EDO STATE UNIVERSITY UZAIRUE

EDO STATE, NIGERIA

FACULTY OF ENGINEERING

DEPARTMENT OF CIVIL ENGINEERING

STUDENT HANDBOOK

FOR UNDERGRADUATE PROGRAMME

2023-2028 EDITION

Administrative Building

Faculty of Engineering

Vice Chancellor, Engr. Prof. Emmanuel O. Aluyor

DVC-Admin, Engr. Prof. Stephen M. Omodia

DVC-ACAD, Engr. Prof. Vincent A. Balogun

Ag. Registrar, Habib I. Ikhelefo

Ag. Bursar, Mr. Osifo Osagie Uwagboe

NOTES ON THE UNIVERSITY

The WHEEL represents technological and innovative advancement. It shows that the University is at the forefront of technological and innovative advancements.

The BEAKER and the TEST TUBE represent scientific expertise and laudable research. They reveal that Edo State University Uzairue is a centre for scientific expertise and laudable research

The COMPASS represents modern methods of educational delivery. It shows that at Edo State University, lectures are delivered using modern educational facilities.

The KEY represents the knowledge potential for future leadership. It reveals that Edo State University is poised to equip students with the knowledge and potential to be future leaders.

The BOOK represents quality education, research and groundbreaking discoveries. It shows that Edo State University Uzairue is a centre for quality education, research and groundbreaking discoveries, all for the development of humanity.

The University colours are Blue, Lemon Green and White. The Blue colour represents harmonizing industry and technology. Lemon green colour represents agriculture: the main occupation of the people of Edo State, especially, the Edo North. White represents peace, which is the hallmark of the Edo people.

Edo State University Uzairue Motto: Quality Education for Development
The motto "Quality Education for Development" positions Edo State University Uzairue as a citadel of learning where the search for truth and academic excellence are pursued for the advancement of man and his culture.

Vision: The vision of Edo State University is to become a centre of excellence in quality teaching, research, innovation and community development.

Mission: Through its teaching, research, and innovative activities, the University is poised to be a major contributor to the advancement of knowledge, wisdom and understanding for the benefit of the University in encouraging and promoting scholarship and will relate its activities to social, cultural and economic needs of the people of Edo State in particular and Nigeria in general.

FOREWARD

The Department of Civil Engineering under the Faculty of Engineering of the Edo State University Uzairue was given approval by the National Universities Commission (NUC) in 2017 under the distinguished leadership of the Vice Chancellor, Engr. Prof. Emmanuel Aluyor. The Department of Civil Engineering of the Edo State University Uzairue is eager to educate students to become outstanding engineers who will possess an excellent leadership skill necessary to excel in a developing and advanced society.

Civil engineers plan, design, and supervise construction of many essential facilities and structures such as bridges, dams, roads, buildings etc. Included in the study of civil engineering are courses in environmental engineering that are directly related to the solution of hazardous waste and pollution problems, to providing potable and economical water supply systems, and to maintaining a safe environment. Other areas of Civil Engineering include but not limited to Structural, Highway and Transportation, Construction, Bioremediation, Airport, ship, Railway and Geotechnical Engineering. Nigeria is the most populous country in Africa with an estimated 182 million people. According to 2015 World bank record; we have a significant infrastructure deficit especially in areas such as water, road, rail and housing. Therefore, the service of a civil Engineer is needed now like never to work on several projects in the areas mentioned above.

The Edo State University Uzairue's Bachelor of Engineering (B.Eng.) in Civil Engineering is designed to meet the needs of civil engineering industry in local and international society. The programme consists of lectures, laboratory, projects, excursion and practical training in industry. We have also put in place a mentorship scheme in the department so that every student is properly guided and tutored to ensure an optimal performance. We have dedicated staff members who are willing and ready to assist and guide you with your daily academic challenges. Student are advised to study the Students Handbook in order to acquaint themselves with what is expected of them and the provisions that have been put in place to assist them actualize their academic goals. I therefore welcome you all to the Department of Civil Engineering, Edo State University Uzairue and I wish you a very fruitful and successful academic career.

Engr. Prof. John Wasiu

Head, Department of Civil Engineering

PREFACE

This maiden edition of the students' handbook is designed with the prospective undergraduate of the Department of Civil Engineering in order to provide a guide and reference point to course registration for each semester of an academic session. It is necessitated by a number of developments: the NUC directive on programme structuring, positive change in the staff strength of the Department and other issues that may arise. These developments have been addressed and included. Any other changes occurring thereafter will be reflected in future editions. I recommend this handbook to all who are interested in Civil Engineering Programme. Wishing you a wonderful and fulfilled academic session.

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STAFF OF THE DEAN'S OFFICE, FACULTY OF ENGINEERING

Table 1: Staff in the Dean's office

S/N	Name	Qualification	Designation
1.	Engr. Prof. Otoikhian S. K.	PhD (UNIBEN), M.Eng (UNIBEN), B.Eng (UNIBEN), Regd Engr (COREN)	Professor/Dean
2	Mr. E.N Efosa	NCE (Business Administration), Certificate in Desktop Publishing	Administrative Assistant / Faculty Officer
3	Mr Lawrence	HND (AUCHI)	Faculty Officer
4	Mr. Silas Nathaniel	SSCE	Office Assistant

FACULTY OF ENGINEERING WORKSHOP STAFF

Table 2: Staff in the Engineering Workshop

S/N	Name	Qualification	Designation
1	Engr. Patricia Okun	B.Eng (1998), PGDME (BUK), PGDE (UNIMAID) ND (AUCHI), COREN, MNSE	Technologist I
2	Jimoh Denis Omeza	B.Eng (AAU), HND (AUCHI), ND (AUCHI)	Technologist I
3	Abdulahi Yaya	HND (Auchi)	Technologist I
4	Evbogbai I. Barry	Trade Test (Grade I, II and III), diploma Computer Science, FGCC, A-NABTEB.	Principal Works Superintendent

5	Ashadi C.V	Trade Test (Grade I and II)	Technician
6	Ibrahim O Mohammed	ND (AUCHI)	Technician
7	John Itebalumhe	Trade Test (Grade II and III)	Technician
8	Onimhawo O. G.	WAEC	Carpenter

Table 3: Academic Staff List							
SN	**NAME OF ACADEMIC STAFF**	**DISCIPLINE**	**AREA OF SPECIALIZATION**	**QUALIFICATION**	**RANK AND DATE OF APPOINTMENT**	**EMPLOY MENT STATUS**	**MODE OF APPOINTMENT**
1	Engr. Prof. Wasiu John	Civil Engineering	Structural Engineering and Materials	B.Eng. (BAYERO) Civil Engrg. (2003) M.Eng. (BAYERO) Structural Engineering (2010) Ph.D (UNILORIN) Structural Engineering & Materials (2018) MNSE 30210 COREN 29385 SPE 4540025, MNICE	Professor/HOD 18th March, 2020	Full time	Fresh appointment
2	Engr. Dr. Onyeka Festus Chukwudi	Civil Engineering	Structural Engineering	B.Eng. (ANSU) Civil Engrg. (2007) M.Eng. (UNN), Structural Engineering (2010) PhD (UNN), Structural Engineering (2019), Regd Engr (COREN) R.25,599	Associate Professor/ 4th October, 2018	Full Time	Fresh Appointment
3	Engr. Joseph Sule	Civil Engineering	Water Resources & Environmental Engineering	Ph.D in progress M.Eng (UNIBEN), B. Eng (Federal Univ. of Agriculture), ND (Federal Poly. Idah)	31st October, 2019/Lecturer I	Full Time	Fresh Appointment

				Regd Engr (COREN) R58739			
4	Engr. Osegbowa Douglas Enoguan	Civil Engineering	Structural Engineering	Ph.D in progress M.Eng (UNIBEN), B.Eng (UNIBEN), B.Eng, Regd Engr (COREN) R61942	18th March, 2020/Lecturer II	Full Time	Fresh Appointment
5	Usifoh Osemudiamen Ayoposi	Civil Engineering	Geotechnical Engineering	Ph.D in progress M.Eng (ABUAD), B.Eng (UNIBEN), B.Eng,	16th February, 2022/ Lecturer II	Full Time	Fresh Appointment
6	Engr. Igbadumhe Oshioke Anthony	Civil Engineering	Geotechnical Engineering	Ph.D (FUTMinna) in progress M.Eng (FUTMinna), PGD (Civil Engineering) Minna, HND (Civil Engineering) AUCHIPOLY, COREN R61123	13th March,2023/ Lecturer II	Full Time	Fresh Appointment
7	Mr. Haruna Daud Gussau	Civil Engineering	Highway & Transportation Engineering	Ph.D (Benin) in progress M.Eng (BAYERO), B.Eng (Civil Engineering) AAU	13th March,2023/ Lecturer II	Full Time	Fresh Appointment

Table 4: Laboratory Staff List

S/N	Name	Qualification	Designation
1	Engr. Ikhazuagbe Ohiwere	M.Eng,(COOU) PGD (COOU), HND (Civil Engineering)	Chief Technologist
2	Adebayo Daniel Uduzeri	HND (AUCHI) Civil Engineering, NATE	Technologist II
3	Shielu Saeed Muhammed	HND (AUCHI) Civil Engineering, NATE	Technologist II
4	Usidamen Daniel	ND, HND (AUCHI)Civil Engineering, NATE	Technologist II
5	Modestus Ebiniyi	ND, HND (AUCHI)Civil Engineering, NATE	Technologist II
6	Thaddeus	ND, HND (AUCHI)Civil Engineering, NATE	Technologist II

Table 5: List of Administrative Staff

S/N	Name	Qualification	Designation
1.	Sanusi Lubabatu Mohammed (Mrs.)	ND (Public Administration) Niger State Polytechnic, Zungeru	Executive Officer (Secretary)
2.	Elogie J. Maris	ND (Estate Management) Auchi Polytechnic, Auchi.	Clerical Officer

B.ENG. CIVIL ENGINEERING

1.1 Overview

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

1.2 Philosophy

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

In consequence of the above, the programme is structured in such a way that students will have opportunity to take courses that will provide a basic understanding of all areas of civil engineering practice.

1.3 Objectives

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

1. a good grounding in basic engineering courses;
2. a good grasp of the essential application and utility courses;
3. a thorough understanding of the experimental and practical bases for the relevant theoretical engineering principles;
4. a good knowledge of all the various branches of civil engineering with further specialisation;
5. construction engineering and management skills (combining engineering and management skills to complete construction projects designed by other engineers and architects);

6. geotechnical engineering skills (analysis of soils and rock in support of engineering projects/applications - building foundations, earthen structures, underground facilities, dams, tunnels, roads.);
7. structural engineering skills (design of all types of stationary structures - buildings, bridges, dams);
8. surveying skills (measure/map the earth's surface in support of engineering design and construction projects and for legal purposes - locating property lines.);
9. transportation engineering skills (design of all types of transportation facilities/systems – streets/highways, airports, railroads, other mass transit, harbours/ports);
10. water resource skills (control and use of water, focusing on flood control, irrigation, raw water supply, and hydroelectric power applications);
11. environmental engineering (air pollution control, hazardous waste treatment and disposal, recycling and solid waste disposal, sanitary engineering (municipal and industrial water and wastewater treatment);
12. substantial practical skills for tackling real life engineering problems; and
13. knowledge of entrepreneurial and management principles upon which enterprising professional careers can be built.

1.4 Employability Skills

1. ability to apply scientific and engineering principles to plan, design and supervise civil engineering projects;
2. skills to convey technical material persuasively to clients, colleagues and subordinates;
3. knowledge of contemporary issues and ability to keep up with emerging technologies relevant to executing civil engineering projects; and
4. capacity to utilize the skills acquired in government (including regulatory and executing agencies), industry (including consulting, construction organizations') and academia.

1.5 21st Century Skills

The 21st century skills include the innovative skills:

1. creativity and innovation;
2. critical thinking/problem solving/decision making;
3. communication;
4. collaboration (team work);

5. learning to learn/metacognition;
6. citizenship 9local and global);
7. general computer literacy and mastery of relevant information technology;

1.6 Unique Features of the Programme

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

1.7 Students Welfare

Prompt attention is given to every student's complaint. All academic grievances from students are usually documented and handed over to the appropriate committee through either the Head of the Department or the Dean of the Faculty. The most common types of academic grievances handled in the past years, included correction of wrong grades, errors in the computation of students' CGPA and omitted results or grades. The students also have the right to petition the University Board or Senate when they are not satisfied with the decision of the Department Board or Faculty Board.

ADMISSION AND GRADUATION REQUIREMENTS

2.1 Admission Requirements

Candidates are admitted into the degree programme in any of the following two ways:

1. Indirect Entry (5 Year Degree Programme)
2. Direct Entry (4 Year Degree Programme)

2.1.1 Indirect Entry

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

2.1.2 Direct Entry

For Four-year Direct Entry, in addition to five (5) Senior Secondary Certificate (SSC) credit passes which must includes English Language, two of which must be principal subjects at Advance GCE Level or NCE and its equivalent. Holder of upper credit level at HND are eligible for consideration for admission into 300 levels respectively.

2.2 Graduation Requirements

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

1. Candidates admitted through the UTME mode shall have registered for a minimum of 150 and maximum of 180 units of courses during the 5 – year engineering degree programme. Such candidates shall have spent a minimum of ten academic semesters.
2. Candidates admitted through the Direct entry mode shall have registered for minimum of 120 and maximum of 150 units of courses during a 4– year engineering degree programme. Such candidates shall have spent a minimum of eight academic semesters
3. The minimum and maximum credit load per semester is 15 and 24 credit units respectively.
4. A student shall have completed and passed all the Courses registered for, including all compulsory courses and such elective /optional courses as may be specified by the university/faculty or department; obtained a minimum Cumulative Grade Point Average (CGPA) specified by the university but not less than 1.00.

5. A student shall also have earned the 15 credit units of Students Industrial Work Experience Scheme (SIWES), eight credit units of University General Study courses and four credit units of Entrepreneurship courses.
6. For the purpose of calculating a student's cumulative grade point average (CGPA) in order to determine the class of Degree to be awarded, grades obtained in ALL the courses registered, whether compulsory or optional and whether passed or failed must be included in the computation. Even when a student repeats the same course once or more before passing it or substitutes another course for a failed optional course, grades scored at each and all attempts shall be included in the computation of the GPA.

7. Pre - requisite courses must be taken and passed before a particular course at a higher level. Furthermore, if a student fails to graduate at the end of normal academic session, he or she would not be allowed to exceed a total of 15 semesters in the case of students admitted through UTME and 13 semesters in the case of Direct Entry students. The minimum admission requirements for Engineering disciplines are passes at credit level in the Senior Secondary School final year examination or GCE 'O' Level in five subjects including Mathematics, English Language, Physics and Chemistry. Candidates are also required to have acceptable pass in the UTME.

2.3 Course System

All Engineering and Technology programmes shall be run on a modularised system, commonly referred to as Course Unit System. All courses are 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. Credits are weights attached to a course. One credit is equivalent to one hour per week per semester of 15 weeks of lectures or three hours of laboratory/studio/workshop work per week per semester of 15 weeks

2.3.1 Definition of Course System

This should be understood to mean a quantitative system of organization of the curriculum in which subject areas are broken down into unit courses which are examinable and for which students earn credit(s) if passed. The courses are arranged in levels of academic progress. There shall be five levels of courses numbered 101-199, 201-299, 301-399, 401-499 and 501599. For ease of identification, course numbers can be prefixed by a three-character programme/subject code. Thus, the course code is in the

form: DEP LNJ (where the threeletter code DEP identifies the programme, 'L' in LNJ represents the level of the course (1 or 2 or 3 or 4 or 5 for all undergraduate courses), N represents the sub-subject area while J represent the semester the course is offered some hierarchical code. Thus, for example, MEE 207 is a 200-Level course with number 0 say for labs and 7 indicating 1st semester, offered in the mechanical engineering programme. The glossary of all the course codes are presented earlier under Glossary of Codes.

The second aspect of the system is that courses are assigned weights allied to Units.

Units: Consist of specified number of student-teacher contact hours per week per semester. Units are used in two complementary ways: one, as a measure of course weighting, and the other, as an indicator of student work load:

1. As a measure of course weighting for each unit course e.g. the credit unit to be earned for satisfactorily completing the course is specified; thus a 2-credit unit course may mean two 1-hour lecture per week per semester or one 1-hour lecture plus 3-hour practical per week per semester.
2. As a measure of work load, "One Credit Unit" means one hour of lecture or one hour of tutorial per week per semester. For other forms of teaching requiring student teacher contact, the following equivalents may apply: two hours of seminar: three hours of laboratory or field work, Clinical practice/practicum, studio practice or stadium sporting activity, six hours of teaching practice; four weeks of industrial attachment where applicable.

Normally, in Course Credit System, courses are mounted all year round, thus enabling students to participate in examinations in which they are unsuccessful or unable to participate on account of ill health or for other genuine reasons. In such a system, no special provisions are made for re-sit examinations.

The minimum number of credit units for the award of a degree in engineering and technology is 150 units, for a 5-year programme subject to the usual Department and Faculty requirements. A student shall therefore qualify for the award of a degree when he has met the conditions. The minimum and maximum credit load per semester is 15 and 24 credit units respectively.

For the purpose of calculating a student's cumulative GPA (CGPA) in order to determine the class of Degree to be awarded, grades obtained in ALL the courses registered, whether compulsory or optional and whether passed or failed must be included in the computation. Even when a student repeats the same course once or more before passing it or substitutes another course for a failed optional course. Grades scored at each and all attempts shall be included in the computation of the GPA. Pre - requisite courses must be taken and passed before a particular course at a higher level.

2.4 Grading of Courses

Grading of courses shall be done by a combination of percentage marks and letter grades translated into a graduated system of Grade Point as shown in Table 6.

Table 6: Grade Point System

Mark %	**Letter Grade**	**Grade Point**
70 – 100	A	5.0
60 – 69	B	4.0
50 – 59	C	3.0
45 – 49	D	2.0
40 – 44	E	1.0
0 – 39	F	0

2.5 Grade Point Average and Cumulative Grade Point Average

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 product of the total number of units x grade point (TUGP) by the total number of units (TNU) for all the courses taken (whether passed or failed) in the semester as illustrated in Table 7.

The Cumulative Grade Point Average (CGPA) over a period of semesters is calculated in the same manner as the GPA by using the grade points of all the courses taken during the period.

Table 7: Calculation of GPA or CGPA

Course	**Units**	**Grade Point**	**Units x Grade Point (UGP)**
C1	U1	GP1	U1 x GP1
C2	U2	GP2	U2 x GP2
-	-	-	-
-	-	-	-
C_i	U_i	GP_i	U_i x GP_i
-	-	-	-
-	-	-	-
CN	UN	GPN	UN x GPN
TOTAL	TNU		TUGP

$$TNU = \sum_{i=1}^{N} U_i \qquad TUGP = \sum_{i=1}^{N} U_i * GP_i \qquad CGPA = \frac{TUGP}{TNU}$$

2.6 Degree Classifications

The following regulations shall govern the conditions for the award of an honours degree.

1. Candidates admitted through the UTME mode shall have registered for at least 150 units of courses during the 5-year degree programme.
2. Candidates must have registered and passed all the compulsory courses specified for the programme.

The determination of the class of degree shall be based on the Cumulative Grade Point Average (CGPA) earned at the end of the programme. The CGPA shall be used in the determination of the class of degree as summarized in Table 7. It is important to note that the CGPA shall be calculated and expressed correct to two decimal places.

Table 8: Degree Classification

Cumulative Grade Point Average (CGPA)	Class of Degree
4.50 – 5.00	First Class (Hons.)
3.50 – 4.49	2nd Class Upper (Hons.)
2.40 – 3.49	2nd Class Lower (Hons.)
1.50 – 2.39	3rd Class (Hons.)
1.00 – 1.49	Pass

The maximum length of time allowed to obtain a degree in any Department in the Faculty of Engineering shall be fourteen semesters for the 5-year degree programme and twelve semesters for students admitted directly into 200 level. For extension beyond the maximum period, a special permission of Senate shall be required on the recommendation of the Faculty Board.

Students who transfer from other departments/programmes or universities shall be credited with only those courses deemed relevant to the programmes, which they have already passed prior to their transfer. Such students shall however be required to pass the minimum number of units specified for graduation for the number of sessions he/she has spent in the Faculty; provided that no student shall spend less than two sessions (4 semesters) in order to earn a degree. Students who transfer from another programme in the Faculty or other faculties for any approved reason shall be credited with those units passed that are within the curriculum of the programme to which he/she has transferred. Appropriate decisions on transfer cases shall be subjected to the approval of Senate on the recommendation of the Faculty.

2.7 Probation

A student whose Cumulative Grade Point Average is below 1.50 at the end of a particular year of study, earns a period of probation for one academic session. A student on probation is allowed to register for courses at the next higher level in addition to his/her probation level courses provided that:

1. the regulation in respect of student work-load is complied with; and
2. the pre-requisite courses for the higher-level courses have been passed.

2.8 Withdrawal

A candidate whose Cumulative Grade Point Average is below 1.5 at the end of a particular year of probation should be required to withdraw from the programme. However, in order to minimize waste of human resources, consideration should be given to withdrawal from programme of study and possible transfer to other programmes within the same University.

2.9 Evaluation

2.9.1 Techniques of Student Assessment

2.9.1.1 Practicals

By the nature of the programmes in Engineering and Technology, laboratory practical are very important in the training of students. To reflect the importance of practical work, a minimum of 9 hours per week or 135 hours per semester (equivalent to 3 units) should be spent on students' laboratory practical's. Consequently, some of the courses have both theory and practical components. Thus, in the description of courses to be taken in any programme, as presented in Sections 2 and 3, the number of lecture hours (LH) and the number of practical hours (PH) per semester are indicated. The overall performance of students in such courses is to be based on the evaluation of the performance in written examination (which tests theory) and also the performance in the laboratory work (based on actual conduct of experiments and the reports).

The experiments to achieve the practical's components of the courses must be designed in quality and quantity to enrich the grasp of the theoretical foundations of the courses. It is left for the department to organize all the experiments in the best way possible. One of the ways to achieve this is to lump all the laboratory practical's under a course, which the student must pass.

2.9.1.2 Tutorials

The timetable for courses shall be designed to make provision for tutorials of at least one hour for every four hours of lecture. Thus a 3-unit course of 45 hours per semester should attract about 10 hours of tutorials. Postgraduate students are normally employed to help in giving tutorials to undergraduate students. This is a veritable training ground for academic career.

2.9.1.3 Continuous Assessments

Continuous assessment shall be done through essays, tests, and practical exercises.

1. Scores from continuous assessment shall normally constitute 30 per cent of the full marks for courses which are primarily theoretical.
2. For courses which are partly practical and partly theoretical, scores from continuous assessment shall constitute 40% of the final marks.
3. For courses that are entirely practical, continuous assessment shall be based on a student's practical work or reports and shall constitute 100% of the final marks.

2.9.1.4 Examinations

In addition to continuous assessment, final examinations should normally be given for every course at the end of each semester. All courses shall be graded out of a maximum of 100 marks comprising:

Final Examination: 60% - 70%

Continuous assessment (Quizzes, Homework, Tests, Practical's): 30% - 40%

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

2.9.2 External Examiners' System

The external examiner system should continue. This system should be used only 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 in the faculty. Furthermore, the existing practice of using different External Examiners for major subject areas in professional programmes, such as Engineering and Technology, should be continued.

2.9.3 SIWES Rating and Assessment

In engineering education, industrial attachment is very crucial. The minimum duration of the Students Industrial Work Experience Scheme (SIWES) should be 45 weeks accomplished in 3 modules.

0. SIWES I : (3 Units) 9 weeks during long vacation at the end of 200-Level session
1. SIWES II : (4 Units) 12 weeks during the long vacation at the end of the 300-Level
2. SIWES III: (8 Units) 24 weeks from second semester of 400-Level to the beginning of the following session.

SIWES is an important aspect of the education and training of engineering students in the universities organised for exposure to some elements of industrial art as articulated below under the Students Industrial Work Experience Scheme (SIWES) and the Technical Support Unit (TSU). This is being emphasised herein in view of the rather poor handling of SIWES, in particular, in most existing faculties of engineering and technology in the country. It should be noted that Industrial Training as a course involves the following: working successfully in the industry or an industrial setting for the specified period; submitting of a Work Report to the Industrial Training Coordinating Centre at the end of the training period; and presentation of seminar on the industrial training experience.

Faculties of Engineering in universities are expected to organise Students Industrial Work Experience Scheme (SIWES) or what most commonly refer to as Industrial Training. Universities are expected to establish a Unit to coordinate SIWES not only for engineering programmes, but also programmes in other faculties that have SIWES component. The SIWES Unit is to shoulder the following responsibilities: soliciting co-operative placements (jobs) in business, industry, government or service agencies depending upon the needs and qualifications of the student, and placing students on such training assignments after analysing the technical contents; need to establish firm strategy to ensure students get placements and options when they cannot get places; coordinating and supervising the cooperative employment of students in such a way that students have the opportunity of learning useful engineering and technological skills on real jobs and under actual working conditions; conducting follow-up activities regarding all placements by checking regularly each student's job performance through company visits and individual student's interview; assembling individual inventory records of students and employers for the purposes of placements and supervision in addition to maintaining functional departmental and personal records and reports; providing necessary advice to students as to the relevance of their chosen field to the industrial requirements of the country; organizing and conducting students' seminars on Work Reports; and Liaison with NUC, ITF, other agencies and industries on student industrial training programme of the University.

All the 15 experiential units of SIWES will be credited towards the overall assessment for graduation/award of the degree. The Grading template for SIWES will be:

SIWES Supervision Continuous Assessment (from Industry)	25%
SIWES Supervision/Log Book Grading (by University Supervisor)	25%
SIWES Comprehensive Report	25%
Seminar: Oral presentation (defense) of SIWES activity	25%

(i) and (ii) will be scored for each SIWES upon completion and the weighted average for each student computed. However, the consolidated report for all industrial experience will be submitted for seminar and assessment at the end of the 400-level SIWES. The overall grade will then be collated with the 400-level CGPA. This scoring system requires hard work, and adequate funding to sustain the interest of lecturers and industry supervisors, whose capacity must also be enhanced through industry and reverse immersion programmes respectively.

The Committee of Deans of Engineering and Technology (CODET) is assigned the statutory role of leading the coordination and mobilization of resources, infrastructure and the triplehelix partnership for ensuring effective SIWES, while all engineering and technology departments prioritize SIWES assignments with utmost dedication. The triple-helix partnership will involve the following MDAs and Stakeholders: (i) Federal Ministry of Education, (ii) Federal Ministry of Science and Technology, (iii) Federal Ministry of Investment, Trade and Industry, (iv) Federal Ministry of Finance and FIRS, (v) Industrial Training Fund (ITF), (vi) NUC, (vii) NBTE, (viii) TETFund, (ix) COREN and NSE, (x) Nigerian Content Board, (xi) SMEDAN, (xii) MAN, (xiii) NESG, (xiv) Chambers of Commerce and Industry, (xv) Vice Chancellors and Councils of Universities, (xvi) Committee of Vice Chancellors (CVC) and Pro-chancellors (CPC), and others as the prevailing context demands.

2.9.4 Reverse Exchange Programmes

There will be well organized and remunerated industry immersion exchange programmes for university staff during the vacations and industrial training periods. Similarly, there must be a reverse immersion period for industry staff, as academic associates/senior associates engaged in teaching and practical assignments in universities. CODET to propose appropriate funding guidance for this scheme. CODET should also collate and document innovations and other Intellectual Property Products (IPPs) that emerge from these novel initiatives.

2.9.5 Industrial Parks and Tech Incubation Centers

Universities that offer engineering and technology courses are encouraged to establish Industrial Parks, Innovation hubs and Tech Incubation Centers. The Federal Government and relevant MDAs should facilitate the establishment of 6 regional Industrial Parks and Tech Incubation Centres to be located in partnership with a university in each of the 6 geo-political zones for a start and ultimately in each state.

These parks shall be, to a large extent, private sector driven and only facilitated by government to limit bureaucracy. Government should provide detailed incentives for companies that establish within the Industrial Parks and Tech Incubation Centres, such as tax rebate, tax moratorium for a few years of establishment and operation.

2.9.6 Maintenance of Curricula Relevance

Using the CCMAS as guide, the curriculum in each discipline shall be reviewed from time to time to determine the continued relevance and fitness for purpose. The NUC, in its role as the national quality assurance agency on university programmes, shall subject the CCMAS statements for review periodically.

It is recommended that universities review their programme, at least once in five years, using the current quality assurance CCMAS statements. Unless otherwise essential for particular programmes, all engineering and technology programmes in a university should be reviewed at the same time. Indeed, because even engineering and technology students normally take their 100 and 200 level courses in science, and their special electives in the humanities, it would be expedient if all courses in the University are reviewed at the same time. A committee of staff, senior enough and competent to carry out an effective review shall do each curriculum review. The review shall include an assessment as to whether the goals and objectives of the programme as formulated are still relevant in dynamic professional and social contexts. Reviews shall endeavour to incorporate the opinions of relevant stakeholders such as students, staff, external examiners, employers, professional bodies, policy makers etc.

Each curriculum so revised shall be subjected to consideration and approval at the levels of Department, Faculty/Colleges, and Senate in the University. Specifically, a good review should examine the curriculum and resources in accordance with the following criteria:

1. Re-assessment/re-formulation of goals and objectives as well as the Learning Outcomes for the programme in relation to the needs of the learners and the market requirements taking into account the broader aspects of the discipline.
2. The market demands of the graduates now and in the future, in terms of skills needed to function as competitive professionals in the current labour market on a global scale.
3. Relevance of the current content in terms of knowledge, skills and attitudes being taught/developed and how these meet the needs of the present and future requirements of the clientele.
4. How the teaching and learning methods meet or fall short of current and future standards of comparable programmes.
5. The quality of teaching and learning material used.

6. Outcomes of learning in terms of success, experience of learners (pass rate, knowledge and skills acquisition, professional capability and integrity) as contributed by the programme.
7. The views of employers and community members on the quality and relevance of the curriculum.

2.9.7 Performance Evaluation Criteria

The accreditation of the Engineering and Technology degree programme means a system of recognising educational institutions (universities and programmes offered by them) for a level of performance, integrity and quality which entitles them to the confidence of the educational and professional community, the public they serve, and employers of labour and services.

The objectives of the accreditation exercise are to:

1. ensure that at least the provisions of the minimum academic benchmark statements are attained, maintained and enhanced;
2. assure employers and other members of the community that graduates of these institutions have attained an acceptable level of competence in their areas of specialization; and
3. certify to the international community that the programmes offered in these universities are of high standards and that their graduates are adequate for employment and for further studies.

CIVIL ENGINEERING DEGREE PROGRAMME

3.1 COMMON ENGINEERING COURSES

In the first two years, all students in the Faculty of Engineering shall take common courses. The 200 level courses are foundation Engineering courses designed to expose students to the fundamentals of the Engineering discipline in a broad sense. Students can take 3-4 credits as electives from their programme of study. It is believed that exposing engineering students to the various aspects of the discipline in the first two years of their study, equips them with enough knowledge to determine their inclinations in terms of specialization at a later stage. This view is further strengthened by the fact that an appreciable number of Engineering students have rural backgrounds which limit their perception of Engineering and the sub-disciplines therein. It is believed that after the second year, the wide Engineering horizon would have been sufficiently illuminated for such students, who are now better placed, to make a choice. In addition, a broad-based programme at these foundation levels becomes an asset to its beneficiaries in the future when they are invariably required to play managerial, supervisory and/or executive roles in Engineering areas that may not be strictly their areas of specialization. The general courses to be offered by the students in the Faculty of Engineering during their 100 and 200 Levels are presented below and subsequently followed by a presentation of courses to be taken for the Civil Engineering programme from 300 Level to 500 Level followed by the detailed course descriptions.

Table 9: First Semester 100 level Courses

Course Code	Course Title	Units	Status	LH	PH
GST 111	Communication in English	2	C	15	45
CHM 101	General Chemistry I	2	C	30	
CHM 107	General Practical Chemistry I	1	C	-	45
GET 101	Engineer in Society	1	C	15	-
MTH 101	Elementary Mathematics I	2	C	30	-
PHY 101	General Physics I	2	C	30	-
PHY 107	General Practical Physics I	1	C	-	45
CEE101	Introduction to Civil Engineering	2	C	30	-
EDSU-MTH 103	Vector and coordinate Geometry	3	C	45	-
Total units		**16**			

Table 10: Second Semester 100 level Courses

Course Code	Course Title	Units	Status	LH	PH
GST 112	Nigerian Peoples and Culture	2	C	30	-
GET 102	Engineering Graphics and Solid Modelling I	2	C	15	45
MTH 102	Elementary Mathematics II	2	C	30	-
PHY 102	General Physics II	2	C	30	-
PHY 108	General Practical Physics II	1	C	-	45
CHM 102	General Chemistry II	2	C	30	
CHM 108	General Chemistry Practical II	1	C	-	45
EDSU-MTH 102	Probability and Statistics	3	C	45	-
EDSU-PHY104	Electricity and Magnetism	2	C	30	-
EDSU-GET 199	SWEP	0	C	-	60
Total		**17**			

Table 11: First Semester 200 level Courses

Course Code	Course Title	Units	Status	LH	PH
ENT 211	Entrepreneurship and Innovation	2	C	30	-
GET 201	Applied Electricity I	3	C	45	-
GET 205	Fundamentals of Fluid Mechanics	3	C	45	-
GET 209	Engineering Mathematics I	3	C	45	-
GET 211	Computing and Software Engineering	3	C	30	45
CEE 201	Civil Engineering Drawing	2	E	30	45
EDSU-CEE 203	Elements of Architecture and Studio Design	2	C	30	45
Total		**16**			

Table 12: Second Semester 200 level Courses

Course Code	Course Title	Units	Status	LH	PH
GST 212	Philosophy, Logic and Human Existence	2	C	30	-
GET 202	Engineering Materials	3	C	45	
GET 204	Students Workshop Practice	2	C	15	45
GET 206	Fundamentals of Thermodynamics	3	C	45	-
GET 208	Strength of Materials	3	C	45	-
GET 210	Engineering Mathematics II	3	C	45	-
EDSU-CEE 202	Basic Civil Engineering Workshop	2	C	15	45
Total		**18**			

Table 13: First Semester 300 level Courses

Course Code	Course Title	Units	Status	LH	PH
GET 301	Engineering Mathematics III	3	C	45	-
GET 305	Engineering Statistics and Data Analytics	3	C	45	-
GET 307	Introduction to Artificial Intelligence, Machine Learning and Convergent Technologies	3	C	45	-
CEE 301	Fluid Mechanics	3	C	30	45
CEE 303	Engineering Geology	2	E	15	45
CEE 307	Structural Mechanics I	2	E	30	-
EDSU-CEE 309	Introduction to Soil Engineering	2	C	30	45
Total		**16**			

Table 14: Second Semester 300 level Courses

Course Code	Course Title	Units	Status	LH	PH
ENT 312	Venture Creation	2	C	15	30
GST 312	Peace and Conflict Resolution	2	C	30	-
GET 302	Engineering Mathematics IV	3	C	45	-
GET 304	Engineering Communication, Technical Writing and Presentation	3	C	45	-
GET 306	Renewable Energy Systems and Technology	3	C	45	-
CEE 302	Strength of Structural Materials	2	C	30	45
CEE 304	Civil Engineering materials	3	E	30	45
CEE 308	Engineering Surveying and Photogrammetry I	2	C	15	45
EDSU-CEE 310	Introduction to Coastal Engineering	3	E	30	45
EDSU-CEE 312	Design of Reinforced Concrete Structures I	2	C	30	-
EDSU-ENT 321	Practical Entrepreneurial Skills	1	C	-	30
Total		**23**			

Table 15: First Semester 400 level Courses

Course Code	Course Title	Units	Status	LH	PH
EDSU-CEE 401	Professional Practice and Contract Administration	2	C	30	-
EDSU-CEE 402	Introduction to Bioremediation	3	E	30	45
EDSU-CEE 403	Engineering Hydrology	2	C	30	45
EDSU-CEE 405	Structural Engineering Mechanics II	2	C	30	-
EDSU-CEE 407	Geotechnical Engineering I	2	C	30	45

EDSU-CEE 409	Highway and Transportation Engineering I	2	C	30	45
EDSU-CEE 411	Civil Engineering Design studio	2	C	30	90
Total		**15**			

Table 16: Second Semester 400 level Courses

Course Code	Course Title	Units	Status	LH	PH
CEE 406	Engineering Surveying and Photogrammetry II	3	E	15	45
*GET 299	SIWES I: Students Work Experience Scheme	3	C	9 Weeks	
*GET 399	SIWES II: Students Work Experience Scheme	4	C	12 Weeks	
*GEE 499	SIWES III	8	C	24 Weeks	
Total		**18**			

Table 17: First Semester 500 level Courses

Course Code	Course Title	Units	Status	LH	PH
GET 501	Engineering Project Management	3	C	45	-
EDSU-CEE 501	Structural Engineering Mechanics III	2	C	30	-
EDSU-CEE 503	Design of Reinforced Concrete Structures II	2	C	30	-
EDSU-CEE 505	Geotechnical Engineering II	2	C	30	45
EDSU-CEE 507	Water Resources Engineering	2	C	30	45
EDSU-CEE 509	Structural Steel Design	2	C	30	-
ELECTIVE COURSES					
EDSU-CEE 511	Demolition, concrete repair and Rock	2	E	15	-

	blasting				
EDSU-CEE 513	Environmental Engineering	2	E	30	-
EDSU-CEE 515	Advanced Structural Mechanics	2	E	30	-
Total		**15**			

Table 18: Second Semester 500 level Courses

Course Code	**Course Title**	**Units**	**Status**	**LH**	**PH**
GET 502	Engineering Law	2	C	30	-
EDSU-CEE 502	Analysis & Design of Timber Structures	2	C	30	-
EDSU-CEE 504	Highway and Transportation Engineering II	2	C	30	45
EDSU-CEE 506	Structural Engineering	2	C	30	-
EDSU-CEE 516	Flood & Stormwater Control	2	C	30	45
CEE 599	Project	6	C	-	270
ELECTIVE COURSES					
CEE 506	Construction Engineering	3	E	30	45
EDSU-CEE 510	Reliability of Structures	3	E	15	-
EDSU-CEE 514	Dam & Irrigation Engineering	3	E	30	-
Total		**19**			

3.2 DETAILED COURSE SYNOPSES

3.2.1 100 Level First Semester Course Description

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

Learning Outcomes

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

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

Course Contents

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

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

Learning Outcomes

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

1. define atom, molecules and chemical reactions;
2. discuss the modern electronic theory of atoms;

3. write electronic configurations of elements on the periodic table;
4. rationalise the trends of atomic radii, ionisation energies, electronegativity of the elements, based on their position in the periodic table;
5. identify and balance oxidation–reduction equation and solve redox titration problems;
6. draw shapes of simple molecules and hybridised orbitals;
7. identify the characteristics of acids, bases and salts, and solve problems based on their quantitative relationship;
8. apply the principles of equilibrium to aqueous systems using LeChatelier's principle to predict the effect of concentration, pressure and temperature changes on equilibrium mixtures;
9. analyse and perform calculations with the thermodynamic functions, enthalpy, entropy and free energy; and
10. determine rates of reactions and its dependence on concentration, time and temperature.

Course Contents

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

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

Learning Outcomes

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

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

Course Contents

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

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

Learning Outcomes

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

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

Course Contents

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

EDSU-MTH 103 Vector and Coordinate Geometry [3 units, CORE: LH 45]

Senate-approved relevance

This course will help to develop knowledge, skills including transferable skills, such as leadership, motivation, time management, prioritization, delegation, listening, communication, analytics and understanding of the mathematics, science and engineering required for analyzing and solving problems in civil engineering and related disciplines so that our graduates will be equipped to enter into self-employment and employment as professional engineers. This in line with the vision and mission of EDSU.

Course Overview

Vector algebra is one of the essential topics of algebra. It studies the algebra of vector quantities. As we know, there are two types of physical quantities, **scalars and vectors**. The scalar quantity has only magnitude, whereas the vector quantity has both magnitude and direction.

Vector Algebra significant subject in Mathematics where we use universal symbols or letters to signify the quantities, numbers and variables. These symbols are later used in many expressions, equations and formulae, to perform algebraic operations. It has many branches. In essence, vector algebra is an algebra where the essential elements usually denote vectors. We perform algebraic operations on vectors and vector spaces.

In coordinate geometry, graphs and coordinates are used to find information about different geometric figures. A definition of coordinate geometry must include a description of the coordinate plane. The coordinate plane, also called the coordinate graph, is a grid system created by the intersection of two number lines, called axes. The horizontal number line is the *x*-axis, and the vertical number line is the *y*-axis. These axes intersect at a point called the origin.

The location of a point on the coordinate plane is indicated by its coordinates, which are shown in parentheses and separated by a comma. The first coordinate is the *x*-coordinate, which represents the point's horizontal distance away from the vertical axis. The second coordinate is the *y*-coordinate, which represents the point's vertical distance away from the horizontal axis.

Objectives

The objectives of the course are to:

1. describe the concept of vectors: addition, subtraction, and multiplication by a scalar;
2. familiarize the students with algebraic operations on vectors;
3. state whether two vectors are equivalent;
4. identify collinear vectors;
5. draw vectors with initial and terminal points;
6. describe the concepts of coordinate geometry;
7. show the principles of the equations of circle, parabola, hyperbola and ellipse;
8. outline the concepts of curves, arc length, divergence and curl of a vector field and line integral.

Learning Outcome

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

1. perform geometric operations on vectors: addition, subtraction, and multiplication by a scalar.

2. perform algebraic operations on vectors: addition, subtraction, and multiplication by a scalar.

3. determine whether two vectors are equivalent.

4. determine whether two vectors are collinear.

5. sketch vectors whose initial and terminal points are given in 2-space.

6. apply the concept of two-dimensional coordinate geometry

7. solve problems in circle, parabola, hyperbola and ellipse.

8. solve problems in curves, arc length, divergence and curl of a vector field and line integral.

COURSE CONTENT

Geometric representation of vectors in 1-3 dimensions. Vector and Scalar Functions and Their Fields. Components and direction cosines. Addition of vectors. Multiplication of vectors. Linear independence. Derivatives of Vector Functions. Gradient of a Scalar Field. Scalar and vector products of two vectors. Differentiation of vectors. Integration of vectors with respect to a scalar variable. Two-dimensional coordinate geometry. Straight lines. Equation of circles. Equation of a parabola. Equation of an ellipse. Equation of hyperbola. Curves. Arc Length. Directional Derivative. Divergence and Curl of a Vector Field. Line Integrals. Path Independence of Line Integrals.

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

Learning Outcomes

On completion, the students should be able to:

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

Course Contents

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

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

Learning Outcomes

On completion, the student should be able to:

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

Course Contents

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

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

Learning Outcomes

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

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

Course Contents

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

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

Learning Outcomes

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

1. explain the profession of civil engineering and
2. explain the roles played by civil engineers.
3. describe the different specialization/branches in Civil Engineering
4. Explain the break-throughs and opportunities in Civil Engineering

Course Contents

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

3.2.2 100 Level Second Semester Course Description

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

Learning Outcomes

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

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

Course Contents

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

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

Learning Outcomes

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

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

8. describe basic properties of transition metals.

Course Contents

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

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

Learning Outcomes

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

1. state the general laboratory rules and safety procedures;
2. collect scientific data and correctly carry out chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. identify and carry out preliminary tests which include ignition, boiling point, melting point, test on known and unknown organic compounds;

5. carry out solubility tests on known and unknown organic compounds;
6. carry out elemental tests on known and unknown compounds; and
7. carry out functional group/confirmatory test on known and unknown compounds which could be acidic/basic/ neutral organic compounds.

Course Contents

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

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

Learning Outcomes

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

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

Course Contents

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

EDSU-CEE 102 Probability and Statistics [3 units, CORE: LH 45]

Senate – approved relevance

The training of high-quality graduates who are highly skilled in the design and analysis of structures, evaluation, planning and creative design abilities in various ways that can contribute to the development of a more satisfying life and environment for the benefit of mankind, in Nigeria and the world at large is of great importance to EDSU.

This is necessary to produce a role model, self – reliant and excellent civil engineers with adequate technical skills, fundamental concepts relevant to latest development, entrepreneurial competences, a sense of public responsibility, communication skills and management skills to handle national and international issues in civil engineering, probability and statistics plays a vital role in equipping the students with critical thinking and analytical abilities for such immediate and future tasks.

Course Overview

Probability involves the numerical descriptions of how likely an event is to occur, or how likely it is that a proposition is true. The knowledge of probability is applicable in the area of risk quantification or uncertainty measurement associated with civil infrastructures. Its helps in making decisions that are proximate to the idea outcome. Statistics is the science that involves the collection, organizing, analyzing, and interpretation of data in order to make decisions. Statistics is a vital tool for robust analysis, measurement system, error analysis, test data analysis, probabilistic risk assessment, etc, in Civil Engineering and other engineering fields.

This course will equip the students during their study and afterwards, in the aspect of design of experiment (DOE) by applying statistical methods in testing and constructing models for civil engineering elements and structures, quality control, reliability analysis of civil infrastructures, probabilistic design of structures and formulation of predictive models etc. This helps in proper design, quantification of risks, and ascertaining the integrity of existing civil infrastructures, thus mitigating the incidence of structural collapse in Nigeria.

Objectives

The objectives of the course are to:

1. state the principles of probability
2. identify the difference between deterministic and statistical (Stochastic) models
3. outline the differences that exist among: binomial distribution, normal distribution, geometric distributions, Poisson distribution, negative binomial distributions and exponential distribution
4. define reliability function and state the relation mathematically.

5. define statistics, types and its importance to the engineering industries;
6. explain the concepts of location and dispersion of ungrouped and grouped data;
7. plot statistical data using table and graph;
8. derive the regression line on a given set of data;
9. appreciate the set theory and combinatorial analysis in statistical events.

Learning Outcome

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

1. appraise the principles of probability in engineering analysis;
2. differentiate between deterministic and statistical (Stochastic) models;
3. perform analysis on a given set of data on: binomial distribution, normal distribution, geometric distributions, Poisson distribution, negative binomial distributions and exponential distribution;
4. apply the reliability function to solving problems;
5. illustrate the importance of statistics to life sciences;
6. compute the location and dispersion using ungrouped and grouped data
7. analyze statistical date using table and graph;
8. apply the regression line equation on a given set of data;
9. analyze statistical data using set – theory and combinatorial methods.

COURSE CONTENT

Elementary principles of probability. Deterministic and Statistical (Stochastic) Models. Elements of probability distribution. Binomial Distribution, Normal Distribution. Geometric Distributions. Poisson distribution. Negative Binomial Distributions. Exponential Distribution. Reliability function. Definition of statistics. Application of statistics in Civil Engineering. Types of statistics (*Descriptive statistics and inferential statistics).* Statistical data(their sources). Measurement of location in ungroup and group data. Measure of dispersion in ungroup and group data. Presentation and analysis of data by table and graphs. Regression analysis. Correlation. Analysis of variable. Generation of statistical events from set-theory and combinatorial analysis.

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

Learning Outcomes

On completion, the students should be able to:

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

Course Contents

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

EDSU-PHY 104 Electricity and Magnetism [2 units, CORE: LH 30]

Senate-approved relevance

This course will help to develop knowledge, skills including transferable skills, such as leadership, motivation, time management, prioritization, delegation, listening, communication, analytics and understanding of the mathematics, science and engineering required for analyzing and solving problems related to civil engineering and related disciplines so that our graduates will be equipped to enter into self-employment and employment as professional engineers. This in line with the vision and mission of EDSU.

Course Overview

Electricity is the phenomenon associated with either stationary or moving electric charges. The source of the electric charge could be an elementary particle, an electron (which has a negative

charge), a proton (which has a positive charge), an ion, or any larger body that has an imbalance of positive and negative charge. Positive and negative charges attract each other (e.g., protons are attracted to electrons), while like charges repel each other (e.g., protons repel other protons and electrons repel other electrons).

Familiar examples of electricity include lightning, electrical current from an outlet or battery, and static electricity. Common SI units of electricity include the ampere (A) for current, coulomb (C) for electric charge, volt (V) for potential difference, ohm (Ω) for resistance, and watt (W) for power. A stationary point charge has an electric field, but if the charge is set in motion, it also generates a magnetic field.

Magnetism on the other hand is defined as the physical phenomenon produced by moving electric charge. Also, a magnetic field can induce charged particles to move, producing an electric current. An electromagnetic wave (such as light) has both an electric and magnetic component. The two components of the wave travel in the same direction, but oriented at a right angle (90 degrees) to one another.

Like electricity, magnetism produces attraction and repulsion between objects. While electricity is based on positive and negative charges, there are no known magnetic monopoles. Any magnetic particle or object has a "north" and "south" pole, with the directions based on the orientation of the Earth's magnetic field. Like poles of a magnet repel each other (e.g., north repels north), while opposite poles attract one another (north and south attract). This course will give the students the basic knowledge of applied Electricity in 200 level.

Objectives

The objectives of the course are to:

1. define electrostatics, electric field and the state the Coulomb's law;
2. explain the concept of electric current and state the ohm's law;
3. describe a simple circuit and state the Kirchoff's law;
4. define the capacitance of a capacitor and derive its equation;
5. draw the magnetic field around magnet, define magnetic field and electromagnet force;
6. explain the concept of atomic models;
7. list the composition of the nucleus;

Learning Outcome

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

1. apply the coulomb's law electrostatics to real life problem;
2. calculate electric current, voltage, resistance by the application of ohm's law;
3. estimate current or voltage in a simple circuit using the Kirchoff's law;
4. determine the capacitance of a capacitor of a given circuit;
5. demonstrate the law of electromagnetic induction;
6. appraise the atomic models, quantum theory, wave particle duality of matter;
7. annotate and label the structure and the composition of the nucleus.

COURSE CONTENT

Electrostatics. Coulomb's Law of electrostatics. Electric Field. Conductors. Electric Current. Ohm's Law and application. Simple Circuit. Kirchhoff's Laws and application. Capacitor and Capacitance. Magnetic Field and Induction. Electromagnetic Forces and their Effects. Maxwell's Laws. Atomic Structure. Models and Theory. X-Rays and application. Planck's Quantum Theory. Wave particle duality of matter. Structure and Composition of Nucleus.

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

Learning Outcomes

On completion, the student should be able to:

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

Course Contents

This practical course is a continuation of PHY 107 and is intended to be taught during the second semester of the 100 level to cover the practical aspect of the theoretical courses that have been covered with emphasis on quantitative measurements, the treatment of measurement errors, and graphical analysis. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis and deduction.

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

Learning Outcomes

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

1. have a good grasp of design thinking and be obsessed with the determination to apply such to solving simple everyday and also complex problems;
2. recognize the fundamental concepts of engineering drawing and graphics;
3. show skills to represent the world of engineering objects in actionable solid models, and put such models in a form where they can be inputs for simulation and analyses;
4. analyze such models for strength and cost;
5. prepare the objects for modern production and manufacturing techniques of additive and subtractive manufacturing;
6. recognize that engineering is multidisciplinary in the sense that mechanical, electrical and other parts of physical structures are modelled in context as opposed to the analytical nature of the courses they take; and
7. analyze and master the basics of mechanical and thermal loads in engineering systems.

Course Contents

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

EDSU-GET 199: Student's Work Experience Programme (SWEP) (0 Unit)

It is eight-week duration activities. During long vacation, students are engaged in practical engineering activities within the university environment to introduce them to some basic workshop practice and what they are likely to experience in higher levels. The activities are organized by technical staff under the supervision of academic staff.

3.2.3 200 Level First Semester Course Description

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

Learning Outcomes

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

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

Course Contents

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

GET 201: Applied Electricity I (3 Units C: LH 30; PH 45)

Learning Outcomes

Students will be able to:

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

Course contents

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

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

Learning Outcomes

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

1. explain the properties of fluids;
2. determine forces in static fluids and fluids in motion;
3. determine whether a floating body will be stable;
4. determine the effect of various instruments, (valves, orifices, bends and elbows) on fluid flow in pipes;
5. measure flow parameters with venturi meters, orifice meters, weirs, etc;
6. perform calculations based on principles of mass, momentum and energy conservation;
7. perform dimensional analysis and simple fluid modelling problems; and
8. specify the type and capacity of pumps and turbines for engineering applications.

Course Contents

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

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

Learning Outcomes

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

1. solve qualitative problems based on vector and matrix analyses such as linear independence and dependence of vectors, rank etc;
2. describe the concepts of limit theory and nth order differential equations and their applications to physical phenomena;
3. solve the problems of differentiation of functions of two variables and know about the maximization and minimization of functions of several variables;
4. describe the applications of double and triple integration in finding the area and volume of engineering solids, and explain the qualitative applications of Gauss, Stoke's and Green's theorem;
5. explain ordinary differential equations and applications, and develop a mathematical model of linear differential equations, as well as appreciate the necessary and sufficient conditions for total differential equations; and
6. analyze basic engineering models through partial differential equations such as wave equation, heat conduction equation, etc., as well as fourier series, initial conditions and its applications to different engineering processes

Course Contents

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

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

Learning Outcomes

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

1. describe and apply computing, software engineering knowledge, best practices, and standards appropriate for complex engineering software systems;
2. develop competence in designing, evaluating, and adapting software processes and software development tools to meet the needs of an advanced development project through practical

object-oriented programming exposure taught in concrete terms with a specific modern language – preferable selected from Python, Java or C++;
3. use widely available libraries to prepare them for machine learning, graphics and design simulations;
4. develop skills in eliciting user needs and designing an effective software solution;
5. recognise human, security, social, and entrepreneurial issues and responsibilities relevant to engineering software and the digitalisation of services; and
6. acquire capabilities that can further be developed to make them productively employable by means of short Internet courses in specific areas;

Course Contents

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

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

Learning Outcomes

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

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

Course Contents

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

EDSU-CEE 203 Architecture and Studio Design [2 units, ELECTIVE: LH 30, PH 45]

Senate – approved relevance

Training high quality graduates who are highly skilled in the design and analysis of structures, evaluation, planning and creative design abilities in various ways that can contribute to the development of a more satisfying life and environment for the benefit of mankind, in Nigeria and the world at large is of great importance to EDSU.

This is necessary to produce a role model, self – reliant and excellent civil engineers with adequate technical skills, fundamental concepts relevant to latest development, entrepreneurial competences, a sense of public responsibility, communication skills and management skills to handle national and international issues in civil engineering with respect to architectural designs and interpretations.

Course Overview

This course deals generally with the elements and principles of architectural design coupled with some of the software used for both architectural design and structural detailing will aid the students in design studies. The knowledge of Engineering Graphics and solid modeling **(GET 102)** is required in this course.

Architecture as the "art of building" has its own language. In order to read and write in a language you(students) should first know the letters, words and the grammar of that language. Same applies here. In order to learn architecture, the students have to learn its letters, its vocabulary (or basic elements) and the grammar (composition principles) that brings them together. Once you learn these fundamental components, you can read and write anything in architecture. This course will introduce the students to the basic elements of form and space and shows how they are manipulated and organized in the development of a design concept using any of the architectural design software(s). The knowledge the students will acquire from the course will be useful in designing Civil infrastructures will be a great boast in terms of infrastructural development in Nigeria as emerging nations.

Objectives

The objectives of the course are to:

1. describe the concept "architecture", its fundamentals and scope
2. describe the concept of dimensioning and its elements and rules coupled with its application to different drawings.
3. relate the concept of graphical communication with respect to architecture
4. outline the importance of Freehand sketching and demonstrate Oblique and isometric sketching.
5. describe the different Elements of design
6. reproduce architectural design and structural detailing of structural elements using AUTOCAD software
7. reproduce existing designs using Use ARCHICAD 3D Home deluxe software
8. demonstrate the use of AUTOSLIP, BEAMAX, StaadPro for design purposes.

Learning Outcome

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

1. apply the concept of "architecture", its fundamentals and scope to Civil engineering field;
2. illustrate the different elements of dimension and apply dimensions to real life drawings putting dimension rules into consideration;
3. interpret graphical communication in relation to architecture;
4. annotate freehand sketching and demonstrate Oblique and isometric sketching;
5. distinguish the different Elements of design;
6. evaluate the use of AUTOCAD software in carrying out a given architectural design of structures and structural detailing of the structural elements in the structure;
7. create an architectural design using ARCHICAD 3D Home deluxe software;
8. detail beam elements using AUTOSLIP, BEAMAX, StaadPro for design purposes.

COURSE CONTENT

Introduction and origin of Architecture. Dimensional awareness. Architectural Production and Creativity. Forms of Architecture. Graphical communication relation to environments. Free hand drawing. Form in terms of shades. light shadow. Common Curves. Orthographics. Dimetrics. perspective projections. Introduction to ARCHICAD Home deluxe. AUTOCAD drafting. AUTOLISP. BEAMAX. StaadPRO. Applications and elementary Designs using ARCHICAD. Home deluxe Package.

Minimum Academic Standard: Engineering drawing studio and Engineering simulation Laboratory with a NUC-MAS requirement.

3.2.4 200 Level Second Semester Course Description

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

Learning Outcomes

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

1. know the basic features of philosophy as an academic discipline;
2. identify the main branches of philosophy & the centrality of logic in philosophical discourse;
3. know the elementary rules of reasoning;
4. distinguish between valid and invalid arguments;
5. think critically and assess arguments in texts, conversations and day-to-day discussions;
6. critically asses the rationality or otherwise of human conduct under different existential conditions;
7. develop the capacity to extrapolate and deploy expertise in logic to other areas of knowledge, and
8. guide his or her actions, using the knowledge and expertise acquired in philosophy and logic.

Course Contents

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

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

Learning Outcomes

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

1. define metals, alloys and metalloids, demonstrate mental picture of the solid mineral resources development as a relay race among four 'athletes': geologist, mining engineer, mineral processing technologist, process metallurgical engineer, and classify metallurgical engineering into 3Ps: process, physical and production;

2. demonstrate the role of atoms and molecules (aggregates of atoms) in the building of solid/condensed matter known as engineering materials, the electrons quantum numbers and how the electrons are arranged in different atomic elements, and explain the role of electronic configuration and valence electrons in bonding;
3. explain the relationship between structure and properties of materials, characteristics, components and compositions of phase diagrams and phase transformations of solid solutions;
4. define ceramics, glass and constituents of glasses and understand application of ceramics in mining, building, art and craft industries;
5. define and classify polymers as a class of engineering materials and polymeric materials, demonstrate polymerisation reactions, their types and mechanism, and applications of polymers;
6. define properties, types and application of composite materials and fibres (synthetic and natural);
7. define and classify nanomaterials, demonstrate applications of nanomaterials, concept, design and classification of fracture mechanics, corrosion classification, including the five principal ways of controlling corrosion and metal finishing processes such as sherardizing, galvanizing and anodizing; and
8. identify factors affecting the performance and service life of engineering materials/metals and metallography of metals/materials (materials anatomy), which enables metallurgical and materials engineers to prescribe appropriate solutions to test metals/materials fitness in service through structure-property-application relationships.

Course Contents

Basic material science; atomic structure, atomic bonding and crystal structures. Engineering materials situating metals and alloys; metals and alloys, classifications of metals, metal extraction processes using iron and steel (ferrous) and aluminium (nonferrous) as examples, phase diagrams/iron carbon diagrams, and mechanical workings of metals. Selection and applications of metals and alloys for specific applications in oil, aerospace, construction, manufacturing and transportation industries, among others. Ceramics (including glass); definition, properties, structure and classifications of ceramics. Bioactive and glass – ceramics. Toughing mechanism for ceramics. Polymers; definition of polymers as engineering materials, chemistry of polymeric materials, polymer crystallization, polymer degradation and aging. Thermoplastic and thermosetting polymers and concepts of copolymers and homopolymers. Composites; definition, classification, characterization, properties and composite. Applications of composites. Nanomaterials; definition, classification and applications of

nanomaterials as emerging technology. Processing of nanomaterials including mechanical grinding, wet chemical synthesis, gas phase synthesis, sputtered plasma processing, microwave plasma processing and laser ablation. Integrity assessment of engineering materials; effect of engineering design, engineering materials processing, selection, manufacturing and assembling on the performance and service life of engineering materials. Metallography and fractography of materials. Mechanical testing (destructive testing) of materials such as compressive test, tensile test, hardness test, impact test, endurance limit and fatigue test. Non-destructive test (NDT) such as dye penetrant, x-ray and eddy current.

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

Learning Outcomes

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

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

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

Course Contents

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

soldering). Heat treatment. Material removal processes. machine tools and classification. Simple theory of metal cutting. Tool action and cutting forces. Introduction to CNC machines.
Supervised identification, use and care of various electrical and electronic components such as resistors, inductors, capacitors, diodes and transistors. Exposure to different electric circuits, wiring schemes, analogue and digital electrical and electronic measurements. Household and industrial energy consumption measurements. Practical energy conservation principles.

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

Learning Outcomes

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

1. describe basic concepts of thermodynamics, quantitative relations of Zeroth, first, second and third laws;
2. define and explain system (surrounding, closed and open system), control volume and control mass, extensive and intensive properties;
3. calculate absolute and gage pressure, and absolute temperature, calculate changes in kinetic, potential, enthalpy and internal energy;
4. evaluate the properties of pure substances i.e. evaluate the state of the pure substances such as compressed liquid, saturated liquid-vapour mixture and superheated vapour using property diagrams and tables; arrange the ideal and real gas equations of state,
5. formulate the first law of thermodynamics for a closed system i.e. organize the change in energy in the closed systems via heat and work transfer;
6. distinguish heat transfer by conduction, convection and radiation, and calculate the amount of heat energy transferred;
7. calculate the changes in moving boundary work, spring work, electrical work and shaft work in closed systems;
8. apply the first law of thermodynamics for closed systems and construct conservation of mass and energy equations;
9. formulate the first law of thermodynamics to the open systems i.e. describe steady-flow open system, apply the first law of thermodynamics to the nozzles, diffusers, turbines, compressors, throttling valves, mixing chambers, heat exchangers, pipe and duct flow;
10. construct energy and mass balance for unsteady-flow processes;
11. evaluate thermodynamic applications using second law of thermodynamics;

12. calculate thermal efficiency and coefficient of performance for heat engine, refrigerators and heat pumps; and
13. restate perpetual-motion machines, reversible and irreversible processes.

Course Contents

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

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

Learning Outcomes

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

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

Course Contents

Consideration of equilibrium; composite members, stress-strain relation. Generalised Hooke's law. Stresses and strains due to loading and temperature changes. Torsion of circular members. Shear

force, bending moments and bending stresses in beams with symmetrical and combined loadings. Stress and strain transformation equations and Mohr's circle. Elastic buckling of columns.

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

Learning Outcomes

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

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

Course Contents

Introduction to ordinary differential equations (ODEs); theory, applications, methods of solution; second order differential equations. Advanced topics in calculus (vectors and vector-valued function, line integral, multiple integral and their applications). Elementary complex analysis including functions of complex variables, limits and continuity. Derivatives, differentiation rules and differentiation of integrals. Cauchy-Riemann equation, harmonic functions, basic theory of conformal mapping, transformation and mapping and its applications to engineering problems. Special functions.

EDSU-CEE 202 Basic Civil Engineering Workshop [2 units, CORE: LH 15: PH 45]

Senate-approved relevance

This course will help to develop knowledge, skills including transferable skills, such as leadership, motivation, time management, prioritization, delegation, listening, communication, analytics and understanding, as well as awareness and "know how", in the fields of civil engineering and its related disciplines so that our graduates will be equipped to enter into self-employment and employment as professional engineers progressing on to Registered Engineer or (equivalent status) or a wide range of other professional careers. This in line with the vision and mission of EDSU.

Course Overview

Workshop practice is an important aspect of engineering practice. Safety rules and regulation are necessary to ensure seamless operation/activities in the workshop. Proper tools and equipment are essential for the effective operation of any civil works site. Equipping the construction site with the correct tools and equipment plays an essential role in achieving timely and good quality results. For every construction activity there is an optimal combination of tools, equipment and labour. Depending on the nature and content of the works, the technical staff needs to know which tools to use and how to effectively combine them with manual labour.

Once on site, equipment requires trained operators and supervisory staff who are proficient in its operation and maintenance. Faulty equipment is a common reason for delays on construction sites. A major responsibility of the project management is to ensure that tools and equipment are maintained in a good condition and are readily available when required for the various work activities. For every construction activity there is an optimum combination of equipment and labour. In order to utilize the equipment and labour in the most effective way, the use of equipment needs to be carefully coordinated with the output of the work gang.

Objectives

The objectives of the course are to:

1. describe laboratory and workshop layouts;
2. state safety rules and regulations in the workshop;
3. identify the sources of accidents and state how they can be prevented;
4. describe a safe working environment/condition;
5. list different firefighting equipment and describe their operation;
6. discuss and identify the different types of tools and equipment;
7. discuss the maintenance programme for workshop tools and Equipment;

8. discuss the precision of various tools and equipment used the workshop;
9. identify faulty tools and equipment;
10. describe different materials used in civil engineering construction;
11. explain the principle of construction;
12. discuss block making, tiling and setting out of building.

Learning Outcome

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

1. illustrate laboratory and workshop layouts;
2. apply the safety rules and regulations on a mini engineering project;
3. recognize the sources of accidents and explain how they can be prevented;
4. appraise safe working environment/condition;
5. carryout a simple firefighting operation;
6. sketch and label the different types of tools in Civil Engineering works;
7. apply the maintenance programme on tools and equipment;
8. estimate the precision of tools and equipment in Civil Engineering Laboratories;
9. fix/remedy faulty tools and equipment;
10. recognize the different materials used in civil engineering construction;
11. apply the principle of construction on given project;
12. carryout setting out, tiling works and block making.

COURSE CONTENT

Laboratory and workshop layouts. Safety rules and regulations. sources of accidents and prevention. safe working environment/conditions and ergonomics. firefighting equipment and operations. Equipment used in Civil Engineering works. Importance of tools and equipment in Civil Engineering works and research. Quality of tools. Characteristics of suitable hand tools. Tools for clearing.

Tools used for wood work Tools for earthwork. Tools for gravelling. Tools for setting out. Maintenance of tools and storage. Construction equipment. Use of construction equipment. Maintenance programme for construction equipment. Estimating equipment precision. Detecting faulty equipment. Materials used in civil engineering construction. Composition of blocks. Plastering and finishing. setting out of building. Block making and process. Tiling work. Concrete and reinforced concrete (RC). Construction principles.

Minimum Academic Standard: Engineering workshop with NUC-MAS requirement.

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

Learning Outcomes

SIWES I should provide opportunity for the students to:

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

Course Contents

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

3.2.5 300 Level First Semester Course Description

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

Learning Outcomes

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

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

Course Contents

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

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

Learning Outcomes

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

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

Course Contents

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

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

Learning Outcomes

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

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

Course Contents

Concepts of human and artificial intelligence; artificial/computational intelligence paradigms; search, logic and learning algorithms. Machine learning and nature-inspired algorithms – examples, their variants and applications to solving engineering problems; understanding natural languages; knowledge representation, knowledge elicitation, mathematical and logic foundations of AI; expert systems, automated reasoning and pattern recognition; distributed systems; data and information

security; intelligent web technologies; convergent technologies – definition, significance and engineering applications. Neural networks and deep learning. Introduction to python AI libraries.

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

Learning Outcomes

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

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

Course Contents

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

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

Learning Outcomes

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

1. describe the engineering properties of rock and soil materials;
2. identify the geological factors affecting the performance and functioning of a facility on and in the soil and/or rock;

3. conduct engineering geological investigations; and
4. explain the importance of engineering geology-related technical issues during construction.

Course Content

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

EDSU-CEE 309 Introduction to Soil Engineering [2 units, CORE: LH 30, PH 45]

Senate – approved relevance

Training high quality graduates who are highly skilled in the design and analysis of structures, evaluation, planning and creative design abilities in various ways that can contribute to the development of a more satisfying life and environment for the benefit of mankind, in Nigeria and the world at large is of great importance to EDSU.

This is necessary to produce a role model, self – reliant and excellent civil engineers with adequate technical skills, fundamental concepts relevant to latest development, entrepreneurial competences, a sense of public responsibility, communication skills and management skills to handle national and international issues in civil engineering with respect to soil mechanics. Proper knowledge of the soils(soil properties) used for construction and on which structures are built on is vital towards actualizing a safe and economical designs and construction in Nigeria and the globe in general.

Course Overview

The course is an introductory course to soil engineering mechanics (branch of science that deals with the study of the physical properties of soil and the behavior of soil masses subjected to various types of forces) and the art of Geotechnical Engineering. The aim of this course is to give knowledge and understanding of basic soil concepts and its mechanics. This course includes introduction to critical state models that enable the calculation of the deformation of a soil element for a given state of stress.

The course also deals with all occurrences that affect the response of soils in any way associated with the field of Civil engineering. Soil engineering gives vital information of the nature and the various factors that affect soils used for construction purpose, and on which constructions are being implemented. This course when fully implemented, will give knowledge of the prevention of building collapse in Nigeria through appropriate soil testing and analysis.

Objectives

The objectives of the course are to:

1. describe soil engineering mechanics
2. describe soil and its origin in relation to civil engineering
3. relate the relationships that exist between physical characteristics and mechanical properties of soils.
4. outline some experimental measurements of the physical and mechanical soil properties commonly used in engineering practice and demonstrate same in the laboratory
5. identify the criteria and schemes used in soil classification and demonstrate same on soil samples.
6. describe soil compaction and its importance in civil engineering construction involving the application of soils.
7. describe hydraulic properties of soils, capillarity and its significance, coupled with computations involving permeability of soils.

Learning Outcome

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

1. appraise soil engineering mechanics in relation Civil Engineering projects;
2. select the appropriate soil type for a specific purpose;
3. express the relationships that exist between physical characteristics and mechanical properties of soils.
4. measure the physical and mechanical soil properties commonly used in engineering practice and demonstrate them in the laboratory
5. classify soil samples using the AASHTO or USCS;
6. carryout soil compaction in the field;
7. compute permeability of different types of soils.

COURSE CONTENT

Introduction to Soil Mechanics. Origin and formation of soils. Soil deposits. Soil properties. Specific gravity analysis of soils. Atterberg's limits and indices, etc. Particle size distribution. Definitions and derivation of void ratio. Porosity. Specific gravity. unit weights/density. Degree of saturation. Weight Volume Relationships. Components of soil and phase diagram. Various unit-weight relationships. USCS soil classification system. AASHTO soil classification system. Introduction to Compaction of Soils. Hydraulic properties of soils. Capillary rise in soils. Hydraulic conductivity (k). Darcy's Law. Estimation of hydraulic conductivity. Falling head and constant head permeability test.

LABORATORY PRACTICAL: Determination of specific gravity. void ratio. Porosity. liquid limit. plastic limit. Atterberg limits. particle size distribution. Permeability. Soil classification. identification and physical properties. Soil survey and soil map study.

Minimum Academic Standard

Soil & Geotechnical Engineering Laboratory with a NUC – MAS requirement facilities.

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

Learning Outcomes

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

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

Course Contents

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

3.2.6 300 Level Second Semester Course Description

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

Learning Outcomes

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

1. analyze the concepts of peace, conflict and security;
2. list major forms, types and root causes of conflict and violence;
3. differentiate between conflict and terrorism;
4. enumerate security and peace building strategies; and
5. describe the roles of international organizations, media and traditional institutions in peace building.

Course Contents

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

GET 302: Engineering Mathematics IV (3 Units C: LH 45)

Learning Outcomes

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

1. solve second order differential equations;
2. solve partial differential equations;
3. solve linear integral equations;
4. relate integral transforms to solution of differential and integral equations;
5. explain and apply interpolation formulas; and
6. apply Runge-Kutta and other similar methods in solving ODE and PDEs.

Course Contents

Series solution of second order linear differential equations with variable coefficients. Bessel and Legendre equations. Equations with variable coefficients. Sturn-Louville boundary value problems.

Solutions of equations in two and three dimensions by separation of variables. Eigen value problems. Use of operations in the solution of partial differential equations and Linear integral equations. Integral transforms and their inverse including Fourier, Laplace, Mellin and Handel Transforms. Convolution integrals and Hilbert Transforms. Calculus of finite differences. Interpolation formulae. Finite difference equations. RungeKutta and other methods in the solutions of ODE and PDEs. Numerical integration and differentiation.

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

Learning Outcomes

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

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

Course Contents

A brief review of common pitfalls in writing. Principles of clear writing (punctuations and capitalization). Figures of speech. Units of grammar. Tenses and verb agreement. Active and passive sentences Lexis and structure Fog Index concept. Skills for communication and communication algorithm. Types and goals of communication; Interpersonal communication; features and the Finger Model or A,B,C,D,E of good interpersonal communication (accuracy of technical terms, brevity of expression, clarity of purpose, directness of focus and effectiveness of the report). Language and organisation of reports. Technical report writing skills(steps, problems in writing, distinguishing technical and other reports, significance, format and styles of writing technical reports). Different formats for communication; styles of correspondences – business report and proposal, business letter, memorandum, e-mails, etc. Proposals for projects and research; format, major steps and tips of grant-oriented proposals. Research reports(competency, major steps, components and formats of research reports and publishable communication). Sources and handling

of data, tables, figures, equations and references in a report. Presentation skills; overview, tips, organisation, use of visual aids and practising of presentation. Intellectual property rights in research reports. Case studies of major engineering designs, proposals and industrial failures with professional presentation of reports.

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

Learning Outcomes

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

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

Course Contents

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

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

Learning Outcomes

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

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

Course Contents

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

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

Learning Outcomes

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

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

Course Contents

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

EDSU-CEE 310 Introduction to Coastal Engineering (2 Units; Elective; LH 30; PH 45)

Senate-approved relevance

Training of high-quality graduates who are highly skilled and knowledgeable in the specific design and construction at or near Nigeria coast are in agreement with EDSU's mission to address African developmental challenges in producing civil engineering graduates.

Relevance is seen in civil engineers from EDSU being able to develop the coast and it boundaries to address the hydrodynamic impact of especially waves, tides, storm surges and tsunamis and (often) the harsh environment of salt seawater are typical challenges for the coastal engineer – as are the morphodynamic changes of the coastal topography, caused both by the autonomous development of the system and man-made changes.

Overview

Introduction to coastal engineering is a vital approach used to build and maintains coastal structures. Most often, in coastal engineering projects there is a need for metocean conditions: local wind and wave climate, as well as statistics for and information on other hydrodynamic quantities of interest. Also, bathymetry and morphological changes are of direct interest. In case of studies of sediment transport and morphological changes, relevant properties of the sea bed sediments, water and ecosystem properties are needed. All these are encompassed in this course.

Objectives

The objectives of the course are to:

1. provide fundamental knowledge about coastal engineering and coastal structures,
2. identify the coastal morphology and related engineering problems
3. identify the linear wave theory
4. familiarize with environmental load impact
5. design of shore protection structures.
6. apply numerical modelling in coastal engineering

Learning outcomes

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

1. apply the concepts of coastal engineering to marine structures;
2. appraise coastal processes, coast-structure, wave-structure and bottom-structure interactions.
3. estimate wave kinematics by using linear wave theory.
4. evaluate environmental loads acting on coastal structures by using related meteorological and oceanographical data.
5. design for shore protection structures and calculate the wave forces acting on vertical breakwaters, pipelines and piles.
6. perform numerical modeling in coastal engineering and its fields of applications.

Course contents

Definition of coastal engineering. Physical description of coasts and coastal processes. Utilization of coasts. Coastal structures. Environmental loads: Waves. Tides. Currents. Linear wave theory. Wave transformation and breaking. Wave-structure interaction: Runup, overtopping and reflection. Representation of irregular waves. Wave spectrum. Wave forecasting. Shore protection structures: fundamentals of design, breakwaters, seawalls. Ports, types and structural elements. Fundamentals of port design. Berths and piers. Coastal sediment transport. Calculation of longshore sediment

transport. Groins. Cross-shore sediment transport and beach profiles. Wave loads on piles and marine pipelines. Fundamentals of numerical modeling in coastal engineering.

Minimum Academic Standards

Civil engineering laboratory with a NUC-MAS requirement facilities.

EDSU-CEE 312 Design of Reinforced Concrete Structures I [2 units, CORE: LH 30]

Senate-approved relevance

Develop technical knowledge, Training high quality graduates who are highly skilled and knowledgeable in the design and analysis of structures, evaluation, planning and creative design abilities in various ways that can contribute to the development of a more satisfying life and environment for the benefit of mankind. This is in line with the vision and mission of EDSU.

This is necessary to produce a role model, self-reliant and excellence civil engineers with adequate technical skills, fundamental concepts relevant to latest development, entrepreneurial competences, a sense of public responsibility, communication skills and management skills to handle national and international issues in civil engineering. This course when fully executed, will help to mitigate the incidences of building collapse in our country.

Course Overview

A problem unique to the design of reinforced concrete structures is the need to detail each member throughout. Steel structures, in general, require only the detailed design of connections. For concrete structures, we must determine not only the area of longitudinal and lateral reinforcement required in each member, but also the best way to arrange and connect the reinforcement to insure acceptable structural performance. This procedure can be made reasonably simple, if not easy. Purpose of this course is to establish a firm understanding of behavior of reinforced concrete structures, then to develop method used in current practice and to achieve familiarity with codes and specifications governing practical design.

In this course, the students will learn the basic performance of concrete and steel as structural materials, and the behavior of reinforced concrete structures. If the basic concepts behind code provisions for design is fully understood, the students will be able to: approach design in a more knowledgeable fashion, not like following a black box; understand and adapt to the changes in code provisions better and faster.

This course deals generally with the analysis and design of reinforced concrete elements such as foundation, column, beam, slab and roof design. The knowledge of civil engineering materials (**CEE 304**) is required in this course. The design of these basic elements will follow the course modules.

Objectives

The specific objectives of this course are to:

1. provide the students with detailed explanation of design philosophy as it relates to reinforced concrete structures;
2. identify and explain the limit state function in reinforced concrete;
3. remember the limit state function in the design of concrete elements;
4. identification and careful selection of foundation type;
5. execute the design of a reinforced concrete model using the RC codes of practice;
6. sketch and detail all reinforced concrete elements after design;
7. analyze, design and detail of reinforce concrete structures;
8. prepare design for submission at the Urban and Regional Planning (URP) unit.

Learning Outcome

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

1. explain the purpose, methods of design and the aim of structural design;
2. describe the two types of limit state function;
3. apply the limit state function in structural design;
4. determine dimensions of base and carefully select the appropriate foundation type for structure;
5. discuss the importance, application of building regulations and codes of practice;
6. evaluate structural design results and detailing of such design;
7. undertake design and detailing of basic RC structures e.g bungalow RC, high rise, box culvert
8. arrange the documentation/report on designs of typical RC structure

COURSE CONTENT

Fundamentals of design process. materials selection. building regulations and codes of practice. Design philosophy; elastic design; limit state designs in concrete. principle of modular ratio and load factor method. Analysis using the Hardy Cross moment distribution. Analysis using the Claperon's method. Theory of design of basic structural reinforced concrete elements. Design of structural elements in Reinforced concrete. Design of one-way slab. Design of two-slab. Design of flat slab. Design of beams and deflection checks. Types of columns, biaxially, uniaxially and axially loaded

column. Short and slender column. Design of the different types of columns. Design of foundation base. Bending schedule and design project.

Minimum Academic Standard: Structural Engineering Laboratory with a NUC-MAS requirement facilities.

EDSU-ENT 321: Entrepreneurial Skills (1 Unit C: LH 0; PH 30)

Senate- approved relevance

The training of high-quality graduates who are equipped with the knowledge of channeling their creativity into creating productive and innovative things that can contribute significantly to the current competitive world at large and particularly Nigeria is of immense relevance to Edo State University. This is important as it will lead to the production of graduates with innovative, analytical, and logical reasoning.

Objectives

The learning objectives of this course are to:

1. Define the concepts and profitability of entrepreneurial skills.
2. Develop high entrepreneurial potential in students.
3. Describe the key requirements for entrepreneurial skills
4. Analyze the various possible business ideas open to students.
5. Engage in practical activities on various entrepreneurial skills

Learning Outcomes:

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

1. Explain at least two concepts and profitability of entrepreneurial skills.
2. Apply the entrepreneurial potential in setting up a business.
3. Outline five key requirements for the entrepreneurial skills
4. Explain one possible business idea.
5. Showcase the product from the practical activities their various entrepreneurial skills for exhibition

Course Contents

Soap/Detergent, Toothbrush, and Toothpaste making; Photography; Brick making; Rope making; Brewing; Glassware production/ Ceramic production, Paper production; Water

treatment/conditioning/packaging; Food processing/preservation/packaging; Metal fabrication; Tanning industry; Vegetable oil extraction; Farming; Fisheries/aquaculture; Plastic making; Refrigeration/Air-conditioning; Carving, Weaving; Bakery; Tailoring; Printing; Carpentry; Interior Decoration; Animal husbandry, etc. Case Study Methodology applied to the development and administration of Cases that bring out key issues of the business environment, start-up, pains and gains of growth of businesses, etc. with particular reference to Nigerian businesses. Experience sharing by business actors in the economy with students during Case presentations.

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

Learning Outcomes

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

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

Course Contents

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

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

Section B: Mechanical design with computer graphics and CAD modelling and drafting. Introduction to Solidworks: software capabilities, design methodologies and applications. Basics part modelling: sketching with SolidWorks, building 3D components, using extruded
Bose base · Basic assembly modelling, and solidWorks drawing drafting. Top-down assembly technique exploded view, exploded line sketch. Introduction to PDMS 3D design software; autoCAD mechanical, SPSS.
A comprehensive case study design project. The student should be introduced to the concept of product/component design and innovation and then be given a comprehensive design project.
Examples of projects should include the following:
a. Design of machine components;
b. Product design and innovation;
c. Part modelling and drafting in Solid Works; and
d. Technical report writing.

3.2.7 400 Level First Semester Course Description

EDSU-CEE 401 Professional Practice and Contract Administration [2 units, CORE: LH 30]

Senate-approved relevance

This course will help to develop knowledge, skills including transferable skills, such as leadership, motivation, time management, prioritization, delegation, listening, communication, analytics and understanding, as well as awareness and "know how", in the fields of civil engineering and its related disciplines so that our graduates will be equipped to enter into self-employment and employment as professional engineers progressing on to Registered Engineer or (equivalent status) or a wide range of other professional careers. Our graduates will be professional engineers trained on leadership track and contract administration.

This course will also provide the engineering industry and profession, in Nigeria and elsewhere, with ready employable and enterprising graduates prepared for the assumption of technical, managerial and financial responsibilities. This is in line with the mission and vision of EDSU.

Course Overview

The practice of civil engineering is a profession which involves the designing and executing structural works that serve the general public, such as dams, bridges, aqueducts, canals, highways, power plants, sewerage systems, and other infrastructure.

In this course, the diverse aspects of civil engineering contract administration are examined and described, with relevant supporting examples. It starts by considering the general backcloth to civil engineering works and contracts, including funding, preliminary investigations and the preparation of engineer's reports. The form and purpose of the various contract documents are examined and the principal requirements of the ICE Conditions summarized and explained. The principal tendering arrangements are described and compared, together with the more commonly practiced approaches to estimating the cost of civil engineering works. Site organization and supervision are covered in sufficient depth to illustrate the means by which a civil engineering project can be effectively planned, managed and controlled, and having regard to such important aspects as productivity, plant usage and safety of operatives. One of the major problems encountered in the operation of civil engineering contracts is a weakness in communication between the parties to the contract and site personnel. Vital communication requirements are described and illustrated, including the preparation of site documents and records and the purpose and conduct of site meetings. The method of measuring and valuing civil engineering works is explored and this encompasses the use of daywork, issue of interim certificates, settlement of final accounts, valuation of variations and financial control of contracts.

Objectives

The specific objectives of this course are to:

1. discuss the civil profession and its various sub-units;
2. explain contract and types in Civil Engineering profession;
3. discuss the bureau of public procurement (BPP) in relation to Civil Engineering contract;
4. appraise the Civil Engineering works and standard of measurement;
5. evaluate bills of Engineering measurement;

6. define and discuss the roles of resident engineers, contactor;
7. explain methods of valuation of work, interim certificate;
8. compare the use of PERT and CPM in contract administration
9. explain construction machinery and equipment.

Learning Outcome

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

1. describe the civil engineering profession and its impact in the nation's infrastructure;
2. identify and discuss simple and formal contract in Civil Engineering works;
3. understand BPP and its application to Civil Engineering works;
4. illustrate the use of BEME for large and small-scale works;
5. apply BEME for large and small-scale contract;
6. compare and contrast the roles of a contractor, engineer, foreman in a given site;
7. apply the daily work pay and monthly payment to any civil engineering contract;
8. appraise the best option in choosing PERT or CPM in project management;
9. decide construction equipment required for a specific job and analyze their depreciation life.

COURSE CONTENT

Introduction to areas where Civil Engineering can be practiced. Definition contracts. The necessity for contracts. Nature and form of contracts. Validity and enforceability of contracts. General principles of contracts (offer and acceptance, terms or contents, privity of contract, misrepresentation, agency etc.). Types of contract. Contract documents. Main characteristics of Civil Engineering contracts. Methods of commissioning Civil engineering works. Sub-contracts. Payment certificates. Retention money etc. Bureau of public procurement (BPP), Objectives and functions. Civil Engineering works standards and Measurements (JCT, FIDIC, ICE, GC/works, etc). Applications/Case study-dams. Foundations. Bridges. Tenders and tendering procedures. Types of tender, opening of tenders. Criteria for selecting contractors. Contractor motivation. Bill of Engineering Measurement and Evaluation (BEME). Estimation of quantities of engineering materials. Schedule of rates on site. Relationships of client, consultant. Contractor in civil engineering projects. Role of resident and site engineers in works construction and supervision.

Job planning and control. Programme charts. Bar charts. Critical path method (CPM). Programme Evaluation and Review Technique (PERT). Applications- Basic methods on varied nature of construction works. Construction machinery and equipment: selection and economics in use.

EDSU-CEE 402 Introduction to Bioremediation [2 units, ELECTIVE: LH 30, PH 45]

Senate – approved relevance

The training of high-quality graduates who are highly skilled in the design and analysis of structures, evaluation, planning and creative design abilities in various ways that can contribute to the development of a more satisfying life and environment for the benefit of mankind, in Nigeria and the world at large is of great importance to EDSU.

This is necessary to produce a role model, self – reliant and excellent civil engineers with adequate technical skills, fundamental concepts relevant to latest development, entrepreneurial competences, a sense of public responsibility, communication skills and management skills to handle national and international issues in civil engineering with respect to having sustainable portable water and environment that is less polluted in our country.

Course Overview

Bioremediation is a multidisciplinary field which combines components of civil engineering, environmental engineering, chemical engineering, microbiology, chemistry, geology and public health, etc. It is a sustainable method that involves the application of living organisms (e.g plants and microorganisms) to improve the conditions of contaminated soils and water and air which can lead to the permanent removal of contaminants from the environment and may be inexpensive when compared to conventional methods.

As an introduction course, it includes an overview of the bioremediation process; explore the applications of bioremediation technologies; discuss the factors that influence the bioremediation rates, success cases in the application of bioremediation technology to contaminated sites, bioremediation of soils and wastewater etc which is geared towards having sustainable portable water and environment that is less contaminated thus aligning with Goal 3, 6, and 11 in the area of Good health and well-being, clean water and sanitation and sustainable cities and communities of the sustainable development goals(SDGs). The objectives of the course, learning outcomes, and contents are provided to address this need

Objectives

The objectives of the course are to:

1. describe bioremediation, principles, techniques and its applications;
2. explain the influence of contaminants to bioremediation;
3. describe bioremediation of wastewater;
4. describe bioremediation of contaminated soils;

5. identify the recent advancement and challenges in bioremediation;

6. outline the importance of the study of bioremediation to Civil Engineers and to the immediate environment and with respect to energy production.

Learning Outcome

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

1. plan bioremediation processes for a given location;
2. justify the influence of contaminants in bioremediation process;
3. apply the principles of bioremediation of wastewater to real life problems;
4. experiment the bioremediation of contaminated soils;

5. apply the recent advancement and challenges in bioremediation

6. appraise the study of bioremediation to civil engineers and to the immediate environment and with respect to energy production.

COURSE CONTENT

Background of bioremediation. Applications of bioremediation technologies. Advantages of Disadvantages of bioremediation. Types of bioremediations. Principles of bioremediation. Factors of Bioremediation. Process of bioremediation. Bioremediation and Energy Production. Bioremediation and Sustainable Environmental Technologies. Introduction to microorganisms and other contaminants. Bioremediation techniques. Bioremediation of wastewater. Bioremediation of contaminated soil. In - situ and ex - situ bioremediation of contaminated soil with examples. Treatment of common contaminants. Treatment of metal polluted environment. Recent Advancement and Challenges in Bioremediation

Minimum Academic Standard: Soil & Geotechnical engineering, water resources Engineering Laboratory with a NUC – MAS requirement facilities

EDSU-CEE 403 Engineering Hydrology (2 Units; CORE; LH 30; PH 45)

Senate-approved relevance

Training of high-quality graduates who are highly skilled and knowledgeable in Engineering Hydrology in Nigeria are in agreement with EDSU's mission to address African developmental challenges in producing civil engineering graduates. Relevance is seen in civil engineers from EDSU being able to analyzed the hydrological components and predict the amount of water that can be available for community consumption and surfaced water runoff in a particular catchment area. This will grant the students the basic knowledge requires in design and construction of conveyance channels.

Overview

Engineering Hydrology will help the students to increase and improve the knowledge of hydrological cycle and predict the amount of rainfall in a catchment area for sustainable development. Engineering Hydrology when fully adopted in civil engineering courses will enable the students to acquire basic knowledge in hydrological analysis.

This course focuses on the analysis of the hydrology cycle and hydrological modeling of small watershed. State-of-the- art practices for controlling runoff are examined for minimizing the hydrologic and ecologic impacts of urban development.

Objectives

The objectives of the course are to:

1. describe the components of hydrologic cycle;
2. examine the rainfall-runoff relations;
3. explain the concepts of unit hydrograph and compute excess rainfall;
4. describe process of estimating hydrograph for ungauged catchment;
5. conduct analysis using hydrological model software.

Learning outcomes

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

1. apply the concept of hydrological cycle and their components (precipitation, evaporation, evapotranspiration, infiltration, runoff) on real life problems;
2. determine the rainfall-runoff relationship for a particular rainfall;

3. estimate unit hydrograph of different durations;
4. formulate the principle of superposition.
5. apply GIS, HEC-HMS and HydroCAD software for hydrological modeling

Course contents

Definition of hydrology. Hydrologic cycle and components. Precipitation. Evaporation. Evapotranspiration. Infiltration and percolation. Runoff. Stream Flow. Rainfall-Runoff Relationships. Stochastic time series models. Hydrology Analysis. The Unit hydrograph. Application of Unit Hydrograph. Principle of superposition and S-hydrograph methods. Limitations and applications of UH. Synthetic Unit Hydrographs. Unit Hydrograph form a complex storm. Instantaneous Unit Hydrograph. Hydrograph of Ungauged Catchments. Flood routing. Channel and reservoir routing. Muskingum method of routing. Introduction to hydrological modeling of small watersheds for conservation: hydrological software such as GIS, HEC-HMS and HydroCAD. Hydrometeorology principles. Probability and statistical methods in hydrology.

Minimum Academic Standards

Civil engineering water laboratory with a NUC-MAS requirement facilities.

EDSU-CEE 405: Structural Engineering Mechanics II (2 Units: CORE; LH 30)

Senate-Approved Relevance

Through its teaching, research, and innovation activities, EDSU is poised to be a major contributor in the advancement of knowledge, wisdom and understanding for the benefit of our country and the world in general. Our graduates will be a role model, self-reliant and excellence civil engineers with adequate technical skills, fundamental concepts relevant to sustainable development, entrepreneurial competences, a sense of public responsibility, communication skills and management skills to handle national and international issues in civil engineering.

Overview

This course is focused on the advance methods (theorems) for the analysis of indeterminate structures. Clearly it is important to avoid deformations so large that they may prevent the structure from fulfilling the purpose for which it is intended. But the analysis of deformations may also help us in the determination of stresses. It is not always possible to determine the forces in the members of a structure by applying only the principle of statics. This is because statics is based on the assumption of undeformable, rigid structures. By considering engineering structures as deformable and analyzing the deformations in their various members, it will be possible to compute forces which are statically determinate. Also, distribution of a given member is statically determinate, even when the force in that member is known as will be derived from the free body diagram. To determine the actual distribution of stresses within the member, it is necessary to analyze deformations which take place in that member. Indeterminate structural analysis using the methods of slope-deflection and moment distribution methods, energy and virtual work methods, second theorem of castigliano, least work theorem is analysed and solved. Furthermore, the problem of elastic instability and simple plastic theory of bending collapse loads will also be presented.

Objectives

The objectives of the course are to:

1. outline procedure and identify the formulation technique of beam to achieve structural response using slope deflection method
2. understand some structure support such as fixed end moment (FEM) and bending moment analysis for a statically indeterminate structures using moment distribution methods.
3. explain strain energy and virtual work principles in the analysis of indeterminate structures.

4. understand the influence line coefficients and other structural parameters in beams using influence line theorems.

5. explain the second theorem of castigliano on least work theorem and its applications in different structural elemental analysis.

6. introduce the elastic structural instability and simple plastic theory of bending collapse loads.

Learning Outcomes

Students should be able to:

1. perform analysis of indeterminate structures slope-deflection methods.
2. derive the Slope Deflection Method equations using mechanics and mathematics.
3. apply the concept of fixed-end moments.
4. compute stiffness factors, distribution factors, balance moment and carry-over moment for various members in a continuous beam using the moment distribution method.
5. perform analysis of a continuous beam using the moment-distribution method.
6. derive the influence lines for moving loads on trusses and beams.
7. draw the influence line diagrams for the reactions at the supports of a beam.
8. construct influence lines for shear, bending moment, deflection and slope at any point on the beam.
9. showing the proof of the Castiglianos theorem for work done in producing displacement for a beam subjected to different loads.
10. solve problems associated with first and second theorem of castigliano.
11. determine the reactions and drawing the bending moment diagram for a simply supported beam, propped cantilever and fixed supported beam using the least work theorem.
12. Solve problems on simple Elastic structural instability and simple plastic theory of bending collapse loads.

Course Content

Analysis of indeterminate. slope-deflection. Moment distribution methods. Energy and virtual work methods for indeterminate structures. Bending analysis. Second theorem of Castigliano. Least work theorem for moment. Shearing of beam structures. Influence coefficient method and influence lines for statically determinate structures. Continuous beams. Simple beams. Trusses with various edge configurations. Elastic instability. Simple plastic theory of bending collapse loads.

EDSU – CEE 407 Geotechnical Engineering I [2 units, CORE: LH 30, PH 45]

Senate – approved relevance

The training of high-quality graduates who are highly skilled in the design and analysis of structures, evaluation, planning and creative design abilities in various ways that can contribute to the development of a more satisfying life and environment for the benefit of mankind, in Nigeria and the world at large is of great importance to EDSU.

This is necessary to produce a role model, self – reliant and excellent civil engineers with adequate technical skills, fundamental concepts relevant to latest development, entrepreneurial competences, a sense of public responsibility, communication skills and management skills to handle national and international issues in civil engineering in relation to foundations of structures which will be of great assistance towards mitigating the incidences of building collapse in our country.

Course Overview

Foundation is the component of a structure which connects it to the ground, and helps to transfer loads from the structure to the ground. It is a general fact that all engineered infrastructures resting on the earth must be supported by foundation. Foundation is an important component of any civil engineering structure which must be safe, stable, and economically designed. This course "Foundation Engineering" is concerned with the application of soil mechanics (soil behavior), rock mechanics, structural analysis, and concrete, etc in the design of foundation components of structures.

The course on Foundation Engineering provides the students with the necessary geotechnical engineering skills to analyze soils and determine their suitability for construction purposes and design shallow and deep foundation systems under different loading and soil conditions. This will help to mitigate the incidences of building and other civil structures collapse in our country.

Objectives

The objectives of the course are to:

1. outline the different soil minerals with respect to clay soils;
2. describe soil compaction, its importance, factors and demonstrate the laboratory test;
3. describe soil stabilization, its importance, factors, and the different soil stabilization techniques;
4. describe sub - surface exploration, methods and its importance;
5. identify in-Situ .test (field test of soil) and Laboratory testing of soils and demonstrate some in the laboratory;
6. identify the different properties of soils used for design purposes;

7. describe plastic equilibrium theory of soil, and carry out the computation of active and passive earth pressure using Rankine's theory;

8. describe foundation in relation to structures and building, its types and demonstrate their designs;

9. identify foundation settlement and relate the reason behind the failure of structures and foundations;

10. describe earth structures excavation, and the bracing and strutting techniques.

Learning Outcome

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

1. recognize the different types of clay soil minerals;

2. demonstrate soil compaction in the laboratory or on the field.

3. investigate soil stabilization materials and the best techniques of application;

4. evaluate sub - surface exploration processes;

5. experiment the in – situ and laboratory testing that can be carried out on soil and demonstrate some in the laboratory;

6. select the best properties of soils used for design purposes;

7. apply the plastic equilibrium and Rankine's theory in the computation of earth pressures;

8. Compute foundation settlement and explain the reasons for foundation failures;

9. calculate settlement of a given foundation;

10. design earth structures excavation, bracing and strutting techniques.

COURSE CONTENT

Mineralogy of soils. Soil Compaction. Soil stabilization. Subsurface exploration and Methods. Planning the exploration program. Soil boring; soil sampling of disturbed and undisturbed specimen. Field and laboratory measurements. Soil profile and geotechnical report. Engineering property of 'soils' for design. Plastic Equilibrium Theory. Shallow and deep foundations. Introduction to Design of footings. Design of spread footings: square footings, rectangular footing, etc. Settlement of shallow foundations: immediate settlement for rigid and flexible footings. Earth structures excavation, bracing and strutting techniques.

Minimum Academic Standard

Soil & Geotechnical Engineering Laboratory with a NUC – MAS requirement facilities

EDSU-CEE 409: Highway and Transportation Engineering I (2 Units C: LH 45 PH 45)

Senate-approved relevance

Training of high-quality graduates who are highly skilled and knowledgeable in transportation engineering in Nigeria are in agreement with EDSU's mission to address African developmental challenges in producing civil engineering graduates. Relevance is seen in civil engineers from EDSU being able to design, construct and maintain highway to address the potholes and road failure issues, which result from inadequate and improper design and construction of highway. This will help to develop the community and the country at large.

Overview

Transportation engineering is a vital approach used to improve the road infrastructures in terms of quality of road construction for sustainable development in the country. Transportation engineering courses will help in mitigating the rate of traffic congestion and accident experiences in the country recently.

Overview

Highway Engineering highlight the importance of road and possible ways to stabilize road, decongest traffic and ensure safety and durability of road. This can be achieved by conducing relevant soil test, design road alignment and intercepts.

Objectives

The objectives of the course are to:

1. understand various developmental stages in the road construction.
2. highlight importance of Highway Engineering in relation to socio-economic development of a country.
3. describe soil tests in bore-hole
4. explain compaction and effective compaction equipment's of the soil.
5. study soil stabilization and various stabilization processes in roads.
6. explain different factors controlling alignments, geometric plan elements, sight distances, design speed.
7. explain orizontal alignment; simple circular and transition curves, super elevation and pavement widening in horizontal curves.
8. explain vertical alignment; gradient limits, curves types, summit curves and valley curves.

9. design the co-ordination of vertical and horizontal alignment, highway cross-section elements. cross slope and shoulders.
10. state different pavement types; (Flexible, rigid and composite), pavement layers and their functions
11. explain differences and similarities between flexible and rigid highway pavements.

Learning outcomes: At the completion of this course, students are expected to

1. recognize different discoveries of early development, Tresaguet, Metcalf, Telford and macadam construction, modern development as stages of road development.
2. appreciate relevance of highway engineering in relation to socio-economic development of a country.
3. conduct soil tests for bore-hole construction
4. perform compaction tests and identify effective compaction equipment's and their applications.
5. study soil stabilization and discuss various stabilization process in road construction.
6. design horizontal alignment, simple circular and transition curves, super elevation and pavement widening in horizontal curves.
7. design vertical alignment and evaluate its gradient limits.
8. study the co-ordination of vertical and horizontal alignment.
9. determine and draw the highway cross-section elements.
10. obtain the cross slope and determine the actual capacity of road shoulders.
11. illustrate different pavement types; (Flexible, rigid and composite), pavement layers and their functions.
12. differences and similarities between flexible and rigid highway pavements in their design and construction.

Course Content: History of roads development. Early development. Tresaguet, Metcalf, Telford and Macadam Construction. Modern developments. Importance of Highway Engineering in relation to socio-economic development of a country. Soil Engineering aspects for Highways. Railways. Airfields: Soil tests and Bore-hole. Compaction and effective compaction equipment's. Soil stabilization and various stabilization process. Highway Geometrics. Factors controlling alignments. Geometric plan elements. Sight distances. Design speed. Horizontal alignment. Simple circular and transition curves. super elevation. Pavement widening in horizontal curves. Vertical alignment.

Gradient limits. Curves types, summit curves and valley curves. Co-ordination of vertical and horizontal alignment. Highway cross-section elements. Cross slope and shoulders. Introduction to Pavement Structure and Design. Pavement types; (Flexible, rigid and composite), pavement layers and their functions. Differences and similarities between flexible and rigid highway pavements. Highway planning and traffic surveys.

Minimum Academic Standard

Transportation Engineering Standard NUC-MAS required facilities.

EDSU-CEE 411 Civil Engineering Design Studio [2 units, CORE: LH 30, PH 90]

Senate-approved relevance

This course will help to develop knowledge, skills and provide practical solutions to problems by applying their knowledge of modelling and their ability to design, develop and implement in at least one of the key areas in civil engineering: construction, construction materials, geotechnical engineering, transportation engineering and hydraulic engineering. This is in line with EDSU vision and mission.

It will adopt lifelong learning as a core principle in their working life, keep up-to-date with the latest developments in the field of Civil Engineering and maintain a demonstrable commitment to continued professional development. This course will provide our graduates with the ability to apply modern methods, for the purpose of designing to meet specific needs of a complex system, process, device or product, under realistic constraints and conditions.

Course Overview

This course is hands-on. It teaches the students the use of some Civil Engineering Design software for the design of reinforced concrete and steel structures. The pre-requisite to this course are CEE 201or EDSU-CEE 203 and EDSU-CEE 306. These courses are required for the proper understanding of EDSU-CIE 413.

This course will help the students to apply modern technology for easy design of reinforced concrete and steel structures. Computer aided design tool will increase speed, reduce error and manage space in the design of steel or concrete structures.

Objectives

The specific objectives of this course are to:

1. discuss the various software used in civil profession;
2. explain its application to Civil Engineering works;
3. evaluate the use of AUTOLISP for drafting;
4. explain the process of modelling using ORION 18, PROTAsteel, CIVIL 3D, ARCHICAD home deluxe;
5. examine the use of MATLAB for solution to boundary problems, graphs, matrix solution;
6. undertake a design project in RC or steel structures;

Learning Outcome

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

1. have good grasp of use of ORION, PROTA-steel, CIVIL 3D and other software related to civil engineering designs;
2. apply the use of these software to Civil Engineering designs;
3. compare and contrast the drafting of RC using AUTOLISP, ORION and PROTA-steel;
4. produce model of structures using AUTOLISP, ORION and PROTA-steel;
5. solve linear equations, plot graphs using MATLAB GUI;
6. carryout full design of RC or steel structures using AUTOLISP, ORION and PROTA-steel.

COURSE CONTENT

Computer aided design using ARCHICAD Home deluxe. Design using ORION 18. Design using CIVILStruct. Detailing using AUTOLISP for RC. Design using PROTAsteel. Design using PROKON. Introduction to CIVIL 3D. MATLAB graphical user interface (GUI). The use of grapher. AUTOLISP for slab. AUTOLISP for box culvert. RCC design spreedsheets. RCC loadings. RCC foundation analysis. Simulation of real-life problem using Beam-max. Loading and analysis process. Design Report.

Minimum Academic Standard

Computer Simulation Laboratory. NUC-MAS required facilities.

3.2.8 400 Level Second Semester Course Description

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

Learning Outcomes

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

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

Course Contents

Further work on contours and contouring - methods of contouring, contour interpolation and uses of contour plants and maps, areas and volumes. Setting out of engineering works. Elementary topographical surveying. Elements of Photogrammetry, photogrammetric equipment and errors of measurements.

EDSU-ENT 421 Entrepreneurship Development (C, 1 unit; LH 30)

Senate- approved relevance

There is no market for vision, and turning the vision into a solution makes a real entrepreneur. One of the greatest challenges of entrepreneurs is staring-up. Having trained and equipped graduates with creative, productive, and innovative knowledge, a key to achieving the vision of Edo State University of graduating competitive graduates is the provision of the opportunity to put the knowledge to practice. One of the channels of achieving this is through entrepreneurial competition which is the main content of this course. This is important as it will help the students to take the step of putting their vision into solution provision, and source of capital for the winner.

Learning objectives

The learning objectives of this course are to:

1. Explain the various models of wealth creation
2. Analyze a profitable and innovative business idea.
3. Examine the capacity of the student to develop a business plan to start a business.
4. Demonstrate the preparation of a proposal on a remarkable and innovative business idea/plan in different fields of study.

Learning Outcomes:

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

1. Explain at least one model of wealth creation
2. Prepare a profitable and innovative business idea.
3. Develop one business plan to start a business.
4. Prepare a proposal on a remarkable and innovative business idea/plan in their field of study

Course Contents

Models of wealth creation, requirements in preparing an innovative business plan, sustainability strategies, managing business growth, time, and self-management, Students are to prepare and defend a competitive business idea/plan where the winner gets an award.

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

Learning Outcomes

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

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

   5. exploit the opportunity to improve and utilise their acquired critical thinking and innate creativity skills, during the program and SIWES Seminar presentation respectively.

Course Contents

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

3.2.9 500 Level Courses Description

EDSU-CEE 501 Structural Engineering Mechanics III [2 units, CORE: LH 30]

Senate-approved relevance

Develop technical knowledge, Training high quality graduates who are highly skilled and knowledgeable in the analysis of structures, evaluation, planning and creative computational abilities in various ways that can contribute to the development of a more satisfying life and environment for the benefit of mankind.

This is necessary to produce a role model, self-reliant and excellence civil engineers with adequate technical skills, fundamental concepts relevant to latest development, entrepreneurial competences, a sense of public responsibility, communication skills and management skills to handle national and international issues in civil engineering.

Course Overview

Structural mechanics, or *solid mechanics,* is a field of applied mechanics in which you compute deformations, stresses, and strains in solid materials. Often, the purpose is to determine the strength of a structure, such as a bridge, in order to prevent damage or accidents. Other common goals of structural mechanics analyses include determining the flexibility of a structure and computing dynamic properties, such as natural frequencies and responses to time-dependent loads.

The study of solid mechanics closely relates to material sciences, since one of the fundamentals is to have appropriate models for the mechanical behavior of the material being used. Different types of

solid materials require vastly different mathematical descriptions. Some examples are metals, rubbers, soils, concrete, and biological tissues. If the students understand the basic concepts behind structural engineering mechanics, they will be able to: approach the analysis in a more knowledgeable fashion. The safety of any structure is dependent on the methods and accuracy of analysis. When the loadings of a structure are accurately estimated and modeled, the incidences of building collapse will a thing of the past in our country. This course gives an overview of the methods of Structural Analysis with emphasis on computer methods and application. At the end of this course, students should be able to solve simple to complex indeterminate structures with advanced techniques. Computer application will enhance speed of analysis of complex problems with boundary conditions. Students will be able to appreciate the use of simulation software to model and analyze real life problems.

Objectives

The specific objectives of this course are to:

1. explain the fundamental of slope deflection method;
2. equip the students with knowledge of plastic analysis;
3. explain the matrix method and finite element method of analysis;
4. identification and careful selection of method of analysis;
5. execute the design of a reinforced concrete element using the yield line and strip method;
6. explain elastic instability, continuum plane stress and strain, elastic flat plates and torsion;
7. analyze structures using ANSYS, MS-EXCEL and a simple MATLAB GUI program.

Learning Outcome

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

1. explain, derive and apply the slope deflection equations to real life problems;
2. explain and analyze the position of plastic hinge in beams and frame structures;
3. apply matrix, elastic and finite element methods to real life civil engineering problems;
4. appraise the best method of analysis;
5. understand and discuss the importance, application of flat plates, torsion, yield line and strip method of analysis of slab;
6. apply the knowledge of analysis in elastic instability, continuum plane stress and strain, elastic flat plates and torsion to solving real-life design problems;
7. compare structural analysis results using ANSYS, MATLAB GUI.

COURSE CONTENT

Introduction to advanced slope deflection method for beams. Symmetrical frames. Unsymmetrical frames. Worked examples for beams. Worked examples for symmetrical frames. Work examples on unsymmetrical frames. Introduction to plastic method of analysis for beams. Plastic method of analysis for frames. Worked examples on plastic method. Matrix method of analysis for beam elements. Matrix formulation. Truss element and matrix formulation. Global system/reference coordinate. Stresses computation. Space trusses and worked examples. Yield line analysis and strip method of slabs. Rules for analysis and application. Elastic instability. Continuum plane stress and strain. Elastic flat plates and torsion. Solution by series. Finite difference. Finite element. Computer programming using MATLAB, EXCEL for slope deflection. Matrix method of analysis and ANSYS, MIDAS for simulation.

Minimum Academic Standard

Structural Engineering Laboratory with a NUC-MAS requirement facilities.

EDSU-CEE 502 Analysis & Design of Timber Structures [2 units, CORE: LH 30]

Senate-approved relevance

Through its teaching, research, and innovation activities, the EDSU is poised to be a major contributor in the advancement of knowledge, wisdom and understanding for the benefit of our country and the world in general. Our graduates will be a role model, self-reliant and excellence civil engineers with adequate technical skills, fundamental concepts relevant to sustainable development, entrepreneurial competences, a sense of public responsibility, communication skills and management skills to handle national and international issues in civil engineering.

Course Overview

Timber may be one of the oldest and low-tech building materials out there, but architects all over the world still rely on timber as their preferred building material. Compared to other building materials, timber offers architects and those in construction a way to make sustainable, affordable and environmentally friendly buildings. And as the globe faces some huge challenges ahead, such as housing shortages, climate change, and personal wellbeing, those in construction are often at the forefront of helping to solve such challenges.

This course teaches the students the analysis and design of a simple to complex pre-fab buildings that can be constructed off site much quicker and cheaper to help solve housing shortages, to buildings that use local materials to reduce the carbon footprint. The department is perfectly positioned to

take the lead and demonstrate innovative solutions to global issues. And as a result, timber keeps emerging as a reliable building material that has the potential to offer great benefits moving into a sustainable future.

Objectives

The specific objectives of this course are to:

1. explain the design philosophy in timber structures;
2. identify and explain defect, preservation seasoning and the limit state function in timber structures;
3. apply the limit state function in the design of timber elements;
4. execute the design of a timber structure, using the relevant codes of practice;
5. analyze, design and detail of timber structures;
6. prepare design for submission at the Urban and Regional Planning (URP) unit.

Learning Outcome

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

1. grasp and discuss the purpose and the methods of design in timber;
2. examine the grading, classification, seasoning of timber;
3. apply the limit state function in the design of timber structures;
4. evaluate the properties, defects and preservation of timber;
5. design timber structures using BS 5268;
6. arrange the documentation/report on designs of typical timber structure

COURSE CONTENT

Limit state philosophy in timber. Design parameters in timber. Elastic methods of design in timber. Classification of timber. Design codes and specifications. Seasoning of Timber. Timber strength. Glulam beam. Grading of timber. Design of structural elements. Compound beam. Glulam beam. Timber column including timber connections. Compression parallel. Compression Perpendicular to grains. Design project. The laboratory tests on Nigerian Timber Species including Compression parallel to grain. Test for Compression perpendicular grain. Classification of Timber species through density and moisture content. Charring characteristics. Flexural test using the ASTM 293 C and ASTM 78C. Design project.

Minimum Academic Standard: Structural Engineering Laboratory with a NUC-MAS requirement facilities.

EDSU-CEE 503: Design of Reinforced Concrete Structures II (2 Units CORE: LH 30)

Senate-approved relevance

Develop technical knowledge, Training high quality graduates who are highly skilled and knowledgeable in the design and analysis of structures, evaluation, planning and creative design abilities in various ways that can contribute to the development of a more satisfying life and environment for the benefit of mankind. This is in accordance with the vision and mission of EDSU. This is necessary to produce a role model, self-reliant and excellence civil engineers with adequate technical skills, fundamental concepts relevant to latest development, entrepreneurial competences, a sense of public responsibility, communication skills and management skills to handle national and international issues in civil engineering. This will help to mitigate the incidences of building collapse in our country.

Overview

An important aspect of the analysis and design of structures relates to the deformations caused by the loads applied to a structure. Clearly it is important to avoid deformations so large that they may prevent the structure from fulfilling the purpose for which it is intended. The structural design is based on the result of the analysis which helps to obtain the maximum bending moment. The structural design is performed to re-enforce the point at which the bending moment is maximum. This will be done with design code of practice (BS8110 or Eurocode) specifications using the established formulas to produce the required concrete cubic meters and re-enforcement bars to achieve structural stability. The goal of this course is to provide students with advanced knowledge of structural design studio which is design from Architectural drawing in the case of building structures and show its applications in other Civil Engineering structures such as dams, bridges, culverts, water retaining structures and retaining walls.etc.

The goal of this course is to provide students with advanced knowledge of structural design studio which is design from Architectural drawing in the case of building structures and show its applications in other Civil Engineering structures such as dams, bridges, culverts, water retaining structures and retaining walls.etc.

Objectives

The objectives of the course are to:

1. produce modern structural form and model of structural drawing.
2. Perform building system and multi-storey building project design.
3. Perform composite design and construction in steel and reinforced concrete.
4. evaluate design of structural foundation and pre-stressed concrete design.
5. Detail the tall buildings lift, shaft, plate girders, stanchions and shear walls using corrosion protection devices.

Learning Outcomes

1. Perform a structural modeling of structural drawing from architectural drawing for both residential (Duplex and blocks of flat) considering all the dimensions and specification.
2. Perform a composite design and construction of steel and reinforce concrete long columns, short columns, one-two ways spanning slabs, beams, water retaining structures and retaining walls.
3. Perform column load transfer and analysis of building system and multi-storey building project design.
4. Interpret soil test result and design structural strip and pad foundation based on the result of the soil analysis.
5. Explain the theory of pre-stressing and losses of pre-stressing in the steel and reinforced concrete and calculate stresses and pre-stress force required.
6. Perform a complete design and detailing of steel, reinforced and pre-stressed concrete structures.
7. Write a computer program for any of the solved problems using some basic computer programming application such as: EXCEL, FORM5, QBASIC, FORTRAN and MATLAB

Course Content: Composite design and construction in steel and reinforced concrete– long columns short columns, slabs, beam, water retaining structures, retaining walls. Design of structural foundations. Pre-stressed concrete design; principles of pre-stressing, methods of pre-stressing, losses of pre-stressing. Modern structural form: tall buildings lift shafts and shear walls, plate girders, crane girders, stanchions in multi-storey building, fire, and corrosion protection devices, system buildings: design projects.

EDSU-CEE 504 Highway and transportation Engineering II (2 units; LH 30; PH 45)

Senate-approved relevance

Training of high-quality graduates who are highly skilled and knowledgeable in transportation engineering in Nigeria are in agreement with EDSU's mission to address African developmental challenges in producing civil engineering graduates. Relevance is seen in civil engineers from EDSU being able to design, construct and maintain highway to address the potholes and road failure issues, which result from inadequate and improper design and construction of highway. This will help to develop the community and the country at large.

Overview

Transportation engineering is a vital approach used to improve the road infrastructures in terms of quality of road construction for sustainable development in the country. Transportation engineering courses will help in mitigating the rate of traffic congestion and accident experiences in the country recently.

Objectives

The objectives of the course are to:

1. identify Nigeria road network system
2. design for individual elements of highway geometry
2. identify and analyse the components of traffic management
3. conduct experiments for ascertaining the quality of highway materials
4. identify various stages in construction of pavements.

Course outcomes:

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

1. plan road network development and Highway planning in Nigeria.
2. design various road geometric elements based on the geographic conditions.
3. application of traffic characteristics and management techniques.
4. conduct analysis of various highway materials and their suitability for construction.
5. apply different design methods for road construction.

Course contents

Highway development and planning. Highway development in Nigeria. Necessity for Highway Planning. Different Road Development Plans Classification of Roads. Road Network Patterns. Planning Surveys. Highway Alignment. Factors affecting Alignment. Engineering Surveys. Drawings

and Reports. Highway geometic design. Importance of Geometric Design. Design controls and Criteria. Highway Cross Section Elements. Sight Distance Elements. Stopping sight Distance. Overtaking Sight Distance. Intermediate Sight Distance. Design of Horizontal Alignment. Design of Super elevation and Extra widening. Design of Transition Curves. Vertical curves. Traffic engineering and management. Basic Parameters of Traffic. Volume, Speed and Density. Traffic Volume Studies. Speed studies. Parking Studies and Parking characteristics. Road Accidents. Causes and Preventive measures. Accident Data Recording. Road Traffic Signs. Types and Specifications. Road markings. Need for Road Markings Types of Road Markings. Intersection design. Types of Intersections. Conflicts at Intersections. Types of At-Grade Intersections. Channelization: Objectives. Traffic Islands. Design of Traffic Signals. Webster Method. IRC Method. Types of Grade Separated Intersections. Rotary Intersection. Advantages and Disadvantages of Rotary Intersection. Highway materials: Sub grade soil: classification. Group Index. Sub grade soil strength. California Bearing Ratio. Modulus of Sub grade Reaction. Stone aggregates. Desirable properties. Tests for Road Aggregates. Bituminous Materials Types. Desirable properties. Tests on Bitumen. Bituminous paving mixes. Requirements – Marshall Method of Mix Design. Highway construction: Types of Highway Construction. Earthwork. Proportion of Sub grade. Construction of Earth Roads. Construction of Gravel Roads. Construction of Water Bound Macadam Roads. Construction of Bituminous Pavements. Construction of Cement Concrete Pavements.

Minimum Academic Standard: Highway & transportation Engineering Laboratory with a NUC-MAS requirement facilities.

EDSU – CEE 505 Geotechnical Engineering II [2 units, CORE: LH 30, PH 45]

Senate – approved relevance

The training of high-quality graduates who are highly skilled in the design and analysis of structures, evaluation, planning and creative design abilities in various ways that can contribute to the development of a more satisfying life and environment for the benefit of mankind, in Nigeria and the world at large is of great importance to EDSU.

This is necessary to produce a role model, self – reliant and excellent civil engineers with adequate technical skills, fundamental concepts relevant to latest development, entrepreneurial competences, a sense of public responsibility, communication skills and management skills to handle national and international issues in civil engineering in relation to foundations of structures which will be of great assistance towards mitigating the incidences of building collapse in our country.

Course Overview

Soils are the bed on which foundations rest on, and the material on the ground which loads are finally are transmitted to, as such this makes soil very important in this regard in addition to other of its applications. Stresses are developed on the soil as results of loads and the ability for the soils to be able to resist these stresses is also of great importance in order for it to be able to carry the intended constructions.

The course will equip the students with the adequate knowledge on the analysis of stresses in soils, computation of earth pressures, soil bearing capabilities, slope stability, which are vital in the safe and economic design and analysis of elements in civil structures like retaining walls, pile foundations, etc, in Nigeria.

Objectives

The objectives of the course are to:

1. describe the stresses in soils
2. relate Boussinesq's and Westergaard's theories to soil stress distribution
3. decribe retaining walls, types, and their applications.
4. relate the earth pressures using already established theories.
5. describe and determine soil bearing capacities.
6. describe pile foundation and outline its applications

7. describe slope stability and design.

Learning Outcome

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

1. discuss and analyze stresses in soils
2. apply the Boussinesq's and Westergaard's theories in relation to soil stress distribution
3. sketch and explain retaining walls, types, and their applications.
4. compute the earth pressures using already established theories.
5. discuss and compute soil bearing capacities.
6. design pile foundation;
7. analyze slope stability and design.

COURSE CONTENT

Stress in soils. Total and effective stress. Pore pressure. Moduli of Elasticity. Poisson's ratio. Introduction to stress distribution in layered system from Boussinesq's and Westergaard theories. Earth retaining structures. Earth pressures. (active, passive and at rest pressures). Computation of earth pressure using the Rankine method. Computation of earth pressure using the Coulomb wedge theories and Culman's method. Earth pressure on retaining walls. Types and analysis of retaining walls. Bearing capacity: Ultimate, safe and allowable bearing capacities. Bearing capacity factor. Case of shallow foundation. Deep foundations. Factor of safety. Shape effect. Footings under eccentric and inclined loads. Use and general characteristics of piles. Piles and sand piles in clay. negative skin friction. Bearing capacity of pile groups. Slope Stability.

LABORATORY PRACTICALS: Laboratory study of bearing capacity, shear strength of Lateritic soil.

Minimum Academic Standard: Soil & Geotechnical Engineering Laboratory with a NUC – MAS requirement facilities

EDSU-CEE 506 Structural Engineering (2 Units CORE: LH 30)

Senate-Approved Relevance

Through its teaching, research, and innovation activities, EDSU is poised to be a major contributor in the advancement of knowledge, wisdom and understanding for the benefit of our country and the world in general. Our graduates will be a role model, self-reliant and excellence civil engineers with adequate technical skills, fundamental concepts relevant to sustainable development, entrepreneurial competences, a sense of public responsibility, communication skills and management skills to handle national and international issues in civil engineering.

Overview

It is not always possible to determine the forces in the members of a structure by applying only the principle of statics. This is because statics is based on the assumption of undeformable, rigid structures. By considering engineering structures as deformable and analyzing the deformations in their various members, it will be possible to compute forces which are statically determinate. Also distribution of a given member is statically determinate, even when the force in that member is known as will be derived from the free body diagram. To determine the actual distribution of stresses within the member, it is necessary to analyze deformations which take place in that member.

This course focused on the advance methods (theorems) for the analysis of indeterminate structures. The goal of this course is to provide students with advanced knowledge of Civil Engineering mechanics and show its applications especially how it can be applied to solve Structural Engineering problems.

Objectives

The objectives of the course are to:

1. energy and virtual work principles of structural Analysis for beams and frames based on the displacement and force approaches.
2. dynamic analysis of frames using any of the displacement and force method. Analysis of indeterminate structures using Energy principles.

3. analysis of thin plate and shells using classical plate theorems. Introduction to Soil structure interaction.
4. application of simple computer programming application like Q-Basic, FORM5, FOTRAN and Monte Carlo simulation or EXCEL to the solution of statics and dynamic problem using displacement method.

Learning Outcomes

1. detailed knowledge of advanced energy and works principles and its application in the beam and frame structures.
2. perform a comparative analysis of beams and frames using the classical displacement methods, stiffness and flexibility method.
3. ensure that force and displacement analysis of beams and frames are performed by generating matrices in a statically indeterminate structures.
4. determine the natural and forcing frequency in the solution of dynamic problems.
5. derive the equations of motion for the free and force vibration analysis of frame structures.
6. ensure that the stiffness or flexibility analysis of frames under motion are performed by generating matrices in an indeterminate frame structures.
7. analyse the effect of resonance on a structure and Drawing the bending moment diagrams and shear force diagrams for different types of beams and frames under static and dynamic condition.
8. perform a statically analysis of plates and shells in Cartesian co-ordinate using any of the classical plate theories.
9. understand the geometrical load carrying characteristics of plate and shell structures and its numerical solutions interpretation.
10. perform a comparative analysis in solution of problems of plate and shells using various methods such as: Navier, Levy and Energy approach.
11. write a computer program for any of the solved problems using some basic computer programming application such as: EXCEL, FORM5, QBASIC, FORTRAN and MATLAB.
12. analyse the effect of resonance on a structure and drawing the bending moment diagrams and shear force diagrams for different types of beams and frames under static and dynamic condition.

EDSU-CEE 507 Water Resources Engineering (2 Units; CORE; LH 30; PH 45)

Senate-approved relevance

Training of high-quality graduates who are highly skilled and knowledgeable in water resources engineering in Nigeria are in agreement with EDSU's mission to address African developmental challenges in producing civil engineering graduates. Relevance is seen in civil engineers from EDSU being able to preserve, purify and distribute the Earth's most abundant resource. Water resource engineering help to determine how much water is needed, where water is available and how much is available, and then determine the hydraulic controls necessary to convey water to where it is needed. This course will enable civil engineers to design works to control the flow of water in open channels, pipe networks, groundwater flow, and hydraulic structures. This is in view of sustainable development goal to provide clean water for all nations.

Overview

Access to clean water and water management is needed to crate progressive strategy for Nigeria's economy, and is an essential condition for enabling sustained economic growth. Water Resources Engineering is very vital approach used to increase and improve water in terms of quantity and quality available for sustainable development. Is the study and management of equipment, facilities and techniques that are used to manage and preserve lives. In addition to assessing how and the best ways in which to control water as it pertains to water-related activities. Water resources engineering will help to address community water needs.

This course focuses on population forecasting, projecting future water demand, data collection, data analyses, structural and non-structural water distribution system design, and cost-benefit analyses. Water resourcing engineering require a comprehensive knowledge of water treatment so that the quality of water is improved upon for various end uses, whether that's recreationally, commercially or industrially.

Objectives

The objectives of the course are to:

1 identify source of water and its quality
2 explain water demand and forecasting consumption rate for future generation
3 describe the methods of water supply and distribution channels for a city

4 identify the components of water supply network
5 identify effective methods of water treatment
6 conduct simple design of water supply network manually and automatically by WaterCAD program

Learning outcome

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

1. determine the sources of water and the minimum quality standard required;
2. determine water demand for future generation and identify various methods of forcasting;
3. apply the branched and looped methods of water distribution system;
4. design the intake structures (screen, pump, pipes, storage)
5. appraise various process of water treatment (screening, coagulation, flocculation, sedimentation).
6. design water distribution channels using EPANET and WaterCAD programs

Course contents

Raw water source. Water quality and pollution. Water demand forecasting. Water supply. Storage. Pumping. Water distribution systems. Pipe network analysis. Intake structure. Water treatment-flow diagrams for the treatment of surface and groundwater, preliminary treatment, screening, coagulation, flocculation and sedimentation. Slow sand, rapid sand and pressure filters disinfection. Water softening. Iron and manganese removal. Chemical water treatment. Computer application in the development of pipe network analysis. The use of Excel, Matlab and other commercial pipe network software like EPANET. Introduction to WaterCAD Program; drawing the elements of water supply system, insert data to the elements, design the network based on steady state case and extended period state, design the network with tank and pump operation conditions.

LABORATORY PRACTICALS: Determination of colour. Taste. odour and PH of water. determination of total Alkalinity. Total hardness. calcium hardness and CO_2 in water. Determination of iron and magnesium in water. Determination of sulphate and chloride concentrations in water.

Minimum Academic Standards: Civil engineering laboratory with a NUC-MAS requirement facilities.

EDSU-CEE 508 Reliability of Structures [2 units, Elective: LH 30]

Senate-approved relevance

Through its teaching, research, and innovation activities, EDSU is poised to be a major contributor in the advancement of knowledge, wisdom and understanding for the benefit of our country and the world in general. Our graduates will be a role model, self-reliant and excellence civil engineers with adequate technical skills, fundamental concepts relevant to sustainable development, entrepreneurial competences, a sense of public responsibility, communication skills and management skills to handle national and international issues in civil engineering.

Course Overview

Structural design, in general, aims at achieving structures that satisfy safety criteria, serviceability and durability under specified service conditions. Since uncertainty is ubiquitous in engineering design, incorporation of uncertainties in engineering design is essentially required. Reliability analysis offers the theoretical framework for considering uncertainties in engineering decision scheme. Reliability can be defined as the probability that a structure or system can perform a required function under specified service conditions during a given period of time.

Conversely, the failure probability (or probability of failure) is the probability that a structure does not perform satisfactorily within a given period of time and stated conditions. As many different reliability analysis methods exist, this course will be focusses on the existing reliability analysis methods such as local Reliability Methods, Sampling Methods and Global Reliability Methods.

Objectives

The specific objectives of this course are to:

1. explain the engineering techniques to prevent or to reduce the likelihood or frequency of failures;
2. identify and explain the causes of failures that occur despite the efforts to prevent them;
3. discuss the ways of coping with failures that occur, if their causes have not been fixed;
4. describe methods for estimating the likely reliability of new software and for analyzing reliability data.
5. explain reliability analysis using FORM, developed MS-EXCEL programme spreedsheet

Learning Outcome

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

1. to apply engineering knowledge and specialist techniques to prevent or to reduce the likelihood or frequency of failures;
2. estimate and correct the causes of failures that exist in a structure;
3. determine ways of coping with failures;
4. apply methods of reliability on a given data sample;
5. design structures using FORM5, SORM, developed MS-EXCEL programme spreedsheet

COURSE CONTENT

Introduction to reliability engineering. Basic requirements. Principles of limit state design. Basic uncertainties in engineering design. Models for physical behaviour. Reliability and methods, First Order Reliability Method (FORM). Second Order Reliability Method (SORM). Target reliability index, reliability analysis and principles. Monte Carlo simulation technique. Hasorfer-lind computation. Point estimate method. Performance function. Components of Reliability analysis. System reliability analysis. Time dependent Reliability. Writing Reliability-Based Design Program in FORTRAN, MS-EXCEL spreadsheet. Deterministic design. Comparing reliability Based Design and Deterministic design.

Minimum Academic Standard: Structural Engineering Laboratory with a NUC-MAS requirement facilities.

EDSU-CEE 509 Structural Steel Design [2 units, CORE: LH 30]

Senate-approved relevance

Develop technical knowledge, Training high quality graduates who are highly skilled and knowledgeable in the design and analysis of structures, evaluation, planning and creative design abilities in various ways that can contribute to the development of a more satisfying life and environment for the benefit of mankind. This is in accordance with the vision and mission of EDSU. This is necessary to produce a role model, self-reliant and excellence civil engineers with adequate technical skills, fundamental concepts relevant to latest development, entrepreneurial competences, a sense of public responsibility, communication skills and management skills to handle national and international issues in civil engineering. This will help to mitigate the incidences of building collapse in our country.

Course Overview

Steel Design, or more specifically, Structural Steel Design, is an area of structural engineering used to design steel structures. These structures include schools, houses, bridges, commercial centers, tall buildings, warehouses, aircraft, ships and stadiums. The design and use of steel frames are commonly employed in the design of steel structures. More advanced structures include steel plates and shells. In structural engineering, a structure is a body or combination of pieces of the rigid bodies in space that form a fitness system for supporting loads and resisting moments. The effects of loads and moments on structures are determined through structural analysis.

A steel structure is composed of structural members that are made of steel, usually with standard cross-sectional profiles and standards of chemical composition and mechanical properties. The depth of steel beams used in the construction of bridges is usually governed by the maximum moment, and the cross-section is then verified for shear strength near supports and lateral torsional buckling (by determining the distance between transverse members connecting adjacent beams). Steel column members must be verified as adequate to prevent buckling after axial and moment requirements are met. There are currently two common methods of steel design: The first method is the Allowable Strength Design (ASD) method. The second is the Load and Resistance Factor Design (LRFD) method. Both use a strength, or ultimate level design approach.

Objectives

The specific objectives of this course are to:

1. explain the design philosophy in structural steel design;
2. explain the advantages and disadvantages of Steel over RC;
3. identify the different grades of steel and their design strength;
4. identify and explain the limit state function in structural steel;
5. discuss the limit state function in the design of steel structures;
6. identification of compression and tension members in structural steel;
7. discuss the design of compression and tension members;
8. sketch and detail all connections, base plates after design
9. describe the design procedure of modern steel structures e.g ware house, bridges, silos;
10. prepare design for submission at the Urban and Regional Planning (URP) unit.

Learning Outcome

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

1. apply the purpose and the design methods in structural steel;
2. summarize the purpose of the use of steel over RC;
3. compare and contrast the use of grade 43, 50 and 55 steel members;
4. apply the elastic, plastic and limit state methods of design;
5. apply the methods of design on compression and tension members;
6. design universal H-section and I-section;
7. design connections, frames and bases;
8. evaluate structural steel design results and detailing;
9. undertake design and detailing of structural steel members e.g ware house, roof top of buildings, silos
10. arrange a documentation/report on designs of typical steel structure

COURSE CONTENT

General Design Considerations. Design of Flexural Members. Design of Compression Members. Design of Tension members. Design of Members Subject to Combined Loading. Design Consideration for Bolts. Design Considerations for Welds. Design of Connecting Elements. Design of Simple Shear Connections. Design of Flexure Moment Connections. Design of Fully Restrained

(FR) Moment Connections. Design of Bracing Connections and Truss Connections. Design of Beam. Design Bearing Plates. Column Base Plates. Anchor Rods, and Column Splices. Design of Hanger Connections. Bracket Plates, and Crane-Rail Connections. General Nomenclature Specification and Commentary for Structural Steel Buildings. Structural Joints Using High-Strength Bolts. Code of Standard Practice and Commentary for Structural Steel Buildings and Bridges. Plastic method of design. Design project.

Minimum Academic Standard

Structural Engineering Laboratory with a NUC-MAS requirement facilities.

EDSU-CEE 510 Dam and Irrigation Engineering (2 Units; Elective; LH 30)

Senate-approved relevance

Training of high-quality graduates who are highly skilled and knowledgeable in dam and irrigation engineering in Nigeria are in agreement with EDSU's mission to address African developmental challenges in producing civil engineering graduates. Relevance is seen in civil engineers from EDSU being able to design, construct and maintain dams and irrigations system within the country. Dams are important because they provide water for domestic, industry and irrigation purposes. Dams often also provide hydroelectric power production and river navigation. Domestic use includes everyday activities such as water for drinking, cooking, bathing, washing, and lawn and garden watering. Dams and their reservoirs provide recreation areas for fishing and boating. They help people by reducing or preventing floods. This courses when implemented will help to mitigate droughting as well as boasting agricultural activities within the country.

Overview

Dam and irrigation engineering will enable the student to understand the design principles of hydraulic structures as related to dams and irrigation. And will enable them to develop competence in design, construction, operation and maintenance of dam and irrigation systems and suggest the remedial measures for assuring the dam and irrigation safety. Also, will enable the students to develop a basic understanding of the engineering behaviour of concrete and embankment dams and their appurtenance structures through appreciation of the geotechnical, geological, structural, hydraulic/hydrological aspects relevant to dam planning, design and construction.

Objectives

The objectives of the course are to:

1. describe the various types of dams
2. understand seepage analysis.
3. explain the stability of gravity dam
4. design gravity and embarkment dams
5. describe characteristics and purpose of Irrigation
6. discuss the irrigation system, construction and maintenance

Learning Outcome

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

1. select the parameters of dam and their elements and to apply calculation methods;
2. apply the various methods of seepage analysis
3. design an embankment and concrete dams;
4. plan and design of spillways and select the parameters of their elements for analysis;
5. appraise the irrigation requirements for crops/-plants for effective delivery; and
6. apply the principles of design, construction, operation and maintenance of different irrigation systems.

Course Contents

Fundamentals of design process, material selection, design philosophy. Types of dams, merits and demerits Factors affecting selection of type of dam. Factors governing selecting site for dam. Types of reservoirs. Selection of site for reservoir. Zones of storage of a reservoir, reservoir yield, estimation of capacity of reservoir using mass curve. Foundations of dams and their treatment. Earth dams: types of Earth dam. Causes of failure of earth dam. Criteria for safe design of earth dam Seepage through earth dam-graphical method, measures for control of seepage. Gravity dams: forces acting on a gravity dam. Causes of failure of a gravity dam. Elementary profile and practical profile of a gravity dam, limiting height of a low gravity dam, stability analysis, drainage galleries. Spillways: types of spillways. Design principles of Ogee spillways. Types of spillway gates. Irrigation planning criteria. Irrigation methods. Supplemental irrigation. Irrigation structures. Design, construction, operation and maintenance of surface, sub-surface and sprinkler irrigation systems.

Minimum Academic Standards

Civil engineering laboratory with a NUC-MAS requirement facilities.

EDSU-CEE 511 Rock blasting, Demolition and Concrete repair [2 units, Elective: LH 30]

Senate-approved relevance

Through its teaching, research, and innovation activities, the University is poised to be a major contributor in the advancement of knowledge, wisdom and understanding for the benefit of our country and the world in general. Our graduates will be a role model, self-reliant and excellence civil engineers with adequate technical skills, fundamental concepts relevant to latest development, entrepreneurial competences, a sense of public responsibility, communication skills and management skills to handle national and international issues in civil engineering. This is in line with the mission and vision of EDSU.

Course Overview

Rock blasting is the process of drilling holes in a rock mass at depths, and spacing to allow an explosive to fracture the rock. In this process, the rock must fracture enough to be broken down to the size intended. It is practiced most often in mining, quarrying, and civil engineering such as dam, tunnel, or road construction. After detonating, chemical energy from the explosive is released, causing the explosive to transform into a glowing gas with large amounts of pressure. In a densely packed hole, this pressure can exceed 10340MPa. The high pressure released is what shatters the area surrounding the drill hole and exposes the rock beyond to high levels of stresses (and strains), stresses, and strains that cause the rock to crack. While under pressure, the cracks in the rock extend, and the rock in front of the drill hole yields and move forward. If the distance of the hole to the closest surface is not too great, the rock in front of the hole will break free. On the other hand, Demolition of building is the process of dismantling or destroying of a structure after its life of serviceability by pre-planned and controlled methods. When buildings are designed, a life-span of 80-100 years is used. When the structures exceed this value, it become unsafe for occupant and such structure is marked for demolition. While Concrete repair involves a condition evaluation to assess the current condition of the concrete structure, a determination of the causes of deterioration or distress, and selection of repair methods/techniques and materials. The evaluation may include a review of available design and construction documents, structural analysis of the structure in its deteriorated condition, a review of available test data, a review of records of any previous repair work, a review of maintenance records, a visual inspection of the structure, an evaluation of corrosion activity, destructive and nondestructive testing, and a review of laboratory results from chemical and petrographic analysis of concrete samples. Following the evaluation, the deterioration mechanism that caused the deficiency should be determined, and finally the appropriate repair

materials and methods can be selected. This course will help our graduates have adequate knowledge of rock-blasting and its effect on adjoining structures, demolition of old building that have exceeded their life-span and repair of concrete deterioration caused by chemical attack, poor mixing, inadequate materials components and curing.

Objectives

The specific objectives of this course are to:

1. explain the fundamental of explosives, detonators/initiators;
2. equip the students with knowledge of rock blasting and fragmentation;
3. identify and explain the parameters influencing rock blasting;
4. identify the best operation method in tunnel blasting and surface and underground blasting;
5. evaluate the primitive and current method of blasting;
6. explain and carryout demolition operation;
7. identify the types of repairs and maintenance of concrete structures.

Learning Outcome

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

1. grasp the knowledge of the use of explosives and detonators/initiators for rock blasting;
2. familiarize themselves with basic process of rock fracture and fragmentation by blasting;
3. apply those important factors or parameters that greatly influence blasting results;
4. make a good plan for rock blasting in various type of operations such as tunnelling or excavation, surface and underground production blasting, vibration control, etc.;
5. examine any necessary improvement to current blasting operation if it is optimum
6. apply the knowledge of demolition to real life problems;
7. apply the knowledge of concrete repair to RC structures.

COURSE CONTENT

Introduce basic knowledge of explosives and initiators/detonators. Introduction to the process of rock blasting. Mechanism of rock fracture by blasting. Present effect of free surface and expansion space on blasting results. Introduction to the of effect of burden and spacing on blasting results. Effect of stemming, primer placement, delay time, specific charge, air deck. Decoupling on blasting results. Notable examples from industry on increasing ore recovery. Improving safety by making a scientific blast plan. Introduction to some special techniques in blasting applications. Definition of demolition. Purpose of demolition. Methods of demolition. Types of demolition. Salvaging of structures. Repairs of concrete, Maintenance of concrete structure. Materials for repair.

Minimum Academic Standard: Concrete Laboratory with a NUC-MAS requirement facilities.

EDSU-CEE 513: Environmental Engineering (2 Units, Elective: LH 30)

Senate-approved relevance

Training of high-quality graduates who are highly skilled and knowledgeable in Environmental Engineering in Nigeria are in agreement with EDSU's mission to address African developmental challenges in producing civil engineering graduates. Relevance is seen in civil engineers from EDSU being able to control and mitigate the Earth's environmental pollution. Environmental engineering uses the principles of engineering, soil science, biology, and chemistry to develop solutions to environmental problems. This will help to mitigate the impact of environmental pollution resulting from water, land and air pollution on humans and animals.

Overview

The 2006 census confirmed that 37.2 million people, representing 26.6% of the total population, live in the coastal zones of Nigeria which have been affected by heavy environmental pollution from oil prospecting activities, petrochemical and other forms of solid and liquid wastes emanating from textile, food processing, metallurgy, rubber/plastic, pharmaceutical, paint and chemical industries and which threaten the livelihood of residents of these areas. Moreover, 80% of all wastewater coming from these industrial facilities receives no form of treatment.

It is estimated that over 40% of Nigerians derive their sources of drinking water from ground-water sources with approximately 30% from hand-dug wells and 10% from boreholes. A further 35% of Nigerians resort to surface water sources to meet their domestic water supply needs and are thus exposed to risks from the effects of flooding and solid waste disposal. Indeed, transported sediments and leachates from wastes, and especially biological wastes, can easily contaminate both surface water and groundwater thus compromising the people's health which is often compounded by a complacent attitude of environmental regulation. Even the air we breath is not pour due to effect of mining activities going on within the country.

Environment engineering will outline and examines specific environmental (wastewater, solid waste, air pollution) challenges facing Nigeria and offers a detailed insight into appropriate technological solutions.

Objectives

The objectives of the course are to:

1. identify the various types of environmental pollution.
2. describe the effect of the pollutants on environment.
3. characterization of wastewater and design effective system to treat wastewater.
4. discuss effective system of collection, disposal and recycle of solid waste.
5. describe a system of managing air pollution.

Learning Outcomes

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

1. recognize the different types of environmental pollution, techniques for their monitoring and control;
2. value the effect of the pollutants on the environment: atmosphere, water and soil;
3. apply methods of wastewater treatment and design an effective system to treat wastewater
4. analyze the various types of solid waste and design an effective system of collection, disposal and treatments;
5. plan an effective method of the control of air pollution.

Course Contents

Sources of wastewater. Industrial and domestic wastewater surveys. Elements of wastewater. Wastewater collection. Principles of wastewater treatment. Wastewater characteristics. Why treats wastewater. Wastewater treatment philosophy. Preliminary & primary, secondary & tertiary treatment units. Reactions and reactors in wastewater treatment. Design of water treatment units. Layout and general outline of water treatment units. Sedimentation, principles, design factors. Coagulation. Flocculation. Clarifier design. Coagulants. Feeding arrangements. Filtration theory. Working of slow and rapid gravity filters and multimedia filters. Design of filters. Troubles in operation Comparison of filters. Disinfection. Theory of chlorination. Chlorine demand, other disinfection practices. Miscellaneous treatment methods. Water softening. Sewage quality. Design of sewage treatment units. Conservancy and water carriage systems. Characteristics of sewage. B.O.D. C.O.D. equations. Ultimate disposal of sewage. Dilution. Self-purification of rivers. Layout and general outline of various units in a waste water treatment plant. Primary treatment design of screens. Grit chambers. Skimming tanks. Sedimentation tanks. Principles of design. Biological treatment. Trickling filters. Standard and high rate. Sludge handling and design of ponds. Concept of ponds. Construction and design of anaerobic and oxidation ponds. Sludge digestion. Factors effecting design of digestion tank.

Sludge disposal by drying. Other options-septic tanks working principles and design soak pits. Solid waste management, classification, quantification and composition of solid waste disposal methods. Air pollution. Monitoring and control. Air pollutants, characteristics, sources. Dispersion of pollutants in air Dispersion models, equations. Design of air pollution control systems.

Minimum Academic Standards: Civil engineering laboratory with a NUC-MAS requirement facilities.

EDSU-CEE 515: Advanced Structural Mechanics (2 Units E: LH 30)

Senate approved Relevance

Develop technical knowledge, Training high quality graduates who are highly skilled and knowledgeable in the design and analysis of structures, evaluation, planning and creative design abilities in various ways that can contribute to the development of a more satisfying life and environment for the benefit of mankind. This is in accordance with the vision and mission of EDSU. This is necessary to produce a role model, self-reliant and excellence civil engineers with adequate technical skills, fundamental concepts relevant to latest development, entrepreneurial competences, a sense of public responsibility, communication skills and management skills to handle national and international issues in civil engineering.

Overview

An important aspect of the analysis and design of structures relates to the deformations caused by the loads applied to a structure. Clearly it is important to avoid deformations so large that they may prevent the structure from fulfilling the purpose for which it is intended. But the analysis of deformations may also help us in the determination of stresses.

A bridge is a structure built to span the physical obstacles without closing the way underneath, such as a body of water, valley, or road, for the purpose of providing the passage over the obstacle. Bridge engineering is an engineering discipline branching from civil engineering that involves the planning, design, construction, operation, and maintenance of bridges to ensure safe and effective transportation of vehicles, people and goods. This course is focused on main topics and the basic principles of bridge engineering and provides the full scope of current information necessary for effective and cost-conscious contemporary bridge. It reflects new engineering and building developments, the most current design methods, and the latest industry standards and policies. It provides a comprehensive overview of the significant characteristics for bridge engineering. It

highlights the recent advancements, requirements, improvements, and details of the latest techniques in the global market.

Objectives

The objectives of the course are to:

1. explain different types of bridges and abutments foundations designs.
2. identify possible degree of freedom in the bridge section, analyse possible forces and stresses.
3. discuss the design of steel and concrete bridge elements considering its abutments.
4. explain the analysis and design of different types of culvert, pipeline crossing, rigid and flexible conduits.
5. explain different types of retaining walls; analyze dams and other earth and water retaining structures and its application on reservoir constructions.
6. understand design and detailing of steel, reinforced and pre-stressed concrete bridge, dams and culverts structures.
7. write a computer program for any of the solved problems using some basic computer programming application such as: EXCEL, FORM5, QBASIC, FORTRAN and MATLAB.

Learning Outcomes

1. plan the different types of bridges and abutments foundations designs.
2. apply possible degree of freedom in the bridge section, analyze possible forces and stresses.
3. conduct design of steel and concrete bridge elements considering its abutments.
4. analysis and design of different types of culverts, pipeline crossing, rigid and flexible conduits.
5. plan and design the different types of retaining walls; analyze dams and other earth and water retaining structures and its application on reservoir constructions.
6. perform a complete design and detailing of steel, reinforced and pre-stressed concrete bridge, dams and culverts structures.
7. formulate a computer program for any of the solved problems using some basic computer programming application such as: EXCEL, FORM5, QBASIC, FORTRAN and MATLAB.

Course Content: Introduction of bridge design. Design consideration of bridge structures. Design of pile cap. Design of pile. Design of pier. Design of beam. HA and HB load on bridge. Box Culvert design. Pipeline crossing. Rigid conducts. Flexible conduits. Steel bridges. Concrete bridge. Abutments Foundations. Design of dams. Design of water retaining structures. Substructure general. Course work on a typical design.

EDSU-CEE 516 Flood and Stormwater Control (2 Units; CORE; LH 30; PH 45)

Senate-approved relevance

Training of high-quality graduates who are highly skilled and knowledgeable in flood and stormwater control in Nigeria are in agreement with EDSU's mission to address African developmental challenges in producing civil engineering graduates. Relevance is seen in civil engineers from EDSU being able to design, construct and maintain conveyance channels and conduits to address the flood crises, which result from inadequate and improper design and construction of conveyance channels. This will help to mitigate climate change menace as well as increase and improve storm water control in terms of quality and quantity through best practices for sustainable development.

Overview

Flood and stormwater control is a vital approach used to increase and improve the storm water management in terms of quantity and quality of flood control for sustainable development. Flood and stormwater control when fully adopted in civil engineering courses will help in mitigating the effect of flooding experiences in the country recently.

This course is designed to teach students how to control urban stormwater systems to reduce the detrimental impacts on the environment. Flood and stormwater control encompasses a variety of activities such as stormwater infrastructure design and maintenance, analysis/modeling and selection of appropriate solutions to urban stormwater problems, and cost estimation of stormwater infrastructure. State-of-the- art practices for controlling runoff are examined for minimizing the hydrologic and ecologic impacts of urban development.

Objectives

The objectives of the course are to:

1. describe the various rainfall statistics from long-term precipitation records
2. identify problems created by floods in the catchment area
3. describe characteristics of stormwater runoff quantity and quality and their impacts on receiving water systems.
4. identify facilities for surface and sub-surface drainage of the urban area
5. discuss the cost-benefit analysis of drainage and flood protection works
6. understand the simulation of stormwater system using EPA SWMM5 model
7. write a comprehensive stormwater management plan for a site

Learning outcomes

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

1. apply the historical flood data and analyze/predict flood event;
2. plan solutions strategies on mitigation of flood in a catchment area;
3. evaluate the characteristics of stormwater runoff and their impacts
4. design effective drainage system for a city
5. compute cost-benefit analysis of drainage and flood protection works
6. apply EPA SWMM5 software for stormwater simulation
7. design a comprehensive stormwater management plan for a site

Course contents

Historic floods. Dam and Reservoir Operations. Meteorologic Storm Frequency Analysis. Hydrologic Flood Frequency Analysis. Hydraulic Systems Analysis. Floodplains. Storm Drains. Open channel flow. Uniform flow computations. Computation of water surface profile (WSP) gradually varied flow estimation using standard step and direct step methods. Saint Venant equation. Kinematic wave routing. Diffusion routing. Overland flow. Steady and unsteady modeling using HECRAS. Stream gauging, direct and indirect methods. Floods-causes and effects. Flood frequency analysis-Gumbel's method. Log Pearson type III method. Flood control methods. Flushing of water courses; methods, facilities and structures. Flood warning systems. Design of floodways and floodway structures such as through-ways, bypasses and mobile weirs. Sediment transport and sedimentation, energy principle. Cost-benefit analysis of flood protection works. Design of surface drainage watercourses. Design of pumping stations. Design of automatic and non-automatic level and discharge control structures. Design of culvert. Flushing of water courses; methods, facilities and structures. Maintenance of watercourses and structures. Weed cutting, removal and disposal of aquatic plants, floating debris, sediments and solid waste. Introduction to EPA SWMM5 modeling.

Minimum Academic Standards

Civil engineering water laboratory with a NUC-MAS requirement facilities.

CIE 599: Projects **(6 Units: CORE, PH 270)**

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

4.0 Minimum Academic Standards

Equipment

List of Laboratories/Workshop and Equipment

Structural Engineering

1. Civil Engineering Materials Laboratory
2. Structures Laboratory:

   Routine testing

   Models and prototype testing

   Studio/design office

Geotechnical Engineering

Field soil survey and testing (including sub-soil investigation and drilling) Laboratory soil/rock testing

Geodetic Engineering and Photogrammetry

1. Laboratory equipment stores
2. Photogrammetry and Remote sensing Laboratory

Water Resources and Environmental Engineering

1. Hydraulics Laboratory
2. Hydrology Laboratory
3. (iii)Environmental Health Laboratory

Highway and Transportation Engineering

1. Highway Materials Testing Laboratory

2. Pavement Laboratory.

Major Equipment

Structural Engineering Laboratory

1. Universal Testing Machine with accessories for tension, compression,
2. transverse 180^{o} cold bend, double shear, punching and brunel hardness tests. Capacity – 10000KN; Transverse beam – 500KN.
3. Proto-type tests facilities for testing of proto-type in structural elements, i.e. beams, frames, trusses, etc. Accessories for the purpose include 1000KN, 250KN load rings, electronic load cells, faculty workshop facilities, DEMEC High accuracy gauges, hydraulic jacks, etc.
4. Compression testing machine and transverse flexural testing frame: suitable for standard compression, flexural tensile tests and split cylinder tests on standard concrete and wood specimens to BS 1881 and CP 112 respectively. Shear rig can be manufactured and attached to this machine for testing shear strength of wood and glued wood joints. Capacity of the machine is 2500KN.
5. Routine testing and demonstration equipment: This includes armfield extensometres, arch frames, suspension bridge frame and pin-jointed frame work.
6. Concrete batching and making equipment:

   Multi-flow mixers, 112 Dm^3 (4ft^3) and 56 Dm^3(2ft^3) capacities 200-240V.

   Test BS sieves of various sizes

   Semi-automatic scale 25kg capacity

   Automatic scale 500kg capacity

   Standard moulds of various sizes and tamping rods

   Vibrating table

7. Concrete quality and workability equipment: Slump cone apparatus to BS 1881 ASTM CI43

   Compacting factor apparatus to BS 1881 (2 sizes)

   Vibro Consistometre to BS 1881

   Vicat apparatus

   Air entrainment metre

Water Resources and Environmental Engineering Laboratory

1. Laminar/turbulent pipe flow apparatus
2. Radial flow pump
3. Radial flow turbine
4. Surges in pipes apparatus
5. Surge tower
6. Water hammer apparatus
    a. Evaporating dish
7. Steam bath or infrared lamp
8. Drying oven
9. Desiccator
10. Analytical balance
11. Reagents – Sodium hydroxide, in distilled
12. Water, phosphate buffer solution, magnesium
13. Sulphate solution, calcium chloride solution, ferric chloride solution, acid and alkali solution, etc
14. Laboratory flow channel
15. Fibre glass
16. Thermometres
17. Funnels
18. Test Tubes

Geotechnical Engineering/Highway and Transportation Engineering Laboratory:

1. Tri-axial testing machine complete with transducers cells and accessories
2. Motorized direct/residual shear box machine complete with load rings, set of weights and accessories
3. CBR Testing machine complete with moulds, load ring gauges and accessories
4. Consolidation apparatus complete with cells, gauges and set of weights
5. Laboratory vane test apparatus complete with set of springs and motorizing attachment
6. Large capacity floor-mounting electric ovens 40°C to 16°C
7. Hotplates with Simmersat heat control unit 220–240V, 2000 W

8. Mettler top-loading balance with optical scale 100 g, Readability 0.01 g, capacity1.3 kg
9. Graduated twine beam scale complete with two stainless steel pans 0 to 200 g x10g
10. Semi-automatic balances, 25kg capacity complete with scoope and set of counter weights 11. Autographic unconfined compression apparatus complete with platens springs
12. Unconfined compression apparatus complete with platens and strain gauge mounting assembly and dial gauge
13. Automatic sieve shaker for up to 200 mm diametre sieve
14. BS sieves 212 mm to 8 mm and 200mm diametres
15. Simple hand boring sampling augers complete with accessories
16. Portable drilling unit with two-stroke petrol engine and two pairs of handles complete with extension rods
17. Atterberg limits determination apparatus complete with liquid limit device and accessories 18. High-speed stirrer complete with cup and baffler
19. Constant temperature bath complete with hydrometre jars, watt heater, thermostat, etc
20. CBR Marshall tester complete with breaking head stability mould and flow metre dial gauge
21. Compaction pedestal complete with hammer and mould body
22. Constant head permeability apparatus complete with cells and accessories
23. Standard proctor compaction mould, 1000 cm^3 capacity complete with rammers and accessories
24. GEONOR swelling test apparatus complete with cells and accessories
25. Riffle boxes complete with three rigid metal containers
26. Wax melting pot with thermostatic control up to 150^oC range
27. Hand-operated extruder – screw type sample extruder for 38mm dia. Complete with builtin sample tube supports
28. Proctor/core cutter extruder comprising a frame and a 15-KN hydraulic jack
29. Universal extruder comprising a frame and a 15-KN hydraulic jack
30. Bench-moulding mixer with three-speed gear box complete with stainless steel bowl 7.5 dm^3 capacity
31. Long stem soil hydrometre graduated 0.995 to 1.030 g/ml
32. Sieving extractor complete with clamps and clamming ring for use with sieves of 200mm dia
33. Minor centrifuge complete with 8-place angle head, 8 x 50 ml metal buckets and caps 34. Ductilometre for testing 4 specimens complete with briquette moulds and base plate

35. Flash and fire-points apparatus gas heated.

Geodetic Engineering and Photogrammetry Laboratory:

1. Theodolites
2. Levels
3. Compasses
4. Umbrellas
5. Protractors
6. Steel tapes
7. Engineer's chains
8. Ranging rods
9. Surveyor's scales
10. Theodolites
11. Levels
12. Compasses
13. Umbrellas
14. Protractors
15. Steel tapes
16. Engineer's chains
17. Ranging rods
18. Surveyor's scales
    a. Various graph paper
    b. French curves
    c. Log tables
19. Planimetres
20. Plumbulbs
21. Arrows
22. Field books
23. Modern survey equipment as affordable e.g. Total Station, Global Positioning System (GPS), Terrestrial Laser Scanner (TLS).

Staffing

Academic Staff

The NUC guidelines on staff/student ratio of 1:15 for Engineering and Technology departments shall apply. However, there should be a minimum of six full-time equivalents of Staff in the department. There is need to have a reasonable number of Staff with doctoral degrees as well as sufficient industrial experience. With a minimum load of 15 Units per semester for students and a minimum of six full-time equivalent of staff in each programme, staff should have a maximum of 15 contact hours per week for lectures, tutorials, practical's and supervision of projects.

NUC requirement encourages all academic staff to have PhD degrees; hence appointment of academic staff is preferably to the Lecturer cadre. Only in exceptional cases are candidates with great promise appointed to Graduate Assistant and Assistant Lecturer positions for the purpose of being developed to the Lecturer cadre as registered PhD candidates.

Academic Support Personne

Teaching Assistant/Demonstrators to help lecturers in the conduct of tutorials, practical's and field work. This category of personnel is not expected to be regular staff as they are to be paid on the basis of approved hourly rate.

Administrative Support Staff

The services of the administrative support staff are indispensable in the proper administration of the departments and faculty offices. It is important to recruit very competent senior staff that are computer literate.

Technical Support Personnel

The services of technical support staff, which are indispensable in the proper running of laboratories and workshop/studios are required. It is important to recruit very competent senior technical staff to maintain teaching and research equipment. They are also to undergo regular training to keep them abreast of developments in equipment operation and maintenance. The minimum of academic staff to technical staff ratio of 5:1 should be maintained.

Student/Staff Ratio

The minimum staff-to-student ratio should be 1:15 from 200 level to 500 level.

Library

There must be adequate library facilities to cater for the interest of all the programmes in the faculty. These include current journals, handbooks, textbooks, manuals, codes of practice, standards and specifications etc. in sufficient numbers**.**

Library Facilities

The following facilities should be provided to enable users make maximum use of library services:

1. Reading Rooms
2. Visually Impaired Resource Centre
3. Radio Frequency Identification (RFID) Security gate for theft detection
4. RFID tags for book tagging
5. Notebook computers for loan service
6. Over two hundred computers distributed at the various service points for Database search at the University library and Faculty Libraries
7. Workstations at the Faculty Libraries for Database search
8. Projectors and Screens for presentations
9. Photocopying machines
10. Scanners
11. Visually Impaired Resource Centre
12. Information display screen
13. E-Library (postgraduate and undergraduate sections)
14. Discussion Rooms

Types of Laboratories

Chemistry and Reaction laboratory

Unit Operations laboratories – at least 3

Instrumentation laboratory

Thermodynamics and Heat transfer laboratory

Table 18: Physical space requirement

Academic	**m^2**
Professor's Office	18.50
Head of Department's Office	18.50
Tutorial Teaching Staff Space	13.50
Other Teaching Staff Space	7.00
Technical Staff Space	7.00
Science Staff Research Laboratory	16.50
Engineering Staff Research Laboratory	14.50
Seminar Space per student	1.85
Drawing Office Space (A.O. Board) (Per Student)	4.60
Drawing Office Space (A.I. Board) (Per Student)	3.70
Laboratory Space	7.50
Non-Academic	
Secretarial Space	7.00

Table 19: Office Accommodation

S/No	**Office**	**No in Room**	**Facilities**
1.	HOD	1	Table, chairs, A/C, filing cabinet, bookshelves, computer unit, Secretary and facilities.
2.	Professor	1	Table, chairs, A/C, filing cabinet, bookshelves, computer unit, Secretary and facilities.
3.	Reader	1	Table, chairs, A/C, filing cabinet, bookshelves, computer unit.
4.	Senior Lecturer	1	Table, chairs, A/C, filing cabinet, bookshelves, computer unit.
5.	Lecturer I	2	Table, chairs, fan, filing cabinet, bookshelves.
6.	Lecturer II	3	Table, chairs, fan, filing cabinet, bookshelves.

APPENDIX I

List of Reviewers

Title	Surname	First Name	Institution	Programme
Professor	FABORODE	Michael O.	Obafemi Awolowo University, Ile-Ife	**Discipline Chairman**
Professor	WAZIRI	Baba Shehu	University of Maiduguri	Water Resources Engineering
Professor	AYESIMOJU	Kola Oluyomi	University of Lagos	Civil Engineering
Professor	OGUNTI	Erastus O.	Federal University of Technology, Akure	Structural Engineering
Professor	BABATOLA	Olufemi	Federal University of Technology, Akure	Wood Products Engineering
Professor	AISIEN	Felix A.	University of Benin, Benin-City	Biomedical Engineering
Professor	FAKINLEDE	O. A.	University of Lagos, Lagos	Systems Engineering
Professor	LETON	Tambari Gladson	University of Port Harcourt	Environmental Engineering
Professor	FUBARA-MANUEL	Isoteim	Rivers State University of Science and Technology, Port Harcourt	Marine Engineering
Professor	ATEYERO	A.A.A.	Covenant university, Ota	Information and Communication Engineering
Professor	AIBINU	Musa Abiodun	Federal University of Technology, Minna	Information and Communication Engineering
Professor	OGBONNA	Chibueze Achimba	Babcock University, Ilishan Remo	Computer Engineering
Professor	NYITMEN	Dominic Saaityo	Nigerian Defence Academy, Zaria	Telecommunication Engineering
Professor	ITODO	Isaac Nathaniel	Joseph Sarwan Tarka University, Makurdi	Agricultural and Biosystems Engineering
Professor	AJAKA	Ebenezer O.	Federal University of Technology, Akure	Mining Engineering

APPENDIX II

List of NUC Representatives

Title	Surname	First Name	Programme
Mr	OGUNNUSI	Afolabi	Water Resources Engineering
Mrs	OZICHI	Happiness Madu	Civil Engineering
Mrs	AGBAJI	Stella Ene	Structural Engineering
Mrs	ABIMBOLA	Oni	Environmental Engineering
Mrs	OPARAUGO	Lilian N.	Wood Products Engineering
Mr	EMENEM	Chinweokwu	Marine Engineering
Mrs	AKAUBA	Vivian	System Engineering
Mr	AKINOLA	Akinlabi	Computer Engineering
Mrs	EFFIONG	Itoro	Biomedical Engineering
Mr	NKESHITA	Valentine	Information and Communication Engineering