engineering and Mechanical Engineering with effect from 2017/2018 academic session.

Academic activities commenced in the Faculty with the admission of the first set of 277 students which consists of 93 for Civil Engineering, 91 for Electrical and Electronics Engineering and 93 for Mechanical Engineering during the 2017/2018 academic session. The Faculty of Engineering and Engineering Technology is located at the Mega School, Ayeka, Okitipupa. All the degree programmes in the Faculty are accomplished in five years, leading to the award of Bachelor of Engineering (B. Eng.) in the three engineering programmes of the Faculty. Presently, the three departments in the Faculty of Engineering and their programmes are listed in Table 1 below:

Table 1. Departments, Programmes and Degrees obtainable in the Faculty of Engineering and Engineering Technology

S/No	Department	Programme	Degree Obtainable
1.	Civil Engineering	Civil Engineering	B.Eng. Civil Engineering
2.	Electrical and Electronics Engineering	Electrical and Electronics Engineering	B.Eng. Electrical and Electronics Engineering
3.	Mechanical Engineering	Mechanical Engineering	B.Eng. Mechanical Engineering

1.2 Administration of the Faculty

The Dean of the Faculty oversees the general administration and academic affairs of the Faculty. It is also the duty of the Dean to present students admitted into the Faculty for matriculation and convocating students, who have passed the prescribed examinations of the Faculty for the award of degrees of the University.

Each department in the Faculty is headed by a Head of Department or Coordinator who coordinates and supervises the academic and administrative affairs of the department.

The Faculty Officer is appointed to assist the Dean in the administrative running of the Faculty. The Faculty Officer is also responsible to the Registrar of the University.

The Faculty Board is the highest decision making body of the Faculty. All academic Staff of the Faculty are automatic members of the Faculty Board.

The pioneer and current Ag. Dean of the Faculty is Dr. Israel O. Megbowon, an Associate Professor of Electrical and Electronics Engineering and the current Faculty Officer is Mr. T. J. Tawose an Assistant Registrar.

1.3 Vision, Mission, Philosophy and Mandate of the University

(a) Vision

The Vision of the University is "To be a leading internationally recognized Institution, raising a corpus of technologically-competent individuals able to respond to the needs of their environment in a technologically-driven economy.

(b) Mission

The Mission of the University is "To provide sound scientific, technological and professional training, identify technological needs and problems, solve them within the content of community and national needs and sustainable development.

(c) Philosophy

OSUSTECH is dedicated to providing opportunities for students of diverse backgrounds and interests, to pursue a well-rounded approach to their development and to realize their unique potentials in professional, leadership and inter-personal skills, irrespective of differences in race, colour, religion, national origin or gender. Graduates of OSUSTECH will be empowered with creative-thinking and decision-making skills necessary to succeed and contribute greatly to the advancement in today's rapidly changing world.

(d) Mandate

The Mandate of the University, which also holds for the Faculty, is to train and provide a pool of high-level human resources with practical skills that have an enormous impact on the society and the world, seeding the "specific society" of the future. The university, and of course, the faculty will promote mutual interactions among other institutions in the state and forge links between engineers and lay persons, merging engineering skills and societal values.

1.4 Philosophy and Objectives of Engineering and Technology

Philosophy

To achieve the goals and objectives of the National Policy on Industrialisation and Self-Reliance, the Engineering and Technology education would be geared towards:

(i) The development of a thorough practice in engineering and technology training

(ii) Broad–based training in general Engineering and Technology at the early stages of the programme

(iii) Practical application of Engineering, Technology and Manufacturing Processes.

(iv) Adequate training in human and organizational behaviour and management

(v) Introduction to entrepreneurial education and training

(vi) Close association of the programme with industries in the country.

The general philosophy therefore is to produce graduates with high academic standard and adequate practical background for self-employment as well as being of immediate value to the industry and the community in general.

Goals and Objectives

The general goals and objectives of Engineering and Technology training is in consonance with the realization of national needs and aspirations vis-à-vis industrial development and technological emancipation. The graduates must therefore be resourceful, creative, knowledgeable and able to perform the following functions:

(i) To design engineering projects and supervise their implementation.
(ii) To design and implement components, machines, equipment and systems.
(iii) To design and develop new products and production techniques in industries.
(iv) To install and maintain complex engineering systems so that they can perform optimally in our environment.
(v) To adapt and adopt exogenous technology in order to solve local engineering problems.
(vi) To be able to exercise original thought, have good professional judgment and be able to take responsibility for the direction of important tasks.
(vii) To be able to manage people, fund, materials and equipment.
(viii) To improve on indigenous technology to enhance local problems solving capability

Engineering and technological skills are the bedrock of technological development of any nation, and therefore responsible for national economic growth and maturity, with attendant contribution to human welfare, health and progress.

1.5 Types of Training

In order to produce ideal manpower required that will lead to the full realization of the objectives outlined, the following types of training are pursued: -

(i) Lectures on prescribed courses for each degree programme.

(ii) Tutorials to complement the formal lectures to enhance better understanding of the taught courses.

(iii) Seminars and workshops on selected topics and specific trainings to be handled by internal and invited speakers and resource persons.

(iv) Field works, industrial attachments and excursions to various locations of interest research and learning institutions and organizations for proper understanding and application of the courses.

1.6 Admission Requirements into Degree Programmes

Admission shall be open to all, irrespective of gender, race, religion or political leanings. The minimum age of prospective candidates is sixteen (16) years and they must satisfy the faculty and departmental admission requirements. The requirements for admission into programmes in the faculty are guided by the University policy on admission which are clearly stated in the University Academic Brief and published in the Joint Admissions and Matriculation Board (JAMB) brochure.

Admission into programmes of the Faculty can be through JAMB Unified Tertiary Matriculation Examination (UTME) and Direct Entry (DE). Table 2 provides a summary of the admission requirements into the programmes of the Faculty.

Table 2: Admission Requirements into the Faculty of Engineering

S/N	Department	U.T.M.E.	Direct Entry	Remarks
1.	Civil Engineering	Five credit passes at SSCE (or its equivalent) in subjects including English, Mathematics, Chemistry, and Physics at not more than two (2) sittings.	(1) National Diploma at Upper Credit level or equivalent in Civil Engineering or related disciplines from a recognized institution. (2) Two A-level passes in Mathematics, Physics and or Chemistry. In addition, candidates in this category will be required to audit and pass some first year courses to remedy deficiencies.	UTME subjects are English, Mathematics Physics and Chemistry.
2.	Electrical and Electronics Engineering	Five credit passes at SSCE (or its equivalent) in subjects including English, Mathematics, Chemistry, and Physics at not more than two (2) sittings.	(1) National Diploma at Upper Credit level or equivalent in Electrical and Electronics Engineering or related disciplines from a recognized institution. (2) Two A-level passes in Mathematics, Physics and or Chemistry. In addition, candidates in this category will be required to audit and pass some first year courses to remedy deficiencies.	UTME subjects are English, Mathematics Physics and Chemistry.
3.	Mechanical Engineering	Five credit passes at SSCE (or its equivalent) in subjects including English, Mathematics, Chemistry, and Physics at not more than two (2) sittings.	(1) National Diploma at Upper Credit level or equivalent in Mechanical Engineering or related disciplines from a recognized institution. (2) Two A-level passes in Mathematics, Physics and or Chemistry. In addition, candidates in this category will be required to audit and pass some first year courses to remedy deficiencies.	UTME subjects are English, Mathematics Physics and Chemistry.

NB: The above criteria will be subjected to the University Post UTME screening for final selection.

1.7 Orientation of Students

Fresh students are usually taken through an orientation programme within the first few weeks of their arrival at the University. The orientation programme is aimed at briefing the new students on the University activities, as well as counsel them on how to settle down quickly and adjust to university life.

1.8 Registration of Students

All students of the Faculty must register with the University. The registration process takes each student through the following sections/Units of the University.

(i) Academic Office or Examination and Records Units for initial screening, clearance and collection of registration forms.

(ii) Bursary Unit for the payment of all necessary fees.

(iii) Students Affairs Office for necessary guidance and directives, including identity card matters.

(iv) University Library for registration to use the library and borrow books.

(v) University Medical Centre for registration to receive medical treatment.

(vi) Departments and Faculty for academic registration.

1.9 Matriculation Ceremony

Every fresh student of the University must be matriculated before he or she is accorded recognition as a bonafide student of the University. At the ceremony, the Vice-Chancellor and other Principal Officers of the University are presented to the students, who will be in the University matriculation gown. The fresh students are made to swear to an oath to abide by the Statutes, Ordinance and Regulations of the University. The matriculation ceremony marks the end of the students' registration exercises. Students are usually issued with matriculation numbers with which they obtain identity card of the University.

1.10 Student Identity Card

The students' identity card which is issued by the Students Affairs Office is an important document which identifies a student as a member of the University community. The identity card is usually required to access University facilities and also necessary for examination purposes. The identity card remains the property of the University, hence it must be submitted by all students on graduation, and loss of the card must be reported immediately to the appropriate authorities.

1.11 Duration of Degree Programmes

All the degree programmes of the Faculty are run in five years. If a student fails to meet the minimum requirements for graduation at the end of the five years, he or she is allowed to slip into the Final Year Non-Graduating Class to write and pass the outstanding or failed courses for a period not exceeding two academic sessions.

1.12 Departmental Associations

All registered students of respective departments are encouraged to be members of OSUSTECH chapter of their Departmental National Associations. The Associations are known to foster unity and promote academic excellence among students. The Heads of different Departments are expected to guide and advise the students on the membership of such associations.

1.13 Staff/Student Forum

In order to bridge communication gap and to encourage better understanding between the university management, lecturers and students, the departments or the students, through their departmental associations usually organize series of activities during the session. Such activities include staff/student forum which affords the students the opportunity to interact with their lecturers on critical issues bothering on academics, student welfare, rules and regulations etc under a relaxed atmosphere.

1.14 Health and Medical Related Matters

All registered students of the university must register with the University Health Centre, where they will be issued clinic registration card, which must be produced each time the student visits the health centre for treatment. All medical cases must be reported to the university clinic as soon as possible. Students are warned to avoid self-medication, drug abuse and drug addiction.

All medical cases occurring during holidays and those warranting taking a student home or elsewhere for treatment must be reported to the Head of his or her department immediately with substantial evidence. The medical report will be authenticated by the University Health Centre. This procedure is very important for academic and administrative purposes.

1.15 Sources of Information

Information and clarifications on matters affecting students' academic activities and welfare can be sought from the following units/sections of the University:

- Academic registration and related academic matters: The Heads of Departments, Course Lecturers/Course Advisers and Level Advisers or Coordinators.
- Health matters: University Health Centre.

- Security matters: Directorate of Student Affairs, Dean of Faculty, Head of Departments, Lecturers and Chief Security Officer.
- ID Card, Travels, Transportation, Games, Sports, Accommodation etc: Student Affairs
- Guidance and Counseling: To advise students on career matters, family matters, psychological and emotional stress: Guidance and Counseling Unit of OSUSTECH of the Student Affairs Office.

The Channels of Communication are as shown in Figure 1 below:

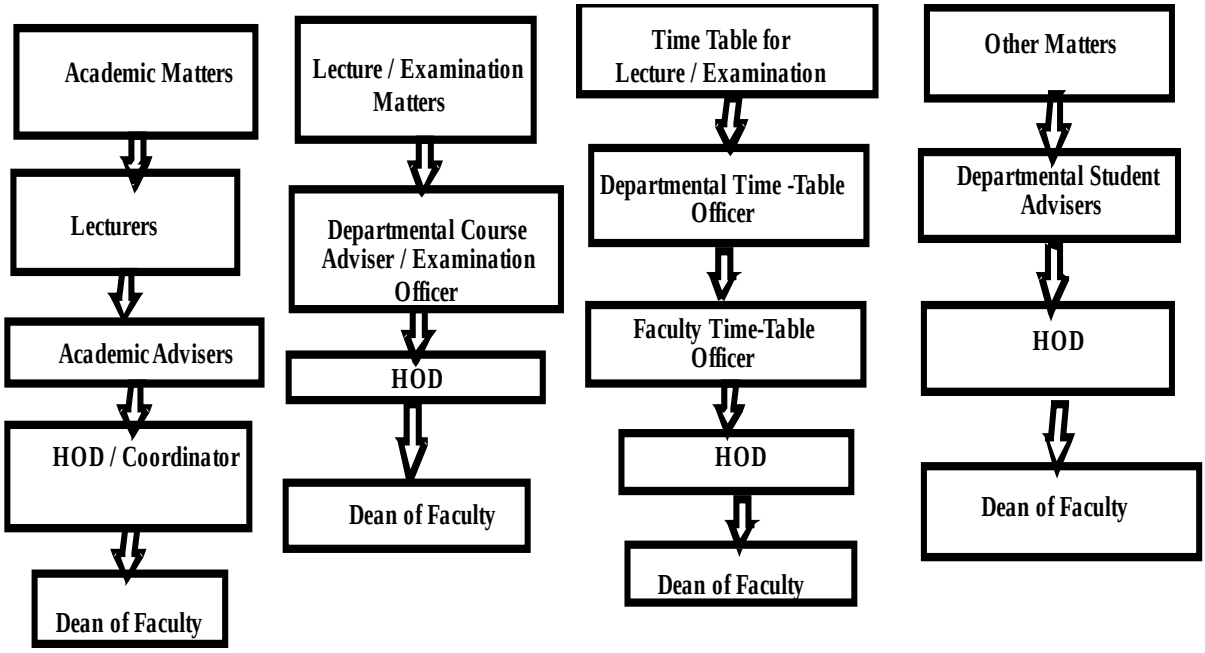

Figure 1: Channels of Communication

CHAPTER TWO: ACADEMIC REGULATIONS

2.1 The Course and Credit System

Ondo State University of Science and Technology adopts a course system in which subjects are broken down into one or more sections called courses. A course is any part or whole of a subject which can be completed through lectures, tutorials and/or practicals and examined within a semester. There will be two semesters in an academic session.

A course is assigned a specific number of lecture and/or practical hours and the total number of hours assigned to it will determine its unit value.

Regulations guiding the operation of the course system in the Faculty of Engineering and Engineering Technology are as specified below. Courses are normally weighted in terms of course units ranging from one to six.

2.2 Guidelines on the Course Unit System

Definition of Unit: The unit of course shall be by the semester, one semester unit being when a class meets one hour every week for one semester of 15 weeks.

- The size of course shall, as much as possible be a maximum of three units and its duration shall be one semester except for projects or design courses which may carry more than three units and may have a duration which is more than one semester.
- A core course is one which must be registered for and passed by student to get the degree and is counted towards the classification his/her degree.
- An elective course is either compulsory or optional. A compulsory elective shall be counted towards the classification of a student's degree. An optional elective is a course that may be taken by the student and may not be counted towards the classification of his/her degree.
- An audited course is one which the student attends without writing an examination in it.
- An elective course is optional; however, a specific minimum number of units of elective courses should be passed by students before graduating.
- Compulsory course is the course prescribed by the University which must be passed before a student can graduate.
- Pre-requisite course is one which the student must pass before proceeding to the higher course.
- Co-prerequisite course is one which may be taken in parallel with the course for which it is specified.

2.3 Student Work Load

a) A full time student must register for a minimum of 15 units and maximum of 24 per semester. However, a final year student can apply for a maximum of extra four units in order to graduate from the programme.
b) A student who is unable to take examination in particular courses due to approved absence will be required to register for the courses at the next available opportunity. Such a student will not be allowed to take any courses for which the incomplete course is a pre-requisite. A student cannot exceed the approved overload.
c) Pre-requisite courses must be taken and passed before progression to next level.

2.4 Credit Units

Courses shall be evaluated in terms of credits units. A courses credit unit is a one-hour lecture/tutorial contact per week or a three-hour laboratory practical class per week or an equivalent amount of study of any combination of these in a semester or session.

4-hour lecture - 4units

3-hour lecture - 3units

2-hour lecture - 2units

3-hour practical - 1unit

2.5 Course Coding

There shall be levels of courses representing the years for the degree programme and the codes are as follows:

Level	**First Semester**	**Second Semester**
100	101 – 199 (odd)	102 – 199 (even)
200	201 – 299 (odd)	202 – 299 (even)
300	301 – 399 (odd)	302 – 399 (even)
400	401 – 499 (odd)	402 – 499 (even)
500	501 – 599 (odd)	502 – 599 (even)

2.6 Students Registration

Registration for courses is done online at the ICT Centre and for two weeks from the beginning of the session. Students who cannot meet this deadline are allowed to do late registration on the payment of prescribed fee for just one extra week. After the submission of registration form in the first semester, change of course for courses meant for second semester are also allowed after the payment of prescribed fees. Registration guidelines are distributed to students before registration begins.

2.7 Course Credit System

All Engineering and Technology programmes shall run on a modularised system, commonly referred to as Course Unit System. All courses should therefore be sub-divided into more or less self-sufficient and logically consistent packages that are taught within a semester and examined at the end of that particular semester. Credit weights should be attached to each course. One credit is equivalent to one hour per week per semester of 15 weeks of lectures or 2 hours of tutorials or 3 hours per week of laboratory/studio work per semester of 15 weeks.

2.8 Grade Point Average and Cumulative Grade Point Average

Grading of courses shall be done by a combination of percentage marks and letter grades translated into a graduated system of Grade Point Equivalents (GPE). For the purpose of determining a student's standing at the end of every semester, the Grade Point Average (GPA) system shall be used. The GPA is computed by dividing the total number of credit points (TCP) by the total number of units (TNU) for all the courses taken in the semester. The credit point for a course is computed by multiplying the number of units for the course by the Grade Point Equivalent of the marks scored in the course. Each course shall be graded out of maximum of 100 marks and assigned appropriate Grade Point Equivalent as in Table 1.2 of page 19.

2.9 Student Evaluation

2.9.1 Techniques of Student Assessment

a) ***Practicals***: By the nature of the disciplines in Engineering and Technology, laboratory practicals are very important in the training of the graduates. To reflect this importance of practical work, a minimum of 9 hours per week (3 credits) should be spent on students' laboratory practicals. Furthermore, it is very important to determine performance of the student in the practical component of the programme. To achieve this, all the laboratory practicals have been lumped together to form a course which the student must pass. It is expected that the weighting given in the various courses is reflected in number and nature in the design of the experiments. These practicals must follow the trend in the current development of the programmes.

b) ***Tutorials:*** There should be one hour of tutorial for every four hours of lecture. Thus a course of one credit unit should comprise 12 hours of lecture and three hours of tutorials.

c) ***Continuous Assessments:*** Continuous assessment shall be done through essays, tests, and practical exercises.

(i). Scores from continuous assessment shall normally constitute 40 per cent of the final marks for courses which are primarily theoretical.

(ii). For courses which are partly practical and partly theoretical, scores from continuous assessment shall constitute 50% of the final marks.

(iii). For courses that are entirely practical, continuous assessment shall be based on a student's practical work or reports and shall constitute 100 percent of the final marks.

d) ***Examinations:*** In addition to continuous assessment, final examinations will normally be given for every course at the end of each semester. The final grade shall be based on the following breakdown:

(i) Final Examination: 60% - 70%, Continuous assessment (Quizzes, Tutorials, Homework, Tests): 30% - 40%

(ii) Each course shall normally be completed and examined at the end of the semester in which it is offered.

(iii) A written examination shall normally last a minimum of one hour for one-unit course.

2.9.2 External Examiners' System

The external examiner system is used in the final year of the undergraduate programme to assess final year courses and projects, and to certify the overall performance of the graduating students, as well as the quality of facilities and teaching. Different experienced professionals are engaged as External Examiners for different programmes in engineering.

2.10 Practical Training / Industrial Training Programmes

Practical training in the field of study is a compulsory part of the degree courses in Engineering programmes. In Engineering education, industrial attachment is very crucial. Practical Training of students are carried out in three forms: the regular practical exercises that are taught simultaneously with lectures, the Students Work Experience Programme (SWEP) that is carried out during a long vacation within the University, and the Industrial Training (IT) Programme, usually referred to as Student Industrial Work Experience Scheme (SIWES). The minimum duration of this training is 34 weeks (one semester and 2 long vacations) and is broken into the following modules: Students Work Experience Programme (10 weeks – long vacation); Students Industrial Work Experience Scheme (24 weeks, one semester plus long vacation). SWEP is conducted in the Faculty Workshops, under strict industrial conditions. On successful completion of Students Work Experience Programme, the Students Industrial Work Experience Schemes can be done in

industries under strict industrial conditions and supervision. SWEP and SIWES are designed to complement the classroom theoretical teachings in Engineering and Technology-based courses with industrial-based work experience. The SWEP programme has four (4) credit units while the SIWES programme carries twelve (12) credit units in the university curriculum. No student shall graduate without passing all the modules of the attachment and they shall be used in degree classification.

For effective assessment of the performance of the trainees and the effectiveness of the programme, the trainees are graded through their weekly reports, final reports, log books and oral presentation in form of a seminar.

Official visits to the industries are conducted by the lecturers in each department to check on the students, grade their weekly reports, endorse their log books, inspect the facilities of the industries and exchange pleasantries with the staff of the industries.

2.11 Examination Regulations

1. To be eligible to write any degree examination, the student ought to have attended at least 70% of lectures for the courses; examiners have the right to prevent defaulting students for sitting for examination.
2. Student must be ready to enter the examination hall 10 minutes before the time the examination is due to start. Students who arrive more than half an hour after the examination has started shall be admitted only at the discretion of the investigators.
3. Student may need leave the hall during the first half and the last quarter of an hour of the examination.
4. Student must bring with them to the examination hall their own biros, pens, pencil and erasers.
5. All rough works must be done in answer booklets and cross neatly throughout.
6. Communication between students is strictly forbidden.
7. The only permissible way of attracting the attention of the invigilators is by the raising of hands.
8. Students are to write legibly. Names are not to be written on the answer booklet. The answers each question must be started on a separate page.
9. Attendance register is to be signed at the commencement of the examination and as each student hands in the scripts to the invigilator.
10. Student must ensure that they have inserted at the appropriate places on the front cover of their booklets, their examination numbers and the numbers of questions they answered.
11. Mobile phones either switched on or off are not allowed in the examination hall. Keep your mobile phones in the hostel. If you bring yours to the examination hall, it would be seized. Handbags of any sort are not allowed in the examination hall and the surroundings.

Students are hereby informed that anyone caught or implicated in examination misconduct would automatically cease to continue with the examination until the case has been decided. Severe penalties are determined by the university and will be imposed on anyone caught committing examination misconduct. No plea will be entertained.

2.12 Grading System

a) In every course assessment consists of continuous assessment (30%) and examination (70%).
b) For practical courses, the overall assessment is 60% weekly practical classes and 40% exams of practical.
c) The pass mark for any course is 45%
d) The grading system is as follows:

Table 1.2

Score %	Letter Grade	Grade Point	Grade
70 – 100	A	5	Distinction
60 – 69	B	4	Very Good
50 – 59	C	3	Good
45 – 49	D	2	Average
0 – 44	F	0	Fail

e) Students' result are to be prepared at the end of every semester reflecting grades, total units taken, total units passed and total units failed.
f) At the end of every session, a summary of students results is prepared level by level reflecting units taken during the session, the units passed during the session, sessional GPA, the courses failed for the session, the cumulative units taken, the cumulative units passed, the CGPA and the remarks of proceeding on caution, probation or withdrawal from the programme as the case may be.
g) Both the sessional GPA and CGPA are calculated using the weighted grade point. The weighted grade point for the courses is the product of the grade point and units for the courses. For example, a student with a grade point of 4 (Grade B) in a 3-unit course has a weighted grade point of 4×3=12 for that course. Thus, the sessional GPA is calculated from the formula:

$$\textbf{Grade Point Average (GPA)} = \frac{\textbf{Total weighted points in the session}}{\textbf{Total units taken}}$$

Similarly, the CGPA is calculated from the following formula:

Cumulative Grade Point Average (CGPA)

$$\text{CGPA} = \frac{\text{Total weighted points in the session to date}}{\text{Total units taken}}$$

Provided that all course taken that are relevant to a particular degree programme are used in the computation of the various averages. In computing CGPA, performance in all registered and taken courses in a particular programme are used.

2.13 Category/Status of Courses

(i) Core/Compulsory Courses

These are courses that must be taken and passed before any student can graduate in any degree programme. The core courses are designated and specific for each degree programme and cannot be compromised by or for any student.

(ii) Elective Courses

These are courses left for students to choose to make up their work load for the degree programme. The elective courses may be selected from the students' fields of study or outside them, but the selected elective courses should be relevant to the students' programme. A prescribed minimum number of units from the elective courses must also be passed before a student can graduate.

(iii) Pre -Requisite Courses

A pre-requisite course is a course which must be taken and passed before a student is allowed to register for another related course, usually a more advanced one to which that course is a pre-requisite. Usually, courses at lower levels are considered as pre-requisite for the courses at higher levels within the same degree programme. Students are usually not allowed to register for elective courses at levels higher than their years of registration.

Courses at higher levels within the same degree programme. Students are usually not allowed to register for elective courses at levels higher than their years of registration.

(iv) Concurrent courses

A “concurrent requirement” course is one which must be taken along with the course to which it is a concurrent requirement within the same semester.

2.14 Course Grading

All registered courses must be taught and examined within a semester and students shall be credited with the appropriate number of course units assigned to each course passed. The pass mark for all courses examined shall be 45 percent.

2.15 Terminologies and Abbreviations used in Results Computation

The following terminologies and abbreviations are commonly used in the Computation of Results:

Total Load Units (TLU) 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 taking 6 courses of 3 units each has TLU of 18 for that semester.

Cumulative Load Units (CLU) is the summation of Total Load Units from t e first semester as a student to date. A student who is prone to repeating courses will finish (if he/she does not drop out) with a higher CLU than his/her non repeating colleagues, and will most likely require a longer time to complete the requirements for the award of degree.

Total Credit points (TCP) is the sum of the, products of course units and rating in each course, for the entire semester or period e.g. consider a student who took five courses of 3 units each. Suppose the grades he/she obtained in the five courses were A, B, C, D and E. The TCP of this student is obtained (3 x 5.00) + (3x 4.00) + (3 x 3.0) + (3 x 2.0) + (3 x 1.0) = 15.00 + 12 + 9.00 + 6.00 + 3.0 = 45.00.

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

Grade Point Average (GPA) is the total credit points (TCP) divided by the Total Load Units (TLU) e.g., consider the student's scores referred to above. His/her TCP is 45.0 and His/her TLU is 15. His/her GPA is therefore 45/15= 3.00. The highest possible GPA that can be earned is 5.00 and this happens when student earned a grade of "A" in every course during the semester. The lowest GPA obtainable is 0.00 for a student that scored a grade of “F” in every course during the semester.

Cumulative Grade Point Average (CGPA) is not the summation of GPA for the semester. Rather, it is the summation TCP for all semesters till date, divided by the summation of TLU for the said semesters. In effect CGPA = CCP/CLU.

Final Assessment and Class of Degree

At the completion of the programme, students' results are prepared reflecting details of the session's performance, including the degree classification according to the following scheme:

CGPA	CLASS OF DEGREE
4.50 – 5.00	1st Class Division
3.50 – 4.49	2nd Class Upper Division
2.50 – 3.49	2nd Class Lower Division
1.50 – 2.49	3rd Class Lower Division

NB: For the purpose of determining the class of degree, the CGPA shall cover 100 to 500-level courses.

2.16 Probation and Withdrawal from the University.

Any student whose CGPA falls below 1.50 at the end first session, shall be placed on probation in the following session. If he/she then fails to achieve a CGPA of at least 1.50 at the end of that session, he/she shall be required to withdraw from the University. A student will not be placed on probation until the end of the second semester of the first session; thereafter, it shall be from semester to semester. A student on probation shall not carry more than the minimum load of 15 units for the semester for which he/she is on probation. A student who is unable to get out of probation at the end of the first semester shall be placed on extended probation till the end of the session, but a student who is out of probation at the end of the first semester shall be allowed to carry a maximum load unit during the following semester.

2.17 Re-sit Examination

There shall be no re-sit examination.

2.18 Carry Over Courses

All failed courses shall be carried over to the corresponding semester of the following year and must be taken and passed before taking higher courses for which such are pre-requisites.

2.19 Dean's List

Student who obtains a GPA of 4.5 and above at the end of any semester will have his/her name published on Dean's list. The validity of the list is only for the session immediately following the publication of the results and until the publication of the results of the following session.

2.20 Duration of Semester

Each semester shall normally consist of 15 weeks or as determined by Senate (exclusive of the Christmas and Easter vacations and mid-semester breaks) which shall be reserved for teaching. The two weeks that come after the 15 weeks of teaching shall be for examination.

2.21 Registration for Course Examinations and Procedure for Deleting Courses

Registration for a course at the beginning of a semester automatically means registration for the course and the examination. Student wishing to add or delete a course must do so within six weeks of commencement of lectures in the course by completing the prescribed form obtained from the Academic Affairs Office.

2.22 Continuous Assessment

Evaluation of student's achievement shall be continuous. The student shall be periodically informed of his/her standing in the course. Continuous assessment shall be by tests and at least three (3) tests shall be given on each course in a semester.

2.23 Final Examination

Final written examination for a course shall not normally exceed three (3) hours duration and it shall take place only at the times and places established for that purpose by Senate or its designated committee. The final examination for each course shall normally be at the end of the semester in which the course is offered. Both the examination and continuous assessment will be used for final grading. Examination carries 70%, and continuous assessment 30%.

2.24 Examination Malpractices

Any student that is involved in University Examination malpractice or violates examination regulations shall be referred to the Disciplinary Committee, which will recommend appropriate disciplinary action.

2.25 Procedure for Seeking a Revision of Marked Scripts at the End of Semester

- Applications for revision of marked scripts shall be made by any aggrieved student, irrespective of the grade obtained in the course, on the payment of a prescribed fee.
- All applications for revision of marked scripts shall be addressed / forwarded to the Registrar through the Dean.
- The receipt of prescribed fee for each course shall accompany application.
- The Registrar shall forward the request to the appropriate Dean.
- The Dean shall appoint a minimum of three independent assessors (internal or external) in consultation with the Head of Department if need be.
- The Dean shall ensure that the marking scheme and model answers originally used are made available to the assessors.
- The Dean shall present his/her report before the Board of Studies and thereafter to Senate for consideration and approval.
- Where the student's case is upheld, the application fee shall be refunded.
- Where the case is not upheld, the student shall forfeit the fee and shall be warned for making frivolous allegations.
- Where Senate is convinced that the marking-down of a candidate by the lecturer is deliberate, such staff shall be reprimanded.

Frivolous Allegation: Making an application for revision of marked script by a student which lacks merit but with no imputation of victimization or malevolence shall be regarded as misconduct.

Penalty: Letter of warning.

Malicious Allegation: Making an application for revision of marked script with imputation of victimization or malevolence shall be regarded as misconduct.

Penalty: Suspension for two semesters.

Absence from Examination: A student who is absent from a course examination without approval of the Head of Department during or at the end of the semester will receive a grade of 0 (F). Permission may be granted only on substantiated, compassionate grounds as recommended by the faculty Board of Studies and by Senate.

2.26 Carryover Course Grade

When a student re-registers for a carry-over course and takes an examination in the course, he/she shall be credited with the actual grade scored.

2.27 Misconduct Before Examination

(1) Involvement in and bearing responsibility for examination question leakage

Penalty: Expulsion from the University.

(2) Participating in or benefiting from question leakage.

Penalty: Expulsion from the University.

(3) Attempting to participate in and, or benefit from examination question leakage of an examination.

Penalty: Expulsion from the University.

(4) Coming into the examination hall within 30 minutes of the commencement of an examination.

Penalty: The candidate should be allowed into examination hall but should not be given extra time.

(5) Coming into the examination hall later than 30 minutes of the commencement of an examination.

Penalty: The candidate should be allowed into the examination hall and should be scored 0 (F) in the course examined.

2.28 Misconduct During Examinations

(1) Candidate that sits for an examination that she/he did not register for or qualify to sit for shall be penalized.

Penalty: The result of the candidate in the course should be nullified He / She should be scored 0 (F) and be issued a letter or warning.

(2) Representing or standing in for another in the course of an examination.

Penalty: Expulsion from the University.

(3) Conniving with another candidate/student /person to represent or stand in for another in an examination

Penalty: Expulsion from the University.

(4) Destroying, defacing, mutilating or swallowing of potentially incriminating material relating to a course during the course of an examination.

Penalty: Suspension for two semesters. In addition, the candidate should be scored O (F) in the course.

(5) Displaying of inappropriate or anti-social behavior (e.g. smoking, singing, cat-call, etc.) capable of causing delay and/or disruption of an examination.

Penalty: Suspension for one semester.

(6) Displaying of inappropriate or anti-social behavior leading to disruption and suspension of an examination.

Penalty: Suspension for two semesters.

(7) Giving or receiving, or anyway benefiting from information relating to a course in an examination through electronic, personal dress material, part of the body in any manner or form whatsoever.

Penalty: Suspension for two semesters.

(8) Leaving the examination hall without the permission of the invigilator.

Penalty: Letter of warning. In addition, the candidate should be scored 0 (F) in the course examined.

(9) Leaving the examination hall with examination material before the end of the examination without the permission of the invigilator.

Penalty: Suspension for two semesters

(10) Substituting or exchanging answer script(s) given to a candidate in whatever manner or form during the examination.

Penalty: Expulsion of all the students involved from the University.

(11) Exhibiting insulting, rude, impolite behavior to a staff during the course of an examination.

Penalty: Suspension for two semesters

(12) Physical assault on another student during the course of an examination.

Penalty: Suspension for two semesters

(13) Physical assault or battery on staff during the course of an examination.

Penalty: Expulsion from the University.

14) Talking to or communicating with another candidate without due permission during the course of an examination.

Penalty: Letter of warning.

(15) Bringing in of prohibited/unauthorized materials(s) into the examination hall by candidate with proven evidence of using the material(s) or any part thereof.

Penalty: Suspension for two semesters. The candidate should also be given 0 (F) in the course.

(16) Failure by a candidate to submit his/her answers script after taking part in examination.

Penalty: Suspension for two semesters. In addition, the candidate should be scored 0 (F) in the course.

(17) Any student that gives/receives irregular assistance, cheat, aid and abet examination malpractice shall be punished.

Penalty: Suspension for two semesters.

2.29 Misconduct after Examination

(1) Involvement in any attempt to substitute or change or remove or effect change in examination script(s), record sheet(s), attendance register or any examination-related, material/document.

Penalty: Expulsion from the University.

(2) Gentle/subtle exertion of influence with a view to obtaining undue advantage in the grading of scripts or award of marks on an internal or external examiner.

Penalty: Letter of warning

(3) Non-gentle/non subtle exertion of influence with a view to obtaining undue advantage in the grading of scripts or award of marks by an internal or external examiner.

Penalty: Expulsion from the University.

(4) Any student that impersonates or conspires with impersonators during or after examination shall be punished.

Penalty: Expulsion from the University.

(5) Any case of disruption of examination, disorderly behavior or assault on invigilator.

Penalty: Expulsion from the University.

(6) Any attempt by the candidate directly or indirectly to influence the process of an examination with a view to obtaining undue advantage, vitiating the examination or getting involved in examination leakages.

Penalty: Suspension for two semesters.

(7) Any effort by a candidate or staff to illegally have or give a pre-knowledge of an examination question or to influence the marking of scripts, the award of marks by the internal or external examiner.

Penalty: The candidate shall be suspended for two semesters. The staff involved shall be referred to the appropriate disciplinary committee.

(8) Any other offence/malpractice as may be determined by the Disciplinary Committee as impacting negatively on the smooth and fair conduct of the examination.

Penalty: Penalty to be determined by the appropriate Disciplinary Committees.

2.30 Graduation from the University

A student should be deemed to have graduated from the University if he/she is found to be worthy in character and in learning.

- Such student must have satisfied all University, Faculty and Departmental requirements for the award of the University degree.
- Such student must have spent a minimum of four (4) academic sessions (D/E Student) or Five (5) academic sessions and maximum (7) academic sessions in the university.

On the merit of individual's application on exceptional cases, the University might grant extension of the period of study by one session.

2.31 Certificate

The degree certificate shall be signed by the Vice-Chancellor and the Registrar.

2.32 List of the Academic Staff of the Faculty

S/N	Name	Qualification	Specialization	Designation
1	I.O. Megbowon	B.Sc., M.Sc., Ph.D, MNSE, R.Eng.	Electrical Engineering (Control Systems)	Senior Lecturer
2	I.O. Olaniyan	HND, PGD, M.Sc., B.Sc., M.Eng.,Ph.D. MNMGS, COMEG, MNSE, R.Eng	Geophysics/ Civil Engineering (Water Resources & Env. Engineering)	Senior Lecturer
3	D. A. Opeyemi	B.Eng., M.Eng., Ph.D, MNSE, M.ASCE, R.Eng	Structural Engineering	Senior Lecturer
4	J.K. Akomolafe	B.Eng., M.Eng., MNSE, R.Eng	Water Resources & Env. Engineering	Lecturer II
5	A. Akinsade	B.Eng., PGDE, M.Eng., MNSE, R.Eng	Thermofluids Engineering	Asst. Lecturer
6	A.O. Orisawayi	B.Sc., M.Eng., MNSE, R.Eng	Production Engineering	Asst. Lecturer
7	B. Iyaomolere	B.Sc., M.Sc., MNSE, R.Eng	Communication Engineering	Asst. Lecturer
8	A. Akinbuluma	B.Eng., M.Eng., MNSE	Highway/Transportation Engineering	Asst. Lecturer
9	G.A. Ibitola	B.Sc., M.Sc., Ph.D., MIEEE	Physics/Electronics	Senior Lecturer
10	O.M. Folarin	B.Sc., M.Sc., Ph.D.	Chemistry	Professor
11	T.G. Okedayo	B.Sc., M.Sc., Ph.D.	Applied Mathematics	Professor
12	A. Adeyeye	B.A., M.A., MBA., Ph.D.	Philosopy/Business Administration	Reader
15	D.T. Akomolafe	HND., BBA, PGD, M. Tech, Ph.D.	Data basis, MIS and GIS	Senior Lecturer

16	S. Fakoya	B. Tech, M. Tech, Ph.D.	Microbiology (Food Microbiology & Mycology)	Senior Lecturer
17	T.F. Ediagbonya	B.Sc., M.Sc., Ph.D.	Environmental Chemistry	Lecturer I

2.33 List of Technical Staff

S/N	Name	Qualification	Position	Section/Programme
1	Mr. M. Famodun	HND, PGD	Technologist II	Mechanical Engineering Lab
2	Mr. S.T. Ogunbayo	SSCE	Laboratory Assistant	RAC
3	Mr. J.O Aderibigbe	B.Sc, FD ANIST, M.Sc.	Chief Technologist	Physics/Electronics
4	Mr. A. J. Adebayo	HND, ANIST	Technologist I	Chemistry

2.34 List of Administrative Staff

S/N	Name	Qualification	Position	Section/Programme
1	Mr. T. J. Tawose	N.C. E in English / Political Science, B.A. (Ed.) English	Assistant Registrar/ Faculty Officer	Faculty
2	Famoyegun, A.R.	HND	Asst. Chief Clerical Officer	Electrical/Electronics Eng. Department
3	Temola Y.F.	NCE	Asst. Chief Clerical Officer	Dean's Office
4	Fapetu A. J.	HND	Senior Office Assistant	Civil Eng. Department
5	Omotoye, K.	SSCE	Data Entry Clerk	Mechanical Eng. Dept.
6	Ajube M.N.	SSCE	Clerical Officer	Dean's Office

CHAPTER THREE: DEPARTMENT OF CIVIL ENGINEERING

3.1 DEGREE OPTION: Bachelor of Engineering in Civil Engineering
(B.Eng. Civil Engineering)

3.2 PROGRAMME PHILOSOPHY

The programme is geared towards early board-based training in general engineering and technology; the development of a thorough engineering practice after appropriate training on the application of Civil Engineering in meeting the basic human needs. Graduates of the programme should have acquired high academics standard with adequate practical background, to be of immediate value to industry and the nation in general. The program is structured in such a way that students will have the opportunity to take courses that will provide a basic understanding of all areas of civil engineering practice, while they can concentrate in some specific options in the final year such as Water Resources and Environmental Engineering, Structural Engineering, Highway and Transportation Engineering, Geotechnical Engineering, Construction Engineering and Management, Hydraulic and Coastal Engineering.

Civil Engineers have several employment opportunities in the public and private sectors of the national economy. These include Federal and State Government Establishments, Ministry of Lands and Housing, Ministry of Environment, Maintenance Agencies, and River Basin Development Authorities. Opportunities in the private sector include consulting (design) firms, construction companies, oil exploration, exploitation and servicing companies. They can also be self-employed.

3.3 PROGRAMME OBJECTIVES

The objectives of the programme are to:

a. Develop the ability of students to use their accumulated technical knowledge, sense of analysis, and creative design abilities, in various ways that can contribute to the development of a more satisfying life and environment for the country and for all mankind;

b. Produce leaders with necessary skill for the planning, design, evaluation and analysis of technological innovation towards improving the quality of the environment, and of life generally, in response to the ever changing goals and needs of the Nigerian society;

c. Produce graduates with entrepreneurial skills for self-employment in the Civil Engineering profession; and

d. Lay the foundation on which students can proceed to further studies in specialized aspects of Civil Engineering practice or multi–disciplinary areas involving Civil and Environmental Engineering.

3.4 ADMISSION REQUIREMENTS

(a) UTME Admission

Admission to 100 level is through the Universal Tertiary Matriculation Examination (UTME) of the Joint Admissions and Matriculation Board (JAMB). To be eligible for admission, candidates must have the GCE (OL) or WASSCE or NECO or equivalent with at least five credit passes in subjects which include English Language, Mathematics, Physics, and Chemistry at **NOT** more than two (2) sittings.

U.T.M.E. Subjects: English Language, Chemistry, Mathematics and Physics.

(b) Direct Entry Admission

In addition to the requirements specified in (a) above, candidates seeking admission to second year (200 level) of the programme through direct entry must possess:

i. National Diploma at Upper Credit level or equivalent in Civil Engineering or related disciplines from a recognized institution, or

ii. General Certificate of Education (Advanced level) or equivalent with good passes in at least two subjects at a sitting which must include Mathematics, Physics and Chemistry. In addition, candidates in this category will be required to audit and pass some first year courses to remedy deficiencies.

However, admission to appropriate level shall be made on any other minimum entry qualifications as may be stipulated by the University.

3.5 PROGRAMME DURATION

The normal duration of the programme is five academic sessions for students admitted to 100 level through UTME and four academic sessions for those admitted into 200 level by Direct Entry. Students may take longer than the normal duration to complete the requirements for graduation but will not be allowed to exceed fourteen (14) semesters for candidates admitted through UTME and twelve (12) semesters for candidates admitted by Direct Entry.

3.6 GRADUATION REQUIREMENTS

To be eligible for a B.Eng degree in Civil Engineering of Ondo State University of Science and Technology, Okitipupa, a candidate must

(a) pass all prescribed core courses, Faculty and University required courses as well as electives;

(b) complete successfully a minimum of 201 units for candidates admitted through UTME and 156 units for candidates admitted through Direct Entry, and obtain a CGPA of not less than 1.5, and

(c) complete successfully all prescribed industrial attachments, projects and seminars.

3.7 LIST OF COURSES

100 LEVEL FIRST SEMESTER

Course Code	Course Title	Type	L	T	P	Unit	Prerequisite
CHM 101	General Chemistry I (Introductory Inorganic Chemistry)	R	2	1	-	2	
CHM 151	Practical Chemistry I	R	-	-	3	1	
GST 101	Use of English I	R	2	-	-	2	
GST 111	Use of Library and Study Skills	R	1	-	-	1	
GST 113	Philosophy and Critical Thinking	R	2	-	-	2	
MTH 101	Introductory Mathematics I	R	2	1	-	3	
PHY 101	General Physics I	R	2	1	-	2	
PHY 103	General Physics III	R	2	-	-	2	
PHY 107	Practical Physics I	R	-	-	3	1	
GET101	Engineering Drawing I	C	1	-	6	3	
GET 105	History and Philosophy of Engineering and Technology	C	1	-	-	1	
CSC 101	Introduction to Computer Science	R	2	-	3	3	
	Total					**24**	

100 LEVEL SECOND SEMESTER

Course Code	Course Title	Type	L	T	P	Unit	Prerequisite
CHM 102	General Chemistry II (Introductory Organic Chemistry)	R	2	-	3	3	
CHM 152	Practical Chemistry II	R	-	-	3	1	
GST 112	Nigerian People and Culture	R	2	-	-	2	
MTH 102	Introductory Mathematics II	R	2	1	-	3	
CSC 102	Introduction to Computer Programming	R	2	-	3	3	
PHY 102	General Physics II	R	2	1	-	3	
PHY 108	Practical Physics II	R	-	-	3	1	
GET 102	Engineering Workshop Practice	C	1	-	3	2	
MTH 104	Introductory Mathematics III	R	1	1	-	2	
GST 102	Use of English II	R	2	-	-	2	
	Total					**22**	

200 LEVEL FIRST SEMESTER

Course Code	Course Title	Type	L	T	P	Unit	Prerequisite
GET 201	Basic Electrical Engineering I	C	2	-	3	3	
CSC 201	Computer Programming	R	2	-	3	3	
GET 205	Basic Fluid Mechanics	C	2	-	3	3	
GET 207	Applied Mechanics	C	2	1	-	3	
CHM 211	Basic Physical Chemistry I	R	2	-	-	2	
MTH 201	Mathematical Methods I	R	2	1	-	3	
GET 211	Introduction to Computer Packages	R	-	-	3	1	
GST 221	History and Philosophy of Science	R	2	-	-	2	
GET 217	Manufacturing Technology I	C	1	-	3	2	
GST 229	Introduction to Vocational Skills	R	-	-	3	1	
	Total					**23**	

200 LEVEL SECOND SEMESTER

Course Code	Course Title	Type	L	T	P	Unit	Prerequisite
GET 206	Basic Thermodynamics	C	2	-	3	3	
GET 202	Basic Electrical Engineering II	C	2	-	3	3	
GET 212	Engineering Materials	C	2	-	-	2	
GET 204	Engineering Graphics	C	1	-	3	2	
GET 216	Strength of Materials I	C	2	-	3	3	
GET 220	Engineer-in-Society	C	1	-	-	1	
GET 222	Engineering Drawing II	C	2	-	3	3	
MTH 202	Numerical Analysis I	C	2	1	-	3	
GST 224	Peace Study and Conflict Resolutions	R	1	-	-	1	
	Total					**21**	

300 Level First Semester

Course Code	Course Title	Type	Contact hours			Units	Prerequisite
			L	T	P	U	
GET 301	Engineering Mathematics I	R	2	1	-	3	MTH 201
CVE 301	Basic Civil Engineering	C	2	-	-	2	-
CVE 303	Fluid Mechanics	C	2	-	3	3	CVE 205
CVE 305	Engineering Geology	C	2	-	3	3	-
CVE 307	Engineering Surveying and Photogrammetry	C	1	-	3	2	
GST 331	Introduction to Entrepreneurial Skills	R	2	-	-	2	-
CVE 313	Strength of Materials II	C	2	-	3	3	CVE 216
MEE 361	Engineering Metallurgy	C	2	-	3	3	
	Total					**21**	

300 Level Second Semester

Course Code	Course Title	Type	Contact hours			Units	Prerequisite
			L	T	P	U	
GET302	Engineering Mathematics II	R	2	1	-	3	GET 301
CVE 302	Basic Hydrology	C	2	-	3	3	
CVE304	Structural Mechanics	C	2	-	3	3	
CVE 306	Soil Mechanics	C	2	-	3	3	
CVE308	Design of Structures I	C	2	1	-	3	
CVE 310	Civil Engineering Materials	C	2	-	3	3	
GET 304	Technical Communication	R	2	-	-	2	
	Total					**20**	

300 Level Long Vacation (8 Weeks) Industrial Training

Course Code	Course Title	Type	Contact Hours			Units	Prerequisite
			L	T	P		
GET 391	Student Work Experience Programme (SWEP)	C				4	
	Total					**4**	

400 Level First Semester

Course Code	Course Title	Type	Contact hours			Units	Prerequisite
			L	T	P	U	
CVE 413	Numerical Methods For Engineering	R	2	1	-	3	-
CVE 401	Hydraulics	C	2	-	3	3	CVE 303
CVE 403	Civil Engineering Practice	C	2	-	-	2	-
CVE 405	Design of Structures II	C	1	-	3	2	CVE 308
CVE 407	Elements of Foundation Engineering	C	2	-	3	3	CVE 305
CVE 409	Elements of Structural Detailing & Architecture	C	2	-	3	3	-
CVE 411	Highway Engineering	C	1	-	3	2	-
	Total					**18**	

400 Level 2nd Semester and Long Vacation (6 months or 24 weeks)
Students Industrial Work Experience Scheme (SIWES)

Course Code	Course Title	Type	Contact hours			Units	Prerequisite
			L	T	P	U	
CVE 420	Industrial Training Assessed by OSUSTECH Supervisors	C				4	
CVE 422	Industrial Training Assessed by Industry based Supervisors	C				4	
CVE 424	Student's Report and Seminar	C				4	
Total						**12**	

500Level First Semester

Course Code	Course Title	Type	Contact hours			Units	Prerequisite
			L	T	P	U	
CVE 501	Engineering Economics	C	2	-	-	2	
CVE 503	Structural Engineering I	C	2	-	3	3	CVE 409
CVE 507	Building Technology	C	2	-	3	3	
CVE 505	Water and Wastewater Engineering	C	2	-	3	3	
CVE 509	Civil Engineering Seminar	C	-	1	-	1	
CVE 591	Final Year Project Seminar	C	-	-	9	3	
	1 No. Specialty Electives Course	C	2	-	3	3	
	Total					**18**	

500 Level 1st Semester
Specialty Courses (Electives)

Course Code	Course Title	Type	Contact hours			Units	Prerequisite
			L	T	P	U	
CVE 513	Construction Management	E	2	-	3	3	
CVE 527	Water Resources Engineering	E	2	-	3	3	
CVE 529	Irrigation and Drainage Engineering	E	2	-	3	3	
CVE 519	Advanced Structural Engineering	E	2	-	3	3	CVE 409
Total							

500 Level: 2nd Semester

Course Code	Course Title	Type	Contact hours			Units	Prerequisite
			L	T	P	U	
CVE 502	Engineering Law and Management	C	2	1	-	3	
CVE 504	Structural Engineering II	C	2	-	-	2	CVE 503
CVE 506	Highway and Transportation Engineering	C	2	-	3	3	CVE 411
CVE 508	Geotechnical Engineering	C	2	-	3	3	CVE 305, 306
CVE 510	Construction Engineering	C	2	-	3	3	
CVE 592	Final Year Project	C	-	-	9	3	
	1 Nos. Specialty Electives Courses					3	
Total						**20**	

Specialty Courses (Electives)

500Level Second Semester

Course Code	Course Title	Type	Contact hours			Units	Prerequisite
			L	T	P	U	
CVE 530	Design of Hydraulic Structures	E	2	-	3	3	CVE 401
CVE 524	Civil Engineering System Design	E	2	-	3	3	
CVE 526	Environmental Engineering	E	2	1	-	3	
CVE 528	Advanced Soil Mechanics	E	2	1	-	3	CVE 306

C= Core Courses R= Required (University) Courses E= Electives

3.8 SYNOPSIS OF CORE COURSES

100 LEVEL

GET 101 ENGINEERING DRAWING I 3 UNITS

Introduction to drawing instruments and their proper use, Use of scales, linework, lettering and dimensioning, Geometrical constructions including bisection of angles, tangents, normal, polygons, etc. loci, including paths of point of simple mechanisms and on profiles, Pictorial drawing; Orthographic projections of simple objects in first and third angles, Isometric and oblique projection, Isometric projections from orthographic projects. Dimensioning and development of simple shapes. Assembly drawing of simple components. Conventional representation of common engineering features. Freehand sketching. Use of engineering drawing software.

GET 102 ENGINEERING WORKSHOP PRACTICE 2 UNITS

Organization of workshop. Workshop hazard, safety practices and codes. Introduction to basic manufacturing processes. Types of workshop equipment, machines and materials Bench-work and fitting. Introduction to turning – straight and step turning, chamfering, screw cutting. Milling and milling exercises. Drilling techniques and exercises. Sheet metal work. Welding and soldering technique with exercises. Properties of wood. Woodwork and joinery exercises. Workshop measurements. Refrigeration and air conditioning: principle of operation, refrigerants and troubleshooting. Methods of leak detection. Safety precautions. Automotive workshop practice: Principle of operation of the motor car, tuning carburettor, setting contact breaker gap, setting ignition timing, electronic ignition system and computer controlled ignition system. Use of computerized engine diagnosis equipment. Engine routine maintenance procedure and engine service. Tyre types and care. Battery care, topping up and charging.

200 LEVEL

GET 201 BASIC ELECTRICAL ENGINEERING I 3 UNITS

Basic Electrical Concepts. **Circuit Laws**: Ohm's law and Kirchoff's Laws. **Methods of Circuit Analysis**: Mesh analysis, Nodal analysis, Delta/Star Transformation, Source Conversion. **Circuit Theorems**: Thevenin's Theorem, Norton's Theorem, Superposition Theorem, Maximum Power Transfer Theorem, Rosen's Theorem, Reciprocity Theorem; Network problems arising in Energy distribution. Transient response of RC, RL and RLC Circuits. **Elementary treatment of semiconductor devices**: PN junction diode, rectifier diodes, varactor diode, Schottky diode, zener

diode, light emitting diode (LED), bipolar junction transistor (BJT), field effect transistor (FET), Thyristors, Integrated Circuits (ICs). **Software Tools for Electrical Circuits**: Use of Electronic Workbench, PSpice, MultiSim and Circuit Maker for Simulation of electrical circuits, elements, devices and component.

GET 202 BASIC ELECTRICAL ENGINEERING II 3 UNITS

Basic AC theory- Periodic wave forms, average instantaneous, peak, mean and RMS values, form and peak factors , single phase series alternating current circuits and Application of complex numbers to series AC networks, single phase parallel alternating current (Admittance, conductance and Susceptance) circuits and Application of complex numbers to parallel AC networks, Series and parallel Resonance, Bandwidth and Q factor, Power in AC circuits and Power factor Correction/improvement, Delta-star and star-delta transformations, Three phase system: balanced wye-wye connection, balanced delta-delta connection, balance delta-wye connection, balanced wye-delta connection, power in a 3-phase balanced system, unbalanced 3-phase system. Magnetic circuit, mutual inductance. **Introduction to electrical machines;** - DC generators and motors. Introduction to Electrical and Electronic Power measuring instruments and equipment, A.C. and D.C. bridges

GET 205 BASIC FLUID MECHANICS 3 UNITS

Elements of fluid statics; density; pressure, surface tension, viscosity, compressibility etc. Hydrostatic forces on submerged surfaces due to incompressible fluid. Introduction to fluid dynamics – conversion laws. Introduction to viscous flow.

Properties of fluids, fluids statics, Basic conservational laws, friction effects and losses in laminar and turbulent flows in ducts and pipes, Dimensional analysis and dynamic similitude, Principles of construction and operation of hydraulic machinery, Hydropower systems. Flow measurement, Fluid power transmission, pumps and pump design.

GET 211 INTRODUCTION TO COMPUTER PACKAGES 2 UNITS

Introduction to packages such as Microsoft Excel, Matlab, Mathematica, SPSS etc. Basic engineering computations, data analysis and graphics using packages. Numerical and symbolic analysis.

GET 212 ENGINEERING MATERIALS 2 UNITS

Introduction to electronic configuration, atomic structures, inter-atomic bonding mechanisms, crystal and macrostructure. Relationship between structure and properties of metals, alloys,

ceramics and plastic. Structure of matter; Crystal structure, crystal imperfection. Non-crystalline and multiple phase solids including polymers. Simple phase diagrams of alloys. Physical properties of materials (wood, cement, plastics and alloys). Mechanical properties of engineering materials. Engineering materials. Engineering and True stress-strain curves. Ultimate strength, ductility, impact strength, hardness, creep and fatigue failure. Electrical properties; conductivity, semi-conductivity and superconductivity. Optical and magnetic properties of materials. Stability of materials in the service environment; corrosive media, sub-zero and elevated temperature. Basic criteria for selection of materials for engineering applications.

CVE 216 STRENGTH OF MATERIALS I **3 UNITS**

Force equilibrium Free body diagrams. Elasticity - Concept of stress and strain. Tensile test, Determination of mechanical properties of materials. Axially loaded bars, composite bars, temperature stresses and simple indeterminate problems. Hoop stresses in cylinders and rings. Theory of beam bending. Deflection of Beams. Double integration and Macaulay's methods. Strain Energy in bending of beams. Castiagliano's and Reciprocal Theorems. Bending moment, shear force and axial force diagrams for simple cases. Simple torsion and application.

GET 220 ENGINEER-IN-SOCIETY **1 UNIT**

The growth and effects of technology. The role and responsibilities of the engineer in society. Education, professional training and regulation of engineers. Role of the Council for the Regulation of Engineering in Nigeria (COREN). Industry and commerce. The relation between business and industry. Private and state control, nationalization, privatization. Effect of industrialization, information technology and free trade. Principles of scientific management. Modern management techniques, organization of business. Labour relations industry and the Law. International Labour Organisation (ILO) convention on collective bargaining and the right to strike.

GET 222 ENGINEERING DRAWING II **3 UNITS**

Further projection of solids. First and third angle projections and Isometric projections of machine components. Intersection of surfaces and developments. Sectional views, Curve of interpenetrations. True lengths and true shapes. Parts and assembly drawings (Detailed drawing of machine components). Preparation of working drawing for manufacturing in accordance with standards. Reading and interpretation of manufacturer's drawing of equipment.

300 LEVEL

GET 301 ENGINEERING MATHEMATICS I 3 UNITS

First order ordinary differential equations. Existence and uniqueness. Second order ordinary differential equations: linear dependence, Wronskian, reduction of undetermined coefficients, variation of parameters. General theory of nth order linear equations. Series solution about ordinary and regular points, special functions: Bessel, Legendre and Hypergeometric. Laplace transform and application to initial value problems.

GET 302 ENGINEERING MATHEMATICS II 3 UNITS

Gamma and Beta functions, Sturm-Liouville problem, orthogonal polynomials and functions. Fourier series and integrals, Fourier transformation. Partial differential equations: general and particular solutions, linear equations with constant coefficients; first and second order equations; solutions of the heat, wave and Laplace equations by the method of separation of variables; Eigen function expansions; Fourier transforms.

GET 304 TECHNICAL COMMUNICATION 2 UNITS

Professional use of English Language for letters, specification descriptions, presentation of charts, graphs, tables, writing of proposals in reports. Case studies of major professional's presentation of reports and proposals. Microsoft Excel, PowerPoint and Project. Special lectures may be required.

CVE 301: BASIC CIVIL ENGINEERING 2 UNITS

The definitions and meaning of engineering, civil engineering and its various specialties. Historical development of civil engineering. Introduction to the various branches and specialties in civil engineering. The profession of civil engineering and its role in the society. Requirements of a civil engineer. Philosophy and responsibilities of the profession. Career opportunities in civil engineering. Discussion and demonstration of civil engineering techniques and projects, problems, solutions. Introduction to the frontiers of research and development in civil engineering. Modern civil engineering applications in the society.

CVE 302 BASIC HYDROLOGY 2 UNITS

Descriptive hydrology, hydrologic cycle and components, meteorological factors, precipitation, evaporation and transpiration, evapo-transpiration, methods of estimating evaporation and evapo-transpiration, infiltration, infiltration capacity of soil, methods of infiltration, surface runoff, rainfall/runoff correlation, flow rating curves etc. Quantitative hydrology - hydrograph and

hydrograph analysis, volume runoff, storage routing. Groundwater Occurrence, factors influencing volume, the abstraction of groundwater, hydraulics of wells, well - yield, hydrological forecasting, introduction to urban hydrology.

CVE 303 FLUID MECHANICS 3 UNITS

Fluid statistic-concept of pressure, pressure and direction, pressure head etc. Floatation and stability. Dynamics of fluid flow-conservation. Equation of mass and momentum. Euler and Bernoulli's equations. Momentum equation, energy equation, Reynolds number, flow in pipes. Dimensional analysis. Similitude, Buckingham Pi theorems. Applications of hydraulic models. Viscous flow – Laminar flow, flow between two parallel plates, flow in circular conduits etc. Flow in pipes. Open channel flow. Ideal fluid flow. Fluid measurements. Flow meters and errors in measurement.

CVE 304 STRUCTURAL MECHANICS I 3 UNITS

Principle of indeterminacy and static stability of plane frames and trusses. Analyses of statically determinate beams and frameworks using method of joint resolution, method of sections and graphical method employing Bow's Notation. Deflection of frameworks. Williot and Williot-Mohr Diagrams. Strain Energy Method. Moment Area Method. Three Moment theorem. Slope Deflection Method Moment Distribution Method for indeterminate If beams and portal frames. Analysis of two-hinged parabolic arches. Influence lines for actions in determinate beams and frameworks.

CVE 305 ENGINEERING GEOLOGY 3 UNITS

Relevance of geology to engineering. Summary of the structure of the planet earth. Minerals and rocks; the common rock-forming minerals – origin, distribution, identification and classification. External earth processes: weathering; principles, processes and agents. Erosion and evolution of landforms. Sedimentation; principles and processes. Sedimentary rocks. Basic principles of stratigraphy; the geologic time scale; the important of fossils. Internal earth processes; igneous processes – plutonic & volcanic; metamorphism types; deformation processes, faults and folds. Fundamentals of plate tectonics; earthquakes. Distribution of rocks, minerals and principal geologic features (structures) in Nigeria.

CVE 306 SOIL MECHANICS 3 UNITS

Mineralogy of soils, soil structure, origin of soils - rocks and minerals. Formation of soils, and soil deposits, soil properties. Soil in water relationship-void ratio, porosity, specific gravity and other factors. Soil Classification; Atterberg limits, particle size distribution. Flow of water in soils;

seepage, permeability, and ground water flow. Compaction and soil stabilization. Site investigations, and methods of subsurface exploration. Laboratory work, on soil classification identification and physical properties. Soil survey and soil map study.

CVE 307 ENGINEERING SURVEYING AND PHOTOGRAMMETRY 3 UNITS

Basic principles, use of topographic map method to obtain field data for topographic surveys. Chain surveying, compass surveying - methods: contours and their uses. Traversing - methods and application. Levelling Geodetic levelling errors and their adjustments. Applications. Tachometry - methods, substance heighting, self-adjusting and electromagnetic methods. Introduction to photogrammetry. Elements of photogrammetry, photogrammetry equipment, principles and uses. Errors of measurements. Evaluation of single photographs. Further work on contours and contouring, Methods of contouring; contour interpolation and uses of contour plans and maps. Areas and volumes. Setting out of engineering works. Elementary topographical surveying.

CVE 308 DESIGN OF STRUCTURES I 3 UNITS

Concept of reinforced concrete and historical development of its theory and practice. Review of the physical and mechanical properties of concrete and reinforcing bars. Fundamentals of design process. Material selection. Building regulations and Codes of Practice. Scopes and Limitations and interpretation of design charts. Design philosophies. Elastic and Limit State designs. Design of reinforced concrete structural elements (slabs, beams, columns and foundations).

CVE 310 CIVIL ENGINEERING MATERIALS 2 UNITS

Concrete technology - types of cements, aggregates, properties. Concrete mix design. Properties and their determination. Steel technology - production, fabrication and properties, corrosion and its prevention. Test on steel and quality control. Timber technology - types of wood, properties defects. Stress grading. Preservation and fire protection. Timber products. Rubber plastics. Asphalt, tar, glass, lime pricks mud, etc. application to buildings, roads and bridges.

CVE 311 STRENGTH OF MATERIALS II 3 UNITS

Analysis of two and three-dimensional state of stress in structural systems. Principal stresses and maximum shear stresses. Analysis' of two and three-dimensional state of strain. Mohr's circle. Energy Theories. Failure theories applied to structural elements. Combined bending and direct stresses in structural members. Shear stress in thin-walled open sections and shear centers, Bending of curved bars and springs. Creep, Fatigue Fracture and stress concentration problems. Analysis/design of compound and composite structural elements.

GET 391 STUDENTS WORK EXPERIENCE PROGRAMME (SWEP) (8 Weeks) 4 UNITS

Introduction to practices and skills through supervised hands-on workshop exercises in computer engineering, information and communication technology (ICT), and related general engineering using the Faculty Workshops and other University facilities under strict industrial conditions. These exercises include familiarisation with basic tools, soldering and de-soldering skill of pass-through and surface-mount components, building of simple electronic circuits, troubleshooting of electronic devices, digital systems, etc. Use of hand drill. Safety precautions in handling electronic devices. Basic welding skill.

400 LEVEL

CVE 401 HYDRAULICS 3 UNITS

Brief revision of fluid mechanics. Types of flow – Laminar and turbulent flows. Gradually and rapidly varied flows. Boundary layer separation conditions. Stream function, velocity, potential and application to flow nets. Steady and unsteady flow in closed conducts. Open channel flows. Steady and unsteady flows in open channels, simple pipe problem. Flow of incompressible fluid in pipelines, pipe networks analysis Dimensional analysis, similitude and hydraulic models. Mass oscillation and pressure transients in pipelines. Application of hydraulic principles in Land drainage and inland navigation problems.

CVE 403 CIVIL ENGINEERING PRACTICE 2 UNITS

Civil engineering works standard and measurements. Civil engineering Bill of Quantities (BOQ). Types of Contracts: fixed price contracts, schedule of rates contract, measured contracts, lump sum contracts, cost reimbursement contracts, Turnkey (package deal) contract, contractor finance contracts, Fast-track contracts. Tendering Procedure: contract document, Advertisement, Open and Selective tendering, Opening of Tenders by Tender Board, Irregularities of Tenders, Tenders Board, Award of Contracts, Form of Contract agreement. Contract Administration: contractor programme, Role of Engineer, Duties of Resident Engineer and Site Engineer, Variation Orders, Interim payment certificates, Retention Money, Final payment Certificates; liquidated Damages; Arbitration; Engineer as Expert Witness; Professional Institutions and Professional Ethics. Cont Works: Simplified Industry model of parties and basic business laws of relations: construction, supervision and client's office involvement. Job planning and control-programme: Bar charts, Critical path methods, etc.

CVE 405 DESIGN OF STRUCTURES II 2 UNITS

Limit state philosophy and design in steel. Guidelines and specifications for steel construction. Elastic and plastic moment designs. Design of structural elements in steel and connections and joints. Limit sate philosophy and design in timber. Guidelines and specifications for timber construction. Elastic methods and design in timber. Design of structural elements in timber and timber connectors. Laboratory test on, structural elements in concrete, timber and steel.

CVE 407 ELEMENTS OF FOUNDATION ENGINEERING 3 UNITS

Stresses in soils: Total and effective stress, pore pressure. Moduli of Elasticity, Poisson's ratio. Introduction to stress distribution in layered system from Boussinesq's theory, Westergaard theory. Earth retaining structures: Earth pressures (active, passive and at-rest pressures), earth pressure coefficients, Computation of earth pressure using the Rankine and the Columb wedge theories, and Culman's method. Earth pressures on retaining walls. Types and analysis of retaining walls. The use of bracings as lateral support in open cuts. Anchored bulkheads. Free earth support method of analysis. Bearing capacity: Ultimate, safe and allowable bearing capacities. Bearing capacity factor. Case of shallow and deep foundations. Factor of safety, shape effect, footings under eccentric and inclined loads. Foundation: Type and choice of foundations. Shallow and deep foundations, raft foundations and piles. Use and general characteristics of piles, piles and sand piles in clay, negative skin friction. Bearing capacity of pile groups. Eccentric vertical loads, dynamic pile driving formulas and efficiency of pile groups.

CVE 409 ELEMENTS OF STRUCTURAL DETAILING AND ARCHITECTURE 3UNITS

Introduction - Dimensional awareness, graphic communication in relation to environment. Free hand drawingforms in terms of shades, light and shadow. Orthographic. Diametric and perspective projections with applications. Common curves. Elementary design of building structures. Detailing of structural elements. Introduction to Computer-Aided Drafting and Detailing of structural members in reinforced concrete, timber and steel.

CVE 411 HIGHWAY ENGINEERING 2 UNITS

Soil engineering aspects of highways: compaction, soil stabilization, soil classification and effect on usage, Methods of soil classification, Determination of California Bearing Ratio (CBR) and applications. Railways and Airfields. Highway geometrics and designs: Factors affecting highway route location. Factors affecting highway geometric design. Highway route location procedure, Generation of Base Map. Horizontal alignment design, Vertical alignment design, cross-sections. Classification of highways, Distinction between rural and urban roads. Pavement structure and

design: Types of pavement, AASHTO Definitions. Methods of pavement design British Method, French Method, Empirical design methods for developing countries (Road Note 31). Pavement materials and laboratory tests.

CVE 413 NUMERICAL METHODS FOR ENGINEERING 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. Probability – Elements of probability, density and distribution functions, moments, standard distribution, etc. Statistics – Regression and correlation – Large sampling theory. Test hypothesis and equality control.

CVE 420, 422, 424: STUDENTS INDUSTRIAL WORK EXPERIENCE SCHEME

12 UNITS

A more comprehensive programme, similar to GET 391, in which the students are attached to civil engineering establishments (public or private) and industries, with a view to making them develop the working practical skills of the profession, and providing additional opportunity to learn how to write field reports and prepare technical documents. Students are supervised during the training period, and are expected to keep log-books and other records designed for the purpose of monitoring their performances.

500 LEVEL

CVE 501 ENGINEERING ECONOMICS 2 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 and uncertainties, planning and Decision making procedures. Macroeconomics, Economic growth, National Income. Economic of technological change.

CVE 502 ENGINEERING LAW AND MANAGEMENT 3 UNITS

PART I: LAW

Definition of a contract. Classification of a contract. Ingredients of a valid contract. Elements of a contract. Consideration. Intention to create legal relation. Capacity of a contract. Consent of a

party. Concept of brevity of a contract and its exceptions. Mistakes of a contract and Duress in a contract. Mispresentation in a contract. Illegality in a contract. How does a contract come to an end. Remedies for breach of a contract.

PART 2: MANAGEMENT

Introduction to Management. Decision Analysis. How to model a decision situation? Qualitative techniques for situations of uncertainty. Decision tree. Project Management. Project evaluation and evaluation and review techniques. Concept of motivation and Theories of Motivation. Hertzberg 2 Factor theory. Transportation Management model.

CVE 503 STRUCTURAL ENGINEERING I 3 UNITS

Plastic methods of structural analysis of beams and frames. Influence lines for redundant structures - MuellerBreslau's Principle and Newmark's Numerical Integration Scheme. Elastic instability: Determination of critical loads of struts. Stability Functions for axially loaded beams and frames. Southwell's Plot for the determination of critical buckling parameters. Analysis of plates using series and finite difference solutions. Yield line analysis of slabs. Matrix methods of structural analysis. Flexibility and stiffness methods. Elastic instability.

CVE 504 STRUCTURAL ENGINEERING II 2 UNITS

Composite design and construction in steel and reinforced concrete. Design of structural foundations. Concept of prestressed concrete structures and systems of prestressing. Types of anchorages. Allowable stress for concrete and prestressing steel. Prestress conditions. Losses of prestressing force. Deflections of prestressed elements. Design of prestressed concrete beams. Modern structural forms: Tall buildings, lifts, shafts and shear walls. Design of retailing walls. Design projects.

CVE 505 WATER AND WASTEWATER ENGINEERING 3 UNITS

Water and Waste-water inter-relationship, water health, water borne diseases. Elements of water chemistry. Treatment process for surface water and for groundwater. Design fundamentals for water supply, treatment and water distribution systems, including storage, pumping and piping. Sources of waste water, industrial and domestic waste water, surveys. Elements of wastewater microbiology, wastewater collection, treatment and disposal and design. Wastewater re-use options and alternatives. Effluent standards.

CVE 506 HIGHWAY AND TRANSPORTATION ENGINEERING 3 UNITS

Highway planning and traffic surveys and analysis. Pavement design. Construction and maintenance. Administration and Finance of highways. Coordination of all Transportation media-(land, sea, air modes). Rail and air-transport systems. Transportation planning and economics. Traffic management and control. Design of traffic signals. Parking. Geometric Design. Construction methods. Construct materials and Laboratory tests. Railways and Airfields, Factors affecting location of railway and airfields, features of railways and airfields. Water/Sea transportation systems.

CVE 507 BUILDING TECHNOLOGY 3 UNITS

Construction planning and administration – cost control policies and procedures, incentives financial control. Network analysis. Arrow diagrams construction of a network, scheduling, time scales and project duration. Structure of the construction industry. Design and construction teams, statutory authorities, approval processes, notices etc. pre and post-contract planning; project evaluation tendering site organization and coordination, productivity and resource management, fast tracking etc operations. Research. Application s in construction management linear programming, sentencing, queuing theory and work study

CVE 508 GEOTECHNICAL ENGINEERING 3 UNITS

Consolidation and settlement: One-dimensional consolidation. The oedometer test. Primary and secondary consolidation. Immediate and consolidation settlements. Analysis of total and time rate of settlement. Settlement of spread and piled foundations. Shear strength of soils: General strength consideration. State of stress at a point and Mohr stress circle. Mohr-Coulomb theory of failure. Shear Tests: Vane shear test, direct shear test, tri-axial test. Shear strength of saturated clays, shear strength of compacted unsaturated clays, sensitivity of soils, residual strength parameters. Slope stability: Types and mechanics of slope failures. Theoretical and graphical solution of slope stability problems. Unsupported vertical cuts. Effects of tension cracks on slope stability.

CVE 509 CIVIL ENGINEERING SEMINAR 1 UNIT

Instruction on the preparation presentation and discussion of critical reviews of topics and projects of importance to the engineering profession in general and Civil Engineering in particular. Oral preparation and presentation of technical essays and project reports by students. Invited lectures on special topics in Civil Engineering.

CVE 510 CONSTRUCTION ENGINEERING 3 UNITS

Earthwork and earth moving and construction equipment. Taking and basement construction. Vertical communication in buildings, staircases, elevators, ramps, escalators systems building. Advance building structural systems, space frames, folded, plates, arches etc. construction materials, Maintenance of civil engineering structures.

ELECTIVES

CVE 513 CONSTRUCTION MANAGEMENT 3 UNITS

Construction planning and administration – cost control policies and procedures, incentives, financial control. Network analysis. Arrow diagrams, construction of a network, scheduling, time scales and project duration. Structure of the construction industry. Design and construction teams, statutory authorities, approval processes, notices etc. pre and post-contract planning; project evaluation tendering, site organization and co-ordination, productivity and resource management, fast tracking etc. Operations research, applications in construction management, linear programming, sentencing, queuing theory and work study.

CVE 519 ADVANCED STRUCTURAL DESIGN 3 UNITS

Limit state design of prestressed and precast concrete members. Design of simple span and continuous span bridges including steel plate deck bridges. Design of suspension bridges and off shore structures using BS codes and modern codes and modern softwares. Composite structures.

CVE 524 CIVIL ENGINEERING SYSTEMS DESIGN 3 UNITS

Analysis and design of civil engineering projects from the viewpoint of the whole interactions between the individual components (subsystems) and the effects of such on the overall system. Optional operational operation of the projects as measured by stability ease of operation, and economic returns. Systems management (operations research) techniques and applications in civil engineering – modelling linear programming, dynamic programming PERT – CPM in systems management. Transportation problems, Queuing theory and application.

CVE 526 ENVIRONMENTAL ENGINEERING 3 UNITS

Basic concepts and theory and design of solid waste collection and disposal systems. Field and laboratory sampling and monitoring of solid wastes. Analysis of municipal, industrial and agricultural solid wastes. Solid waste handling and disposal methods. Air pollution. Air pollution.

Air-borne waste and the control of atmospheric pollution, sources, type and effects of air pollutants, analysis of particulate and gaseous pollutant by classical and instrumental methods. Meteorological phenomena affecting dispersal or deposit. Methods of pollution control including use of fuels and cleaning of gas. Noise and noise control. Inter-relationship between the disposal of solid, liquid and gaseous wastes and the pollution of air soil and water. Environmental modeling, Environmental impact assessment. Water quality characteristics and analysis. Water pollution abatement and control.

CVE 527 WATER RESOURCES ENGINEERING 2 UNITS

Element of water resources and utilization. Hydraulics of open channels and wells. Drainage, Hydrograph analysis. Reservoir and flood-routing. Hydrological forecasting and its applications. Hydraulic structures i.e. Dams, Dykes/leaves. Weirs, Docks and Harbours, spillways, Stilling basin, manholes and other water related structures coastal problems. Erosion problems- types, occurrence, factors affecting occurrence, erosion mitigation methods. Urban drainage problems-design and management, Hydraulic structures etc. Urban water management. Engineering Economy in Water Resources Planning, Water resources evaluation.

CVE 528 ADVANCED SOIL MECHANICS 3 UNITS

Summary of common clay minerals. Clay mineralogy and clay water systems. Rate of consolidation. Accelerating consolidation with sand drains and surcharge. Shear strength of saturated clays. Stress paths. Shear strength of compacted unsaturated clays. Undrained vane shear test. Review of slope stability of circular slip surfaces. Slope stability of non-circular slip surfaces. Foundation subjected to dynamic forces. Maintenance; Avoiding failures in construction materials and foundation. Students will write and present in class a report on a given topic on Soil Mechanics and Foundation Engineering. Students will present a term paper using the most recent computer software for slope stability analysis.

CVE 529 IRRIGATION AND DRAINAGE ENGINEERING 3 UNITS

Land classification; crop water requirement. Crop; Irrigation requirements; Farm delivery requirement; Diversion requirements; Soil water relationships, Movement of soil moisture, measurement of infiltration and soil moisture. Irrigation, water quality. Irrigation Planning criteria. Irrigation methods, supplemental irrigation, Irrigation structures, Design, construction, operation and maintenance of surface, sub-surface and sprinkler irrigation systems. Surveys and investigation - sources of water, soils and salinity. Water tables: Drainage structures. Subsurface

drains. Design criteria - drain size, materials used; installation of subsurface drains, pumping for drainage and maintenance of drains. Urban storm drainage. Land drainage. Land drainage. Land reclamation.

CVE 530 DESIGN OF HYDRAULIC STRUCTURES 3 UNITS

Hydraulic models, hydraulic design. Criteria, problems of reservoirs, river training and regulations, transition structures, Dams, weirs, spillways, gates and outlet works, stilling basins. Cofferdams, Breakwaters, moulds, surge tanks. Design of municipal storm drains, land drainage systems culverts and bridge. Design of drainage inlets, manholes and catch basins. Introduction to multiple purpose designs involving flood control, water supply, irrigation, recreation, drainage navigation and erosion control.

CVE 591 FINAL YEAR PROJECT – Part I 3 UNITS

CVE 592 FINAL YEAR PROJECT – Part II 3 UNITS

Taken in each of the final year semesters – (total of 6 units) Final year students' individual or group projects in one of the several areas of Civil Engineering, under the supervision of the academic staff of the Department or Faculty. These independent projects may involve literature research, design, elementary fabrication, construction or feasibility studies. A formal report on this is required at the end of the academic year. Students may also be required to present their results orally before a panel of examiners. 15^{th} (T); 180h (P); C; PR: CVE 591.

3.9 SUMMARY OF CREDITS REQUIRED FOR GRADUATION

1. Requirements in major Civil Engineering Courses	81 Credits
2. General Courses in Engineering (GET courses)	42 Credits
3. Elective Requirements	6 Credits
4. General Studies Courses	13 Credits
5. Courses from other Faculties	43 Credits
6. Industrial Training – SWEP (4 Credits) + SIWES (12 Credits)	16 Credits

TOTAL CREDITS REQUIRED FOR GRADUATION – UTME=201 Credits, DE=156 Credits

CHAPTER FOUR: DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

4.1 DEGREE OPTION: Bachelor of Engineering in Electrical and Electronics Engineering (B.Eng. Electrical and Electronics Engineering)

4.2 PROGRAMME PHILOSOPHY

The undergraduate programme is designed to produce graduates that can be readily absorbed into several areas of the rapidly developing fields of Electrical and Electronics Engineering. Students are exposed to intense programme of basic and applied courses, experimentation, projects and industrial training. These are designed to enable them satisfy the manpower needs in the public and industrial sectors of the economy.

The programme involves research and training in the following areas: Computer, Control and Instrumentation Engineering; Communication and Electronics; and Electric Power Systems and Electric machines. The thrust is to emphasize aspects of study that are relevant to articulated national development objectives and those that enhance the relevance of institution to the society. At the end of the programme, the products will be suitable for employment in all relevant public and private enterprises.

4.3 PROGRAMME OBJECTIVES

The objectives of the programme are to:

(a) give students basic knowledge in Electrical and Electronics Engineering;
(b) provide sufficient depth of knowledge to enable promising graduates of the Department pursue postgraduate programmes in the Electrical and Electronics Engineering or related disciplines; and
(c) prepare graduates for employment in the industry (public and private) in the areas of electric power, electronics, communications, and computer engineering.

4.4 ADMISSION REQUIREMENTS

(c) UTME Admission

Admission to 100 level is through the Universal Tertiary Matriculation Examination (UTME) of the Joint Admissions and Matriculation Board (JAMB). To be eligible for admission, candidates must have the GCE (OL) or WASSCE or NECO or equivalent with at least five credit passes in subjects which include English Language, Mathematics, Physics, and Chemistry at **NOT** more than two (2) sittings.

U.T.M.E. Subjects: English Language, Chemistry, Mathematics and Physics.

(d) Direct Entry Admission

In addition to the requirements specified in (a) above, candidates seeking admission to second year (200 level) of the programme through direct entry must possess:

i. National Diploma at Upper Credit level or equivalent in Electrical and Electronics Engineering or related disciplines from a recognized institution, or

ii. General Certificate of Education (Advanced level) or equivalent with good passes in at least two subjects at a sitting which must include Mathematics, Physics and Chemistry. In addition, candidates in this category will be required to audit and pass some first year courses to remedy deficiencies.

However, admission to appropriate level shall be made on any other minimum entry qualifications as may be stipulated by the University.

4.5 PROGRAMME DURATION

The normal duration of the programme is five academic sessions for students admitted to 100 level through UTME and four academic sessions for those admitted into 200 level by Direct Entry. Students may take longer than the normal duration to complete the requirements for graduation but will not be allowed to exceed fourteen (14) semesters for candidates admitted through UTME and twelve (12) semesters for candidates admitted by Direct Entry.

4.6 GRADUATION REQUIREMENTS

To be eligible for a B.Eng degree in Electrical and Electronics Engineering of Ondo State University of Science and Technology, Okitipupa.

(a) pass all prescribed core courses, School and University required courses as well as electives;

(b) complete successfully a minimum of 198 units for candidates admitted through UTME and 153 units for candidates admitted through Direct Entry, and obtain a CGPA of not less than 1.5, and

(c) complete successfully all prescribed industrial attachments, projects and seminars.

4.7 LIST OF COURSES

100 LEVEL FIRST SEMESTER

Course Code	Course Title	Type	L	T	P	Unit	Prerequisite
CHM 101	General Chemistry I (Introductory Inorganic Chemistry)	R	2	1	-	3	
CHM 151	Practical Chemistry I	R	-	-	3	1	
GST 101	Communication in English and Use of Library	R	2	-	-	2	
GST 113	Logical and Critical Thinking	R	2	-	-	2	
MTH 101	Introductory Mathematics I	R	2	1	-	3	
PHY 101	General Physics I	R	2	1	-	3	
PHY 103	General Physics III	R	2	-	-	2	
PHY 107	Practical Physics I	R	-	-	3	1	
GET101	Engineering Drawing I	C	1	-	6	3	
CSC 101	Introduction to Computer Science	R	2	-	3	3	
	Total					**23**	

100 LEVEL SECOND SEMESTER

Course Code	Course Title	Type	L	T	P	Unit	Prerequisite
CHM 102	General Chemistry II (Introductory Organic Chemistry)	R	2	-	3	3	
CHM 152	Practical Chemistry II	R	-	-	3	1	
GST 112	Nigerian People and Culture	R	2	-	-	2	
MTH 102	Introductory Mathematics II	R	2	1	-	3	
CSC 102	Introduction to Computer Programming	R	2	-	3	3	
PHY 102	General physics II	R	2	1	-	3	
PHY 108	Practical Physics II	R	-	-	3	1	
GET 102	Engineering Workshop Practice	C	1	-	3	2	
MTH 104	Introductory Mathematics III	R	1	1	-	2	
GST 102	Communication in English II	R	2	-	-	2	
	Total					**22**	

200 LEVEL FIRST SEMESTER

Course Code	Course Title	Type	L	T	P	Unit	Prerequisite
GET 201	Basic Electrical Engineering I	C	2	-	3	3	
CSC 201	Computer Programming	R	2	-	3	3	
GET 205	Basic Fluid Mechanics	C	2	-	3	3	
GET 207	Applied Mechanics	C	2	1	-	3	
CHM 211	Basic Physical Chemistry I	R	2	-	-	2	
MTH 201	Mathematical Methods I	R	2	1	-	3	
GET 211	Introduction to Computer Packages	R	-	-	3	1	
GST 221	History and Philosophy of Science	R	2	-	-	2	
GET 217	Manufacturing Technology I	C	1	-	3	2	
	Total					**22**	

200 LEVEL SECOND SEMESTER

Course Code	Course Title	Type	L	T	P	Unit	Prerequisite
GET 206	Basic Thermodynamics	C	2	-	3	3	
GET 202	Basic Electrical Engineering II	C	2	-	3	3	GET 201
GET 212	Engineering Materials	C	2	-	-	2	
GET 204	Engineering Graphics	C	1	-	3	2	
GET 216	Strength of Materials I	C	2	-	3	3	
GET 220	Engineer-in-Society	C	1	-	-	1	
GET 222	Engineering Drawing II	C	2	-	3	3	
MTH 202	Numerical Analysis I	C	2	1	-	3	
GST 224	Peace Study and Conflict Resolutions	R	1	-	-	1	
	Total					**21**	

300 Level First Semester

Course Code	Course Title	Type	Contact Hours			Units	Prerequisite
			L	T	P		
ELE 301	Electric Circuit Theory I	C	2	1	-	3	GET 202
ELE 303	Electronics Engineering I	C	2	1	-	3	GET 202
ELE 305	Electromagnetic Field Theory	C	2	1	-	3	GET 202
ELE 307	Electrical Machine I	C	2	1	-	3	GET 202
ELE 309	Signal and Systems	C	2	-	-	2	GET 202
ELE 311	Electric Circuit Laboratory	C	-	-	3	1	
GET 301	Engineering Mathematics I	C	2	1	-	3	MTH 201
GST 331	Introduction to Entrepreneurial Skills	R	1	-	3	2	
	Total					**21**	

300 Level Second Semester

Course Code	Course Title	Type	Contact Hours			Units	Prerequisite
			L	T	P		
ELE 302	Electric Circuit Theory II	C	2	-	-	2	ELE 301
ELE 304	Electronics Engineering II	C	2	1	-	3	ELE 303
ELE 306	Electromagnetic Wave Theory	C	2	-	-	2	ELE 305
ELE 308	Electrical Machine II	C	2	1	-	3	ELE 307
ELE 310	Computer Software Application in Electrical and Electronics Engineering	C	2	-	-	2	
ELE 312	Measurement and Instrumentation	C	2	-	-	2	ELE 301 & ELE 303
ELE 316	Electrical Machine Laboratory	C	-	-	3	1	
GET 302	Engineering Mathematics II	C	2	1	-	3	GET 301
GET 304	Technical Communication	C	2	-	-	2	
	Total					**21**	

300 Level Long Vacation (8 Weeks)

Course Code	Course Title	Type	Contact Hours			Units	Prerequisite
			L	T	P		
GET 391	Student Work Experience Programme (SWEP)	C				4	
	Total					**4**	

400 Level First Semester

Course Code	Course Title	Type	Contact Hours			Units	Prerequisite
			L	T	P		
ELE 401	Classical Control Theory	C	2	1	-	3	ELE 302, ELE 304
ELE 403	Electronics Engineering III	C	2	1	-	3	ELE 304
ELE 405	Communication Principles	C	2	-	-	2	ELE 304, ELE 306
ELE 407	Systems Modelling and Analysis	C	2	1	-	3	ELE 309
ELE 411	Electrical Power Principles	C	2	1	-	3	ELE 308
ELE 415	Electrical and Electronics Laboratory	C	-1	-	3	1	
	Total					**15**	

400 Level 2nd Semester and Long Vacation (6 months or 24 weeks)
Students Industrial Work Experience Scheme (SIWES)

Course Code	Course Title	Type	Contact hours			Units	Prerequisite
			L	**T**	**P**	**U**	
ELE 420	Industrial Training Assessed by OSUSTECH Supervisors	C				4	
ELE 422	Industrial Training Assessed by Industry based Supervisors	C				4	
ELE 424	Student's Report and Seminar	C				4	
Total						**12**	

500 Level First Semester

Course Code	Course Title	Type	Contact Hours			Units	Prerequisite
			L	T	P		
ELE 501	Engineering Economics and Management	C	2	-	-	2	-
ELE 503	Control System Engineering I	C	2	-	-	2	ELE 401
ELE 505	Digital Signal Processing	C	2	-	-	2	ELE 407
ELE 507	Electrical Services Design	C	2	-	-	2	ELE 411
ELE 509	Communication System Engineering	C	2	-	-	2	ELE 405
ELE 511	Object-Oriented Programming and Computer Simulation	C	2	-	-	2	ELE 409
ELE 591	Final Year Project I	C	-	-	9	3	
	2 Optional Courses (2 Units each)	E				4	
	Total					**19**	

First Semester Optional Courses (Electives)

Course Code	Course Title	Type	Contact Hours			Units	Prerequisite
			L	T	P		
ELE 513	Power Systems Engineering I	E	2	-	-	2	
ELE 515	Analogue & Digital Computers	E	2	-	-	2	
ELE 519	Power Electronics Devices and Applications	E	2	-	-	2	
ELE 521	High Frequency and Microwave Electronics	E	2	-	-	2	
ELE 523	Wireless Communication	E	2	-	-	2	
ELE 525	Computer Communication Principles	E	2	-	-	2	
ELE 527	Electrical Drives	E	2	-	-	2	
ELE 529	Power Systems Communication and Control	E	2	-	-	2	

500 Level Second Semester

Course Code	Course Title	Type	Contact Hours			Units	Prerequisite
			L	T	P		
ELE 502	Reliability and Maintainability of Electrical Components and Systems	C	2	-	-	2	
ELE 504	Digital Control Systems	C	2	1	-	3	ELE 503
ELE 592	Final Year Project II	C	-	-	9	3	
ELE 508	Electrical Energy Conversion and Storage	C	2	-	-	2	ELE 411
ELE 510	Seminar	C	-	1	-	1	
ELE 512	Engineering Law & Management	C	2	1	-	3	
	2 Optional Courses (2 units each)	C				4	
Total						**18**	

Second Semester Optional Courses (Electives)

Course Code	Course Title	Type	Contact Hours			Units	Prerequisite
			L	T	P		
ELE 514	Industrial Electronics Design	E	2	-	-	2	
ELE 516	Energy & Power Quality Assessment	E	2	-	-	2	
ELE 518	Digital communication	E	2	-	-	2	
ELE 520	Radio and Television Broadcasting	E	2	-	-	2	
ELE 522	Electric Power System Engineering II	E	2	-	-	2	
ELE 524	Electrical Machine Design and Protection	E	2	-	-	2	
ELE 526	High Voltage Engineering	E	2	-	-	2	
ELE 528	Non-linear Control Theory	E	2	-	-	2	
ELE 530	Substation Engineering	E	2	-	-	2	
ELE 532	Antenna Theory and Radar Systems	E	2	-	-	2	

C= Core Courses R= Required (University) Courses E= Electives

4.8 SYNOPSIS OF CORE COURSES

100 LEVEL

GET 101 ENGINEERING DRAWING I 3 UNITS

Introduction to drawing instruments and their proper use, Use of scales, linework, lettering and dimensioning, Geometrical constructions including bisection of angles, tangents, normal, polygons, etc. loci, including paths of point of simple mechanisms and on profiles, Pictorial drawing; Orthographic projections of simple objects in first and third angles, Isometric and oblique projection, Isometric projections from orthographic projects. Dimensioning and development of simple shapes. Assembly drawing of simple components. Conventional representation of common engineering features. Freehand sketching. Use of engineering drawing software.

GET 102 ENGINEERING WORKSHOP PRACTICE 2 UNITS

Organization of workshop. Workshop hazard, safety practices and codes. Introduction to basic manufacturing processes. Types of workshop equipment, machines and materials Bench-work and fitting. Introduction to turning – straight and step turning, chamfering, screw cutting. Milling and milling exercises. Drilling techniques and exercises. Sheet metal work. Welding and soldering technique with exercises. Properties of wood. Woodwork and joinery exercises. Workshop measurements. Refrigeration and air conditioning: principle of operation, refrigerants and troubleshooting. Methods of leak detection. Safety precautions. Automotive workshop practice: Principle of operation of the motor car, Tuning carburettor, setting contact breaker gap, setting ignition timing, electronic ignition system and computer controlled ignition system. Use of computerized engine diagnosis equipment. Engine routine maintenance procedure and engine service. Tyre types and care. Battery care, topping up and charging.

200 – LEVEL

GET 201 BASIC ELECTRICAL ENGINEERING I 3 UNITS

Basic Electrical Concepts. **Circuit Laws**: Ohm's law and Kirchoff's Laws. **Methods of Circuit Analysis**: Mesh analysis, Nodal analysis, Delta/Star Transformation, Source Conversion. **Circuit Theorems**: Thevenin's Theorem, Norton's Theorem, Superposition Theorem, Maximum Power Transfer Theorem, Rosen's Theorem, Reciprocity Theorem; Network problems arising in Energy distribution. Transient response of RC, RL and RLC Circuits. **Elementary treatment of semiconductor devices**: PN junction diode, rectifier diodes, varactor diode, Schottky diode, zener diode, light emitting diode (LED), bipolar junction transistor (BJT), field effect transistor (FET), Thyristors, Integrated Circuits (ICs).

Software Tools for Electrical Circuits: Use of Electronic Workbench, PSpice, MultiSim and Circuit Maker for Simulation of electrical circuits, elements, devices and component.

GET 202 BASIC ELECTRICAL ENGINEERING II 3 UNITS

Basic AC theory- Periodic wave forms, average instantaneous, peak, mean and RMS values, form and peak factors , single phase series alternating current circuits and Application of complex numbers to series AC networks, single phase parallel alternating current (Admittance, conductance and Susceptance) circuits and Application of complex numbers to parallel AC networks, Series and parallel Resonance, Bandwidth and Q factor, Power in AC circuits and Power factor Correction/improvement, Delta-star and star-delta transformations, Three phase system: balanced wye-wye connection, balanced delta-delta connection, balance delta-wye connection, balanced wye-delta connection, power in a 3-phase balanced system, unbalanced 3-phase system. Magnetic circuit, mutual inductance, **Introduction to electrical machines;** - DC generators and motors. Introduction to Electrical and Electronic Power measuring instruments and equipment, A.C. and D.C. bridges.

GET 211 INTRODUCTION TO COMPUTER PACKAGES 2 UNITS

Introduction to packages such as Microsoft Excel, MATLAB, Mathematica, SPSS etc. Basic engineering computations, data analysis and graphics using packages. Numerical and symbolic analysis.

GET 212 ENGINEERING MATERIALS 2 UNITS

Introduction to electronic configuration, atomic structures, inter-atomic bonding mechanisms, crystal and macrostructure. Relationship between structure and properties of metals, alloys, ceramics and plastic. Structure of matter; Crystal structure, crystal imperfection. Non-crystalline and multiple phase solids including polymers. Simple phase diagrams of alloys. Physical properties of materials (wood, cement, plastics and alloys). Mechanical properties of engineering materials. Engineering materials. Engineering and True stress-strain curves. Ultimate strength, ductility, impact strength, hardness, creep and fatigue failure. Electrical properties; conductivity, semi-conductivity and superconductivity. Optical and magnetic properties of materials. Stability of materials in the service environment; corrosive media, sub-zero and elevated temperature. Basic criteria for selection of materials for engineering applications.

GET 220 ENGINEER-IN-SOCIETY 1 UNIT

The growth and effects of technology. The role and responsibilities of the engineer in society. Education, professional training and regulation of engineers. Role of the Council for the Regulation of Engineering in Nigeria (COREN). Industry and commerce. The relation between

business and industry. Private and state control, nationalization, privatization. Effect of industrialization, information technology and free trade. Principles of scientific management. Modern management techniques, organization of business. Labour relations industry and the Law. International Labour Organisation (ILO) convention on collective bargaining and the right to strike.

GET 222 ENGINEERING DRAWING II 3 UNITS

Further projection of solids. First and third angle projections and Isometric projections of machine components. Intersection of surfaces and developments. Sectional views, Curve of interpenetrations. True lengths and true shapes. Parts and assembly drawings (Detailed drawing of machine components). Preparation of working drawing for manufacturing in accordance with standards. Reading and interpretation of manufacturer's drawing of equipment.

300 LEVEL

GET 301 ENGINEERING MATHEMATICS I 3 UNITS

First order ordinary differential equations. Existence and uniqueness. Second order ordinary differential equations: linear dependence, Wronskian, reduction of undetermined coefficients, variation of parameters. General theory of nth order linear equations. Series solution about ordinary and regular points, special functions: Bessel, Lengendre and Hypergeometric. Laplace transform and application to initial value problems.

GET 302 ENGINEERING MATHEMATICS II 3 UNITS

Gamma and Beta functions, Sturm-Liouville problem, orthogonal polynomials and functions. Fourier series and integrals, Fourier transformation. Partial differential equations: general and particular solutions, linear equations with constant coefficients; first and second order equations; solutions of the heat, wave and laplace equations by the method of separation of variables; eigenfunction expansions; fourier transforms.

GET 304 TECHNICAL COMMUNICATION 2 UNITS

Professional use of English Language for letters, specification descriptions, presentation of charts, graphs, tables, writing of proposals in reports. Case studies of major professional's presentation of reports and proposals. Microsoft Excel, Powerpoint and Project. Special lectures may be required.

ELE 301 ELECTRIC CIRCUIT THEORY I 3 UNITS

Laplace and Fourier transforms, application of Laplace transformation to transient analysis of RLC circuits, transfer function concepts, reliability of functions, Foster and Causer's methods of Synthesis, 2-port network synthesis of non-linear resistive circuits, harmonic analysis of non-linear dynamic circuits, applications of computers in the analysis of linear and non-linear circuits. Network graph theory, independent loop equations and independent node equations (loop and nodal analysis), Analysis of linear circuits using MATLAB, Network reduction by Tee-Pi transformations, maximum power transfer theorem, Millman's and Reciprocity theorems.

ELE 302 ELECTRIC CIRCUIT THEORY II 2 UNITS

Fourier Series: Representation of continuous time periodic signals, calculations of Fourier coefficients. Continuous time and discrete time Fourier series and transforms. **Laplace Transformation and its Application:** Laplace transforms applications to steady and transient state analysis of circuits. **Realisability of transfer functions**, Foster and Cauers methods of synthesis. 2-ports network synthesis. Filters: design, operation, low, high, Band pass.

ELE 303 ELECTRONICS ENGINEERING I 3 UNITS

Elementary Physical Electronics: Crystal structure; electron and energy band schemes, Semiconductor Fundamentals: materials, charge carrier behaviour: majority and minority carrier equilibrium behaviour, non-equilibrium behaviour under excitation such as radiation, temperature and voltage. Free electron motioning static & magnetic fields, electronic structure of matter, atomic models. Theory of energy bands in conductors, insulators and semiconductors: Atomic bonding in semiconductors, types of semiconductors. Electrons and holes in intrinsic semiconductors. Femi-energy acceptor impurities. Majority and minority carriers. Charge densities in a semiconductor electrical properties of Germanium and Silicon. Hall Effect, Drift and diffusion currents, recombination and generation. Electrons in metals and electron emissions; carriers and transport phenomena in semi – conductors, characteristics of some electronic devices: photoresistors, photodiodes, phototransistors, photo cell and light emitting diode. Formation of depletion layer, Junction or barrier voltage. Energy band diagram of a p-n junction. Forward biased p-n junction. Forward V-1 characteristics. Reversed biased p-n junction Reversed V-l characteristics. Reversed biased breakdown. Construction and types of P-N Junction diode. Elementary discrete devices fabrication techniques and IC technology. FET and MOSFET: I-V characteristics and operating regimes (Cut-off, Linear/Triode and saturation). Charge control model, Channel length modulation, Back gate effect. Quasi-static equivalent circuit models (large and incremental models), High frequency

models Junction diodes, and transistors, FETS, SCR, photo resistors, diodes, transistors, photocell and light emitting diodes. Boolean algebra: Logic, Positive logic, Negative logic, De Morgan's law, Kanaugh Maps Information: Binary representation of information, Encoding Information, Representing digital information with voltage, noise margins, static discipline, sign magnitude representation, 1's complement, 2's complement CMOS technology: CMOS Inverter, CMOS logic, NAND, NOR, and Complex gates, Voltage transfer curves, Static discipline, Single Stage Amplifiers: Two-port representation, General Amplifier concepts, Types of Amplifiers (voltage, Trans-conductance, Trans-impedance and current amplifiers. Common Source, Common Emitter, Common Emitter with Degeneration Resistor, Common Drain, Common Collector, Common Gate and Common Base. Combinational Logic: Adders, Multiplexers, Demultiplexers and Synthesis of Combinational logic, n-bit adder, half adder, full-adder, two level and/ synthesis, multiplexers, decoders, MUX & ROM, Combinational logic Synthesis, Implementations of combinational logic using a hardware description language such as Verilog.

ELE 304 ELECTRONICS ENGINEERING II 3 UNITS

Frequency Response of Single Stage Amplifiers: Review of Bode plot, Intrinsic frequency response of MOSFETs and BJTs, Frequency response of CS and CE stages. Frequency response of CG and CB stages. Frequency response of CD and CC stages. Methods of analyzing Frequency Response **Multistage Transistor Amplifiers:** Transconductance amplifiers, transresistance amplifiers, voltage, current and power amplifiers. Voltage buffers and current buffers. Impedance matching. Methods of amplifier stage coupling – AC coupling, DC coupling, level shifting. DC voltage and current sources, cascaded circuits. Switching properties of electronic devices. Switching and waveshaping circuits. Generation of non-sinusoidal waveforms; astable, monostable and bistable multi-vibrators, comparator. Analysis and design of logic gates of various families. Diode logic, RTL, TTL, RCL, MOS and MOS of digital integrated circuits. Interfacing between various logic families. **Programmable/Reconfigurable Logic:** Programmable Logic Arrays (PLAs), Programmable Array Logics (PALs): AND plane, OR plane, Standard cell libraries, gate arrays, Sea of gates. **Sequential Logic:** Timing and States, Dynamic discipline, Storage and States, Storage using capacitors and Storage using feedback (SRAM DRAM) **Clocked Sequential Circuits:** Finite state machines, Dynamic discipline, Concept of discrete state and time, FSM implementations, Moore vs Mealy machine, Valley state diagrams and unreachable states, FSM simplification, **Introduction** to analog-to-digital and digital-to-analog conversion principles.

3 UNITS

ELE 305 ELECTROMAGNETIC FIELD THEORY

Review of Vector Analysis: Vector and scalars, addition and subtraction of vectors, dot and cross product of vectors, gradient of a scalar function, divergence of vectors, divergence theorem, curl of vectors, Stoke's theorem, laplacian, cartesian, cylindrical and spherical coordinates, variable transforms. **Electrostatics:** Coulomb's law, electric fields, permittivity, principle of superposition, Gauss's law and electric flux, method of images, electric scalar potential, energy density, coaxial cables and applications, calculations of fields by Gauss's theorem and potentials, conductors and insulators in electric field, capacitance. **Magnetostatic:** Magnetic field, Biot-Savart law, forces between conductors due to electric current, magnetic flux, Ampere's law, Maxwell's static equations, magnetic vector potential, energy density, coaxial cables and applications, magnetic fields in presence of magnetic materials, magnetic dipoles, permeability, magnetic vectors, ferromagnetism, boundary conditions. **Boundary Value Problems:** Methods of solving electrostatic and magnetostatic field problems, Poisson's and Laplace equations. **Time varying magnetic and electric fields:** time varying fields and electromagnetic induction, Faraday's law, inductance, quasi-static magnetic fields, magnetic diffusion. **Computer applications in simulation and solving electromagnetic field problems**: Quickfield, ANSYS, Maxwell softwares etc. Includes lectures, demonstrations, mini project and laboratory assignments.

ELE 306 ELECTROMAGNETIC WAVE THEORY 2 UNITS

Maxwell's equations: Derivation of Maxwell's equations, consideration of various media, displacement current and generalization of magnetic circuit law, consequence of Maxwell equations, electromagnetic field wave functions. **Electromagnetic waves:** Plane waves in free space, energy transfer in electromagnetic waves, Poynting vector; boundary conditions; wave propagation in unbounded conducting and dielectric media, skin effect, reflection and transmission of electromagnetic waves across boundaries of different media, propagation of electromagnetic waves in ionized media. **Transmission Lines:** Fundamentals of transmission lines, matching, voltage reflection coefficient, standing wave ratio, electromagnetic wave transmission in wave guides, radiation and reception of e.m. waves, antennae. Applications of wave theory in communication. **Computer applications in simulation and solving electromagnetic wave problems.** Includes lectures, demonstrations, mini project and laboratory assignments.

ELE 307 ELECTRICAL MACHINES I **3 UNITS**

This course introduces fundamental concepts of electric machines. Students should be able to identify components of the system from the course and describe their basic operations from the course having electromagnetic and circuit concepts learned in previous fundamental courses. **Review of Principles** of electromechanical energy conversion; general rotating machines. Principles of coil windings – Lap, wave windings. Design, construction and characteristics of DC machines. **Performance of DC machines:** Starting and speed control of shunt, series and compound motors. **Transformers:** design and construction fundamentals. Equivalent circuits analysis, open and short circuit tests. Regulation. **Autotransformers and three-phase transformers**: design and performance; connections and parallel operations. Includes lectures, demonstrations, mini project and laboratory assignments.

ELE 308 ELECTRICAL MACHINES II **3 UNITS**

Induction machines, construction, characteristic, circuit diagram of induction motors. Torque/slip relation and speed control. Introduction to induction generators. **Synchronous Generator:** rotating magnetic fields, emf equations, steady-state performance, Mathematical representation of cylindrical rotor and salient pole synchronous machine characteristics. Synchronizing torque, infinite bus and parallel operation. **Synchronous motor:** construction, characteristics, circuit diagram, Method of starting. **Single-phase induction motors**: universal motor, reluctance motors, applications. Protection of machines.

ELE 309 SIGNALS AND SYSTEMS **2 UNITS**

Signal and system analysis. Topics include discrete-time and continuous-time signals, Fourier series and transforms, Laplace Signals and systems and transforms, Mathematical representation of signals and systems; spectrum representation; representation of signals by sample values; discrete-time filter characterization and response; continuous-time signals and linear, time-invariant systems; frequency response; continuous-time Fourier transform and application to system analysis. Time-Domain Analysis of Continuous Time Systems, Linear Algebra Overview, Fourier Series, Hilbert Spaces and Orthogonal Expansions, Fourier Analysis on Complex Spaces, Fourier Transform and application to system analysis, Sampling Theorem, Laplace Transform and System Design, Z-Transform and Digital Filtering, MATLAB basics with application to signals and systems. Includes lectures, demonstrations, and laboratory assignments.

ELE 310 COMPUTER SOFTWARE APPLICATIONS IN ELECTRICAL ENGINEERING 2 UNITS

Review of Computer Systems: Hardware, Operating systems, Application software and Programming languages. **MATLAB:** Review of matrix algebra, MATLAB programming environment, numerical methods with MATLAB, introduction to symbolic mathematics, GUIDE interface programming. Data acquisition, digital signal processing and embedded systems in MATLAB. **SIMULINK:** Introduction to SIMULINK, block_sets, building custom blocks, editing blocks. Setting up and running simulations. Simulation of electrical and electronics systems. **SPICE:** Introduction to electronic component modeling and simulation. Models of common components; resistors, capacitors, inductors, diodes, small signal amplifiers and power amplifiers. Models of op-amps, linear integrated circuits and digital circuits. Basic_circuit simulation in SPICE. **Electronic Workbench:** Introduction, circuit drawing and simulations. **OrCAD:** circuit drawing, printed circuit board layout, exporting circuit diagrams to PCB layout.

ELE 311 ELECTRICAL CIRCUIT LABORATORY I 1 UNIT

Network classification: Distributed and lumped, passive and active, time variable and time invariant, symmetrical and asymmetrical networks

Network analysis: mesh and nodal analysis; super-node and super-mesh analysis; T-Pi and Pi-T conversions, Network theorems: Review of Thevenin's, Norton's Millman's theorems; Compensation, Reciprocity and Tellgen's Theorem. Resonance: Series and Parallel resonance, Band Width, selectivity and Q-factor of response circuits.

Two port networks: Z, Y, H and ABCD parameters, Equivalent circuits, inter-relationship between the two port parameters; input, output and image impedance of two ports. Multi-terminal Networks: Multi-terminal networks, indefinite (floating) Admittance Matrix.

Fundamental concepts, definitions in metrology. Theory of errors, indicating instruments. Moving coil, and moving iron devices. I, V, kWh, P.F. Instruments. Dynamometer. Frequency measurement. Digital bridges analog electronic measuring instruments. Cathode Ray oscilloscope. Transducers, Guages, Recorders.

ELE 312 MEASUREMENTS AND INSTRUMENTATION 2 UNITS

Introduction to Signals and Measuring Systems: Analog and digital signals. Fundamental elements of measurement systems. Static and dynamic characteristics of measurement systems. **Modeling of Measuring Systems:** Random noise (thermal, shot and $1/f$ noise), interference, errors and accuracy. Mathematical modeling of non-ideal measuring systems. Standards and calibration. **Instruments for direct measurement** of current, voltage resistance

and other circuit parameters: - moving coil, moving iron, electrodynamics and electrostatic measuring instruments. Measurement of electrical energy, power, power factor and frequency. **Transducers:** Basic requirements of transducers, classifications. Sensor principles. Thermocouples, thermistors, Platinium100 (Pt100), Linear Voltage Differential Transformers (LVDTs), accelerometers, microphones, pressure transducers, photodiodes, strain gauges, Hall-effect transducers, flow transducers etc. **Instruments for indirect measurement** of electrical parameters: - DC and AC bridges.

ELE 316 ELECTRICAL MACHINE LABORATORY 1 UNIT

Graph theory: Basic concepts and definitions, matrices associated with networks graphs: Incidence, Cut-set, Tie-set Matrices and Duality. Applications to mesh and Nodal Analysis. The Laplace Transform and its application in the analysis of electric circuits. Network synthesis; positive real functions; synthesis of RL. RC, and ladder networks; Foster's and Cauer's forms.

GET 391 STUDENTS WORK EXPERIENCE PROGRAMME (SWEP) (8 Weeks) 4 UNITS

Introduction to practices and skills through supervised hands-on workshop exercises in computer engineering, information and communication technology (ICT), and related general engineering using the Faculty Workshops and other University facilities under strict industrial conditions. These exercises include familiarisation with basic tools, soldering and de-soldering skill of pass-through and surface-mount components, building of simple electronic circuits, troubleshooting of electronic devices, digital systems, etc. Use of hand drill. Safety precautions in handling electronic devices. Basic welding skill.

ELE 401 CLASSICAL CONTROL THEORY 3 UNITS

Control system concepts: Open and closed loop control systems, block diagrams, Resume of Laplace transforms: Transfer functions of electrical and control systems. Electromechanical devices: Simple and multiple gear trains electrical and mechanical analogues. Error detector and transducer in control systems. The amplidyne: AC and DC techno generator and servomotors; rotary and translational potentiometers. Hydraulic and pneumatic servomotors and controllers. Dynamics of simple servomechanism: Steady state error and error constants, the use of non-dimensional notations and the frequency response test. Log and Polar plots of control systems, Basic stability concepts in control systems. Routh-Hurwtz stability criterion. Transient response analysis with MATLAB, Example problems solved with MATLAB. Application of singularity functions as test signals in control systems.

ELE 403 ELECTRONICS ENGINEERING III 3 UNITS

Introduction to integrated circuits: Integrated circuit (IC) technology: - packaging, manufacturing, identification and sources of data on IC's. **Operational Amplifiers:** Characteristics of Amplifiers, Different types of operational amplifiers and their characteristics. Feedback in operational amplifiers. Bipolar and biFET integrated circuit operational amplifiers. **Amplifier Circuits:** Inverting and non-inverting amplifiers, buffer amplifiers, single-supply amplifiers, Norton or current-mode Op Amps. Instrument amplifier. **Applications of Operational Amplifiers:** Summing, subtracting, integrating amplifiers. Differentiating, logarithmic and exponential amplifiers. **Comparators:** Op. Amps as comparators; zero-crossing comparator circuits, level sensing comparator, comparators with hysteresis etc. **Active filters:** Basic types of filter; low-pass and high-pass filters, band pass and band-rejection active filters, switched-capacitor filters. **Linear Power Supplies:** Rectifier circuits, regulation, voltage references and Op-Amp regulator. Switched-Mode Power Supplies. **Oscillator Circuits:** Theory of oscillation, relaxation, bootstrap, sine-wave oscillators

ELE 405 COMMUNICATION PRINCIPLES 3 UNITS

Basic concepts of a communication system – Source, channel and user. Signal and systems analysis. Amplitude modulation and demodulation methods, double sideband, single sideband and vestigial sideband modulation schemes; simple modulators, power and bandwidth performance. Angle modulation; frequency modulation, phase modulation, bandwidth requirements, Amplitude modulated signal reception; discrimination frequency tracking loop, phase locked loop and noise performance commercial radio systems. Sampling principles, theorems and techniques. Transmission media; attenuation in open space, air, cable and fibre channels Pulse amplitude modulation, pulse width modulation multiplexing, quantisation systems and pulse code modulation, delta modulation, causes and correction of errors in PCM and DM, ideal and matched filters, frequency acquisition, phase referencing and timing line codes, block encoding and Shannon's theorem.

ELE 407 SYSTEM MODELLING AND ANALYSIS 3 UNITS

Multivariate Analysis, Classification of Multivariate Techniques, Factor Analysis, Introduction of Multiple Regression Analysis and Logistic Regression, Multivariate Analysis of Variance; Probability. DSS - Introduction to Decision Support System (DSS), Decision and Decision makers, Modelling Decision processes, Expert System and Artificial Intelligence (AI), Knowledge Engineering and Acquisition, Machine That Can Learn – ANN and Fuzzy Logic, Data Mining and Data Warehouse and System Perspective, Designing and Building DSS,

Implementing and Integrating DSS, Creative Decision Making and Problem Solving in the 21st Century. Mathematical models, database systems, expert systems, neural networks, data mining, operations research, management science, user interface, graphics techniques and programming techniques. Includes lectures, demonstrations, mini project and laboratory assignments.

ELE 411 ELECTRICAL POWER PRINCIPLES 3 UNITS

Introduction to Power Systems: Structure of electric system, load characteristics, energy transmission and distribution. **Properties of Three-Phase Systems:** Balanced and unbalanced delta and Wye connected loads. Delta-wye transformation. Use of symmetrical component method to solve unbalanced three-phase networks. **Energy Sources:** Principles and methods of energy conversion employing steam, gas, water, nuclear, wind and magneto hydrodynamic generation. Solar energy, and other renewable energy: **Components of Power Generating System**: Prime mover systems, generators, characteristics, equivalent circuits, control and operation. Voltage regulation. **Design and Organisation of Power Stations:** Siting of power stations. Power station auxiliaries. **Power system equipment: Standards and safety.**

ELE 415 ELECTRICAL AND ELECTRONICS LABORATORY 1 UNIT

Laboratory experiments for electronics, control communication, power and assembly language programming.

ELE 420, 422, 424: STUDENTS INDUSTRIAL WORK EXPERIENCE SCHEME 12 UNITS

A more comprehensive programme, similar to GET 391, in which the students are attached to electrical/electronics engineering establishments (public or private) and industries, with a view to making them develop the working practical skills of the profession, and providing additional opportunity to learn how to write field reports and prepare technical documents. Students are supervised during the training period, and are expected to keep log-books and other records designed for the purpose of monitoring their performances.

ELE 501 ENGINEERING ECONOMICS AND MANAGEMENT 2 UNITS

Scope of managerial economics, management models, revenue of various forms, production decision, cost of product, profit analysis of firms, pricing techniques, location and localization of industries, industrial growth in Nigeria, the size of a firm, integration and diversification, marketing demand and forecasting, distributive trade in Nigeria, business finance, investment, capital budgeting and management control, government policies and the firm. Management: Organizational structure and behaviours, engineer manager transition, managerial functions, principles and techniques of planning forecasting, organizing technical activities, project selection and management, style of leadership and management techniques.

ELE 502 RELIABILITY AND MAINTAINABILITY OF ELECTRICAL COMPONENTS AND SYSTEMS 2 UNITS

Introduction to reliability. Elementary reliability theory. Indices of reliability failure rate models. Failure distribution reliability function. Mean time to failure. Mean time between failures. Reliability of systems, serial configuration, parallel configuration, and redundancy. Determination of reliability of electronic systems. Power systems reliability. Factors affecting power systems reliability. Power systems reliability indices – customer oriented and system oriented. System maintainability. Analysis of down time. Repair-Time distribution. Exponential Repair-Time. Reliability concept in preventive maintenance. Methods of improving systems reliability.

ELE 503 CONTROL SYSTEM ENGINEERING I 2 UNITS

Relative stability concepts: Root Locus Analysis: Introduction, Root-locus plots, general rules for constricting root locus. Root-locus plots with MATLAB, Root-locus analysis of control systems and root contour plots **Control Systems Design by Root-Locus Method:** Preliminary design consideration, lead, lag and lead-lag compensation. **Frequency response Analysis:** Bode diagrams, plotting of Bode diagrams with MATLAB, Polar plots. Nyquist stability criterion, drawing of Nyquist plots with MATLAB. Log-Magnitude versus phase plots. Stability analysis. Closed loop frequency response. Experimental determination of transfer functions. **Control Systems Design by Frequency Response:** Introduction, lead, lag and lead-lag compensation. **PID Control and Introduction to Robust Control:** Tuning rules for PID controllers. Modifications of PID control schemes. Two-degrees-of –freedom control. Design consideration for Robust Control.

ELE 504 DIGITAL CONTROL SYSTEMS 3 UNITS

Digital control; concept of sampling, z-transform, inverse zero-order-hold, stability analysis. State variables of dynamic system, formulation of state vector differential equation, solution state equation, transition matrix, eigenvalues and eigenvectors, stability. Nonlinear control, common types and effects of nonlinearities, phase-plane and describing function analysis.

ELE 505 DIGITAL SIGNAL PROCESSING 2 UNITS

The scope of Digital Signal Processing (DSP). Sampling and analog to digital conversion. Types of digital signals - deterministic, random, Gaussian and peak factor of a random signal. Time-Domain Analysis: digital LTI processors; digital convolution and differences equations; and Fourier transforms. Frequency–domain analysis: Discrete Fourier Transform; FFT; z-transform. Digital Filters: Design of recursive filters (IIR - Butterworth, Chebyshev) and nonrecurssive (FIR) filters. Digital ladder filters. DSP implementation using DSP toolbox in

Matlab. Application of DSP – image, frequency detection, multifrequency receivers, PCM, Data modems, speech recognition, etc.

ELE 507 ELECTRICAL SERVICES DESIGN 2 UNITS

Lighting installation, Basic power installation, Power supply and distribution systems; regulations, IEE, NEC, Nigerian standards, choice of cables and conductors, wire systems and accessories, outdoor low voltage lines and cables, protection of low voltage installation, design of electrical installation - domestic, industrial and commercial. Earthing and testing of electric installations. Proposals and contract document preparation. The use of software such as Microsoft Visio, AUTO CAD, etc.

EEE 508 ENERGY CONVERSION AND STORAGE 3 UNITS

Electromechanical energy conversion; induced EMF, forces and torques in magnetic field system, sources of electrical and motive power, dynamic equations of electromechanical systems solar energy and other sources of renewable energy, Wind, geothermal, and pumps energy storage, Primary and secondary cells, battery types and characteristics, battery applications in energy conversion systems, light and heavy machines and transports, testing, fault diagnosis, repairs and effect of environmental factors on battery life.

ELE 509 COMMUNICATION SYSTEMS ENGINEERING 2 UNITS

Review of probability for information theory, measure of information, entropy, Lossless source coding and data compression methodology using Huffman coding, Arithmetic coding and Lempel – ziv algorithms, Material information; channel capacity. Different channel coding system: Error detection and correction codes using block and convolution codes. Random signals. Autocorrelation functions and power spectral densities. Optimal signal processing.

ELE 510 SEMINAR 1 UNIT

Each student must present one seminar and be present at all engineering seminars within the department. Each student's seminar topic must be related to the student's final year project and shall be assessed by oral presentation and defense.

ELE 511 OBJECT-ORIENTED PROGRAMMING AND COMPUTER SIMULATION 2 UNITS

The use of Object-Oriented Programming (OOP) to develop computer simulations of engineering problems. Programming with the C++ and MATLAB languages. (OOP) concepts including classes, inheritance and polymorphism. Programming with class libraries. Event-driven simulation techniques in an object-oriented environment. Programming projects will include the development of a simulator for an engineering application.

ELE 512 ENGINEERING LAW AND MANAGEMENT 3 UNITS

Law Ethnics and conduct in engineering, legal definitions and specifications, application of business law to engineering, patents and inventions, trademarks and copyrights contract documents, engineering business, types, the structure and functions of organizations, professional problems – legal responsibilities professional liability, role of engineer in law suits. Management: Organizational structure and behaviours, engineer manager transition, managerial functions, principles and techniques of planning forecasting, organizing technical activities, project selection and management, style of leadership and management techniques.

ELE 513 POWER SYSTEM ENGINEERING I 2 UNITS

Modeling of Power Components: Transmission line, transformers and synchronous machines, Single line representation of three-phase systems. Per unit system representation. **Power Flow Analysis:** Power flow equation. Solution by Gauss-Siedel, Newton-Raphson, and other methods. Control of voltage, real and reactive power in Power flow problems. **Load forecasting:** principles; short term (daily, weekly, quarterly; annual); long term (half decade, decade); and applications. Economic operation of power systems: generating systems; power transfer systems.

ELE 514 INDUSTRIAL ELECTRONICS DESIGN 2 UNITS

Industrial transducers, position, velocity, temperature and regulatory systems. Electric arc furnaces; welding, heaters, selection of motors, motor control panels specification and design, Temperature control and PH measurement and control. Computer controlled systems.

ELE 515 ANALOGUE AND DIGITAL COMPUTERS 2 UNITS

Introduction to analysis and design of digital systems. Boolean algebra and mapping methods. Karuangh and variable entered maps, combinational logic realization with gates, multiplexers, read only memories (ROMS) and programmable logic arrays (PLAS). State machine analysis and design; State diagrams, redundant states sequential counters and mainly synchronous systems, state machine realization with multiplexers, ROMs and PLAs. Asynchronous systems approach to digital systems designs, top-down design, trial and error methods. Codes, number systems and arithmetic operations. Introduction to computer structures; register transfer, hardware programming methods. Von Neumann machines, and memory systems. Standard logic function with MSI circuits; seven segment display drivers, parity generators/checker encoders, adders, etc.

ELE 516 ENERGY AND POWER QUALITY ASSESSMENT 2 UNITS

Energy Conservation, Use efficiency, auditing and management. Power quality – definitions; voltage dips (SAGS), brief interruptions, SWELLS, transients, voltage fluctuations, flickers and their effects. Power quality assessment – notches, harmonics, and voltage unbalances. Power quality monitoring.

ELE 518 DIGITAL COMMUNICATION 2 UNITS

Digital signals and characters. Serial and parallel data transmission systems. The ISO-OSI layered architecture, packet switching and circuit switching, error detection and recovery (ARQ) protocols, bridges and routers, basic queuing theory, telephone switches, Erlang-B and Erlang-C blocking formulae, TCP/IP, X.25, signaling (Signaling System 7), Personal Communication Services (PCS) networks, Broadband Networks. Modulated carrier signals: Binary modulation (ASK, PSK, FSK), Spread Spectrum.

ELE 519 POWER ELECTRONIC DEVICES AND APPLICATION 2 UNITS

Introduction to power semiconductor components: diodes, transistors, thyristors, etc., use as switches. **Power rectifier and circuits:** analysis of uncontrolled and controlled rectifier circuit with resistive and reactive loads; half wave, full wave and three phase full wave rectifier circuit. Analysis of circuits containing transistors as switches, power control circuits. Converter circuits, characteristics of switching transformers. Protection of power semi-conductor devices. Application of power semi-conductor circuits; regulated power supplies, uninterruptible power supplies, d-c and a-c drives. Induction heating and relays. Concept of Flexible alternating current Control System.

ELE 520 RADIO AND TELEVISION BROADCASTING 2 UNITS

Radio spectrum, ITU and spectrum management, Transmission lines and scattering parameters; Design of RF components (low noise amplifiers, power amplifiers, oscillators, RF power detector, active and passive mixers); Introduction to telephony, signaling system. Principles of automatic telephone; strowger and cross bar exchanges, Electronic switching system. Traffic considerations. Telex and facsimile transmission, data transmission. Introduction to television Engineering, Black and white Television broadcasting, colour television systems. Cable TV systems.

ELE 521 HIGH FREQUENCY AND MICROWAVE ELECTRONICS 2 UNITS

A survey of microwave engineering, models in waveguides and resonators, passive components, reactive and resistive elements, directional couplers and tees ferrite isolators and circulators active components. Klystrons, magnetrons, travelling wave tubes, parametric

amplifiers and solid-state sources, introduction to varactor. PIN, Gunn- effect diode, photodiode, phototransistor.

ELE 522 ELECTRICAL POWER SYSTEM ENGINEERING II 2 UNITS

Fault Analysis: symmetrical components, symmetrical and unsymmetrical faults analysis.

Power System Stability Studies: Dynamics of a synchronous machine, power angle equation, steady state stability, transient stability, and equal area criterion. **Power System Protection:** Components of power system protection: circuit breakers, relays, instrument transformers. Principles of fault detection, discrimination and clearance. Various types of relays used in power systems. Methods of protecting power system devices –transmission lines, transformers, generators and motors.

ELE 523 WIRELESS COMMUNICATION 2 UNITS

Tropospheric propagation: Special features of VHF and UHF propagation. Propagation characteristics at microwave frequencies Design of microwave links system. Effect of ionosphere on radio waves. Satellite communication systems, Multiple access methods in satellite communication. Earth stations for international communications. Mobile radio communications: simplex, half-simplex or full duplex, FDD, TDD cordless telephone systems cellular systems: System design fundamentals.

ELE 524 ELECTRICAL MACHINES DESIGN AND PROTECTION 2 UNITS

Review of generalized theory of machines: magnetic circuits; magnetically induced emf and force; hysteresis and Eddy current losses; application of permanent magnet materials; DV an AV (single and three phase) generation principles. Review of transformers, DC and AC rotating machines: Characteristics; starting techniques; speed control and protections of rotating machines. Application of transformers: in power transmission and distribution; as source to relay protection operating circuits; as source to measurement and instrumentation circuits. Applications of DC Machines: prime movers, standard DC drive systems, DC generation. Applications of AC rotating machines: AC generation and drive systems; var regulation in power distribution systems. Special Machines: Linear Induction machines, Commutator machines, stepping. Stepper motor and servomotor, power transmission, traction. Electrometrical relays, solid state relays.

ELE 525 COMPUTER COMMUNICATION PRINCIPLES 2 UNITS

Introduction to communication networks: point-to-point and networked communications. Time, Space and frequency division multiplexing, Packet switched networks. Multi access communication, local area networks and wide area network services. Error control protocols,

Synchronous data link control (SDLC). Routing algorithms, various Internet networking issues. Integrated Services Digital Networks: Narrowband and broadband ISDN, ATM, Traffic issues. Wireless propagation channel, Cellular systems, Media access in wireless networks. Communication network simulation.

ELE 526 HIGH VOLTAGE ENGINEERING 2 UNITS

Switching and lightning over-voltages. **Propagation of surges** in high voltage transmission lines, protection from direct lightning strokes. Earthing. Protection of transmission lines and substations from lightning. Corona and radio interference. Propagation of surges in transformers. **Insulation coordination. Breakdown mechanisms** in gases, vacuum, liquids and solids media. **Insulation** of overhead line and substation, bus-bars, isolators and circuit breakers insulation. High voltage bushings, terms in high voltage technology. Preventive testing of insulation, processes in a multi-layer dielectric, measurement of tan (δ), capacitance, partial discharge voltage distribution, leakage resistance.

ELE 527 ELECTRICAL DRIVES 2UNITS

Types of electrical drives-factors influencing the choice of electrical drives – heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and load variation factors.

ELE 528 NON-LINEAR CONTROL THEORY 2 UNITS

Non-linear differential equations. Characteristics of non-linear systems; common non-linearities. Analysis of non-linear systems: Linearizing approximations, piecewise linear approximation, the describing function concept and derivation for common non-linearities, the dual input describing function; stability analysis using the describing function. Limit cycle prediction. The phase plane method construction of phase trajectories, transient analysis by the phase plane method. Stability analysis of non-linear systems using Liapunov method. Introduction to sample data systems; The z-transforms; pulse transfer function and stability analysis in the z-plane.

ELE 529 POWER SYSTEM COMMUNICATION AND CONTROL 2 UNITS

Review of transmission line theory, high frequency communication on power lines. Carrier systems and power line carrier applications. Multiplexing. Telemetering, signal processing and data transmission. Control of power generation. Voltage control, system stability, automatic voltage regulators, regulating transformers.

ELE 530 SUBSTATION ENGINEERING 2 UNITS

Causes of over voltages and their effects on power systems – lightning, switching surges and temporary over voltages – protection against over voltages. Gaseous breakdown in uniform

and non-uniform fields – corona discharges – vacuum breakdown – conduction and breakdown in pure and commercial liquids – breakdown mechanisms in solid and composite dielectrics. Generation of high DC and AC impulses, voltages, and currents. Tripping and control of impulse generators. Measurement of high voltages and high currents – Digital techniques in high voltage measurement. High voltage testing of electrical power apparatus – power frequency, impulse voltage and DC testing – international and Indian standards – Insulation Coordination.

ELE 532 ANTENNA THEORY AND RADAR SYSTEMS 2 UNITS

Concept of antenna radiation patterns, radiation resistance, gain, effective area, reciprocity. Traveling wave and HF antenna. Analysis, design and evaluation of antenna, small and large HF types, Special microwave antennas. Principle of range and direction finding by means of radio echoes. Requirements and limitation of radar, Modulation and microwave components of radar.

ELE 591 ELECTRICAL AND ELECTRONIC ENGINEERING FINAL YEAR PROJECT I 3 UNITS

Original individual student project related to a prescribed Electrical and Electronics Engineering problem involving literature review, identification, deflection and formulation of the problem, theoretical investigation, modeling simulation analysis and design. 15^{th} (T); 180h (P); C

ELE 592 ELECTRICAL AND ELECTRONIC ENGINEERING FINAL YEAR PROJECT II 3 UNITS

Second phase of research investigations involving the fabrication of the designed model, debugging, calibration, testing, data collection and analysis, and presentation of a comprehensive written report of the investigations. 15^{th} (T); 180h (P); C; PR: ELE 591.

4.9 SUMMARY OF CREDITS REQUIRED FOR GRADUATION

1. Requirements in major Electrical and Electronics Engineering Courses	76 Credits
2. General Courses in Engineering (GET courses)	42 Credits
3. Elective Requirements	8 Credits
4. General Studies Courses	13 Credits
5. Courses from other Faculties	43 Credits
6. Industrial Training – SWEP (4 Credits) + SIWES (12 Credits)	16Credits

TOTAL CREDITS REQUIRED FOR GRADUATION –

UTME=198 Credits, DE=153 Credits

CHAPTER FIVE: DEPARTMENT OF MECHANICAL ENGINEERING

5.1 DEGREE OPTION: Bachelor of Engineering in Mechanical Engineering (B. Eng. Mechanical Engineering)

5.2 PROGRAMME PHILOSOPHY: The philosophy of the programme is to train mechanical engineers that can apply scientific principles to real life situations in order to sustain the human society and improve its standard of living. The programme is fashioned to be broad based and it encompasses major aspects of mechanical engineering such as manufacturing and production engineering, refrigeration and air conditioning engineering, automobile engineering, and Mechatronics. In this programme, theory is integrated with practicals to produce engineers with a broad based knowledge and skills that can prepare them for the challenges of the 21st century in the complex field of mechanical engineering. At the end of the programme the graduate engineer would be suitable for employment in both public and private sectors such as federal and state ministries, manufacturing companies and transport firms (land, rail, water and air). They can also be self-employed.

5.3 PROGRAMME OBJECTIVES

The objectives of the programme are to produce graduates that:

a) have broad based knowledge of Mechanical Engineering;

b) have acquired the ability to investigate, analyze and provide solutions to problems arising from engineering processes and can apply scientific principles to the design of machines and equipment that fulfill human needs and improve the standard of living; and

c) are socially, morally and legally responsible with good understanding of the economics and marketing principles that are essential for commercial success of industrial products and engineering endeavors,

5.4 ADMISSION REQUIREMENTS

(a) UTME Admission

Admission to 100 level is through the Universal Tertiary Matriculation Examination (UTME) of the Joint Admissions and Matriculation Board (JAMB). To be eligible for admission, candidates must have the GCE (OL) or WASSCE or NECO or equivalent

with at least five credit passes in subjects which include English Language, Mathematics, Physics, and Chemistry at **NOT** more than two (2) sittings.

U.T.M.E. Subjects: English Language, Chemistry, Mathematics and Physics.

(b) Direct Entry Admission

In addition to the requirements specified in (a) above, candidates seeking admission to second year (200 level) of the programme through direct entry must possess:

i. National Diploma at Upper Credit level or equivalent in Mechanical Engineering or related disciplines from a recognized institution, or
ii. General Certificate of Education (Advanced level) or equivalent with good passes in at least two subjects at a sitting which must include Mathematics, Physics and Chemistry. In addition, candidates in this category will be required to audit and pass some first year courses to remedy deficiencies.

However, admission to appropriate level shall be made on any other minimum entry qualifications as may be stipulated by the University.

5.5 PROGRAMME DURATION

The normal duration of the programme is five academic sessions for students admitted to 100 level through UTME and four academic sessions for those admitted into 200 level by Direct Entry. Students may take longer than the normal duration to complete the requirements for graduation but will not be allowed to exceed fourteen (14) semesters for candidates admitted through UTME and twelve (12) semesters for candidates admitted by Direct Entry.

5.6 GRADUATION REQUIREMENTS

To be eligible for the award of B.Eng. degree in Mechanical Engineering, a student must have:

(a) passed all core, University/School required, audited and elective courses;
(b) accumulated a minimum of 207 units for those admitted through UTME and a minimum of 162 units for those admitted through direct entry and obtain a CGPA of not less than 1.0; and
(c) completed successfully all industrial attachments and visits, practicals and seminars.

5.7 LIST OF COURSES

100 LEVEL FIRST SEMESTER

Course Code	Course Title	Type	L	T	P	Unit	Prerequisite
CHM 101	General Chemistry I (Introductory Inorganic Chemistry)	R	2	1	-	3	
CHM 151	Practical Chemistry I	R	-	-	3	1	
GST 101	Communication in English and Use of Library	R	2	-	-	2	
GST 113	Logical and Critical Thinking	R	2	-	-	2	
MTH 101	Introductory Mathematics I	R	2	1	-	3	
PHY 101	General Physics I	R	2	1	-	3	
PHY 103	General Physics III	R	2	-	-	2	
PHY 107	Practical Physics I	R	-	-	3	1	
GET101	Engineering Drawing I	C	1	-	6	3	
CSC 101	Introduction to Computer Science	R	2	-	3	3	
	Total					**23**	

100 LEVEL SECOND SEMESTER

Course Code	Course Title	Type	L	T	P	Unit	Prerequisite
CHM 102	General Chemistry II (Introductory Organic Chemistry)	R	2	-	3	3	
CHM 152	Practical Chemistry II	R	-	-	3	1	
GST 112	Nigerian People and Culture	R	2	-	-	2	
MTH 102	Introductory Mathematics II	R	2	1	-	3	
CSC 102	Introduction to Computer Programming	R	2	-	3	3	
PHY 102	General physics II	R	2	1	-	3	
PHY 108	Practical Physics II	R	-	-	3	1	
GET 102	Engineering Workshop Practice	C	1	-	3	2	
MTH 104	Introductory Mathematics III	R	1	1	-	2	
GST 102	Communication in English II	R	2	-	-	2	
	Total					**22**	

200 LEVEL FIRST SEMESTER

Course Code	Course Title	Type	L	T	P	Unit	Prerequisite
GET 201	Basic Electrical Engineering I	C	2	-	3	3	
CSC 201	Computer Programming	R	2	-	3	3	
GET 205	Basic Fluid Mechanics	C	2	-	3	3	
GET 207	Applied Mechanics	C	2	1	-	3	
CHM 211	Basic Physical Chemistry I	R	2	-	-	2	
MTH 201	Mathematical Methods I	R	2	1	-	3	
GET 211	Introduction to Computer Packages	R	-	-	3	1	
GST 221	History and Philosophy of Science	R	2	-	-	2	
GET 217	Manufacturing Technology I	C	1	-	3	2	
	Total					**22**	

200 LEVEL SECOND SEMESTER

Course Code	Course Title	Type	L	T	P	Unit	Prerequisite
GET 206	Basic Thermodynamics	C	2	-	3	3	
GET 202	Basic Electrical Engineering II	C	2	-	3	3	
GET 212	Engineering Materials	C	2	-	-	2	
GET 204	Engineering Graphics	C	1	-	3	2	
GET 216	Strength of Materials I	C	2	-	3	3	
GET 220	Engineer-in-Society	C	1	-	-	1	
GET 222	Engineering Drawing II	C	2	-	3	3	
MTH 202	Numerical Analysis I	C	2	1	-	3	
GST 224	Peace Study and Conflict Resolutions	R	1	-	-	1	
	Total					**21**	

300 LEVEL 1ST SEMESTER

Course Code	Course Title	Type	L	T	P	Unit	Prerequisite
GET 301	Engineering Mathematics I	R	2	1	-	3	MTH 201
GST 331	Introduction to Entrepreneurial Skills	R	1	-	3	2	
MEE 309	Strength of Materials II	C	2	-	3	3	GET 216
MEE 313	Engineering Measurement and Testing (Workshop Practice)	C	1	-	3	2	
MEE 321	Mechanics of Machines	C	2	-	-	2	
MEE 355	Applied Fluid Mechanics	C	2	-	-	2	GET 205
MEE 311	Manufacturing Technology II	C	1		3	2	GET 217
MEE 361	Engineering Metallurgy	C	2	-	-	2	
ELE 307	Electrical Machines I	R	2	1	-	3	
	Total					**21**	

300 LEVEL 2ND SEMESTER

Course code	Course title	Type	L	T	P	Unit	Prerequisite
GET 302	Engineering Mathematics II	R	2	1	-	3	GET 301
GET 304	Technical Communication	C	2	-	-	2	
MEE 306	Heat Transfer I	C	1	-	3	2	
MEE 308	Refrigeration and Air Conditioning I (Workshop Practice)	C	1	-	3	2	
MEE 334	Machine Design I	C	2	1	-	3	
MEE 342	Applied Manufacturing Processes I	C	2	-	3	3	
MEE 354	Applied Thermodynamics	C	2	-	-	2	
MEE 382	Thermo Fluid Laboratory	C	-	-	3	1	
ELE 308	Electrical Machines II	R	2	1	-	3	ELE 307
	Total					**21**	

300 Level Long Vacation (8 Weeks)

Course Code	Course Title	Type	Contact Hours			Units	Prerequisite
			L	T	P		
GET 391	Student Work Experience Programme (SWEP)	C				4	
	Total					**4**	

400 LEVEL 1ST SEMESTER

Course Code	Course Title	Type	L	T	P	Unit	Prerequisite
MEE 401	Mechanical Vibration	C	2	-	-	2	
MEE 403	Machine Design II	C	2	1	-	3	MEE 334
MEE 405	Quality Control and Reliability	C	2	-	-	2	
MEE 407	Operations Research	C	2	1	-	3	
MEE 409	Heat Transfer II	C	1	-	3	2	MEE 306
MEE 411	Engineering System and Modelling	C	2	1	-	3	
MEE 413	Introduction to Mechatronics	C	1	-	3	2	
MEE 415	Control Systems	C	2	-	3	3	
MEE 417	Technology Policy and Development	C	1	-	-	1	
	Total					**21**	

400 Level 2nd Semester and Long Vacation (6 months or 24 weeks)
Students Industrial Work Experience Scheme (SIWES)

Course Code	Course Title	Type	Contact hours			Units	Prerequisite
			L	T	P	U	
MEE 420	Industrial Training Assessed by OSUSTECH Supervisors	C				4	
MEE 422	Industrial Training Assessed by Industry based Supervisors	C				4	
MEE 424	Student's Report and Seminar	C				4	
Total						**12**	

500 LEVEL 1ST SEMESTER

Course Code	Course Title	Type	L	T	P	Unit	Prerequisite
MEE 501	Engineering Economics	C	2	-	-	2	
MEE 509	Computer Aided Design and Manufacture I	C	1	-	3	2	
MEE 523	Internal Combustion Engines and Transmission	C	2	-	3	3	
MEE 505	Turbo-Machinery	C	2	-	3	3	
MEE 507	Seminar	C	-	1	-	1	
MEE 591	Final Year Project I	C	-	-	9	3	
	2 Optional Courses (3 units each)	E				6	
	Total					**20**	

Electives: Select only two courses from any of the options

Manufacturing & Production Engineering

Course Code	Course Title	Type	L	T	P	Unit	Prerequisite
MEE 503	Tool design	E	2	1	-	3	
MEE 519	Metrology	E	2	1	-	3	
	Total					**6**	

Refrigeration & Air Conditioning Engineering

Course Code	Course Title	Type	L	T	P	Unit	Prerequisite
MEE 517	Characteristics of Refrigerants	E	2	1	-	3	
MEE 535	Load Estimating	E	2	1	-	3	
	Total					**6**	

Automotive Engineering

Course Code	Course Title	Type	L	T	P	Unit	Prerequisite
MEE 527	Vehicle Structures & Design	E	2	-	3	3	
MEE 529	Vehicle Dynamics & Control Systems	E	2	-	3	3	
	Total					**6**	

Mechatronics

Course Code	Course Title	Type	L	T	P	Unit	Prerequisite
MEE561	Sensor Technology	E	2	-	3	3	
MEE563	Actuator Technology	E	2	-	3	3	
	Total					**6**	

500 LEVEL 2ND SEMESTER

Course Code	Course Title	Type	L	T	P	Unit	Prerequisite
MEE 502	Engineering Law and Management	C	2	1	-	3	
MEE 506	Applied Manufacturing Processes II	C	2	1	-	3	MEE 342
MEE 510	Computer Aided Design and Manufacture II	C	1	-	3	2	
MEE 516	Computational Fluid Dynamics	C	2	1	-	3	
MEE 592	Final Year Project II	C	-	-	9	3	
	2 Optional Courses (3 units each)	E				6	
	Total					**20**	

Electives: Select only two courses from any of the options

Manufacturing & Production Engineering

Course Code	Course Title	Type	L	T	P	Unit	Prerequisite
MEE 504	Applied Production Engineering Methods II	E	2	-	3	3	
MEE 512	Machine Tools Engineering	E	2	-	3	3	
	Total					**6**	

Refrigeration & Air Conditioning Engineering

Course Code	Course Title	Type	L	T	P	Unit	Prerequisite
MEE 514	Refrigeration & Air-Conditioning Engineering II (Psychrometry & System Design)	E	2	-	3	3	
MEE 534	Refrigeration & Air-Conditioning Engineering III (Equipment Design & Manufacture)	E	2	-	3	3	
	Total					**6**	

Automotive Engineering

Course Code	Course Title	Type	L	T	P	Unit	Prerequisite
MEE524	Internal Combustion Engines Design	E	2	-	3	3	MEE 523
MEE536	Vehicle Design	E	2	-	3	3	
	Total					**6**	

Mechatronics

Course Code	Course Title	Type	L	T	P	Unit	Prerequisite
MEE562	PLC Programming	E	2	-	3	3	
MEE564	CNC Technology and Robotics	E	2	-	3	3	
	Total					**6**	

C: Core course R: Required (University) course E: Elective course

5.8 SYNOPSIS OF CORE COURSES

100 LEVEL

GET 101 ENGINEERING DRAWING I 3 UNITS

Introduction to drawing instruments and their proper use, Use of scales, linework, lettering and dimensioning, Geometrical constructions including bisection of angles, tangents, normal, polygons, etc. loci, including paths of point of simple mechanisms and on profiles, Pictorial drawing; Orthographic projections of simple objects in first and third angles, Isometric and oblique projection, Isometric projections from orthographic projects. Dimensioning and development of simple shapes. Assembly drawing of simple components. Conventional representation of common engineering features. Freehand sketching. Use of engineering drawing software.

GET 102 ENGINEERING WORKSHOP PRACTICE 2 UNITS

Organization of workshop. Workshop hazard, safety practices and codes. Introduction to basic manufacturing processes. Types of workshop equipment, machines and materials Bench-work and fitting. Introduction to turning – straight and step turning, chamfering, screw cutting. Milling and milling exercises. Drilling techniques and exercises. Sheet metal work. Welding and soldering technique with exercises. Properties of wood. Woodwork and joinery exercises. Workshop measurements. Refrigeration and air conditioning: principle of operation, refrigerants and troubleshooting. Methods of leak detection. Safety precautions. Automotive workshop practice: Principle of operation of the motor car, Tuning carburettor, setting contact breaker gap, setting ignition timing, electronic ignition system and computer controlled ignition system . Use of computerized engine diagnosis equipment. Engine routine maintenance procedure and engine service. Tyre types and care. Battery care, topping up and charging.

200 – LEVEL

GET 201 BASIC ELECTRICAL ENGINEERING I 3 UNITS

Basic Electrical Concepts. **Circuit Laws**: Ohm's law and Kirchoff's Laws. **Methods of Circuit Analysis**: Mesh analysis, Nodal analysis, Delta/Star Transformation, Source Conversion. **Circuit Theorems**: Thevenin's Theorem, Norton's Theorem, Superposition Theorem, Maximum Power Transfer Theorem, Rosen's Theorem, Reciprocity Theorem; Network problems arising in Energy distribution. Transient response of RC, RL and RLC Circuits. **Elementary treatment of semiconductor devices**: PN junction diode, rectifier diodes, varactor diode, Schottky diode,

zener diode, light emitting diode (LED), bipolar junction transistor (BJT), field effect transistor (FET), Thyristors, Integrated Circuits (ICs). **Software Tools for Electrical Circuits**: Use of Electronic Workbench, PSpice, MultiSim and Circuit Maker for Simulation of electrical circuits, elements, devices and component.

GET 202 BASIC ELECTRICAL ENGINEERING II 3 UNITS

Basic AC theory- Periodic wave forms, average instantaneous, peak, mean and RMS values, form and peak factors , single phase series alternating current circuits and Application of complex numbers to series AC networks, single phase parallel alternating current (Admittance, conductance and Susceptance) circuits and Application of complex numbers to parallel AC networks, Series and parallel Resonance, Bandwidth and Q factor, Power in AC circuits and Power factor Correction/improvement, Delta-star and star-delta transformations, Three phase system: balanced wye-wye connection, balanced delta-delta connection, balance delta-wye connection, balanced wye-delta connection, power in a 3-phase balanced system, unbalanced 3-phase system. Magnetic circuit, mutual inductance, **Introduction to electrical machines;** - DC generators and motors. Introduction to Electrical and Electronic Power measuring instruments and equipment, A.C. and D.C. bridges

GET 204 ENGINEERING GRAPHICS (3D Solid Models) 2 UNITS

Three dimensional mechanical engineering graphics using Inventor, Solid Works or Solid Edge and applications to design, symbols screws, fasteners, couplings, clutches, gears etc. Advanced topics in auxiliary and sectional views, development, intersection of surface, Isometric projection, dimensioning and tolerances.

GET 205 BASIC FLUID MECHANICS 3 UNITS

Elements of fluid statics; density; pressure, surface tension, viscosity, compressibility etc. Hydrostatic forces on submerged surfaces due to incompressible fluid. Introduction to fluid dynamics – conversion laws. Introduction to viscous flow.

Properties of fluids, fluids statics, Basic conservational laws, friction effects and losses in laminar and turbulent flows in ducts and pipes, Dimensional analysis and dynamic similitude, Principles of construction and operation of hydraulic machinery, Hydropower systems. Flow measurement, Fluid power transmission, pumps and pump design.

GET 206 BASIC THERMODYNAMICS 3 UNITS

Definition of basic thermodynamic terminologies; System, boundary, state (pv, Ts, ph and other property diagrams and their uses), properties (Intensive and Extensive) processes and cycles. Energy and energy conversion; work, heat, non-flow processes. zeroth law. First Law of thermodynamics and applications to close and open systems. The steady flow energy equation and its applications. Otto, diesel, turbine and dual cycles. Second Law of Thermodynamics; consequences and applications of the second law. Thermodynamic properties of ideal and real fluids. Thermodynamic tables. Introduction to steam power and refrigeration cycles. and reduction methods.

GET 207 APPLIED MECHANICS 3 UNITS

Vectors, operations with forces, resultants of coplanar force systems. Resultant of spatial force systems. Equilibrium and coplanar force systems. Center of gravity and center of mass. Newton's laws of motion and their applications, Friction and its applications. Impulse and momentum; Kinetic energy. Kinematics of a particle, composition and resolution of velocities and accelerations, relative velocity and acceleration, representation by vectors.

Plane Kinematics of rigid body, angular velocity diagrams applied to simple mechanisms. Gyroscope. Instantaneous center of rotation. Equations of motion, linear momentum and moment of momentum. moment of inertia. Free vibrations of systems with one and two degrees of freedom including damping. Torsional vibration.

GET 211 INTRODUCTION TO COMPUTER PACKAGES 2 UNITS

Introduction to packages such as Microsoft Excel, Matlab, Mathematica, SPSS etc. Basic engineering computations, data analysis and graphics using packages. Numerical and symbolic analysis.

GET 212 ENGINEERING MATERIALS 2 UNITS

Introduction to electronic configuration, atomic structures, inter-atomic bonding mechanisms, crystal and macrostructure. Relationship between structure and properties of metals, alloys, ceramics and plastic. Structure of matter; Crystal structure, crystal imperfection. Non-crystalline and multiple phase solids including polymers. Simple phase diagrams of alloys. Physical properties of materials (wood, cement, plastics and alloys). Mechanical properties of engineering materials. Engineering materials. Engineering and True stress-strain curves. Ultimate strength, ductility, impact strength, hardness, creep and fatigue failure. Electrical properties; conductivity, semi-conductivity and superconductivity. Optical and magnetic properties of materials. Stability

of materials in the service environment; corrosive media, sub-zero and elevated temperature. Basic criteria for selection of materials for engineering applications.

GET 216: STRENGTH OF MATERIAL I 3 UNITS

Force equilibrium, Free body diagrams. Elasticity – Concept of stress and strain. Tensile test, Determination of mechanical properties of materials. Axially loaded bars, composite bars, temperature stresses and simple indeterminate problems. Hoop stress in cylinders and rings. Theory of beam bending. Deflection of beams. Double integration and macaulay's method. Strain energy in bending of beams. Castigliano's and reciprocal theorems. Bending moment, shear force and axial force diagrams for simple cases. Simple torsion and bending application

GET 217 MANUFACTURING TECHNOLOGY I 2 UNITS

Basic workshop machine tools: (Lathe, Milling, Drilling, etc). Metal cutting and cutting tools. Theory and practice of bench work: Marking-out; punching; measuring, turning, drilling, boring, shaping, planning, slotting, grinding, milling, gear cutting. Press and presswork. Broaching and sawing. Erection and testing of machine tools. Advanced workshop exercises in metal cutting processes.

GET 220 ENGINEER-IN-SOCIETY 1 UNIT

The growth and effects of technology. The role and responsibilities of the engineer in society. Education, professional training and regulation of engineers. Role of the Council for the Regulation of Engineering in Nigeria (COREN). Industry and commerce. The relation between business and industry. Private and state control, nationalization, privatization. Effect of industrialization, information technology and free trade. Principles of scientific management. Modern management techniques, organization of business. Labour relations industry and the Law. International Labour Organisation (ILO) convention on collective bargaining and the right to strike.

GET 222 ENGINEERING DRAWING II 3 UNITS

Further projection of solids. First and third angle projections and Isometric projections of machine components. Intersection of surfaces and developments. Sectional views, Curve of interpenetrations. True lengths and true shapes. Parts and assembly drawings (Detailed drawing of machine components). Preparation of working drawing for manufacturing in accordance with standards. Reading and interpretation of manufacturer's drawing of equipment.

300 LEVEL

GET 301 ENGINEERING MATHEMATICS I 3 UNITS

First order ordinary differential equations. Existence and uniqueness. Second order ordinary differential equations: linear dependence, Wronskian, reduction of undetermined coefficients, variation of parameters. General theory of nth order linear equations. Series solution about ordinary and regular points, special functions: Bessel, Lengendre and Hypergeometric. Laplace transform and application to initial value problems.

GET 302 ENGINEERING MATHEMATICS II 3 UNITS

Gamma and Beta functions, Sturm-Liouville problem, orthogonal polynomials and functions. Fourier series and integrals, Fourier transformation. Partial differential equations: general and particular solutions, linear equations with constant coefficients; first and second order equations; solutions of the heat, wave and Laplace equations by the method of separation of variables; Eigen function expansions; Fourier transforms.

GET 304 TECHNICAL COMMUNICATION 2 UNITS

Professional use of English Language for letters, specification descriptions, presentation of charts, graphs, tables, writing of proposals in reports. Case studies of major professionals presentation of reports and proposals. Microsoft Excel, PowerPoint and Project. Special lectures may be required.

MEE 309 STRENGTH OF MATERIALS II 3 UNITS

Advanced topics in bending moments and shear forces and deflection in beams. Three moments equation. Theory of bending of beams. Deflection of beams. Unsymmetrical bending and shear center. Application of strain energy. Biaxial and Triaxial states of stress. Transformation of stresses. Mohr's circle. Normal stress, Stress components. Failure theories, creep, fatigue, fracture and stress concentration. Factor of safety. Thin walled section and concept of bimoment. Development of slope deflection equations and matrix structural analysis programs.

MEE 306 HEAT TRANSFER 1 2 UNITS

Modes of heat transfer: conduction, convection and radiation. Basic concepts of conduction. Basic laws of conduction, thermal conductivity. Differential equation of conduction with boundary conditions. Steady-state conduction through solids. Heat transfer through a single layer slab: composite plane slabs; single layer cylinder walls and multi-layer composite cylindrical

wall. Heat transfer by conduction through a spherical wall. Steady-state conduction from fluid to fluid. Heat transfer through plane and composite walls; cylindrical single layer and multi-layer walls of a cylinder. Critical diameter of insulation. Heat transfer through a spherical wall, conduction with heat sources. Transient conduction: the quenching of billets, numerical solution of unsteady one-dimensional conduction, two-dimensional conduction.

MEE 306 REFRIGERATION & AIR-CONDITIONING WORKSHOP PRACTICE 2 UNITS

Refrigeration accessories and their functions. Identification and standard sizes. Standard notations on drawing. Piping notation on drawings and standards. Testing of refrigeration equipment, testing of air-conditioning equipment, leak detection methods: charging (Over- and under- charging) effects of both and other service procedures for refrigeration and air-conditioning systems. Electrical systems – Lighting, switches, wire rating and colour-codings. Trouble shooting – flushing and blockages. Construction of air ducts, including design calculation. Duct coding and standard symbols/notation.

MEE 311 MANUFACTURING TECHNOLOGY II 2 UNITS

Fundamental structures of metal and alloys. Properties, testing and inspection of metals. Production methods for ferrous, non-ferrous metals and alloys. Heat treatment of metals and alloys. Mechanical working of metals. Smithing and forging. Welding, soldering and related processes. Wood and wood working. Pattern making. Foundry work. Power metallurgy. Plastics and their processes. Principles of measurements and inspections. Limits, fits and surface finish. Assembly methods. Advanced exercises in non-cutting production methods.

MEE 313 ENGINEERING MEASUREMENT AND TESTING 2 UNITS

Fundamentals of instrumentation and techniques for measurement of mechanical phenomena such as temperature, flow, pressure, force, stress displacement, velocity and acceleration, transducers design techniques and construction of simple measuring devices.

MEE 321 MECHANICS OF MACHINES 2UNITS

Force and motion relationship in constrained mechanisms. Analysis of cam, gear, linkage, belt drive and chain drive systems for motion and power transmission. Fluctuation of energy and speed, flywheels. Reduction of out-of-balance forces due to rotating and reciprocating bodies; primary and secondary effects. Vehicle mechanics brake and clutch systems, friction clutches; cone and plate types. Governors.

MEE 334 MACHINE DESIGN I 3 UNITS

Design and selection of shafts, bearings, springs, seals and packing and couplings. Design of bolted joints, riveted joints, welded joints and power screws. Design and selection of gears, gear trains, brakes and clutches. Design and application of mechanisms, linkages, and cams. Fatigue and fracture considerations in design: failure types, failure under static and dynamic loading fatigue failure, crack initiation, and propagation. Preferred numbers and diameters. The concept of surface finish, including surface finish measurement and clarifications. Limits and fits using ISO and other standards. Introduction to the FEM in mechanical design.

MEE 342 APPLIED MANUFACTURING PROCESSES I 3 UNITS

Theory of metal cutting: effects temperature in metal cutting, tool wear and tool design, Cutting tool geometry and tool materials. Appropriate tool selection for cutting. Elements of the cutting processes in turning operations. Design of single point tools. Planning and shaping processes. The cutting processes in drilling, milling, gear-cutting, thread-cutting and broaching. Grinding and other forms of abrasive machining. Determination of appropriate machining process and technique to give required material removal rate, surface finish and accuracy Economics of metal removal. Lubrication in cutting operations. Lubricants – Types, composition, selection and effects.

MEE 354 APPLIED THERMODYNAMICS 2 UNITS

Fuels and combustion: combustion stoichiometry, air/fuel ratio, gas composition, excess air, formation of exhaust gases, dew point of flue gas. Boiler control, enthalpy changes and combustion efficiency. Thermodynamics of engine cycles: air standard analysis, the simple gas turbine cycle, the Otto, diesel and dual cycles, Refrigeration and heat pump cycles. Renewable sources of energy: solar, wind, biomass, biodiesel, etc. Introduction to chemical thermodynamics. Global warming, pollution and carbon credit initiatives.

MEE 355 APPLIED FLUID MECHANICS 2 UNITS

Fluid statics – pressure variation with altitude; Newton's law of pressure at a point; plane of pressure/stress; application of Newton's law. Types of fluid – Newton's law viscosity, Newtonian and non-Newtonian fluids. Forces on submerged surfaces. Equations of fluid motion. Flow measurements. Forces exerted by flowing fluids. Laminar and turbulent flows. Reynolds number. Flow in pipes and channels. One, two and three dimensional steady flows of

incompressible fluid, critical flow, small amplitude waves, shock waves. Fluid machinery. Similarity and dimensionless analysis.

MEE 361 ENGINEERING METALLURGY 2 UNITS

Introduction to metallurgy. Processes for extraction and production of Iron and Steel, brief description of each process and their technology, raw materials requirements, types of fuels and fluxes used in each process routes. The physical chemistry of iron making in each process and their respective controls. Thermodynamics and kinetics of iron and steel production. Secondary iron and steel production processes and manufacture of alloy steel principles. Treatment for various engineering applications, hardening of metals, deformation and annealing of metals. Corrosion and Oxidation phenomena. Alloy steels. Stainless, creep and heat resisting steels. Cast iron.

MEE 382 THERMOFLUIDS LABORATORY 1 UNIT

Experimental uncertainty. Design of experiments. Test facilities. Temperature and pressure measurement techniques and instrumentation Velocity and flow rate measurement techniques. Flow visualization. Case studies of industrial and research experimental practice.

GET 391 STUDENTS WORK EXPERIENCE PROGRAMME (SWEP) (8 Weeks) 4 UNITS

Introduction to practices and skills through supervised hands-on workshop exercises in computer engineering, information and communication technology (ICT), and related general engineering using the Faculty Workshops and other University facilities under strict industrial conditions. These exercises include familiarisation with basic tools, soldering and de-soldering skill of pass-through and surface-mount components, building of simple electronic circuits, troubleshooting of electronic devices, digital systems, etc. Use of hand drill. Safety precautions in handling electronic devices. Basic welding skill.

400 LEVEL

MEE 401 MECHANICAL VIBRATION 2 UNITS

Vibration of mechanical systems. The general nature of free, forced and self-excited vibrations. Lumped one and two degree-of-freedom linear system; 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 and its application to torsional vibration. Flexural vibration of beams, whirling of a single disc on a shaft. Shaft whirling.

MEE 403 MACHINE DESIGN II 3 UNITS

Design Methodologies; Systematic method. Innovation and creativity in engineering design. Design of machine structures. Principle and practice of material selection. Lubrication in design of shafts and bearings. Operational environmental and manufacturing considerations. Application of stress analysis, failure theories and material selection to design of mechanical elements and systems. Design for economic manufacture, assembly and disassembly, safety, misuse, recycle and repair/rework, energy reduction and recyclability. Rules for product and part design. Ergonomics and use of anthropometric data in product design. Design of pneumatic and hydraulic circuits. Electronic components selection; switches, motors (dc & ac) transducers etc. Use of a selected mechanical design work benches and use of design packages, Design drafting and engineering working drawing, Design of systems and machines, (Project must be given to students in groups of four on design of mechanical systems).

MEE 405 QUALITY CONTROL AND RELIABILITY 2 UNITS

Standard instrumentations for precision measurements. Flatness and precision surface inspection. Application of statistics and probability theory to the design and analysis of procedures for control of production processes. Sampling, design and management of reliability engineering.

MEE 407 OPERATIONS RESEARCH 3 UNITS

Linear programming – formulation, simplex method: simplex algorithm for solving linear programming problems - primal and dual, interpreting optimal solution. Concept of duality. Transportation/Trans-shipment problem:shortest path, maximum flow, minimum spanning tree, minimum cost network flow, sensitivity analysis. Network analysis: shortest route problem. Minimal/maximal flow problem. PERT and CPM with application to project planning and control. Dynamic programming – deterministic and stochastic: shortest path, knaspsack, job planning, production management. Game theory. Integer programming using branch and bound technique. Applications of operation research software packages.

MEE 409 HEAT TRANSFER II 2 UNITS

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 of conduction of unambiguity to

dimensionless form; criterion equations. Heat transfer in laminar, turbulent and transition flows in tubes. Heat transfer by free convection. Nucleate boiling. 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's 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 exchanger equipment: types of heat exchanger. Basic heat calculations: Calculation of outlet temperatures of hot fluid; Fluid in parallel flow, counter-flow and across-flow arrangements.

MEE 411 ENGINEERING SYSTEM AND MODELLING 3 UNITS

Basic definition and classification of Mathematical Modelling – deterministic, stochastic, distributed parameter, lumped parameter, static and dynamic nodes. Basic of Model Development – Model formulation and validation, Model formulation using systems of linear equation, Calculus foundation of Modelling – Series, finite difference, differentials, difference equations; modelling using selected transform procedures, - partial fraction expansions, complex numbers, Laplace transform; Curve fitting and Evaluation, modelling stochastic system – Markov chains, Non –Markov process, etc.; development of deterministic model of discrete and continuous system. Optimization techniques; Linear Programming method. Application of Mathematical Modelling to material and energy balance, Transport phenomena and rate process; Computer aided modelling using Matlab, Excel and SPSS.

MEE 413 INTRODUCTION TO MECHATRONICS 2 UNITS

Definition of basic terms and general functional overview of mechatronics system. Application of mechatronics. Mechatronics Design Process. Elements of Mechatronics: basic electromechanical components, basic mechanical components and mechanism, basic electrical/electronic components, control system, computer system. Analog and digital devices; Op-amp, ADC, DAC, and power transistors. Modelling and control of electro-mechanical systems. Overview of Sensors, actuators, transducers, MEMS and their applications to intelligent manufacturing and mechatronics systems. Introduction to software and data acquisition; Matlab/Labview DAQ toolbox, signal/data recording and logging, amplification, signal conditioning.

MEE 415 CONTROL SYSTEMS 3 UNITS

Review of Laplace transforms. Nature and use of automatic control. The concept and purpose of feedback, Description of simple systems in process control, position control and regulation. Mathematical models; representation of control systems by differential equations.

Representation of transfer function by poles and zeros on the *s*-plane. The computation of modulus and phase from the pole-zero pattern, residues, modulus and phase contours. Transient response from the *s*-plane pattern. Closed-loop analysis of systems. The root locus, closed-loop poles and modes. Stability assessment criterion. Damping ratio and angle. Harmonic response locus (Nyquist locus) and its derivation from the s-plane pattern by conformal transformation. Gain and phase margins, contours of closed-loop modulus, use of hall chart. Bode diagram, relationship between gain and phase. Nichols diagrams, use of Nichols chart. Analogue computer: use of analogue computer in solving first and second order differential equations. Fundamentals of scaling. Use of control system design work benches.

MEE 417 TECHNOLOGY POLICY AND DEVELOPMENT 1 UNIT

Science and technology tradition in the society. Scientific and engineering infrastructure. National and international technological policy. Technological policy, its design and implementation, Nigeria's technology policy and problems in its implementation. Technology selection, appropriate and advanced technologies. Technology transfer; factors fostering and hindering transfer, international and intercompany transfers, legal framework. Manpower skills planning and acquisition, Education and training. The role of research, development and innovation. The acquisition of technology as a resource, its role as a vehicle for monopolistic control and economic growth.

MEE 420, 422, 424: STUDENTS INDUSTRIAL WORK EXPERIENCE SCHEME 12 UNITS

A more comprehensive programme, similar to GET 391, in which the students are attached to mechanical engineering establishments (public or private) and industries, with a view to making them develop the working practical skills of the profession, and providing additional opportunity to learn how to write field reports and prepare technical documents. Students are supervised during the training period, and are expected to keep log-books and other records designed for the purpose of monitoring their performances.

500 LEVEL

MEE 501 ENGINEERING ECONOMICS 2 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. Resources Allocation. Interest rates. Interest formulas and problems. Annual costs. Present worth, rate 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 and uncertainties, planning and Decision making procedures. Macroeconomics, Economic growth, National Income. Economic of technological change.

MEE 502 ENGINEERING LAW AND MANAGEMENT 3 UNITS

PART 1-LAW: Definition of a contract Classification of a contract. Ingredients of a valid contract. Elements of a contract. Consideration, intention to create legal relation. Capacity of a contract. Consent of a part. Concept of brevity of a contract and its exceptions. Mistakes of a contract and Duress in a contract. Misrepresentation in a contract. Illegality in a contract. How does a contract come to an end? Remedies for breach of a contract.

PART 2-MANAGEMENT: Introduction to Management. Decision Analysis. How to model a decision situation? Qualitative techniques for situations of uncertainty. Decision tree. Project Management Project evaluation and evaluation and review techniques. Concept of motivation and Theories of Motivation, Hertzberg 2 Factor theory. Transportation Management model.

MEE 503 TOOL DESIGN 3 UNITS

Tool geometry, properties and materials. The tool cutting process, general problems of tool design – cutting and mounting elements. Design of single point lathe tools including form tools, cutting tools for planning and shaping. The design of drills; core drilling, counter-bores, counter sinks, spot faces and reamers. Design of milling; milling cutters. Design of gear cutting tools operating by the form cutting principle and the generating principle. Design of internal and external surface broaches, special cutting tools such as combination tools and tools for automated production. Design of abrasive tools. Design of press tools. Design of jigs and fixtures: for turning, milling, drilling and grinding. Fixture design for NC machines. Flexible fixture design. Applications of computer in tools design.

MEE 504 APPLIED PRODUCTION ENGINEERING METHODS II 3 UNITS

Manufacturing properties of metals. Metal forming processes; hot forging, rolling, extrusion, flute making and cold drawing. Sheet metal forming and cold forging, Fabrication by welding, brazing or adhesion, Casting and sintering of metals. Polymer processing. Composites. Advance principles of metal cutting: Temperature effects in metal cutting, tool wear and tool design, Cutting tool geometry and tool materials. Appropriate tool selection for cutting. Design of tools. Planning and shaping processes. The cutting processes in drilling, milling, gear-cutting, thread-cutting and broaching. Grinding and other forms of abrasive machining. Lubricants – Types, composition, selection, standard coding and effects.

MEE 505 TURBO-MACHINERY 3 UNITS

Classification of fluid machines. Theory of rotodynamic machines, one dimensional theorem, isolated and cascade considerations, departure from Euler's theory and losses. Compressible flow through rotodynamic machines. Performance of rotodynamic machines. Performance characteristics, losses and efficiencies. Dimensionless coefficients and similarity laws, scale effects, centrifugal pumps and fans, axial-flow pumps and fans, water turbines, the Pelton wheel. Francis turbine, axial-flow turbines, the fluid coupling, the torque converter. Positive displacement machines, reciprocating pumps, rotary gear, vane and piston pumps, hydraulic motors. Pipe machine system: Pump and the pipe system, parallel and series pump operation, cavitations in pumps and turbines, pump selections.

MEE 506 APPLIED MANUFACTURING PROCESS II 3 UNITS

Manufacturing properties of metals. Metal forming processes; hot forging, rolling, extrusion, flute making and cold drawing. Sheet metal forming and cold forging, Fabrication by welding, brazing or adhesion, Casting and sintering of metals. Polymer processing. Composites. Advance principles of metal cutting: Temperature effects in metal cutting, tool wear and tool design, Cutting tool geometry and tool materials. Appropriate tool selection for cutting. Design of tools. Planning and shaping processes. The cutting processes in drilling, milling, gear-cutting, thread-cutting and broaching. Grinding and other forms of abrasive machining. Lubricants – Types, composition, selection, standard coding and effects.

MEE 507 SEMINAR 1 UNIT

Each student must present one seminar and be present at all engineering seminars within the department. Each student's seminar topic must be related to the student's final year project and shall be assessed by oral presentation and defence.

MEE 509 COMPUTER AIDED DESIGN AND MANUFACTURE I 2 UNITS

NC programming and machining with interactive CAD/CAM systems. Curve and surface geometry for tool-path generation. Tool-path generation methodologies. Geometric modelling techniques for simulation and verification of manufacturing processes. Introduction to Computer-Aided process planning Commercial packages such as Product Lifecycle Management System, etc.

MEE 510 COMPUTER AIDED DESIGN AND MANUFACTURE II 2 UNITS

Objectives and elements of Computer-integrated manufacturing, information control, computer/device networks. Sensor and sensor fusion, layout and material handling issues.

Production line design, and design for manufacturing flexible automation, virtual manufacturing rapid prototyping quality control and reliability issues and Artificial intelligence applications.

MEE 512 MACHINE TOOLS ENGINEERING 3 UNITS

Economics of machine tool design, design of machine tool constructional elements, design, production and installation of center lathes, milling, drilling and fixtures employed in machine tool, basic principles of machine tools, elements of machine tools, rigidity, kinematics, hydraulic and electrical transmission in machine tools, machine tools maintenance, installation and testing of machine tools. Transfer machines: types, and economic considerations. Ergonomic considerations in machine tool design. Computer numerical controlled machine tools. Machine centers: automated guided vehicle systems, fixtures, pallets work tables. Robotics and effects on productivity and employment. Design of automatic assembling machines. Rapid prototyping.

MEE 516 COMPUTATIONAL FLUID DYNAMICS 3 UNITS

Techniques for numerical solution of ordinary and partial differential equation, including an introduction to the finite difference, finite volume and finite element approaches. Simulation of laminar and turbulent flows including common turbulent models. Validation techniques. Use of ANSYS, NASTRAN or another commercial package.

MEE 514 REFRIGERATION AND AIR CONDITIONING II (PSYCHROMETRY & SYSTEM DESIGN) 3 UNITS

The psychometric chart, sensible heating and cooling, dehumidification, water injection, steam injection, cooling and dehumidification with reheat. Preheat and humidification with reheat. mixing and adiabatic saturation with reheat, super saturation, system characteristics, Comfort and inside design conditions, climate and outside design conditions. The choice of supply design conditions, equipment selection techniques. The psychometrics of air-conditioning process. Use of R&A design packages. (Project must be given to individual student or group of students on design when it is five weeks into the semester.

MEE 517 CHARACTERISTICS OF REFRIGERANTS 3 UNITS

Refrigeration cycles, absorption cycle, refrigerant properties, flammability and toxicity, miscibility theoretical hp per ton of refrigeration, rate of leakage, leak detection, vapor density. Common refrigerants; halocarbons, ammonia, others, classification of refrigeration, chemical reaction in refrigeration systems, oils, oil-refrigerant reactions. Refrigerant selection: compression cycle, absorption cycle, refrigerant pipe sizing, halocarbon systems, ammonia system. Secondary refrigerants, brine selection, design considerations, applications. Global

warming and alternate refrigerants. Development of environmental friendly refrigerants. Carbon credit concept.

MEE 519 METROLOGY 3 UNITS

General principles of instrumentation and measurements. Precision and accuracy. Measurement of length-light rays, block gauges, comparison with known lengths, graduated scales, rotation of screwed shaft, angular measurement-combination angle gauges, sine bars, auto-collimator angle deckor, precision level. Determination of straightness of surfaces. Measurement of form. Optical measurement of screw threads major/minor diameters, simple effective diameter, thread pitch, thread form, virtual effective diameter, measurement of gears, the involutes form, gear tooth element, rolling gear test, checking gear tooth profile, gear tooth thickness, gear pitch measurement of surface finish. Co-ordinate measuring machines. Computer Aided inspection. Application of laser in metrology.

MEE 523 INTERNAL COMBUSTION ENGINES AND TRANSMISSION 3 UNITS

Hydrocarbon fuels; structure, properties and test methods. Alternative fuels for automobile engines. Combustions stoichiometry; effect of dissociation, residual fraction etc. Fuel – air cycle analysis using combustion charts. Piston engine combustion phenomena; pre-ignition, detonation and knocking. Exhaust gas emissions; characteristics, effects, methods of measurement and reduction. Exhaust emission regulations. Fluid mechanics of internal combustion engines: fuel systems, intake and exhaust systems. Carburetor and fuel injection systems. Electronic and computer fuel injection systems. Turbocharging and turbochargers. Engine components and complete engine design. Engine testing. Manual gear box: Gear ratio pattern, synchromesh mechanism, overdrive and fifth gear. Automatic transmission principles and design: fluid flywheel, torque converter. epicyclic gearbox and clutches. Propeller shaft and differential assembly.

MEE 524 INTERNAL COMBUSTION ENGINES DESIGN 3 UNITS

Estimating vehicle engine power requirements. Matching engine and gearbox. Design methodologies in the motor industry. Cylinder block design: layout, cooling and lubrication considerations. Cylinder head and combustion chamber design. Crankshaft design; Balancing, torsional vibration and strength analysis. Design of Piston, connecting rod and bearings. Design of valve mechanisms: valves, springs, camshaft and rockers. Design of fuel system: carburetors, fuel injector pumps and nozzles. Cooling system design. Lubrication system design. Design of inlet manifold and exhaust systems. Engine mounting design. Part standardization in the motor

industry. Methods of manufacture of engine components. Material selection for engine components.

MEE 527 VEHICLE STRUCTURES AND DESIGN 3 UNITS

Revision of basic theories of strength of materials. Shear in beams. Thin walled beams. The theory of elastic hinges and collapse mechanism. Unit load method of analysis. Analysis of vehicle structures: main structural elements of a vehicle. Methods of idealization of vehicle structures; beam element, space frame, simple structural surfaces, etc. Loading cases: torsion and bending. Deflection and torsional stiffness. Matrix methods of analysis. Vehicle structure design: Structural layout to accommodate suspension and running gear. Chassis frame design. Floor design, Roof design. Design of complete car, bus, truck and utility vehicles. Design of structures for production: Types of section for car body. Design for spot welding. Adhesives and sealants, gravimetric analysis, weather stripping materials for vehicle body.

MEE 529 VEHICLE DYNAMICS AND CONTROL SYSTEMS 3 UNITS

Vehicle kinematics: axis system and notation. Velocity and acceleration distributions and slip angles. Tyre mechanics: axis system, tyre forces and geometry, cornering capacity and self-aligning torque. Vehicle handling two degree-of-freedom model. Steady and transient states responses. Handling characteristics to include yaw, sideslip and curvature responses. Computer method of analysis. Vehicle ride: suspension elements and models. Three-degrees of freedom vehicle model. Roll centre and angles. Design of suspension systems for front and rear.

MEE 534 REFRIGERATION AND AIR CONDITIONING II (EQUIPMENT DESIGN AND MANUFACTURE) 3 UNITS

Refrigeration accessories and their functions. Identification and standard sizes. Standard notations on drawing. Piping notation on drawings and standards. Air handling equipment: ducts, fans, side wall grills, diffusers, cooler coils and air washers; cooler coil construction, parallel and contra flow, contact factor; direct expansion (DX) coils, air washers. Fitting and system symbols. Application of load estimations. Case design of central air-conditioner.

MEE 535 LOAD ESTIMATING 3 UNITS

Heat gain from solar and other sources; the composition of gain, the physics of solar radiation, sky radiation, the declination of the sun, the altitude and azimuth of the sun, the intensity of direct radiation on a surface, external shading. The transmission of solar radiation through glass, heat due to solar gain through walls, sol-air temperature, calculation of heat gains through wall. Air conditioning load due to solar gain through wall. Air conditioning load due to solar gain

through glass, infiltration, heat gains through lighting occupants and other appliances. Case study of load estimation.

MEE 536 VEHICLE DESIGN 3 UNITS

Preliminary considerations; the morphology of vehicle design. Basic design methodologies. Marketing and operating requirements, production and vehicle system requirements. Factors influencing design trends in the automotive industry. Automotive aerodynamics: Boundary separation, types of drag, forces and moments and their effects on handling. Methods of reducing drag, noise and dirt deposition, ventilation and cooling. Vehicle packaging; Basic shapes i.e. one, two and three boxes design. Design of saloon, family, sports car, pick – up and special purpose vehicles. Interior packaging; seat layout, instruments, Controls, stability and comfort. Use of models and mock-ups for the appraisal of basic size, physical appearance, color proportion and materials. Materials for styling model: clay plastering, foam, etc. Materials for mock-up. Case study of a vehicle layout and design. Use of car design softwares. Practical: Each student shall be required to undertake an individual or group design project and build a scaled model of a car.

MEE 561 SENSOR TECHNOLOGY 3 UNITS

Physics of sensors (optic, acoustic, tactile sensors), Basics of measuring electrical quantities, Basics of measuring mechanical, optical, acoustic and heat quantities, measurement of signals, amplification of signals, signal analysis, measuring error analysis, integrated sensor system, smart sensors, miniaturization, networking of sensors, handling of a data acquisition system.

MEE 562 PLC PROGRAMMING 3 UNITS

Build-up and operation of digital mini controllers, Programming of mini controllers, Basic PLC hardware configuration, programming language, Build-up and operation of a PLC, Programming with list, ladder diagram, function chart, applications for logic control, applications for sequence control, software installation and tests, error detection, disturbance analysis, error documentation.

MEE 563 ACTUATOR TECHNOLOGY 3 UNITS

Pneumatic components, basic circuit in Pneumatic, design and simulation of Pneumatic circuit, servo Pneumatic, hydraulic components and pumps, basic circuits in hydraulics, design and simulation of hydraulics circuits, servo hydraulics, basics of servo drive, D.C. drives, stepping motors, brushless D. C. motors, feed drives for CNC Machines.

MEE 564 CNC TECHNOLOGY AND ROBOTICS 3 UNITS

Position processes, degrees of freedom, test and measurement procedure for determining position, gears and couplings, Basics of CNC Technology, Programming and handling of CNC machines, communication at CNC machines, basics of robotics, working space, programming of robots, manipulator application, safety and protection measures.

MEE 591 MECHANICAL ENGINEERING PROJECT I 3 UNITS

Original individual student project related to a prescribed Mechanical Engineering problem involving literature review, identification, deflection and formulation of the problem, theoretical investigation, modeling simulation analysis and design. 15^{th} (T); 180h (P); C

MEE 592 MECHANICAL ENGINEERING PROJECT II 3 UNITS

Second phase of research investigations involving the fabrication of the designed model, debugging, calibration, testing data collection and analysis, and presentation of a comprehensive written report of the investigations. 15^{th} (T); 180h (P); C; PR: MEE 591.

5.9 SUMMARY OF CREDITS REQUIRED FOR GRADUATION

1. Requirements in major Mechanical Engineering Courses	81 Credits
2. General Courses in Engineering (GET courses)	42 Credits
3. Elective Requirements	12 Credits
4. General Studies Courses	13 Credits
5. Courses from other Faculties	43 Credits
6. Industrial Training – SWEP (4 Credits) + SIWES (12 Credits)	16 Credits

TOTAL CREDITS REQUIRED FOR GRADUATION: UTME=207 Credits, DE=162 Credits

CHAPTER SIX: COURSES FROM FACULTY OF SCIENCE

CHM 101: Introductory Inorganic Chemistry (2 units)

Atoms, molecules and their structures.Hybridization and shapes of simple molecules (simple AB, AB2 etc type of compounds).Modern electronic theory of atoms and electronic configuration. Periodicity and building up of periodic table. Variations in physical properties with atomic numbers across the 2nd and 3rd periods.Variation in first ionization energies, atomic radii, melting points and explanations in terms of structure and bonding in the elements. Comparative chemistry of Gp1A (Alkali metals), Gp 11A (Alkaline earth metals) and Gp IV A (Carbon group) elements.Chemistry of first transition metals.Extraction of metals.Acids, bases and salts. Introduction to radio-nuclear chemistry

CHM 102: Introductory Organic Chemistry (2 units)

Hybridization of Carbon.Classification of organic compounds on the basis of functional group.Empirical and molecular formulae. Determination of elemental composition of organic compounds (Sodium fusion test). Introduction to stereoisomerism.Chemistry of hydrocarbons (aliphatic and cyclic) including crude oil.Chemistry of benzene, alcohols, phenols, aldehydes, ketones, acids, amines and amides.Structure of simple sugars, polysaccharides such as starch and cellulose, peptides and proteins, fats and oils. Mechanisms of reactions to be discussed where applicable and the uses of the compounds emphasized.

CHM151 Practical Chemistry I

Acid base titrations; Oxidation reduction titrations, pH measurements; Buffer preparations; Determination of heat of neutralization, solution and reaction; Rate of chemical reaction measurement, Partition co-efficient determination.

CHM152 Practical Chemistry II

Qualitative analysis and confirmatory tests for anions and cations; Melting Point determination; Functional group Identification.

CHM 211: Basic Physical Chemistry I (2 units)

Bond dissociation energies.Energy cycles (Born Haber cycle) of covalent compounds.Heats of formation and their determination.1st, 2nd and 3rd laws of thermodynamics and their applications. Reversible reactions, equilibrium constants (Kc and Kp). Relationship between Kc and Kp. Free energy, spontaneity of reactions and equilibrium.Vant Hoff isochore and chemical potentials.Effect of temperature on reaction rate.Arrhenius equation. Collision and transition state theories. Catalysis.Methods for studying fast reactions.Colligative properties of solutions

CSC 101: Introduction to Computer Science 3 units

History of computers, functional components of a Computer, Characteristics of a computer system.Broad Introduction to programming methodology and algorithm & flowcharts.Theinternet, social, ethical and professional issues of computing; software, hardware and network development trend.Social application of computing; network communication, internet piracy / crime and computing technologies.Computer application.

CSC 102: Introduction to Computer Programming 3units

Problem solving strategies, role of algorithm in problem solving process, implementation strategies, concepts and properties of algorithms

BASIC Programming: Variables, Statement, selection, repetition, subroutines and procedure, table, graphics, sound, string processing, sorting and searching.

CSC 201: Computer Programming l 3units

Visual Basic: Should be taught in CSC 201. Introduction to problem solving methods and algorithm development, designing, coding, debugging, and documenting program using techniques of programming language.Properties and controls, programming building blocks, graphic controls, graphics method, grid control displaying and printing, interfacing with window, file system control, accessing files, data control, sound, multimedia, animation.

MTH 101 INTRODUCTORY MATHEMATICS I (3 Units)

Elementary set theory, subsets, union, intersections, complement, Venn diagrams, Indices, Logarithm, polynomial, operation, addition, multiplication and division, remainder and surds theorem, theory of quadratic equations, binomial theorem. Circular measure, trigonometric functions and identity angles of any magnitude, addition and factor formulae, sequence and series elementary, matrix operation, complex numbers, permutation

MTH 102 INTRODUCTORY MATHEMATICS II (3 Units)

Function of a real variable, graphs, limits and idea of continuity. The derivative, as limit of rate of change.Techniques of differentiation.Turning point curve sketching, Approximation, Application of differentiation, integration as an inverse of differentiation.Methods of integration, Definite integral.Applications areas, volumes areas, etc.

MTH 104 INTRODUCTORY MATHEMATICS III (3 Units)

Geometric representation of vectors in 1-3 dimensions, components, direction cosines. Addition, Scalar, multiplication of vectors, linear independences, Scalar and scalar variable.Two dimensional co-ordinate geometry.Straight lines. Circles, parabola, ellipse, hyperbola Tangents, normal, Kinematics of a particle, components of velocity and acceleration of a particle moving in a plane force, momentum, laws of motion, under gravity projections, resisted vertical motion, elastic string, simple pendulum, impulse. Impact of two smooth sphere and of a sphere on a smooth sphere. Pre-requisite MAT 111.

MTH 105 INTRODUCTORY STATISTICS (2 Units)

Measure of location and dispersion in simple and grouped data, Elements of probability and probability distribution, normal, binomial, Poison, geometric, Negative binomial distribution. Regression, correlation and analysis of variance.

MTH 201 MATHEMATICAL METHODS I (3 Units)

Real valued function of a real variable. Review of differentiation and integration and their applications, Mean value theorem, Taylor series, Real-value functions of two or three variable. Partial derivatives, chain rule. Extremer, Lagrange's multipliers.Increments, differentials and linear approximations.Evaluation of line integral.Pre-requisites MAT 102.

MTH 202 NUMERICAL ANALYSIS I (3Units)

Solution to algebraic and transcendental equations. Curve fitting. Error analysis, Interpolation and approximation.Zeros of non-linear equations of one variable, System of linear equations.Numerical differentiation and integration.

PHY 101: GENERAL PHYSICS I (MECHANICS) (3 UNITS) (L:2 P:0 T:1)

Space and Time, frame of references.Units and dimensions.Kinematics.Fundamental laws of Mechanics.Statics and dynamics. Galilean invariances: Universal gravitation: work and energy, rotational dynamics and angular momentum: conservation laws. Prerequisite: MAT 101.

PHY 102: GENERAL PHYSICS II (ELECTRICITY AND MAGNETISM) (2 UNITS) (L: 2 P: 0 T: 1)

Electrostatics: conductors and currents: dielectrics: magnetic fields and induction: Maxwell's equations: electro-magnetic waves: applications. Pre-requisite: MAT 102.

PHY 103: GENERAL PHYSICS III 3 UNITS (L: 2 P: 0 T: 1)

Molecular treatment of properties of matter, elasticity.Hooke's law.Young's, shear and bulk moduli. Hydrostatics: Pressure: buoyance. Archimede's Principles. Hydrodynamics: Streamline Bernoulli and continuity equations, turbulence. Reynold's number viscosity: laminar flow, Poiseuille's. Surface tension.Adhesion, cohesion, capillarity, drops and bubbles. Temperature: the zeroth law of thermodynamics: heat: gas laws of thermodynamics: kinetic theory of gases. Applications.Pre-requisite - in O/L Physics and Mathematics.

PHY 107/108: PRACTICAL PHYSICS LABORATORY I & II (2 UNITS EACH) (L: 0 P: 6 T: 0)

This Introductory course emphasizes quantitative measurements, the treatment of measurement errors and graphical analysis. A variety of experimental techniques will be employed. The experiments are to include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity, etc. covered in PHY 101, PHY 102 and PHY 103.

CHAPTER SEVEN: GENERAL STUDIES (GST) COURSES AND SYNOPSIS

GST 101: THE USE OF ENGLISH I (2 units)

- Principles and Practice of Communication
- Concord in English
- Answering Essay Questions
- Language Skills
- Note-taking and Note-making
- Comprehension
- Sentence Construction
- Outlines and paragraphs
- The Mechanics of Written English
- The Novel in English

GST 102: THE USE OF ENGLISH II (2 units)

- Logical Presentation of Papers
- Word Formation
- Phonetics
- Speech Making
- English Registers
- Reported Speech
- Figures of Speech
- Summarization
- Report Writing
- The Long Essay

GST 111: USE OF LIBRARY AND STUDY SKILLS (2 units)

- Brief history of libraries.
- Library and education.
- University libraries and other types of Libraries.
- Study skills (reference services).
- Types of library materials.
- Using library resources including e-learning, e-materials, etc.
- Understanding library catalogues (card, OPAC, etc) and classification.
- Copyright and its implications.
- Database resources.
- Bibliographic citations and referencing.

GST 112: NIGERIAN PEOPLE AND CULTURE (2 units)

- Concepts of Culture and Civilization.

    - The Dynamics of Culture Change in Africa: Nigeria as a Case Study.
    - The Concept of Material Culture and Contemporary Issues in Nigeria.
- African Philosophy and World-view.
- Sources for the Study of Nigerian Culture and History.
- Culture areas of Nigeria and their Characteristics.
- A Survey of Early Nigerian People and History.
    - Pre-colonial Political Institutions and Governance in Nigeria.
    - Traditional Kingdoms in Nigeria: Impact of Indirect Rule on Traditional Governance in Nigeria.
    - Evolution of Modern Nigeria as a Political Unit.
    - African Indigenous Political Systems and the Search for Recognition in Contemporary Politics.
- Aspects of Culture in Traditional Nigeria.
    - African Traditional Education: Nigerian Experience.
    - Traditional Religion in Nigeria: The Yoruba Experience.
    - Management Practices in Nigerian Traditional Agriculture
- Cultural Rebirth, National Values and the "New" Nigeria.
    - Towards a Cultural Revival: A Critique of Nigerian Traditional Values.
    - Nation-Building and the Search for Nigerian National Identity.
    - An Alternative Platform for Sustainable Development: A Social-Reform Agenda for Nigerian Intellectuals.
    - Citizens' Rights and Duties as Nigerians: Nigerian Constitution in Perspective.
    - Major Landmarks in the 1999 Nigerian Constitution.
    - Social Justice, Democratic Dialogue and the Quest for National Security in Nigeria.
    - The Independent Corrupt Practices and Other Related Offences Commission (ICPC) and the National Values Curriculum.
- Nigeria in the Context of Globalization.
    - Nigeria's Foreign Policy
    - Nigerian Culture and Technological Change.
    - Nigeria's Economy: Response to Global Opportunities and Costs.

GST 113: INTRODUCTION TO PHILOSOPHY AND CRITICAL THINKING (2 units)

- Philosophical Foundations of human existence.
- A survey of the main branches of philosophy.
- Nature of philosophical problems and evolution of human institutions: Science, Politics, Religion, Morality, etc.
- Types, sources and foundations of knowledge and non-scientific knowledge.
- Truth, belief and opinion.
- Foundations of logic and critical thinking.
- Types of discourse.
- Nature of arguments.
- Validity and soundness.

- Techniques for evaluating arguments.
- Distinction between inductive and deductive inferences, etc.
- Illustrations for this course will be taken from familiar texts, including literature materials, Novels, Law reports and Newspaper publications.

GST 221: HISTORY AND PHILOSOPHY OF SCIENCE (2 credits)

- 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.

GST 224: PEACE STUDIES AND CONFLICT RESOLUTION (2 credits)

- Basic Concepts in Peace Studies and Conflict Resolution.
    - Conflict
    - Crisis/Violence
    - Dispute Settlement
    - Resolution
    - Peace
    - Creative and Destructive Conflicts
    - Conflict Motivations
    - Conflict Contexts
    - Conflict Types
    - Conflict Resolution Styles
- Theories of Conflict
- Indigene/Settler Phenomenon in Community Conflict.
- Conflict Management
    - Concept of Management
    - Third-Party Intervention
    - Theory and Practice of Mediation
    - Management of International Conflicts
    - United Nations and Global Peace
- Conflict Resolution
    - Resolution of Conflict
    - Problems of Conflict Resolution
- Conflict Transformation
    - The Concept of Conflict Transformation
    - Factors Responsible for Conflict Transformation
    - Conflict Transformation Workshops
- Conflict Issues: International Case Studies

    - The State of Israel and the Middle East
    - Nigeria and Cameroun on the Bakassi Peninsula
- Root Causes of Conflicts and Violence in Africa.
    - Poor Management of Ethnic Diversity
    - Struggle for State Control
    - Struggle for Economic Resources
- Peace-building.
- Peace as Vehicle for Unity and Development.
- National Security: The Imperatives of Social Justice and Democratic Dialogue

GST 229 INTRODUCTION TO VOCATIONAL SKILLS 1 (1 credit)

Every student should mandatorily be exposed to any three (3) of the following vocations at the first semester of 200 Level.

- Fish farming
- Fish smoking and preservation technology
- Animal farming: goats, sheep, grass cutter, pigs, etc.
- Poultry
- Crop farming and modern irritation technology
- Land scalping and horticulture
- Palm oil and palm kernel oil extraction and applied technology
- Tailoring and fashion designing
- Beadworks and wireworks for jewellery
- Soap and cosmetic productions
- Drum making and traditional/cultural performance
- Tie and dye cloth technology.
- Bee keeping and honey production technology
- Traditional cloth weaving technology (Asoofi production)
- Drama/Dance performance
- Wood carving
- Photography
- Tiling
- Interior Decoration
- Brick making
- Plumbing
- Vulcanising
- Printing
- Water treatment/Conditioning/Packaging
- Metal fabrication
- Steel and aluminium door and windows
- Domestic Electrical Wiring
- Bakery and Confectionaries
- Carpentry

GST 331: INTRODUCTION TO ENTREPRENEURIAL SKILLS (2 credits)

- Introduction to entrepreneurship and new venture creation.
- Entrepreneurship in theory and practice.
- The Opportunity.
- Forms of business.
- Staffing, Marketing and the new venture.
- Determining – capital requirements.
- Raising capital.
- Financial planning and management.
- Starting a new business
- Feasibility studies.
- Innovation.
- Legal issues.
- Insurance and environmental considerations.
- Possible business opportunities in Nigeria.