

**STATE UNIVERSITY OF MEDICAL AND APPLIED SCIENCES,
IGBO-ENO, ENUGU STATE**

**FACULTY OF ENGINEERING AND THE BUILT
ENVIRONMENT
DEPARTMENT OF CIVIL ENGINEERING**



STUDENTS' HANDBOOK

UNDERGRADUATE DEGREE PROGRAMME

2026

STATE UNIVERSITY OF MEDICAL AND APPLIED SCIENCES
IGBO-ENO, ENUGU STATE

FACULTY OF ENGINEERING AND BUILT ENVIRONMENT
(FEBE)

DEPARTMENT OF
CIVIL ENGINEERING (DoC)

STUDENTS' HANDBOOK
5 YEAR STANDARD UNDERGRADUATE
BACHELORS OF ENGINEERING (B.Eng)
DEGREE PROGRAMME IN CIVIL ENGINEERING
(CCMAS EDITION)

2026-2031

RELEVANT CONTACTS

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PREFACE

Welcome to the Department of Civil Engineering, Faculty of Engineering and the Built Environment (FEBE), State University of Medical and Applied Sciences (SUMAS), Igbo-Eno.

This maiden edition of the **Department of Civil Engineering Students' Handbook** has been carefully prepared to serve as a comprehensive guide for both newly admitted and returning students throughout their academic journey. The handbook provides essential information on admission requirements, curriculum structure, semester course registration, academic regulations, graduation requirements, and other departmental policies and activities. It is intended to assist students in making informed academic decisions and ensuring compliance with departmental and university regulations.

Students are strongly advised to use this handbook as a constant reference throughout their period of study. Careful adherence to the guidelines contained herein will help prevent common academic challenges such as incorrect course registration, excessive credit load, and non-compliance with graduation requirements.

Beyond academic pursuits, students are encouraged to participate actively in the intellectual, professional, social, and leadership opportunities available within the University. Membership of recognized student organizations, including the Students' Union Government (SUG), the Nigerian Union of Engineering Students (NUESA), and the Nigerian Society of Civil Engineering Students (NSCES), is highly encouraged. At the professional level, students are advised to register as Student Members of the Nigerian Society of Engineers (NSE) to begin building their professional network and career development from an early stage.

The Department also recognizes the importance of moral and personal development. Students are therefore encouraged to participate in approved religious and community-based activities that promote ethical conduct, discipline, and responsible citizenship. However, it is important to emphasize that the University maintains a strict prohibition against all forms of secret cults, unlawful societies, and related activities. Any involvement in such organizations constitutes a serious violation of University regulations and attracts appropriate disciplinary measures.

Students experiencing academic or personal challenges are encouraged to seek timely guidance from their Level Advisers, Staff Advisers, or the Head of Department. The Department remains committed to providing the necessary academic support and mentorship to ensure every student has the opportunity to succeed.

While this handbook provides information specific to the Department of Civil Engineering, it should be read alongside the official **State University of Medical and Applied Sciences Students' Handbook**, which contains the University's General and Academic Regulations, policies, and information on student services.

We warmly welcome you to the Department of Civil Engineering and wish you a fulfilling, productive, and successful academic experience. We encourage you to uphold the highest standards of academic excellence, professionalism, integrity, and service as you prepare for a rewarding career in civil engineering.

Engr. Boniface C Ezea

Editor in Chief, Department of Civil Engineering

WELCOME NOTE

My dear Students of Civil Engineering, I welcome you to the exciting journey of studying Civil Engineering! This handbook is designed to guide you through your B.Eng. Civil Engineering program, providing essential information and resources to support your academic and professional growth. Civil Engineering is a blend of innovation, mathematical knowledge, structural design and analysis technical skill, and passion for shaping and creating executable models that inspire and serve communities. As you explore design studios, learn about structures, history, and technologies, you'll discover the multifaceted nature of this rewarding profession. We hope this handbook helps you navigate your studies, understand program requirements, and make the most of opportunities here. We're excited to see your ideas, innovations, and growth as future engineers contributing to the Built Environments that enrich lives. Finally, on behalf of myself and the entire staff of the Department, we welcome you. I also wish you God's guidance, a successful and memorable stay in the Department of Civil Engineering in particular and the University as a whole.

Best regards,

Engr. Dr. C. O. Ugwoke.

Ag. Head of Civil Engineering Department.

PHILOSOPHY OF STATE UNIVERSITY OF MEDICAL AND APPLIED SCIENCES (SUMAS)

The University is fully committed to efficient time management skills which are critical for students and lecturers alike in teaching and learning processes. Allocating realistic amount of time means effective learning for student and effective teaching for lecturers. How an institution defines time expectations for student, lectures, administrations, and other professional staff can establish the basis for high performances for all. Time on task will be a principle that applies to all person within, and all components of, an institution. The university will therefore consider student time on task (learning), lecturer time on task (teaching), and institutional time on task (devoted to teaching and learning). Student typically will have heavy course-hour requirement, and the University will expect a tremendous amount of work outside class in preparation for each hour. For lecturers, the University will ensure that individual teachers themselves commit sufficient time to the institutional task. Teachers are powerful role model for their student. The simple matter of starting and ending class on time can send important messages about how professors and profession view and use time. Corresponding efforts may be required to ensure the students are timely in their own class attendance. Lecturers will be expected to prepare conscientiously for class and employ teaching methods appropriate for the subject matters and objective of their courses. The objectives and requirement of their courses, including applicable attendance and grading rules, will be clearly stated.

The university is fully committed to devoting adequate resources to teaching. The University will actively compete for funds that are appropriated to support teaching enhancement and improvement, multidisciplinary teaching and collaborative teacher-student efforts. Private donors may be quite interested in programmes to enhance teaching. While donors have traditionally supported teaching through such gifts as endowed chairs, in recent years, private funds have been successfully raised for other teachings initiatives. The university will develop a principles and practice programme, in which practicing professionals team-teach upper-level courses with fulltime lecturers. Students will learn from both the practitioners and the professors and members of the teaching-team learn from each other. The university will seek a donor to endow the programme, as well as donors to support lecturer-practitioner teams in individual principles-and-practice courses.

Not only will the University focus on ways in which individual students and teachers can become more focused on appropriate tasks; the lecturers should also consider the institutional structure in which teaching, and learning occur. Lecturers will consider the impact of the University's curriculum on their efforts to make the most of efficient use of student and staff time. The University will, furthermore, make efficient use of student time by careful curriculum planning. Moreover, the University will review its curricula regularly in with global best practices and to consider the needs of the stakeholders in our rapidly changing society.

CORE VALUES

As operating ethos, the following values are prioritized to underlie the University's mission. These values serve as the foundation for commitment of the University as a tertiary institution focusing on health sciences, technology, and legal studies to provide a more equitable and inclusive atmosphere for education, practice and research while envisioning both personal enhancement and social progress.

Respect: Vicissitude of ideas leads to gaining a trenchant perspective; thus, the university will respect diverse scientific approaches of its community members.

Communication: In pursuit of sustaining its leadership role, the university will exhort scholars to exchange ideas, and create an effective communicative environment. To serve its global vision, the university will also attempt to excel its international relations and communicate its scholarly views worldwide.

Diversity: The university will endeavour to be home to people from different walks of life. Diversity fosters a productive academic atmosphere, promoting the university's mission and enriches a greater creative environment. Being hospitable to diverse backgrounds will strengthen understanding of each other.

Teamwork: Every department and division of the university will be called for synergy to boost both the university resourcefulness and scientific progress.

Unity: Although the university is deemed a platform for the plethora of options, a home to diverse people and a forum to exchange divergent ideas, it is viewed holistically and as an entity which attempts to become united with others across the globe.

Excellence: In teaching, research, and public service, excellence will be observed to utilize the available to create new ones and to ensure quality delivery.

Innovation: Consistently seeking noble approaches to healthcare systems, engineering, technology, and research will be among the focal values to positively impact practice and experience the university.

Compassion: Compassion will be one of the university's true hallmarks reflected in the university's humanitarian attitude in sympathizing with those suffering, standing with them in their suffering and endeavouring to alleviate their pains.

Service: Commitment to the wellbeing of the national community and any other person the university encounters, will compel the university to provide the people with state-of-the-art service.

Respect for the national environment: The university recognizes human impact on environment and ramifications that they shall consequently incur. The university, therefore, understands its responsibilities towards nature and values ecological solutions and interdisciplinary practices to

ameliorate environmental degradation or diminish the negative results of the activities the university may cause.

Integrity: honesty and truth will pervade the university words and deeds and serve as the basis for every decision the university will make.

VISION OF THE UNIVERSITY

The vision of State University of Medical and Applied Sciences is “to be a leading university of excellence in medical and applied sciences”. The University will accelerate progress as an international leader in medical and applied sciences. It will empower its students to fulfill their academic and professional passions in a university that is welcoming and inclusive for all students, lecturers, and professional staff. The University will create innovative connections among medical, health, natural and applied sciences, and engineering. It will strengthen support for dynamic set of lecturers dedicated to teaching, mentoring, research, clinical care, engineering services and technology

MISSION OF THE UNIVERSITY

The mission of the University is to provide a learning environment in which staff and student can discover, examine critically, preserve, and transmit the knowledge, wisdom and values that will help ensure the survival of this and future generations and improve the quality of life for all. The University will seek to help student to develop an understanding and appreciation for complex cultural and physical worlds in which they live and to realize their highest potential of intellectual, physical, and human development.

GOAL AND OBJECTIVES OF THE UNIVERSITY

The state university of medical and applied sciences shall be firmly committed to offering students of widely varied ages, backgrounds, interests and needs, a broad range of educational opportunities and experiences.

The objectives of the university shall be, to:

- (a) Provide a wide range of quality learning opportunities for undergraduates and postgraduate students without distinction of race, creed, sex, religion, or political convictions that will enhance their best intellectual, social, and personal development.
- (b) provide academic, professional, and vocational training of high quality in a way as to enrich and improve state, national and international human resource capabilities and assist its graduates to contribute to the common good of the society.
- (c) foster academic research which contributes to human knowledge and the vitality of the institution.
- (d) Encourage thoughtful and responsible staff and students’ participation in local, state, national and international affairs.

(e) Maintain the highest academic standards in respect of university degrees and other awards and preserve and protect their reputation and integrity.

DEPARTMENT OF CIVIL ENGINEERING

Introduction

The Department of Civil Engineering hosts the Bachelor of Engineering Degree programme in Civil Engineering of the State University of Medical and Applied Sciences. The Department strives to operate at the cutting edge of the curriculum on offer. The Department of Civil Engineering offers a very attractive Bachelor of Engineering (B.Eng) programme of five-year duration. The programme sets out to give the undergraduate a firm academic foundation in the scientific principles upon which civil engineering is based, then introduces him to the technological applications of these fundamental scientific principles and finally grooms him to develop the professional capability for carrying out such applications. `

Brief History

The Department of Civil Engineering hosts the Bachelor of Engineering Degree programme in Civil Engineering of the State University of Medical and Applied Sciences. It came into existence with the enactment of the University Act by the Enugu State House of Assembly in 2022 and was conceived as an inception course in the drawing up of the academic programmes for the new university. The program commenced in 2022/23 session. The first set of Academic and support Staff were recruited through a competitive process.

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The department started with a total of 6 students whom it aims to groom into professionals that could compete favorably after graduation. It has also progressively increased its staff strength to meet up with the academic demands on the curriculum.

The structure of Civil Engineering courses as taught in SUMAS is such that the students are introduced to and engaged in the core curriculum set out by the Core Curriculum Minimum Academic Standard (CCMAS) of both the National Universities Commission (NUC) and the Council for the Regulation of Engineering in Nigeria (COREN). However, additional courses are added to the courses suggested by the CCMAS in such a way as to facilitate a robust Civil Engineering graduate that is up-to-date with the current global advancement drive.

OVERVIEW

The B.Eng. Civil Engineering Core Curriculum and Minimum Academic Standards (CCMAS) is the new curriculum approved by the National Universities Commission (NUC) for use in all Nigerian universities for the educational training of civil engineers. It is the efforts of all the universities in Nigeria and experts who worked together to develop it. It is an improvement over

the B.Eng. Civil engineering Benchmark Minimum Academic Standards (BMAS), which was in use from 2007 until the approval of the present CCMAS. The B.Eng. Civil Engineering CCMAS compares significantly well with any B.Eng. as this CCMAS provides a unique basis upon which specialization and uniqueness of individual institution can be built.

The aim is to produce graduates that meet the needs of today's building/construction industries by providing a thorough understanding of the subject, technical competence, and transferable skills required for the 21st Century knowledge-based and digital economy. The B.Eng Civil Engineering CCMAS contains 105 Units of core courses in Basic Sciences, General Engineering and Civil Engineering Sciences. The course content for all the courses as well as learning outcomes for individual courses in the CCMAS are outlined as a guide for content delivery. The balance of the 150 units required for graduation are to be designed by the University to suit its purpose. The aim is to produce Civil Engineers with generic skills, competencies and attitudes fit for the 21st Century and the 4th Industrial Revolution.

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

AREAS OF SPECIALIZATION

The Civil Engineering Programme includes several courses in structural analysis, design of structures, geology, soil mechanics, hydraulics, water resources and environmental engineering, highway design and traffic analysis, irrigation and drainage design/planning and design of water retaining structures. The primary areas of specialisation are:

1. Structural Engineering
2. Water resources and Environmental Engineering
3. Construction Management Engineering
4. Highway Engineering

PHILOSOPHY OF CIVIL ENGINEERING

The Philosophy of Civil Engineering programme of State University of Medical and Applied Sciences is to train and produce qualified engineers with high academic standards and adequate practical background in Civil Engineering through broad-based training and exposure to industrial as well as entrepreneurial practices to enable them satisfy the immediate manpower needs of the industry and the community.

The B.Eng. programme adopts current and landmark advances for conceptualization, planning, design, construction and management of Civil Engineering facilities and projects based on the latest requirements of NUC and Council for the Regulation of Engineering in Nigeria (COREN)

which focus on the programme educational objectives, programme outcomes and course outcomes such that the graduates can be relevant to national development and be internationally competitive. The graduates of the programme are being prepared to function effectively in government parastatals and establishments, private and public industries, research institutions, and as employers of labour.

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.

Graduates from Civil Engineering Department are expected among other things to:

- a) Be job creators in their areas of specialization in particular, civil engineering discipline in general.
- b) Design and construct civil engineering structures primarily in their areas of specialization.

- c) Supervise the construction, commissioning and maintenance of structures.
- d) Design, develop and produce innovative products and techniques for industrial growth.
- e) Adapt and adopt indigenous technology in order to solve engineering and technological problems in the relevant area of specialization in particular and Civil Engineering in general.

Program Educational Objectives (PEOs)

PEO 1: Graduates of the Civil Engineering programme shall demonstrate competence in applying engineering principles, modern technologies, and innovative problem-solving skills to the planning, design, construction, operation, and maintenance of sustainable civil engineering infrastructure.

PEO 2: Graduates shall practice Civil Engineering professionally and ethically, communicate effectively, work collaboratively in multidisciplinary teams, and provide solutions that address industrial, environmental, and societal challenges in accordance with national and international engineering standards.

PEO 3: Graduates shall pursue continuous professional development, research, innovation, entrepreneurship, and leadership while advancing their expertise in specialized areas of Civil Engineering, including Structural Engineering, Geotechnical Engineering, Transportation and Highway Engineering, Construction Engineering and Management, Water Resources Engineering, Environmental Engineering, and Project Management.

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Construction Engineering and Management, Water Resources Engineering, Environmental Engineering, and Project Management.

Program Outcomes (PO)

PO1 Engineering Knowledge

PO2 Problem Analysis

PO3 Design/Development of Solutions

PO4 Investigation

PO5 Modern Tool Usage

PO6 The Engineer and Society

PO7 Environment and Sustainability

PO8 Ethics

PO9 Individual and Team Work

PO10 Communication

PO11 Project Management

PO12 Lifelong Learning

PO1: Engineering Knowledge: apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of developmental and complex engineering problems

PO2: Problem Analysis: identify, formulate, research literature and analyze developmental and complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PO3: Design/Development of Solutions: proffer solutions for developmental or complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.

PO4: Investigation: conduct investigation into developmental or complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.

PO5: Modern Tool Usage: create, select and apply appropriate techniques, resources and modern engineering and ICT tools, including prediction, modeling and optimization to developmental and complex engineering activities, with an understanding of the limitations.

PO6: The Engineer and Society: apply reasoning informed by contextual knowledge including Humanities and Social Sciences to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

PO7: Environment and Sustainability: understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

PO8: Ethics: apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice, including adherence to the COREN Engineers Code of Conducts

PO9: Individual and Team Work: function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

PO10: Communication: communicate effectively on developmental or complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management: demonstrate knowledge and understanding of engineering, management and financial principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments

PO12: Lifelong Learning: recognize the need for, and have the preparations and ability to engage in independent and lifelong learning in the broadest context of technological and social changes.

Employability Skills

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

21st Century Skills

The 21st century skills includes the innovative skills:

1. creativity and innovation;

2. critical thinking/problem solving/decision making;
3. communication;
4. collaboration (team work);
5. learning to learn/metacognition;
6. citizenship (local and global);
7. general computer literacy and mastery of relevant information technology;

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.

STUDENTS WELFARE

Prompt attention is given to every complaint from the students. All students' grievances are usually noted (documented) and handed over to the appropriate committee through either the Head of Department or the Dean of Faculty. Issues of Health are referred to Medical Centre Director while the Department works with the CSO on all security cases. The Department of Civil Engineering does not abandon students on matters on personal concern that need guidance and counselling or possible distressing needs which may bring the students to heartening level of restoration.

PROGRAMME DURATION

Civil Engineering offers a degree programme of ten semesters (five years) and six or eight semesters (for Direct Entry Students depending on the level of training of applicant) leading to the award of Bachelor of Engineering (B.Eng.) Degree in Civil Engineering. Students' Industrial Training programme (tagged SIWES (Students Industrial Work Experience Scheme) of a total of 45-week duration is incorporated in the programme without prejudice to the minimum academic semesters recommended.

ADMISSION AND GRADUATION REQUIREMENTS

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 (3 or 4 Year Degree Programme)

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.

Direct Entry

For Four-year Direct Entry, in addition to five (5) Senior Secondary Certificate (SSC) credit passes which must include 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.

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. Candidates admitted through the Direct Entry mode at 300-Level shall have registered for a minimum of 90 and a maximum of 120 units of courses during a 3–year engineering degree programme. Such candidates shall have spent a minimum of 6 academic semesters.
4. HND holders who enter the degree programme at 300 level should register for a minimum of 90 units of courses and a maximum of 120 units of courses.
5. The minimum and maximum credit load per semester is 15 and 24 credit units respectively.
6. A student shall have completed and passed all the Courses registered for, including all compulsory courses and such elective /optional courses as may be specified by the university/faculty or department; obtained a minimum Cumulative Grade Point Average (CGPA) specified by the university but not less than 1.50.
7. 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.

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.

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.

GENERAL ACADEMIC REGULATIONS FOR DEGREE COURSE

- i. The unit of a course shall be per semester; one semester unit being when a class meets one hour every week in the studio for the semester or the equivalent in workshop or field work time. The size of a course shall, as much as possible, be a maximum of three units and its duration shall be one semester except for projects and design courses which may carry more than three units and may last more than one semester.
- ii. A core (C) is one which must be registered for and passed by a student to get its degree is counted towards the classification of his/her degree.
- iii. An elective (E) is either compulsory or optional. All elective courses taken are used in final computation for the degree classification. There are compulsory elective which implies that every student must offer the course before graduation; and the optional elective implies that a student may or may not offer the course provided such a student has taken the required units of elective courses for graduation.
- iv. A university required course (R) is a compulsory course prescribed by the University which must be passed before a student can graduate. It would be counted towards the computation and classification of the student's degree

STUDENTS WORKLOAD

Maximum numbers of units a student can register for is 24 units per semester. The minimum number of units a student can register for is 15 units per semester.

COMPUTATION OF RESULTS

The following terminologies and abbreviations are commonly used in the computation of Grade Point Average (GPA)

Total Load Units (TLU): This is the total number of course units carried by a student in a particular semester. It is the load units on all courses carried during the semester. Take for example, a student who is taking 6 courses of 3 units each has a TLU of 18 for the semester (meaning 6 multiplied by 3 Units =18)

Cumulative Load Units (CLU): This is the summation of the total load units over all the semester from the beginning to date. Student who is prone to repeating courses will finish (if he/she does not drop out) with a higher CLU than his non-repeating colleagues, and will most likely require a longer time to complete the requirements for the award of a degree.

Total Credit Points (TCP): These are the sum of product of course units and rating in each course for the entire semester. Take for example, a student who took four (4) courses of 3 units each;

suppose the grades he obtained in the four courses are A, B, C, and D, respectively, the TCP of the student is calculated as $(3 \times 5.0) + (3 \times 4.0) + (3 \times 3.0) + (3 \times 2.0) = 15 + 12 + 9 + 6 = 42$.

Cumulative Credit Point (CCP): This is the summation of Total Credit Points over all semester from the beginning to date. v. **Grade Point Average (GPA):** This is the total Credit Points (TCP) divided by the Total Load Units (TLU). Take for example, consider the student's score referred to in section (iii) above. His TCP is 42.0 and his TLU is 12, his GPA is therefore $42/12 = 3.50$. The highest GPA that can be earned is 5.0 and that is when a student has earned a grade "A" in every course during the semester. The lowest GPA obtainable is 1.50 to remain and graduate in Department of Civil Engineering.

Cumulative Grade Point Average: this is the summation of GPAs for all the semesters to date, divided by the summation of TLU for the said semesters. Like the GPA, CGPAs obtainable range from 1.50 to 5.0. In effect, $CGPA = CCP/TLU$.

COURSE CREDIT SYSTEM(CCS)

In SUMAS, we practice Course Credit System; therefore, all Civil Engineering programmes shall be run on a Course Credit System, that is, a modularized system commonly referred to as Course System. Going by this system, therefore, all courses should 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. In that case, credit weights should be attached to each course. Note, one credit is equivalent to one hour per week per semester of 15 weeks of lecturers or 2 hours of tutorials or 3 hours per week of laboratory/ studio work per semester of 15 weeks.

COURSE CODING

Civil engineering courses are coded as three letters (CEE) as acronym for Civil engineering with three-digit number indicating the level of study, the course stress area number and the semester respectively. For example CEE 301 means 300 level, 2 being the stress area, and 1st semester represented by odd number, second semester courses are coded in even numbers. The middle number is the stress area. The required courses are borrowed from other departments as either subordinate or elective courses with various course coding system.

Stress Area

General Engineering	0
Structural Analysis and Design, Strength of Materials	1
Water Resources, Environmental Engineering, Fluid Mechanics, Hydraulics and Hydrology	2
Civil Engineering Materials and Construction.	3
Geotechnical and Foundation Engineering, Soil Mechanics and Engineering Geology.	4

Transportation Engineering and Civil Engineering Survey.	5
Laboratory and Field Studies	6
Seminar	8
Project	9

GRADING SYSTEM (GS)

State University of Medical and Applied Sciences operates a five (5) point grading system. Examination carries 70% (percent) while the continuous assessment (which is made up of class attendance/quiz/test/assignment/mini-project) all at the discretion of the course lecturer, carries 30% (percent) giving a total of 100% (percent). Apparently, a student must have at least 75% attendance in lectures before he/she is qualified to sit for any examination in the Faculty. The overall grading system and the class of graduation degree are as given in the tables below.

OVERALL GRADING SYSTEM

Grade	Point	Range of Point %	Remark
A	5.0	70-100	Excellent pass
B	4.0	60-69	Distinction pass
C	3.0	50-59	Credit pass
D	2.0	45-49	Pass
E	1.0	40-44	Fair pass
F	0.0	0-39	Fail

CLASS OF GRADUATION DEGREE

S/N	Class of Degree	CGPA
1	First Class	4.5-5.0
2	Second Class Upper	3.5-4.49
3	Second Class Lower	2.4-3.49
4	Third Class	1.5-2.39
5	Failure	< 1.5

DESCRIPTION OF STUDENTS STATUS ON SEMESTER/SESSION RESULTS

Dean's List (DL)

In-Good Standing (IGS)

Deficient (DEF)

Probation (PR)

Withdrawal (WD)

NOTES AND DESCRIPTION:

Any student that is able to make GPA or CGPA of 4.0 and above shall be deemed to be in the Dean's List (DL) of exceptional good students so as to encourage such a student.

A student shall be deemed to be in good standing (IGS) if he/she has earned a GPA/CGPA of 2.0 and above; and had not failed any course(s).

A student is disqualified from proceeding to 400-level SIWES if he/she has accumulated more than 15 failed units or if their Cumulative Grade Point Average (CGPA) drops below the minimum probation threshold of 1.50 on a scale of 5.0

A student is not allowed to write a higher Pre-Requisite within a similar semester.

PROBATION

A student shall be placed on academic probation if at the end of the second semester of an academic year the student earns less than 1.5 Cumulative Grade Point Average (CGPA). During Probation, a student will be expected to register for all failed courses as well as other compulsory and required courses which the student may have failed to register for in an attempt to improve the CGPA. A student on probation may be 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. pre-requisite courses for the higher-level courses have been passed.

TECHNIQUES FOR STUDENT EVALUATION

The primary goal of assessment is to improve the overall quality of learning as well as evaluate the quality of instruction. It is recommended that different types of formative and summative evaluation methods be adopted through the semester for all course offered in the environmental science discipline. The list below though not exhaustive, highlights some of the more common methods of assessment that may be adopted for students' courses performance evaluation:

- a. Problem Solving Exercises
- b. Term Papers/Essay Assignments
- c. Individual Project Work

- d. Oral Presentations
- e. Seminar Assessment
- f. Design exercises
- g. Surveys and Evaluation reports
- h. Laboratory Reports
- i. Collaborative Project Work
- j. Report on External Placement (SIWES)
- k. End of semester examinations
- l. External Examination Reports

ASSESSMENT OF THEORY SUBJECTS

Assessment used for theory subjects should include continuous monitoring of student's progress by subject lecturers through course work evaluation. Continuous assessment may involve class tests, tutorial assignments, seminar presentations, and reports on fieldwork, class attendance and so on. These should carry 30% of the total weighting for any subject. The final end of semester examination will normally account for the balance of 70% of the overall marks for the subjects.

EXTERNAL EXAMINER SYSTEM

The involvement of external examiners from other universities is a crucial quality assurance requirement for all courses in Nigerian University System. In this regard, external examiner should go beyond mere moderation of examination questions to examining of examination papers to scope and depth of examination questions vis a vis the curricular expectation.

SIWES RATING ANDASSESSMENT

Students in the Civil Engineering disciplines shall be exposed to a combination of field and office experience both in the public or private sectors relevant to their various disciplines. This is achieved through the students' participation in the supervised Student Industrial Work Experience Scheme (SIWES). SIWES shall be undertaken in an approved establishment. A commulative minimum period of 45 weeks for a 5 year programme of SIWES should be undertaken as part of the graduation requirements. Consult the table on global course structure to see the breakdown of this SIWES programme.

At the end of the SIWES programme, each participating students' is required to submit a systematic log-book for assessment by the programme in addition to undergoing any other forms of assessment as may be required by individual programmes and institutions. Individual programmes will be expected to allocate credit unit ratings to the SIWES training programme that count towards the requirements for graduation. Students with unsatisfactory performance in SIWES shall be required to repeat the training programme.

STUDENTS' EVALUATION OF COURSES

As an integral part of the course credit system, students will be given the opportunity to evaluate the courses taken in the semester based on the following criteria:

- a. Course relevance
- b. Adequacy in terms of time and content coverage
- c. Students understanding of the courses
- d. Adequacy of Teaching, tutorials and practical technology/aids
- e. Instructor evaluation

The students' course evaluation is aimed at improving the efficiency of course delivery by offering timely feedback to the course lecturers/instructors. It is expected that each programme will work out a mechanism to achieve this goal.

WITHDRAWAL (WD) FROM THE UNIVERSITY

A student shall be asked to withdraw from a particular programme if they have been on probation for two consecutive semesters or if the student fails to make satisfactory progress (CGPA at least above 1.0). Such a student may however be allowed a change of programme within the same university or alternatively asked to withdraw from the university.

- A. **Voluntary withdrawal:** Student who wishes to withdraw from the University shall notify the Registrar in writing through the Dean of the Faculty and Head of Department. The period of withdrawal shall not exceed one academic year and shall be subject to approval by the Senate;
 - For fresh students, the written notice of withdrawal shall be given not later than two weeks after matriculation. For old (continuing) students, the notice shall be given not later than four weeks after the beginning of the semester.
 - Any Student from the University shall be required to write a letter giving brief statement of the reason(s) and effective date of leaving. The letter shall be by the parents or guardian of the student.
 - Such a student may retain grades carried for the semester examinations proceeding the date of voluntary withdrawal.
 - A student who so withdraws from the university shall, in order to be readmitted, be required to send a formal application to the Registrar through his/her Head of Department and Dean of the Faculty and receive official clearance from the Registrar
- B. **Unauthorized Withdrawal:** A student whose withdrawals from the University without authority for one academic year may not be reconsidered for readmission until his/her case has been considered on its merit by the Department/Faculty Board and approved by Senate.
- C. **Withdrawal for Academic Reasons:** A Student whose Cumulative Grade Point Average is still Below 2.0 at the end of a particular year of probation should be required to withdraw from Civil Engineering programme and if it is below 1.50, the candidate should be required to withdraw from the University. However, in order to minimize waste of human resources, consideration should be given to withdrawal from study of Civil Engineering and possible transfer to other programmes within the University but outside the Faculty of Engineering.
- D. **Withdrawal for Health Reasons:** A Student may withdraw or be asked to withdraw for health reasons certified by the Director of Health Services of the University. Such a student

shall be readmitted into the University on production of a valid medical report from an approved Medical Officer, and certified by the Director of Health Services.

- E. **Withdrawal Based on Disciplinary Action:** A Student who is suspended on disciplinary grounds may not be readmitted unless with express permission of the Senate.

Financial Obligation after Withdrawal

A Student who withdraws from the University for any reason whatsoever shall be required to clear any outstanding debts before they may be reconsidered for readmission.

Time Limit for Re-Admission

A Student who withdraws from the University for any reason and who is not re-admitted within a period of three (3) academic sessions from the date of his/her withdrawal may be credited with course(s) taken prior to withdrawal should he/she return to the University. The Head of Department may however make a general assessment of the individual's knowledge of the courses taken prior to withdrawal and recommend the year of entry for admission

TRANSFER STUDENTS

Students who transfer from other universities shall be credited with only those courses deemed relevant to the programme, 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 three sessions (6 semesters) to earn a degree of the university transferred to. 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 the transfer cases shall be subjected to the approval of the senate of each university on the recommendation of the faculty.

RULES GUIDING THE CONDUCT OF UNIVERSITY EXAMINATIONS

1. Conditions for Admission into Examination Hall The following conditions should be used in admitting students into examination hall:
 - i. Presentation of University ID. Cards, fee clearance/ school fees receipt, class admit card (where applicable) or any other material that may be relevant for the purpose.
 - ii. Search of students by invigilator.
2. Conditions for Admission into Examination Hall
 - i. It is the responsibility of the individual student intending to take any University Examination to ascertain the date, time and venue of the particular examination as indicated in the examination timetable. Candidates must present themselves at the examination venue thirty (30) minutes to the scheduled time of commencement of the examination.
 - ii. Candidates must not be admitted into the examination hall after the examination has been in progress for thirty (30) minutes. Candidates will not also be allowed to leave

- the examination hall during the first thirty (30) minutes and the last fifteen (15) minutes of an examination.
- iii. Candidates will not be permitted to leave an examination hall temporarily until formally instructed to do so by the examiner/invigilator in charge of the examination. Candidates wishing to leave the examination hall must obtain the express permission of the examiner/invigilator before doing so.
 - iv. Any candidate permitted to leave an examination hall temporarily must hand over his/her question paper(s) and answer script(s) to the examiner/invigilators and must be accompanied by the security personnel.
 - v. Candidates may take printed materials or manuscripts into an Examination hall (in an open book) when it has been previously announced in the examination timetable and when it is stated in the instructions on the question paper that such material may be used.
 - vi. All brief cases, bags and other materials not associated with the examination must be deposited at a designated place. Candidates will, however, be allowed to use their own mathematical instruments/tables and such other aids for drawing as the examiner/invigilator may permit.
 - vii. Mobile Phones, electronic programmable calculator, information storage devices, calculator instruction manuals, textbooks, atlases, lecture notes, projects materials, etc. shall not be allowed to be taken into the examination hall.
 - viii. Candidates must sit at the particular desk assigned to them by the invigilator. The university administration will not condone any swapping of seats by the candidates.
 - ix. It is compulsory for candidates to sign (in and out) the Examination Attendance Register when Examiner/ Invigilators present it to them during examination.
 - x. Candidates must ensure that their answer scripts are handed over to the Examiner/ Invigilators before leaving the examination hall.
 - xi. Smoking, chewing of gums and the consumption of food and drinks are not permitted during Examinations.
 - xii. All questions in written examination must be answered in simple English unless instructions on the question paper indicate otherwise.
 - xiii. It is an academic offence punishable by expulsion from the University for a candidate to prevent other candidate(s) from taking the scheduled University examinations or cause obstruction to examination process.

3. PROCEDURES FOR HANDLING SUSPECTED EXAMINATION MALPRACTICE CASE

The following procedures shall apply in handling all suspected cases of examination malpractice in the university:

- i. The attention of any invigilator present should be drawn to the suspicious circumstance(s), if an invigilator suspects that a candidate has committed an examination malpractice offence. If another student suspects that there is misconduct, he/she should alert the invigilator.

- ii. The invigilator(s) should approach the suspected candidate and inform him/her of the suspicion, and give the candidate an opportunity to make a written statement. Refusal to make a written statement shall also constitute an offence.
- iii. The invigilator should withdraw candidate's script and issue a fresh script for him/her to continue the examination. If any unauthorized material is discovered, it should be confiscated by the invigilator(s) and tendered in the evidence against the candidate.
- iv. Within twenty-four hours, the invigilators(s) should make a written report to the Chief Examiner, who is the Head of the Department.
- v. Written Accounts of the incident by the invigilator(s), Suspect's script, any unauthorized materials confiscated by the invigilator(s), the Chief Examiner and the student's statement must be submitted under confidential cover, by the Chief examiner to the Chairman, Examination Committee who shall forward to the Senate Examination Malpractice Committee within forty-eight (48) hours from the end of the course examination. By way of information, the list of the students involved in examination malpractice should be presented to the Senate by the Chairman, Examination Committee at the end of the semester examination.
- vi. If, however, during the marking, moderating or collating of the examination materials, an examiner or any member of staff suspects that malpractice has taken place, the examiner or member of staff must confer with the Chief examiner (Head of Department). As soon as prima Facie case has been established, the examiner or member of staff must submit written reports with the student's script and other corroborating evidence to the Dean of Faculty through the Chief Examiner ((Head of Department) within seventy-two (72) hours. The students so affected must be informed immediately of the allegation and made to submit a written statement.
- vii. The suspect will be invited to appear before, and be heard by the Senate Examination Malpractice Committee.
- viii. The decision of the Senate on report of Senate Examination mal-practice Committee shall be conveyed to the candidate(s) within the shortest possible time.
- ix. All cases of examination malpractices must be disposed of within the shortest possible time but not longer than three (3) months. All materials confiscated from students in proven cases of malpractice shall be kept by the university until punishment has been served.

LIST OF ACADEMIC STAFF

S/N	NAME OF ACADEMIC STAFF	AREA OF SPECIALIZATION	STATUS	QUALIFICATION	RANK
1	Engr. Prof. C.U.Nwoji	Structural Engineering	Visiting	PhD 1998 UNN M.Eng 1985 UNN	Professor

				B.Eng 1982 UNN	
2	Engr. Prof. H.N.Onah	Structural Engineering	Visiting	PhD 1994 France M.Eng France B.Eng 1983 UNN	Professor
3	Engr. Prof. C.C.Nnaji	Water Resources and Environmental Engineering	Visiting	PhD 2011 UNN M.Eng 2007 UNN B.Eng 2005 UNN	Professor
4	Engr. Dr. C. O. Ugwoke	Structural Engineering	Full time	PhD 2025 UNN M.Eng 2018 UNN B.Eng 2012 ESUT	Lecturer I
5	Engr. Ezea Boniface Chukwuebuka	Strength of structural engineering materials. Residual properties of concrete at elevated temperatures. Geopolymer concrete	Full time	PhD. In view M.Sc (2022), UI B.Eng (2015), FUTO COREN	Lecturer II
6	Engr.Mrs Ozor Obiageli Chinenye	Environmental Engineering	Full time	COREN, M.ENG (2017) UNN B.ENG (2012) UNN	Lecturer II
7	Engr. Vivian Chinwendu Okpalaku-Nath	Highway Engineering	Full time	Chukwuemeka Odumegwu university, Uli,Anambra State 2018	Lecturer II

8	Odoh Eugenia Nkechi	Water Resources and Environmental Engineering	Full time	PhD in view UNN M.Eng 2009 UNN B.Eng 1988 FUTO	Lecturer II
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List of Laboratory Staff

S/N	NAME	QUALIFICATION	RANK
1	Amadi Patrick McWilliam	B.TECH (2003), FUTO	Technologist II
2	Diarua Eddyfloyd Chiemerigo	B.Tech (2014) FUTO	Technologist II

List of Administrative Non-teaching Staff

S/N	NAME	QUALIFICATION	RANK
1	Igbodiegwu Loveth	HND OSISATECH 2024	Assistant Executive Officer

Global Course Structure

100 level - First Semester

Course Code	Course Title	Units	Status	LH	PH
GST 111	Communication in English	2	C	15	45
GET 101	Engineer in Society	1	C	15	-
CHM 101	General Chemistry I	2	C	30	-
CHM 107	General Practical Chemistry I	1	C	-	45
MTH 101	Elementary Mathematics I	2	C	30	-
PHY 101	General Physics I	2	C	30	-
PHY 103	General Physics III	2	C	30	-
PHY 107	General Practical Physics I	1	C	-	45
CEE 101	Introduction to Civil Engineering	2	C	30	-
SUMAS COS 101	Introduction to Computer Science	2	C	15	45
SUMAS GET 109	Environmental Awareness and Protection	2	C	30	
Total		19			

100 level - Second Semester

Course Code	Course Title	Units	Status	LH	PH
GST 112	Nigeria Peoples and Culture	2	C	30	-
GET 102	Engineering Graphics and Solid Modeling I	2	C	15	45
CHM 102	General Chemistry II	2	C	30	-
CHM 108	General Practical Chemistry II	1	C	-	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
SUMAS GET 108	Occupational Safety	2	C	30	
SUMAS GET 106	Applied Mechanics	3	C	45	
PHY 104	General Physics IV	2	C	30	
Total		19			

200 level – First Semester

Course Code	Course Title	Units	Status	LH	PH
ENT 211	Entrepreneurship and Innovation	2	C	30	-

GET 201	Applied Electricity I	3	C	45	-
GET 205	Fundamentals of Fluid Mechanics	3	C	45	-
GET 209	Engineering Mathematics I	3	C	45	-
GET 211	Computing and Software Engineering	3	C	30	45
CEE 201	Civil Engineering Drawing	2	C	15	45
SUMAS MEE 243	Measurement and Instrumentation	3	C	45	
GET 203	Engineering Graphics and Solid Modelling 2	3	C	30	-
Total		22			

200 level – Second Semester

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	-
SUMAS GET 214	Engineering Economics	2	C	15	45
SUMAS CEE 206	Hydrology	2	C	30	-
Total		20			

300 level – First Semester

Course Code	Course Title	Units	Status	LH	PH
GET 301	Engineering Mathematics III	3	C	45	-
GET 305	Engineering Statistics and Data Analytics	3	C	45	-
GET 307	Introduction to Artificial Intelligence, Machine Learning and Convergent Technologies	3	C	45	-
CEE 301	Fluid Mechanics	3	C	30	45
CEE 303	Engineering Geology	2	C	15	45
CEE 307	Structural Mechanics I	2	C	30	-
CEE 305	Soil Mechanics I	3	C	15	45
SUMAS-CEE 305	Design of Structures I	2	C	30	
Total		21			

300 level – Second Semester

Course Code	Course Title	Units	Status	LH	PH
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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	30	45
CEE 302	Strength of Structural Materials	2	C	30	
CEE 304	Civil Engineering Materials	3	C	30	45
CEE 308	Engineering Surveying and Photogrammetry I	2	C	15	45
SUMAS-CEE 352	Water Resources and Public Health	2	C	30	45
Total		22			

400 level – First Semester

Course Code	Course Title	Units	Status	LH	PH
CEE 406	Engineering Surveying and Photogrammetry II	3	C	30	45
GET 402	Engineering Project I	2	C		90
GET 404	Engineering Valuation and Costing	2	C	30	
SUMAS-CEE 411	Structural Analysis I	2	C	30	
SUMAS-CEE 421	Water Resources and Environmental Engineering I	2	C	30	45
SUMAS-CEE 441	Highway and Transportation I	2	C	15	45
SUMAS-CEE 451	Civil Engineering Practice	2	C	30	-
SUMAS-CEE 453	Design of Structures II	2	C	30	
Total		17			

400 level – Second Semester

Course Code	Course Title	Units	Status	Duration
GET 299	SIWES I	3	C	9 Weeks
GET 399	SIWES II	4	C	12 Weeks
GET 499	SIWES III	4	C	24 Weeks
Total		15		

500 level First Semester

Course Code	Course Title	Units	Status	LH	PH
GET 501	Engineering Project Management	3	C	45	-
SUMAS-CEE-589	Seminar	2	C	30	
SUMAS-CEE 523	Design of Structures III	2	C	30	-
SUMAS-CEE 531	Geotechnical Engineering	2	C	15	45
SUMAS-CEE 541	Highway Engineering II	2	C	15	45
SUMAS-CEE 551	Environmental Pollution	2	C	30	-
SUMAS-CEE 553	Advanced Structural Analysis	2	E	15	45
SUMAS-CEE 555	Transportation Engineering	2	E	30	-
SUMAS-CEE 561	Drainage and Irrigation	2	E	30	
Total		19			
One Elective for first semester					

500 level Second Semester

Course Code	Course Title	Units	Status	LH	PH
GET 502	Engineering Law	2	C	30	-
CEE 506	Construction Engineering	3	C	30	45
CEE 599	Project	6	C	-	270
SUMAS-CEE 532	Foundation Engineering	2	E	30	
SUMAS-CEE 552	Advanced Strength of Structural Materials	2	E	30	-
SUMAS-CEE 554	Water Resources and Environmental Engineering II	2	E	15	45
SUMAS-CEE 556	Unit Processes Water and Waste Water Resources Engineering	2	E	30	
SUMAS-CEE 558	Terotechnology in Civil Engineering	2	C	30	
SUMAS-CEE 520	Building Services Engineering	2	E	30	
Total		17			

Two Electives for second semester
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SUMMARY OF 30% ADDITIONAL

100 level = 11 units

200 level = 7 units

300 level = 4 units

400 level = 14 units

500 level = 18 units

TOTAL = 54 units

COURSE CONTENTS AND LEARNING OUTCOMES

GST 111: Communication in English

(2 Units C: LH 15; PH 45)

Learning Outcomes

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

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

Course Contents

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

GST 112: Nigerian Peoples and Cultures

(2 Units C: LH 30)

Learning Outcomes

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

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

8. list possible solutions to identifiable Nigerian environmental, moral and value problems.

Course Contents

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

CHM 101: General Chemistry I

(2 Units C: LH 30)

Learning Outcomes

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

1. define atom, molecules and chemical reactions;
2. discuss the modern electronic theory of atoms;
3. write electronic configurations of elements on the periodic table;
4. rationalize the trends of atomic radii, ionization 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 hybridized 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. analyze 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. Hybridization and shapes of simple molecules. Valence forces; Structure of solids. Chemical equations and stoichiometry; chemical bonding and intermolecular forces, kinetic theory of matter. Elementary thermochemistry; rates of reaction, equilibrium and thermodynamics. Acids, bases and salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity

CHM 102: General Chemistry II

(2 Units C: LH 30)

Learning Outcomes

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

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

Course Contents

Historical survey of the development and importance of organic chemistry; fullerenes as fourth allotrope of carbon, uses as nanotubules, nanostructures, nano-chemistry. 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 1A, IIA and IVA elements. Introduction to transition metal chemistry.

CHM 107: General Practical Chemistry I

(1 Unit C: PH 45)

Learning Outcomes

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

1. state the general laboratory rules and safety procedures;
2. collect scientific data and correct carry out chemical experiments;

3. identify the basic glassware and equipment in the laboratory;
4. state the differences between primary and secondary standards;
5. perform redox titration;
6. record observations and measurements in the laboratory notebooks; and
7. analyse the data to arrive at scientific conclusions.

Course Contents

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

CHM 108: General Practical Chemistry II

(1 Unit C: PH 45)

Learning Outcomes

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

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

Course Contents

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

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

Learning Outcomes

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

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

5. solve some problems using binomial theorem.

Course Contents

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

MTH 102: Elementary Mathematics II (Calculus)

(2 Units C: LH 30)

Learning Outcomes

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

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

Course Contents

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

PHY 101: General Physics I (Mechanics)

(2 Units C: LH 30)

Learning Outcomes

On completion, the students should be able to:

1. identify and deduce the physical quantities and their units;
2. differentiate between vectors and scalars;
3. describe and evaluate motion of systems on the basis of the fundamental laws of mechanics;

4. apply Newton's laws to describe and solve simple problems of motion;
5. evaluate work, energy, velocity, momentum, acceleration, and torque of moving or rotating objects;
6. explain and apply the principles of conservation of energy, linear and angular momentum;
7. describe the laws governing motion under gravity; and
8. explain motion under gravity and quantitatively determine behaviour of objects moving under gravity.

Course Contents

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

PHY 102: Electricity and Magnetism

(2 Units C: LH 30)

Learning Outcomes

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

1. describe the electric field and potential, and related concepts, for stationary charges;
2. calculate electrostatic properties of simple charge distributions using Coulomb's law, Gauss's law, and electric potential;
3. describe and determine the magnetic field for steady and moving charges;
4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere's law;
5. describe electromagnetic induction and related concepts and make calculations using Faraday and Lenz's laws;
6. explain the basic physical significance of Maxwell's equations in integral form;
7. evaluate DC circuits to determine the electrical parameters; and
8. determine the characteristics of AC voltages and currents in resistors, capacitors, and Inductors.

Course Contents

Forces in nature. Electrostatics (electric charge and its properties, methods of charging). Coulomb's law and superposition. Electric field and potential. Gauss's law. Capacitance. Electric dipoles. Energy in electric fields. Conductors and insulators. DC circuits (current, voltage and

resistance). Ohm's law. Resistor combinations. Analysis of DC circuits. Magnetic fields. Lorentz force. BiotSavart and Ampère's laws. Magnetic dipoles. Dielectrics. Energy in magnetic fields. Electromotive force. Electromagnetic induction. Self and mutual inductances. Faraday and Lenz's laws. Step up and step-down transformers. Maxwell's equations. Electromagnetic oscillations and waves. AC voltages and currents applied to inductors, capacitors, and resistance.

PHY 103: General Physics III (Behaviour of Matter)

(2 Units C: LH 30)

Learning Outcomes

On completion, the students should be able to:

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

Course Contents

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

PHY 107: General Practical Physics I

(1 Unit C: PH 45)

Learning Outcomes

On completion, the student should be able to:

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

Course Contents

This introductory course emphasizes quantitative measurements. Experimental techniques. The treatment of measurement errors. Graphical analysis. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity, 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.

PHY 108: General Practical Physics II

(1 Unit C: PH 45)

Learning Outcomes

On completion, the student should be able to:

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

Course Contents

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

PHY 104: General Physics IV (Vibration, Waves and Optics) (2 Units C: LH 30)

Senate Approved Relevance:

Exceptional Engineering graduates with relevant skills and knowledge of physics stand in a better position to solve industrial problems such as design of engineering processes and equipment. This training is in line with SUMAS technological development mission for delivery of quality educational services. Graduates from this field of study can expand their careers in broad areas including industries, research institutes, engineering and life sciences firms, medical devices and supplies firms, universities, and other manufacturing industries. This career development shall encourage self-employment. Therefore, SUMAS engineering graduates will be readily available to close/fill the gap in terms of employability, manpower and quality service delivery.

Overview

Waves and oscillations characterize many different physical systems, including vibrating strings, springs, water waves, sound waves, electromagnetic waves, and gravitational waves. Quantum mechanics as a course describes particles with wave functions.

Vibrations, waves and optics focused on unify physical phenomena as periodic motion, oscillations and waves in different parts of physics as in mechanics, acoustics, electricity and especially in optics. The course provides the basic knowledge to graduates of SUMAS especially in engineering measurements which are in line with the university's vision.

Objectives

The objectives of the course are to:

1. illustrate the fundamentals of electrostatic, conductors and dielectrics
2. discuss the different magnetic field and the application of Maxwell's electromagnetic oscillations and waves
3. explain the types of waves and oscillations
4. apply the different types of optics and optical communications
5. describe the overview of quantum mechanics, wave behavior and optical effects

Learning Outcome

By the end of this course, the students should be able to;

1. outline concept of electrostatic, conductors and dielectrics;
2. describe magnetic fields and the application of Maxwell's electromagnetic oscillations and waves;
3. explain and outline the types of waves and oscillations;
4. understand the concept of quantum mechanics, wave behavior and optical effects;
5. outline the applications of optics and optical communications.

Course contents

Electrostatics. Conductors and currents. Dielectrics. Magnetic fields. Maxwell's electromagnetic oscillations and waves. Applications. Waves and oscillations. Vibrating strings. Water waves. Sound waves. Electromagnetic waves. Gravitational waves. Quantum mechanics. Particles with wave functions. Oscillations of simple. Transverse and longitudinal waves in continuous media. Wave behavior. Optical effects such as interference and diffraction. Modern applications of optics. Pulse lasers. Optical communications.

GET 101: Engineer in Society

(1 Unit C: LH 15)

Learning Outcomes

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

1. differentiate between science, engineering and technology, and relate them to innovation;
2. distinguish between the different cadres of engineering – engineers, technologists, technicians and craftsmen and their respective roles and competencies;
3. identify and distinguish between the relevant professional bodies in engineering;

4. categorise the goals of global development or sustainable development goals (SDGs); and
5. identify and evaluate safety and risk in engineering practice.

Course Contents

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

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

Learning Outcomes

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

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

Course Contents

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

Learning Outcomes

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

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

Course Contents

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

SUMAS-COS 101 Introduction to Computer Application (1 Unit, C: LH 15; PH 45)
Senate-Approved Relevance

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

Introductory computer application course is to provide students at SUMAS with the foundation needed to proficiently use computers for personal and professional purposes. The course will introduce students to the basic functions of a computer, keyboard, mouse, and Internet. Students will also be introduced to software applications commonly used in business, including word processing, spreadsheet, presentation, and database software. Students will be encouraged to utilize online resources, such as Blackboard and Freedom, to augment classroom instruction. The skill and knowledge that will be acquired in ICA will launch SUMAS students up to an academic pedestal that will allow them to compete favorably with their peers anywhere in the world.

Overview

Introduction to Computer Application is a course that provides an overview of basic computer concepts and applications. It covers the essential knowledge and skills needed to use computer systems, software applications, and the Internet. The course typically includes instruction on basic computer hardware components, operating systems, word processing, spreadsheet software, and presentation software.

Students will learn the basics of computer organization, such as input/output devices, memory, storage, and central processing units. They will learn how to create, save, and print documents using word processing software, create and format spreadsheets using spreadsheet software, and create presentations using presentation software.

The course also covers basic computer security and privacy concepts and introduces students to internet browsing and email usage. Additionally, students will learn about digital citizenship, online ethics, and responsible online behavior.

Overall, an introductory computer application course provides students with a fundamental understanding of computer technology, its applications, and its impact on daily life. It is an essential foundation for individuals pursuing further education or careers in fields such as business, education, engineering, science, or technology.

Objectives

The course is aimed at providing the following:

1. Recognize basic computer hardware and software: The first objective of an introductory computer application course is to help students understand the basic components of a computer system, such as the processor, memory, hard drive, and input/output devices, as well as common software applications, such as word processing, spreadsheets, and presentation software.
2. Identify basic computer skills: The course should aim to develop students' basic computer skills, such as using a mouse and keyboard, opening and closing applications, creating and saving files, and managing files and folders.
3. Illustrate the use common productivity software: The course should teach students how to use common productivity software applications, such as Microsoft Office or Google Suite, including word processing, spreadsheets, and presentation software.
4. Recognize the basics of computer networks: Students should learn about the basics of computer networks, such as how data is transmitted over a network, how to connect to a network, and how to troubleshoot basic network issues.
5. Identify basic programming skills: An introductory computer application course can also introduce students to programming concepts, such as basic programming syntax and logic, and provide hands-on experience with simple programming tasks.
6. Identify basic internet and web concepts: Students should also learn about basic internet and web concepts, including how to use a web browser, how to search for information on the internet, and how to create and manage an email account.
7. Identify information literacy: Finally, the course should aim to develop students' information literacy skills, such as how to evaluate the credibility and reliability of online sources, how to properly cite sources, and how to avoid plagiarism.

Learning Outcomes

On completion of this course, the student will be able to learn the followings:

1. **Apply Basic computer skills:** Students learn fundamental computer skills, including how to use the keyboard and mouse, navigate through the file system, create and save documents, and manage files and folders.
2. **Operate Software applications:** Introductory computer applications courses expose students to various software applications like word processors, spreadsheets, presentation tools, and database software.
3. **Apply Internet skills:** Students learn how to search for information online, how to browse the web safely, and how to use email and other forms of online communication.
4. **Practice Time management:** Computer application courses teach students how to manage their time effectively by prioritizing tasks and setting achievable goals.
5. **Demonstrate Analytical skills:** Students learn how to analyze data and create reports using spreadsheets, graphs, and charts.
6. **Demonstrate Communication skills:** Computer application courses help students improve their communication skills by teaching them how to create professional-looking documents, presentations, and other forms of communication.
7. **Apply Problem-solving skills:** Through hands-on exercises and assignments, students develop problem-solving skills as they learn how to troubleshoot software applications and resolve technical issues.

Course Content

An introductory computer application course is designed to introduce students to fundamental computer skills and concepts, including the use of software applications, hardware components, and basic programming concepts. The following are some common topics covered in an introductory computer application course:

Introduction to computers and computing devices. Operating systems and file management. Word processing software and document formatting. Spreadsheets and data analysis. Presentations and multimedia software. Web browsing and internet navigation. Email and communication software. Social media and online collaboration tools. Cloud computing and data storage. Computer security and data privacy. Basic programming concepts and logic. Algorithms and problem-solving techniques. HTML and web development. Database management and querying. Basic networking and network protocols. Computer hardware components and peripherals. Emerging technologies and trends in computing.

These topics may vary depending on the course and the instructor, but they provide a good overview of the basic concepts and skills covered in an introductory computer application course.

Minimum Academic Standard

As described in CCMAS

Senate-Approved Relevance

It is in line with the SUMAS vision and mission to train undergraduates who will use acquired skills to mitigate the effects of various environmental contaminants that pose various kinds of risks to public health. This course is therefore one of the parameters to achieving this vision as it serves as an introduction to methods and policies of reducing human exposures to environmental contaminants in communities.

Course Overview

In many communities of the World especially Nigeria, there are health risks resulting from human exposures to contaminants in air, soil, water and food. This course therefore focuses on the relationship between people and their environment.

The course; deals with the promotion of human health, safe well-being, healthy and safe communities. It also introduces the students to methods, policies, and programs to reduce chemical and other environmental exposures in soil, water, air and food to protect people and provide communities with healthier environments. The course is thus an introduction to environmental and public health.

Objectives

The objectives of the course are to:

1. introduce environmental and Public Health to the students as a course;
2. enlighten the students on the principles of securing a healthy environment for a healthy living;
3. train the students on the basic methods of controlling environmental pollution;
4. educate the students the importance of food security;
5. let the students understand that environmental and industrial hygiene is necessary for good public health; and
6. Enable the students understand the concept of health risk assessment.

Learning Outcomes

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

1. define terms used in environmental health;
2. describe the historical background of environmental and public health;
3. discuss some of the public health laws in Nigeria;
4. explain the principles of environmental health;
5. outline the pillars of environmental health; and
6. discuss health in relation to environment.

Course Contents

Terms used in Environmental health: Environment, health, agent, host, public health, sanitation, and hygiene. History of Environmental health including Mosaic laws (Torah), Hippocrates, Sir Edwin Chadwick. Introduction of public health laws in Nigeria. Health organizations: World

Health Organization (WHO), United Nations (UNDP, UNICEF), International Federation of Environmental Health (IFEH), etc. Principles of Environmental Health: protection of public health and the environment, qualitative and quantitative risk assessment. Pillars of Environmental Health: community health, water quality, air quality, pollution, and control, built environment, food quality and industrial hygiene, management. Health and Environment: Agent factors, environmental factors, host factors, Health risk assessment, environmental management, mitigation. Effects of man's domestic, industrial, and other anthropogenic activities on individual and family health. Ameliorative measures to maintain environmental health, application of recent health models and theories.

Minimum Academic Standards

As described in CCMAS

SUMAS GET 106 Applied Mechanics

(3 Units C: LH 45)

Senate-approved relevance

Training of well skilled graduates that can apply the knowledge gained in applied mechanics as applicable to Civil Engineering design and construction. This is in line with SUMAS' mission statement of producing graduates that are globally competitive and locally relevant. Graduates from Civil Engineering programme in SUMAS will be relevant as well as to train future engineers.

Overview

Applied mechanics is concerned with the motion of any substance that can be experienced or perceived by humans without the help of instruments. In short, when mechanics concepts surpass being theoretical and are applied and executed, general mechanics becomes applied mechanics. The course deals with the study of actual application of principles of mechanics to solve civil engineering problems. This course affects our day to day life like the use of balance, use of iron rod to move heavy object, motion of vehicle etc. Some of the important applications of principles of mechanics in daily life are: motion of vehicles, trains, flight of airplanes and projectiles, stresses in bridges and trusses, forces on columns and walls in buildings, buoyant forces in water and air etc.

The course will teach students forces, moments and couples. Equilibrium of simple structures and machine parts will extensively be dealt with. Students will be able to understand the concept of friction. First and second moments of area, kinematics of particles and rigid bodies in plane motion as well as Newton's laws of motion will be explained to students. Students will be able to understand the knowledge of force, work and energy to calculate work done, power required and efficiency for various simple machines.

The following objectives of the course, learning outcomes, and contents are provided to address this need:

Objectives:

1. Provide a common foundation of mathematical modelling and simulations in solid and fluid mechanics
2. Integrate modelling (formulation of mathematical models based on fundamental laws and experimental knowledge), algorithmic formulations, implementations
3. Analyze simulation results and experimental results
4. Identify, formulate, and solve engineering problems
5. Understand the knowledge of force, work and energy to calculate work done, power required and efficiency for various simple machines
6. Describe the importance and application of various laws of mechanics
7. Solve simple problem of work and energy

Learning Outcomes

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

1. explain the fundamental principles of applied mechanics;
2. describe the equilibrium analysis, friction, kinematics and momentum;
3. identify, formulate, and solve complex engineering problems by applying principles of engineering, science, mathematics and applied mechanics;
4. synthesize Newtonian Physics with static analysis;
5. determine the complete load impact (net forces, shears, torques, and bending moments) on all components (members and joints) of a given structure with a load;
6. apply engineering design principles to produce solutions that meet specified needs with consideration of public health, safety, and welfare;
7. apply engineering principles to solve problems that may be global, cultural, social, environmental, and/or economic factors.

Course Contents

Forces, Moments, Couples, Equilibrium of simple structures, Machine parts, Friction, First and second moments of area, Centroids, Kinematics of particles. Rigid bodies in plane motion. Newton's laws of motion. Kinetic energy, Momentum analysis, Complete load impact, Torques, Free bodies and machines, Foundation of mathematical modelling.

Minimum Academic Standards

NUC-MAS requirement facilities.

SUMAS GET 108: Occupational Safety

(2 Units, C: LH 30)

Senate-Approved Relevance

The core mandate of the Faculty of Engineering and Built Environment holds that all our students notwithstanding their course of study should be exposed to environmental best practices so as to obtain sound knowledge in environmental safety for immediate and future application. The course will make extensive use of case studies (incidence exercises), to produce industry-ready graduates and graduates who can run their own businesses with the culture of safety. This course will also give students a strong theoretical background through a solid and meticulous documentation, which they will be able to use in their working position as a reference.

Course Overview

Safety is a condition which gives workers freedom from hazard, risk, accident which may cause injury, damage and loss to material or property damage and even death. A work-related illness or injury can not only put an employee out of work for a while or permanently and impact their quality of life; it may also impact negatively on productivity, finances, and reputation; all of which can be difficult to recover from. Unfortunately, accidents that result from failure to pay attention to safety protocols and procedures happen all too often.

Every workplace is a risky place with potential hazards. For instance, from 2007 to 2016, more than 1,000 workers were killed in oil and gas extraction operations (U.S. Bureau of Labour Statistics). On 6 July 1988, 167 lives were lost on and in the vicinity of the Piper Alpha offshore installation in the North Sea. Worker fatalities can result from contact with objects/equipment, fires/explosions, exposure to harmful substances/environments, and falls, e.tc. At sea, risks include storms and inclement weather, humidity, strong winds, tides, and sun exposure, as well as relative isolation for extended periods of time. On land, workers may experience excessive heat and humidity or, at the opposite extreme, cold temperatures, and strong winds. This course will prepare students in advance on the need to work safely and stay alive and also not to endanger the lives of their colleagues at the workplace.

Objectives

The objectives of the course include to:

1. Identify and discuss the specific hazards in a workplace and measures to protect the work force from hazards;
2. Inculcate the culture of safety in our students for their future use at the workplace;
3. Pull together a number of key issues in the development of a “holistic” approach to safety management;
4. describe the danger of exposure to industrial chemicals;
5. Discuss the importance of Personal Protective Equipment (PPE);
6. Discuss Safety Regulations and the need for compliance; and
7. provide oil and gas industry safety measures in Nigeria.

Learning Outcomes

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

1. describe all risks associated with the workplace and ways to assess and mitigate them;
2. state the specificities and key elements of a safety management system tailored for workplace operations;
3. identify measures to reduce fatality rate at the workplace;
4. identify benefits of compliance with safety regulations;
5. identify standards for the management of health and safety and the control of major hazards at workplace;
6. state importance of safety awareness in the workplace and elsewhere; and
7. develop emergency measures at the workplace.

Course Contents

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

Minimum Academic Standards

As described in CCMAS

200 LEVEL

GST 212: Philosophy, Logic and Human Existence

(2 Units C: LH 30)

Learning Outcomes

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

1. know the basic features of philosophy as an academic discipline;
2. identify the main branches of philosophy & the centrality of logic in philosophical discourse;
3. know the elementary rules of reasoning;
4. distinguish between valid and invalid arguments;
5. think critically and assess arguments in texts, conversations and day-to-day discussions;
6. critically assess 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.

ENT 211: Entrepreneurship and Innovation

(2 Units C: LH 30)

Learning Outcomes

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

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

Course Contents

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

GET 201: Applied Electricity I

(3 Units C: LH 30; PH 45)

Learning Outcomes

Students will be able to:

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

Course contents

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

GET 202: Engineering Materials

(3 Units C: LH 45)

Learning Outcomes

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

1. demonstrate the role of atoms and molecules (aggregates of atoms) in the building of solid/condensed matter known as engineering materials, the electrons quantum numbers and how the electrons are arranged in different atomic elements, and explain the role of electronic configuration and valence electrons in bonding;
2. define metals, alloys and metalloids, demonstrate mental picture of the solid mineral resources development as a relay race among four 'athletes': geologist, mining engineer,

mineral processing technologist, process metallurgical engineer, and classify metallurgical engineering into 3Ps: process, physical and production;

3. explain the relationship between structure and properties of materials, characteristics, components and compositions of phase diagrams and phase transformations of solid solutions;
4. define ceramics, glass and constituents of glasses and understand application of ceramics in mining, building, art and craft industries;
5. define and classify polymers as a class of engineering materials and polymeric materials, demonstrate polymerisation reactions, their types and mechanism, and applications of polymers;
6. define properties, types and application of composite materials and fibres (synthetic and natural);
7. define and classify nanomaterials, demonstrate applications of nanomaterials, concept, design and classification of fracture mechanics, corrosion classification, including the five principal ways of controlling corrosion and metal finishing processes such as sherardising, galvanising and anodising; and
8. identify factors affecting the performance and service life of engineering materials/metals and metallography of metals/materials (materials anatomy), which enables metallurgical and materials engineers to prescribe appropriate solutions to test metals/materials fitness in service through structure-property-application relationships.

Course Contents

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

GET 203: Engineering Graphics and Solid Modelling 2

(3 Units C: LH 30; PH 45)

Learning Outcomes

Students should be able to:

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

Course Contents

Projection of lines, auxiliary views and mixed projection. Preparation of detailed working production drawing; semi-detailed drawings, conventional presentation methods. Solid, surface and shell modeling. Faces, bodies and surface intersections. Component-based design. Component assembly and motion constraints. Constrained motions and animation. Introduction to electronics modeling. Electronics board layout preparation, Component

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, press-tool work, spinning, etc.). Metal joining processes (welding, brazing and soldering). Heat treatment. Material removal processes. machine tools and classification. Simple theory of metal cutting. Tool action and cutting forces. Introduction to CNC machines.

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

GET 205: Fundamentals of Fluid Mechanics

(3 Units C: LH 45)

Learning Outcomes

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 206: Fundamentals of Engineering Thermodynamics

(3 Units C: LH 45)

Learning Outcomes

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

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

Course Contents

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

GET 208: Strength of Materials

(3 Units C: LH 45)

Learning Outcomes

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

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

Course Contents

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

GET 209: Engineering Mathematics I

(3 Units C: LH 45)

Learning Outcomes

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

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

Course Contents

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

GET 210: Engineering Mathematics II

(3 Units C: LH 45)

Learning Outcomes

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

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

Course Contents

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

GET 211: Computing and Software Engineering

(3 Units C: LH 30; PH 45)

Learning Outcomes

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

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

Course Contents

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

GET 299: Students Industrial Work Experience I

(3 Units C: 9 weeks)

Learning Outcomes

SIWES I should provide opportunity for the students to:

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

Course Contents

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

CEE 201: Civil Engineering Drawing

(2 Units E: LH 15; PH 45)

Learning Outcomes

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

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

Course Contents

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

SUMAS MEE 243 Measurement and Instrumentation

(3 Units, C: LH 45)

Senate-Approved Relevance

The importance of measurement in everyday life cannot be overemphasized as it enables one to monitor, control and manage scarce resources. As the price of raw materials and resources needed for production and ensuring safety increases, it has become pertinent to find more effective ways of utilizing them. Measurements of these resources accurately offers one such opportunity. This course is designed primarily for 200 level undergraduate students studying towards a bachelor's degree in any of the following Engineering disciplines: Mechanical, Mechatronics and Metallurgical & Materials Engineering, Civil engineering. Those who need continuous professional development can also benefit from the course. This course will provide a foundational understanding on the theory of measurements and expose students to systems that can be used for measuring various physical quantities. The course would also help to train high-quality graduates who are well skilled and knowledgeable in the in the design, development and use of various measurement systems.

Overview

Measurement is the process of empirical, objective assignment of numbers to the attributes of objects and events of the real world, in such a way as to describe them while Instrumentation is the process of designing, constructing and using instruments to monitor and control a process variable within a production, laboratory or manufacturing area. The course is structured to enable the student to: (a) understand the basic concepts of measurements, (b) understand the various types of measurement instruments for different physical quantities, (c) evaluate the quality of the measurement taken, and (d) Develop some typical measurement systems.

Course Objectives

The main aim of the course is to provide a foundational understanding on the theory of measurements and expose students to systems that can be used for measuring various physical quantities.

The key objectives of the course are as follows are to enable the student to:

1. understand the basic concepts of measurements,
2. understand the various types of measurement instruments for different physical quantities,
3. evaluate the quality of any measurement taken, and
4. Develop some typical measurement systems.

Learning Outcomes

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

1. Define basic terminology used in measurements and instrumentation.
2. Identify the components of a measurement/control system.
3. Analyze zeroth order, first order and second order systems.
4. Explain the working principles of various sensor technologies.
5. Mention factors required for selecting measurement instruments.
6. Understand various sensor technologies and application.
7. understand thermocouples, RTDs, and thermistors.
8. understand pressure transducers, strain gages, and flow meters.
9. Design measurement systems for design prototypes.
10. Design an experiment using the Taguchi Method.
11. Calculate total uncertainty based on measured precision and estimated bias error.
12. Calculate probabilities based on normal distributions.

Course Contents

Measurement principles and basic definitions. Standards. Accuracy and error analysis; measurement statistics. Instrument systems: sensing devices, transmitting devices, terminating devices. Typical systems and devices for measuring quantities such as temperature, pressure, flow, size, displacement, velocity, acceleration, force, power, torque, stress and strain. Analog methods

of measurement. Digital measurement systems: Introduction to Arduino and applications. Dynamics of measurement. Data presentation and curve fitting. Team project on design, and implementation of a measurement and control device.

Minimum Academic Standards

As described in CCMAS

SUMAS CEE 206: Hydrology

(2 Units C: LH: 30)

Relevance

To produce graduates with a broad scientific foundation and a sound professional knowledge. In recognition of the critical role of water supply infrastructure in the built environment, this course is geared towards providing the students with a basic but firm understanding of the hydrological cycle and how it relates to water availability and supply. This course has never been more important than now, especially in the face of mounting and excruciating water scarcity and water stress, with some cities approaching the dry water tap crisis.

Overview

The interplay and relationship between the various phases of the water cycle to maintain water balance in the bio-physical environment. Rainfall as the most important form of precipitation in the tropics for the replenishment of lost water. Runoff and infiltration as fundamental catchment response to rainfall resulting in stream flow, increase in soil moisture as well as groundwater recharge. Drainage basins as a unit of catchment contributing runoff to the outlet as a result of rainfall; and runoff hydrograph as system response model to rainfall. Flood routing as a hydrological tool for determining channel or reservoir response in terms of out flow to inflow. Introduction to confined, unconfined and perched aquifers as types of water bearing formations. Determination of steady state well hydraulics for confined and unconfined aquifer.

Objectives

The objectives of the course are as follows:

1. Introduction to water cycle and expression as a water balance mechanism
2. Introduction to rainfall, measurement of rainfall types of rainfall, temporal and spatial variation in rainfall
3. Illustration of the use of simple arithmetic mean and Thiessen's Polygon to obtain representative rainfall average
4. Review of evaporation measurement methods, formulae and theories

5. Introduction to infiltration as catchment response to rainfall.
6. Review of Horton's and Green-Ampt infiltration models
7. Review of drainage basins and their characteristics.
8. Introduction/development to hydrographs and unit hydrograph
9. Illustration of conversion of hydrograph from one duration to another
10. Introduction to synthetic unit hydrograph and sample calculations
11. Review of flood routing - stream flow routing and storage-outflow routing
12. Development of equations for steady state pumping of confined and unconfined aquifers.
13. Review of methods of groundwater exploration

Learning Outcomes

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

1. Understand the water cycle and its role in water balance in the bio-physical environment
2. Understand rainfall measurement and description of different types of rain gauge,
3. Apply simple arithmetic mean and the Thiessen's Polygon for obtaining representative rainfall over an area.
4. Understand evaporation measurement and application of basic evaporation models
5. Understand the role of infiltration in the water cycle
6. Derive and apply Horton and Green-Ampt infiltration models
7. Understand drainage basin and basic characteristics
8. Develop unit hydrograph, use unit hydrograph to obtain runoff and convert D-hour unit hydrograph to X-hour unit hydrograph
9. Develop synthetic unit hydrograph such as the Snyder's synthetic unit hydrograph and the SCS triangular or curvilinear unit hydrograph
10. Apply Storage-inflow and stream flow routing methods for outflow determination
11. Derive the discharge expressions for steady state pumping of confined and unconfined aquifer.

Course Content

Introduction; Hydrological cycle, rainfall, measurement of rainfall and analysis of rainfall. Evaporation: measurement of evaporation, formulae and theories, their use and applications. Infiltration: the role of infiltration in hydrological cycle, infiltration as factor of runoff and as recharge of ground water, comparison of methods of estimating infiltration. Drainage basins and hydrographs: monthly and annual runoff relations, characteristics of drainage basin, hydrograph analysis. The unit hydrograph: Basic principles, unit hydrographs for various durations, derivation of unit hydrographs from complex storms, synthetic unit hydrograph. Flood routing: routing in a simple reservoir, streamflow, routing, frequency and duration studies. Hydraulics of wells, groundwater investigations and exploration for water.

Minimum Academic Standard

Hydrological Laboratory with NUC-MAS requirement facilities.

SUMAS-GET 204: Engineering Economics

(2 Units C: LH 30)

Senate-approved relevance

Training of well skilled graduates that can apply the knowledge of economics to design of structures which is safe and economical. Engineering economics is an integral part of the design course in all Civil Engineering curricula. This course offers a commentary on the importance and future role of engineering economics. Many topics of engineering economics display the engineering problem-solving approach at its best, in a manner that is shared by all engineering disciplines. The earlier exposure to engineering economics will allow economic studies to be integrated into many intermediate-level courses with engineering design elements.

Overview

The engineering degree programs are designed to develop students with the values, knowledge, and skills essential to positively influence engineering-related industries in the current and evolving economy. The programs prepare graduates for the thoughtful integration of work and life and to view the engineering profession as a lifelong commitment to serving others. Within a few years of graduating, engineering graduates will be able to advance in an engineering career or graduate studies. They will be recognized as creative thinkers exhibiting an aptitude for continuous learning. They will also display professional ethics and behavior consistent with engineering principles.

This course introduces the engineering student to the analysis of the economic aspects of a vast number of problems both in the business world, as well as one's personal life. The student learns and applies the techniques to solve problems and the decision-making process within an economic context and economic constraints. This paper offers a commentary on the importance and future role of engineering economics. Many topics of engineering economics display the engineering problem-solving approach at its best, in a manner that is shared by all engineering disciplines. The earlier exposure to engineering economics will allow economic studies to be integrated into many intermediate-level courses with engineering design elements.

The following objectives of the course, learning outcomes, and contents are provided to address this need:

Objectives:

1. Understand the fundamental concepts of engineering economics.
2. Describe the basic knowledge of micro and macro economics
3. Learn about applications of economics in the field of Civil Engineering
4. Explain the relevance of economics to Civil Engineering

5. Enumerate different economic systems that can be used for Civil Engineering
6. Explain the application of labour law and theory.
7. Derive and use the engineering economy factors to account for the time value of money.

Learning Outcomes

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

1. understand management models, revenue of the firms, production decision, cost of production,
2. understand profit analysis of the firms, pricing techniques location and localization of industries and industrial growth in Nigeria;
3. know distributive trade in Nigeria, business finance, investment, capital budgeting and management control.
4. understand financing technology, capital equipment investment appraisal methods.
5. Comprehend break even analysis as well as budgeting and financial control.
6. determine the breakeven for one or two alternatives and calculate the payback period with and without a return required and communicate the results.
7. be acquainted with the fundamentals of cost accounting with emphasis on production costing.

Course Contents

Law of management economics. Management models. Revenue of the firms. Production decision. Cost of production. Profit analysis of the firms. Pricing techniques location and localization of industries. Industrial growth in Nigeria. Size of the firm integration and diversification marketing. Demand and forecasting. Distributive trade in Nigeria. Business finance, investment, capital budgeting and management control. Government policies and firm. Financing Technology. Capital equipment investment appraisal methods. Break even analysis. Budgeting and financial control. Fundamentals of cost accounting with emphasis on production costing. Areas of conflicts between engineering valuations.

Minimum Academic Standards

Civil Engineering laboratory with NUC-MAS requirement facilities.

300 LEVEL

ENT 312: Venture Creation

(2 Units C: LH 15; PH 45)

Learning Outcomes

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

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

Course Contents

Opportunity identification (sources of business opportunities in Nigeria, environmental scanning, demand and supply gap/unmet needs/market gaps/market research, unutilised resources, social and climate conditions and technology adoption gap). New business development (business planning, market research). Entrepreneurial finance (venture capital, equity finance, micro-finance, personal savings, small business investment organizations and business plan competition). Entrepreneurial marketing and e-commerce (principles of marketing, customer acquisition & retention, B2B, C2C and B2C models of e-commerce, First Mover Advantage, E-commerce business models and successful e-commerce companies). Small business management/family business: Leadership & Management, basic book-keeping, nature of family business and family business growth model. Negotiation and business communication (strategy and tactics of negotiation/bargaining, traditional and modern business communication methods). Opportunity discovery demonstrations (business idea generation presentations, business idea contest, brainstorming sessions, idea pitching). Technological solutions (The concept of market/customer solution, customer solution and emerging technologies, business applications of new technologies - artificial intelligence (AI), virtual/mixed reality (VR), Internet of things (IoTs), blockchain, cloud computing, renewable energy, etc. Digital business and e-commerce strategies).

GET 301: Engineering Mathematics III

(3 Units C: LH 45)

Learning Outcomes

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

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

Course Contents

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

GET 302: Engineering Mathematics IV

(3 Units C: LH 45)

Learning Outcomes

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

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

Course Contents

Series solution of second order linear differential equations with variable coefficients. Bessel and Legendre equations. Equations with variable coefficients. Sturm-Liouville boundary value problems. Solutions of equations in two and three dimensions by separation of variables. Eigen value problems. Use of operations in the solution of partial differential equations and Linear integral equations. Integral transforms and their inverse including Fourier, Laplace, Mellin and Hankel 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.

GET 305: Engineering Statistics and Data Analytics

(3 Units C: LH 45)

Learning Outcomes

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

1. work with data from the point of view of knowledge convergence, machine learning, and intelligence augmentation, which significantly raises their standard for engineering analysis (the approach forces them to learn statistics in an actionable way that helps them to see the holistic importance of data analytics in modern engineering and technology);
2. anticipate the future with Artificial Intelligence while fulfilling the basic requirements of conventional engineering statistical programming consistent with their future careers;
3. perform, with proficiency, statistical inference tasks with language or programming toolboxes such as R, Python, Mathematica or MATLAB, and Design Expert to summarise

- analysis and interpretation of industry engineering data, and make appropriate conclusions based on such experimental and/or real-life industrial data;
4. construct appropriate graphical displays of data and highlight the roles of such displays in data analysis, particularly the use of statistical software packages;
 5. plan and execute experimental programmes to determine the performance of programme-relevant industrial engineering systems, and evaluate the accuracy of the measurements undertaken; and
 6. demonstrate mastery of data analytics and statistical concepts by communicating the results of experimental and industry-case investigations, critically reasoned scientific and professional analysis through written and oral presentation.

Course Contents

Descriptive statistics, frequency distribution, populations and sample, central tendency, variance data sampling, mean, median, mode, mean deviation, 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.

GET 399: Students Industrial Work Experience II

(4 Units C: 12 weeks)

Learning Outcomes

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

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

Course Contents

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

in the industry. Examples of outline of activities and experiences to which students are expected to be exposed to earn prescribed credits include:

Section A:

Welding and fabrication processes, automobile repairs, · lathe machine operations: machining and turning of simple machine elements, such as screw threads, bolts, gears, etc. Simple milling machine operations, machine tool maintenance and troubleshooting, and wooden 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 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 SolidWorks; and
- d. Technical report writing.

CEE 301: Fluid Mechanics

(3 Units C: LH 30; PH45)

Learning Outcomes

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

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

7. obtain simplified estimates of forces exerted by flow in pipes due to rapid closing or opening of valves, and the use of surge tanks to reduce these forces.

Course Contents

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

CEE 302: Strength of Structural Materials

(2 Units C: LH 30)

Learning Outcomes

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

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

Course Contents

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

CEE 303: Engineering Geology

(2 Units E: LH 15; PH 45)

Learning Outcomes

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

1. describe the engineering properties of rock and soil materials;

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

Course Content

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

CEE 304: Civil Engineering Materials

(3 Units E: LH 30; PH 45)

Learning Outcomes

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

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

Course Contents

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

CEE 305: Soil Mechanics I

(3 Units C: LH 30; PH 45)

Learning Outcomes

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

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

Course Contents

Mineralogy of soils and soil structures. Formation of soils, soil classification, engineering properties of soils. Soil in water relationships - void ratio, porosity, specific gravity, permeability and other factors. Atterberg limits, particle size distribution, Shear strength of soils and Mohr's stress circle. Compaction and soil stabilisation, settlement, theory of consolidation. General principles, reduced standard, standard modifies proctor and West African standard. Maximum dry density, optimum moisture content, zero air-voids curve. Field control tests, percent compaction and soil stabilization. Site investigation. Laboratory work.

SUMAS-CEE 305: Design of Structures I

(2 Units C: LH 30)

Senate-approved relevance

Training of well skilled graduates that can apply the responses from structural analysis to design of structures which is safe and economical. That is means finding out member concrete section, cross sectional dimension, amount of reinforcement etc. to withstand the internal forces. This is consistent with SUMAS' mission of producing graduates who are both globally competitive and locally relevant. The number of building collapses in Nigeria is alarming, and most of these collapses are attributed to structural failure caused by inadequate or underdesigned structures. Knowledge of structural design will aid in determining the most appropriate concrete sections with appropriate proportions, dimensions, and production of the steel and concrete sections provided. Graduates of SUMAS Civil Engineering program will be useful in training future engineers to provide structural enhancement programs to society.

Overview

Structural design is a part of Structural Engineering which is a sub-division of Civil Engineering. It can be described as a process which comes after knowing all forces (loadings) and their effects (structural analysis). At this stage structural engineer propose the desired dimensions, materials and construction method of structural members. This is to ensure that the whole structure is safe and serviceable to users for all designed life.

This course studies fundamentals of design, process, and materials selection. Building regulations and codes of practice will be exposed to students. They will be thought design philosophy with regards to elastic, load factors and limit state methods. Design of structural elements including beam, slab, column, stair and footing in reinforced concrete would also be presented to the students. They will be exposed to further work in Computer Aided Design. Students must be able to apply the knowledge in the design of real life building that is safe and economical.

The following objectives of the course, learning outcomes, and contents are provided to address this need:

Objectives:

1. Understand the fundamentals of structural design.
2. Learn about the design theories (Limit state philosophy) and design in concrete.
3. Carry out loading estimation in reinforced concrete.
4. Analyze the structure to determine axial loads, shears and moments at critical points in all members.
5. Understand the steps involved in the design of structural member in reinforced concrete.
6. Design the different structural elements using the steps in (4)
7. Produce the arrangement and detail drawing from the designer's sketches.

Learning Outcomes

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

1. understand the fundamentals of design, process and materials selection;
2. comprehend building regulations and codes of practice;
3. understand the basic rudiment of structural design of reinforced concrete structures;
4. apply fundamental mechanics to the design of reinforced concrete structural elements using elastic design and limit state principles;
5. use the latest industry standard formulas, tables, design aids and computer software in the design of reinforced concrete members;
6. generate safe, economical and robust designs of reinforced concrete structures; and
7. use theory to derive solutions that are applicable to specific structures and structural details used in building and construction industries.

Course Contents

Fundamentals of design process. Materials selection. Building regulations. Codes of practice. Design philosophy. Elastic and load factor design. Limit State design. Design of structural elements in reinforced concrete. Design of beams. Design of columns. Design of solid slab. Design of flat slab. Design of stair. Design of shallow foundation. Design of deep foundation. Detailing of structural elements in reinforced concrete. Further work in Computer Aided Design.

Minimum Academic Standards

Civil/Structural Engineering laboratory with 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, geometrical redundancy, geometrical constraints, primary system, degree of geometrical redundancy. Theorem of three moments and slope deflection method. Superposition principle.

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.

SUMAS CEE 352: Water Resources and Public Health (2 Units C: LH: 30, PH:45)

Senate Approved Relevance

To train and produce high quality Civil Engineering graduates who are well equipped with the state of arts skills and broad-based knowledge of design, laboratory testing and experimentation in water resources systems, public health and sanitary engineering. Water resource skills is essential in the control and use of water, flood control, irrigation, raw water supply, and hydroelectric power applications while environmental engineering skills are so needed in hazardous waste treatment and disposal, sanitary engineering (municipal and industrial water and wastewater treatment. In line with achieving the Sustainable Development Goals 6: clean water and sanitation, the relevance of this course is so as to improve our water supply facilities and make our hydraulic structures

befitting for the sustainability of the environment and public health especially in this critical times when challenges like flooding, climate change and different water challenges are ravaging many states in Nigeria.

Overview

Laboratory testing and experiments are designed to enhance and extend the student's firstly in understanding of the fundamental principles of fluid mechanics and hydraulic and secondly, understanding of courses related to public health such as water and wastewater treatment and plant operations. The proper sampling and analytical techniques are of fundamental importance in the characterization of water and wastewater. The fluid mechanics and hydraulics part of this course is to equip the students with skills needed in the determination of the effect of various instruments, (valves, orifices, bends and elbows) on fluid flow, measurement of flow parameters with venturi meters, orifice meters, weirs, etc; needed in regulation of water flow rate through hydraulic turbines for electric power generation; flood prevention, warning and control; erosion prevention and control; drainage; design of natural channels, and treatment and supply of water for municipal, industrial and agricultural purposes.

Objective

The objectives of the course are as follow:

1. Introduction of water and wastewater quality characteristics and their importance in every good public health.
2. Review of the procedures for determining the water and wastewater quality characteristics.
3. Experimentally illustrate the standard procedure for determining different water and wastewater characteristics that is the chemical, physical and biological in the laboratory.
4. Introduction to flow measurement, calculation of discharge in fluid mechanics and hydraulics
5. Experimentally Illustrate how to Calibrate the following flow meters- orificemeter, venturimeter, rotameter and volumetric tank
6. Experimentally Illustrate how to measure discharge in closed conduit by the following flow meters- orificemeter, venture meter, rotameter and volumetric tank
7. Experimentally perform the measurement of discharge or flow rate throw flow channels using the velocity/ current meter
8. Experimentally perform the measurement of discharge of fluid over the different types of weirs and discharge of fluid through orifice.

Learning Outcomes

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

1. Understand water and wastewater quality characteristics and their importance or application with regards to public health.
2. Understand and explain procedures for determining the water and wastewater quality characteristics.
3. Experimentally determine the different water and wastewater quality characteristics according to the standard procedure and instrumentations.
4. Understand different means of measuring flow or discharge in fluid mechanics and hydraulics.
5. Practically calibrate the following flow meters- orifice, venturimeter, rotameter and volumetric tank.
6. Practically measure discharge in closed conduit by the following flow meters- orifice, venture meter, rotameter and volumetric tank.
7. Practically measure discharge or flow rate throw flow channels using the velocity/ current meter.
8. Practically measure discharge of fluid over weirs and discharge of fluid through orifice.
9. Successfully report the laboratory findings and interpret the results.

Course Content

Public Health Engineering Laboratory

Experiments will cover: Basic water sampling and analysis; Solids' determination (total, suspended, and volatile); pH, acidity, and alkalinity; colour and turbidity; use of Dissolved Oxygen (DO) meter; Determination of water hardness (total, calcium, and magnesium); Biochemical Oxygen Demand (BOD); Chemical Oxygen Demand (COD); Determination of Nitrate (NO_3) and Phosphate (PO_4); Enumeration of bacteria – Agar Plate Count, Most Probable Number (MPN) method, and Membrane filtration.

Fluids & Hydraulics Laboratory

The experiments will cover flow over weir: measurement of discharge over of broad crested weirs and sharp crested weirs, calibration of orificemeter, venturimeter, rotameter and volumetric tank, discharge measurement using orificemeter, venturimeter, rotameter and volumetric tank in closed conduit, discharge measurement using velocity meter.

Minimum Academic Standard

Public Health Engineering Laboratory and Fluids & Hydraulics Laboratory with NUC-MAS requirement facilities.

400 Level

GET 402 Engineering Project I

(2 Units C: PH 90)

Learning Outcomes

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

1. complete the design phase of a complex engineering problem sourced from industry or community during the SIWES III programme; and
2. demonstrate the connection between engineering product-making and the theoretical courses they have learned following the applicable industry best practices.

Course Contents

In the second semester of the 400-level students, preferably in groups, work from the university on the identified industry or organization to tackle industry complex engineering problems. Theoretical issues may be provided by the department faculty or industry experts. During the vacation, students will now work full time with the organisation/industry on the project as part of the SIWES III. The students can also go beyond the department and engage in multidisciplinary undertakings. Literature survey, review of existing systems etc. must be achieved to a satisfactory extent.

GET 404 Engineering Valuation and Appraisal

(2 Units C: LH 30)

Learning Outcomes

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

1. identify at least three (3) objectives of engineering valuation work, valuer's primary duty and responsibility and valuation terminologies;
2. describe at least four (4) Valuer's obligation to his or her client, to other valuers, and to the society;
3. demonstrate with example the engineering valuation methods, valuation standards, and practices;
4. prepare engineering valuation and appraisal reports and review;
5. discuss expert witnessing and ethics in valuation; and
6. determine price, cost, value, depreciation and obsolescence in real property, personal property, personal property, machinery and equipment, oil, gas, mines, and quarries valuation.

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.

SUMAS-CEE 411: Structural Analysis I

(2 Units C: LH 30)

Senate-approved relevance

Training of well skilled graduates that can apply the knowledge gained from structural analysis to determine the support forces (reactions), displacement and member forces resulting from the external excitations. These structural responses are used to design the structural elements such that the structures which can resist all the applied loads without failure during its serviceability state. This is in line with SUMAS' mission statement of producing graduates that are globally competitive and locally relevant. Cases of building collapse in Nigeria is alarming and these collapses are in most cases attributed to structural failure resulting from inadequate or under design structures. Knowledge of design of structures will help in determining the most appropriate steel sections with adequate proportions, dimensions and produce the details of the steel section provided. Graduates from Civil Engineering programme in SUMAS will be relevant as well as to train future engineers to offer the society this structural enhancing programmes.

Overview

Structural analysis deals with a calculation of load coming on the structure and analyzing them. It is a procedure followed to find and measure the effect of external forces on physical objects like built structure elements. Structural analysis is the main tool that structural engineers use to assure that a structure can withstand various types of forces that it will encounter during its normal operation. It is used to predict the behaviour of the structure upon loads acting on them.

This course teaches students about the analysis of determinate structures and structural analysis theorems. It deals with influence lines and Williot-Mohr diagram. Student will learn deflection of statically determinate structures including unit load, moment-area methods and strain energy methods. Also, indeterminate structural analysis including energy and virtual work methods, slope deflection and moment distribution methods. Other things to learn include elastic instability, simple plastic theory of bending, collapse loads and grading of timber.

The following objectives of the course, learning outcomes, and contents are provided to address this need:

Objectives:

1. Learn about the analysis of indeterminate structures with application to beam, frames and trusses.
2. Learn about how to use energy and virtual work methods to estimate the deflection in beam, frames and trusses.
3. Estimate the reactions and moments in indeterminate structures such as beams, frames and trusses using slope and deflection method
4. Learn about simple plastic theory of bending and collapse load for the analysis of beam, frames and trusses.
5. Be able to derive the influence lines for moving loads on trusses and beams.
6. Moment-distribution method of calculating shear force and bending moment.
7. Applications of influence line for analysis of indeterminate structures e.g. beams and frames.

Learning Outcomes

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

1. Analyze statically determinate structures, including beams, frames, and trusses, using structural analysis theorems and graphical methods
2. Determine deflections and displacements of determinate structures using the unit load, moment-area, strain energy, and virtual work methods.
3. Apply slope-deflection and moment distribution methods in the analysis of statically indeterminate structures
4. Evaluate the stability and behavior of structural members subjected to elastic buckling, plastic bending, and collapse loading conditions
5. Apply influence lines and Williot–Mohr diagrams in solving structural engineering problems involving moving loads and truss deformations.
6. Assess the structural properties and stress-grading methods of timber for engineering applications using visual, mechanical, and electronic grading techniques
7. Interpret structural behavior and recommend appropriate analytical methods for the safe and economical design of civil engineering structures in accordance with relevant engineering standards.
8. Demonstrate competence in applying engineering principles, analytical techniques, and professional judgement to solve structural engineering problems

Course contents

Structural analysis theorems, graphical methods, application to simple determinate trusses, williot-Mohr diagram, unit load method of analysis, moment-area method, strain energy method, energy and Virtual work methods, indeterminate structural analysis. Elastic Instability, simple plastic theory of bending, collapse loads. Stress-Grading of Timber, visual mechanical and electronic stress grading of Timber.

Minimum Academic Standards

Civil/Structural Engineering laboratory with NUC-MAS requirement facilities.

SUMAS-CEE 441: Highway and Transportation I

(2 Units C: LH 15; PH 45)

Senate-approved relevance

Training of well skilled graduates that can apply the knowledge gained the study of highway engineering to better the lives of various individual and society. This is in line with SUMAS mission statement of producing graduates that are globally competitive and locally relevant. Knowledge of highway engineering and their designs will help to improve the design and construction of roads to meet up with standard. In addition, to build a more durable and less expensive road. Graduates from Civil Engineering programme in SUMAS will be relevant as well as competent engineers in the society,

Overview

Highway engineering is an aspect of civil engineering in which knowledge of mathematics, physical sciences, economics, town planning, survey, geotechnics, demands, psychology and sociology were employed in the planning, design, construction and maintenance of roads, which is one of the modes of transportation. Understanding of highway engineering and their designs will help to improve the design and construction of roads to meet up with standard. Additionally, to build a more durable and less expensive road.

This course will teach soil engineering aspects of highways. Railways and airfields. Highway geometric design, pavement structure and design, interchange design and spacing. Highway information systems, freeway, networks and safety. Design, construction and maintenance of culverts. Design of drainage appurtenances. Different cross-sections of roads. Construction equipment types as well as pavement structure and design. Students will have exposure to practical highway experiments. Laboratory works in highway engineering are useful in the determination of pavement materials properties to avoid untimely failure of road networks. Students must be able to apply the knowledge in the real life highway engineering designs.

The following objectives of the course, learning outcomes, and contents are provided to address this need:

Objectives:

1. Understand how to undergo survey and locate route for road construction
2. Carry out geometric, pavement and interchange design
3. Understand highway information systems, freeway, networks and safety.
4. Design drainage appurtenances and different cross section of roads
5. Know the different types of highway construction
6. Understand the soil aspect of highway construction
7. Understand the various highway construction machinery and plants

Learning outcomes

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

1. Apply engineering surveying techniques to route selection, route location, and alignment for highway construction projects.
2. Design highway geometric elements including horizontal curves, vertical curves, intersections, interchanges, and pavement structures in accordance with accepted engineering standards.
3. Analyze highway transportation systems, highway information systems, traffic operations, road safety principles, and transportation networks for effective mobility and sustainable development.
4. Design highway drainage systems, culverts, and road cross-sections for efficient stormwater management and pavement performance
5. Evaluate the selection and application of highway construction equipment, pavement materials, laboratory testing procedures, and quality control measures used in highway engineering projects.

Course contents

Soil Engineering Aspects of Highways, railways and Airfields, highway Geometric design, horizontal and vertical alignments, pavement structure and design, interchange design and spacing, design of various horizontal and vertical curves, highway information systems, freeway, networks and safety, design of culverts, construction and maintenance of culverts, design of drainage appurtenances, different cross-sections of roads, construction equipment types, pavement Structure and Design, pavement materials Laboratory tests on materials.

Minimum Academic Standards

Good Highway and Transportation laboratory with functional equipment for various highway material test that is in line with NUC-MAS requirement facilities.

SUMAS-CEE 453: Design of Structures II

(2 Units C: LH 30 PH 45)

Senate-approved relevance

Training of well skilled graduates that can apply the knowledge gained from to design of structures which will be built and capable of resisting all the applied loads without failure during its serviceability state. This is in line with SUMAS' mission statement of producing graduates that are globally competitive and locally relevant. Cases of building collapse in Nigeria is alarming and these collapses are in most cases attributed to structural failure resulting from inadequate or under design structures. Knowledge of design of structures will help in determining the most appropriate steel sections with adequate proportions, dimensions and produce the details of the steel section provided. Graduates from Civil Engineering programme in SUMAS will be relevant as well as to train future engineers to offer the society this structural enhancing programmes.

Overview

Structural design is a highly specialized area of civil engineering. It can be described as a set of methods or tools that are used to determine safe and economical specifications for a structure and to ensure that a planned structure will be sufficiently strong to carry its intended load. Structural design is the sequential examination of structures for stability, strength and rigidity of structures based upon the physical requirement of the structure and an understanding of the material loading, strength and structural capabilities and geometries used.

Utility or function (strength and serviceability), safety (permanence), economy and elegance are conditions that must be satisfied for a structural design to be satisfactory. This course teaches students the limit state philosophy and design in steel as well as elastic and plastic moment designs. Design of structural elements in steel and connections and joints. Limit state philosophy and design in timber. Elastic methods and design in timber. Design of structural elements in timber and timber connectors. Students will also be exposed to laboratory tests on structural elements in concrete, timber and steel as well as computer aided design of structures.

The following objectives of the course, learning outcomes, and contents are provided to address this need:

Objectives:

1. Understand the fundamentals of structural design.
2. Learn about the design theories (Limit state philosophy) and design in steel and timber.
3. Describe different types of steel and timber frame buildings and various structural elements with loading conditions in them.
4. Carry out loading estimation in structures and analyze the structure to determine axial loads, shears and moments at critical points in all members.
5. Understand the steps involved in the design of several steel and timber structural elements.
6. Design the different structural elements using the steps in (4)
7. Produce the arrangement and detail drawing from the designer's sketches.

Learning outcomes

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

1. Describe the fundamentals of structural design
2. Describe the design theories (Limit state philosophy) used in steel and timber design
3. Explain and identify different types of steel and timber frame buildings and various structural elements with loading conditions in them
4. Estimate loads in structures and analyze the structure to determine axial loads, shears and moments at critical points in all members

5. Design the various structural elements in steel and timber based on the specified design steps.

Course contents

Fundamentals of structural design, limit state philosophy and design in steel, elastic and plastic moment designs, steel frame buildings, loading conditions. Load estimations. Design of structural elements in steel, design of connections and joints. Limit state philosophy and design in timber, elastic methods and design in timber, timber frame buildings, design of structural elements in timber, design of timber connectors. Laboratory tests on structural elements in Concrete. Laboratory tests on structural elements in Timber. Laboratory tests on structural elements in Steel. Computer Aided Design of structures.

SUMAS-CEE 421: Water Resources and Environmental Engineering I

(2 Units C: LH 15; PH 45)

Senate-approved relevance

Training of well skilled graduates that can apply the knowledge gained from Water Resources and Environmental Engineering to design of hydraulic structures which will be built and capable of resisting all the applied loads without failure during its serviceability state. This is in line with SUMAS' mission statement of producing graduates that are globally competitive and locally relevant. Cases of flooding in Nigeria is alarming and these are in most cases attributed to failure from inadequate design of drainage structures and reservoir. Knowledge of hydraulic structure design will help in determining the most appropriate flow channels with adequate dimensions to avoid flooding. Graduates from Civil Engineering programme in SUMAS will be relevant as well as to train future engineers to offer the society this structural enhancing programmes.

Overview

Water structure design is a highly specialized area of civil engineering. Water resources planning involves the hydraulics of open channels, wells and drainage. It covers hydrograph analysis, reservoir and flood-routing. Hydrological forecasting of hydraulic structures is also included. Cases of flooding in Nigeria is alarming and these are in most cases attributed to failure from inadequate design of drainage structures and reservoir.

Knowledge of hydraulic structure design will help in determining the most appropriate flow channels with adequate dimensions to avoid flooding. Water Resources and Environmental Engineering will teach students how to design of hydraulic structures. These hydraulic structures must be capable of resisting all the applied loads without failure. Drought in Nigeria is alarming and these are in most cases attributed to shortage of water in reservoir. Knowledge of water supply and treatment will help in design water treatment plant to avoid drought.

The following objectives of the course, learning outcomes, and contents are provided to address this need:

Objectives:

1. Describe the hydraulics of open channels and wells.
2. Know drainage design.
3. Understand hydrograph analysis.
4. Learn reservoir and flood-routing.
5. Relate hydrological forecasting to hydraulic structures.
6. Learn engineering economy in water resources planning.
7. Perform experimental tasks involving water resources testing.

Learning Outcomes

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

1. investigate the hydraulics of open channels and wells;
2. design and investigate drainage;
3. understand hydrograph analysis, reservoir and flood-routing;
4. apply hydrological forecasting to hydraulic structures;
5. formulate water resources plans using knowledge of engineering economy;
6. perform experimental tasks in teams; and
7. develop and present practical reports.

Course Contents

Hydraulics of open channels, hydraulics of wells, drainage. Hydrograph analysis. Reservoir and flood-routing. Hydrological forecasting of hydraulic structures. Dams. Dykes/Levees. Weirs. Docks and harbours. Spillways. Stilling basins. Manholes. Coastal hydraulic structures. Water resources planning. Engineering economy in water resources planning. Laboratory work.

Minimum Academic Standards

Civil Engineering laboratory with NUC-MAS requirement facilities.

SUMAS-CEE 451: Civil Engineering Practice**(2 Units C: LH 30)****Senate-approved relevance**

Training of well skilled graduates that can apply the knowledge gained through Civil Engineering Practice to prepare cost estimate for engineering works in the society. This is in line with SUMAS' mission statement of producing graduates that are globally competitive and locally relevant. The expertise of various industry participants was used during the construction process, and the professionals include building contractors, subcontractors, architects, builders or structural engineers, project managers, and quantity surveyors. However, it is important for the cost engineers to estimate every resource required in the construction process to avoid an improper

estimation of the project cost. Graduates from SUMAS Civil Engineering programme will be relevant and to train future engineers to offer cost estimation to the various engineering project available to the society.

Overview

The use of drawing details in the preparation of bill of engineering measurement and evaluation (BEME) necessitates an understanding of building construction. Cost Engineers took the bill of quantities and contract law into account when making an accurate estimation of a building. A bill is composed of the three steps of taking off, abstracting, and billing. Taking off is an in-person or blueprint measurement of the subject matter. This is done in conjunction with the Standard Method of Measurement. All labour and materials are included, making the items contained complete. The bill lists the items for the tenderer to add his prices, while the abstract is a sheet that groups together all similar items.

Civil engineering practice teaches civil engineering standard method of measurement. Students will be able to understand the essentials of contracts and subcontracts. They will also be able to Preparation of Bill of Engineering Measurement and Evaluation (BEME). Works construction and supervision, job planning and control will be dealt with. Lastly, students will be exposed to construction machinery and equipment as well as applications/case study - dams, foundations, bridges, highways, industrial buildings, sewage works.

The following objectives of the course, learning outcomes, and contents are provided to address this need:

Objectives:

1. Describe standard method of measurements as related to civil engineering works.
2. Estimate materials to use in civil works
3. Transform drawing into descriptions and quantities undertaken for value and cost
4. Describe principle of units of measurements.
5. Explain girth in relation to the internal and external
6. Describe rules for quantifying building component
7. Know tendering process and selection procedures;
8. Describe taking off and its application to the foundation, planning, scheduling, abstracting and billing.
9. Application of bill of quantities estimation writing completed civil engineering works
10. Explain job planning and control – programme

Learning Outcomes

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

1. critique standard methods of measurement as related to civil engineering works;

2. estimate various materials used in civil engineering works;
3. prepare of Bill of Engineering Measurement and Evaluation (BEME);
4. appraise and understand contracts and subcontracts for civil engineering works;
5. evaluate tendering process and selection procedures;
6. critique Public Procurement Act;
7. develop job planning and control – programme;
8. prepare progress reports and certificates.

Course Contents

Civil Engineering Work Standards and measurements. Contracts and subcontracts. Elements of valid contracts. Disputes in the construction industry. Alternative dispute resolution mechanism and litigation. Bureau of Public Procurement and Public Procurement Act. Procurement process. Tendering process and selection procedures. Preparation of Bill of Engineering Measurement and Evaluation (BEME). Building up unit rate for the excavation and disposal of compacted materials. Building up unit rate for the provision and placement of concrete. Works construction and supervision. Job planning and control – Bar charts. Critical Path Method (CPM). Program Evaluation and Review Technique (PERT). Construction machinery and equipment. Applications/Case study-dams, foundations, bridges, highways, industrial buildings, sewage works.

Minimum Academic Standards

Civil Engineering laboratory with NUC-MAS requirement facilities.

GET 501: Engineering Project Management

(3 Units C: LH 45)

Learning Outcomes

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

1. Explain the principles, concepts, and life cycle of engineering project management and their application to civil engineering projects
2. Apply project planning, scheduling, budgeting, resource allocation, and risk management techniques in the execution of engineering projects
3. Develop project management plans using work breakdown structures (WBS), Gantt Charts, Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), and other project management tools
4. Evaluate project performance using monitoring and evaluation techniques, key performance indicators (KPIs), quality management principles, and engineering economic considerations.
5. Demonstrate leadership, communication, teamwork, stakeholder management, negotiation, and ethical decision-making skills required for successful engineering project delivery.

6. Analyze engineering project financing, procurement, contract administration, sustainability, and resource management strategies for effective project implementation

Course Contents

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

GET 502: Engineering Law

(2 Units C: LH 30)

Learning Outcomes

Students will be able to:

1. Explain the fundamental concepts, sources, classifications, and functions of law and their relevance to engineering practice
2. Differentiate between the various branches of law, legal institutions, courts, and jurisdictions applicable to engineering projects and professional practice
3. Apply legal principles relating to contracts, torts, occupational health and safety, labor law, intellectual property, and company law in engineering design, construction, and project management.
4. Analyze engineering disputes and professional liability issues using relevant legal principles, statutory provisions, and engineering codes of practice
5. Prepare technical reports, legal opinions, and expert witness documentation for engineering disputes and quasi-judicial proceedings using professional standards of communication and evidence

6. Demonstrate ethical decision-making, professional responsibility, and compliance with legal and regulatory requirements in engineering practice

Course Contents

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

CEE 506: Construction Engineering

(3 Units C: LH 30; PH 45)

Learning Outcomes

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

1. Plan construction activities by selecting appropriate construction methods, equipment, manpower, materials, and work sequences for civil engineering projects.
2. Apply construction planning, scheduling, resource allocation, and site management techniques to achieve project objectives within specified time, cost, and quality requirements.
3. Evaluate construction equipment performance, productivity, and operational efficiency for different civil engineering applications.
4. Implement quality assurance, quality control, occupational health, safety, and environmental management practices on construction projects
5. Analyze construction costs, productivity, resource utilization, and project risks to improve construction efficiency and project performance
6. Demonstrate effective communication, leadership, teamwork, and professional ethics in the management of multidisciplinary construction projects.

Course Contents

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

Course Overview and Description

This course introduces students to Seminar. Individual student or group of students' will embark on a seminar topic to strengthen them and encourage creativity, Entrepreneurship and independent/team work (as the case may be).

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

1. Apply knowledge of mathematics, science and computer engineering to the solution of local and global computer engineering problems
2. Identify, formulate, research literature and analyze civil engineering problems and proffer informed, efficient and effective theoretical and practical solutions
3. Design, develop and deploy computer-based systems, devices or processes to meet specified civil engineering needs
4. Apply critical reasoning and logic in resolving engineering problems using research-based knowledge and research methods including the set-up of experiments, analysis and interpretation of data, and distilling of information to create new knowledge, products and services
5. Create, select and apply appropriate techniques, resources and modern engineering and ICT tools, including prediction, modelling and optimisation to developmental and complex engineering activities, with a clear understanding of the theoretical and practical limitations

Course Content

Application of critical reasoning and logic in resolving civil engineering problems. Using research-based knowledge and research methods including the set-up of experiments, analysis and interpretation of data, and distilling of information to create new knowledge, products and services. Creation, selection and application of appropriate techniques. Application of appropriate resources. Application of modern engineering and ICT tools, including: Prediction, Modelling, Optimisation to developmental and complex engineering activities, with a clear understanding of the theoretical and practical limitations. The project ends in a comprehensive written report of a developed system, and/or product/service and oral presentation/defence before a panel of assessors one of in the department and must involve a project supervisor

Minimum Academic Standards

Civil Engineering laboratory with NUC-MAS requirement facilities.

Training of well skilled graduates that can apply the responses from structural analysis to design of structures which is safe and economical. That is means finding out member steel section, cross sectional dimension, amount of reinforcement etc. to withstand the internal forces. This is consistent with SUMAS' mission of producing graduates who are both globally competitive and locally relevant. The number of building collapses in Nigeria is alarming, and most of these collapses are attributed to structural failure caused by inadequate or underdesigned structures. Knowledge of structural design will aid in determining the most appropriate steel sections with appropriate proportions, dimensions, and production of the steel and concrete sections provided. Graduates of SUMAS Civil Engineering program will be useful in training future engineers to provide structural enhancement programs to society.

Overview

Structural design is a part of Structural Engineering which is a sub-division of Civil Engineering. It can be described as a process which comes after knowing all forces (loadings) and their effects (structural analysis). At this stage, structural engineer proposes the desired dimensions, materials and construction method of structural members. This is to ensure that the whole structure is safe and serviceable to users for all designed life.

Utility or function (strength and serviceability), safety (permanence), economy and elegance are conditions that must be satisfied for a structural design to be satisfactory. This course teaches students the composite design and construction in steel and reinforced concrete. Students will learn design of structural foundations. They will be exposed to pre-stressed concrete design. Modern structural form, tall buildings, lift shafts and shear walls, system buildings will be extensively dealt with. Design projects is also included for practical experience of students.

The following objectives of the course, learning outcomes, and contents are provided to address this need:

Objectives:

1. Understand the fundamentals of structural design.
2. Learn about the design theories (Limit state philosophy) and design in steel and concrete.
3. Describe different types of composite structures, foundation and prestressed concrete elements with loading conditions in them.
4. Carry out loading estimation in composite structures, foundation and prestressed concrete and analyze the structure to determine axial loads, shears and moments at critical points in all members.
5. Understand the steps involved in the design of several composite structures, foundation and prestressed concrete.
6. Design the different structural elements using the steps in (4)
7. Produce the arrangement and detail drawing from the designer's sketches.

Learning outcomes

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

1. Determine design loads and analyze composite, prestressed concrete, and foundation systems under various loading conditions using relevant design standards.
2. Design reinforced concrete, steel, composite, prestressed concrete, and foundation elements using Limit State Design principles and applicable engineering codes.
3. Evaluate the structural behavior, stability, serviceability, and safety of tall buildings, shear walls, lift cores, and other modern structural systems
4. Prepare complete structural detailing, reinforcement schedules, fabrication drawings, and construction documentation for structural engineering projects.
5. Apply computer-aided structural analysis and design software in the modelling, analysis, optimization, and detailing of complex structural systems.
6. Recommend appropriate structural systems and construction techniques based on safety, economy, constructability, durability, sustainability, and professional engineering standards

Course contents

Fundamentals of structural design. Design theories (Limit state philosophy) and design in steel. Design theories (Limit state philosophy) and design in concrete. Design of steel structural elements. Design of timber structural elements. Composite design and construction in steel. Composite design and construction in reinforced concrete. Loading estimation in composite structures. Design of structural foundations. Pre-stressed concrete design. Prestressing and its methods. Stages/operations involved in the production of pre-tensioned and post-tensioned pre-stressed concrete. Pre-tensioning pre-stressed concrete design. Post-tensioning pre-stressed concrete design. Modern structural form. Tall buildings, lift shafts and shear walls, system buildings. Design projects.

Minimum Academic Standards

Good Structural laboratory with functional models for Civil Engineering Structures that is in line with NUC-MAS requirement facilities.

SUMAS-CEE 531: Geotechnical Engineering

(2 Units C: LH 15; PH 45)

Senate-approved relevance

Training of well skilled graduates that can apply the knowledge gained the use of geotechnical engineering to reduce the stresses encountered on various engineering project in the society. This is in line with SUMAS' mission statement of producing graduates that are globally competitive and locally relevant. The majority of Nigeria's engineering infrastructure such as buildings, overhead tanks or silos, and embankments settled and collapse after a few period of construction as a result of consolidation. Lastly, geotechnical engineers provide structural supports to ensure that the structure is not excessively tilted, settled, or damaged as a result of foundation soil failure.

Graduates from SUMAS Civil Engineering programme will be relevant and to train future engineers to offer various engineering structures enhancement programmes to society.

Overview

In geotechnical engineering, issues involving deformation of soil structure resulting from stress will be studied. Geotechnical knowledge of a site's soil enables civil engineers to understand the engineering properties and behaviour of soils at a specific site. This will enable him to provide satisfactory solutions to problems when civil engineering structures such as buildings, overhead tanks or silos, sunk or semi-sunk water reservoirs, bridges, road or railway embankments, tunnels, canals, or dams are founded on soils that ultimately support the structure in such a way that the structure does not collapse. Knowledge of this course (geotechnical engineering) will be useful in reducing the stresses encountered on various engineering project.

This course will expose students to stresses in soils. Students will be taught the concept of consolidation and settlement extensively. Shear strength of soils as related to cohesionless and cohesive using morh- coulomb theory will also be dealt with. They will be able to determine the earth pressures as well as bearing capacity of soils. Laboratory works in geotechnical engineering are useful in the determination of soil properties in order to know suitable soils to be used for foundation of any structure. Lastly, geotechnical engineers provide structural supports to ensure that the structure is not excessively tilted, settled, or damaged as a result of foundation soil failure.

The following objectives of the course, learning outcomes, and contents are provided to address this need:

Objectives:

1. Describe elements of stress analysis in terms of total stress, pore water pressure and effective stress
2. Describe consolidation of saturated clay with its components
3. Describe the settlement of foundations, types and weight of structures
4. Explain shear strength of soils as related to cohesionless and cohesive using morh- coulomb theory
5. Describe earth pressure, retaining structures and stability analysis of retaining wall
6. Describe bearing capacity of soils: ultimate bearing capacity, allowable bearing capacity, factor of safety, general shear, local shear failure, punching shear and determination of bearing capacity.
7. Describe the concept of foundation, types of foundation: shallow foundation (strip footings, spread footings, mat foundation, pad foundation) and deep foundation (piles, drilled shafts and caissons).

Learning outcomes

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

1. Analyze stress distribution, consolidation, and settlement behavior of soils for the design of civil engineering foundations
2. Determine the shear strength characteristics of cohesive and cohesionless soils using the Mohr–Coulomb failure criterion and appropriate laboratory methods.
3. Evaluate earth pressures acting on retaining structures using classical earth pressure theories and recommend suitable retaining systems.
4. Determine the bearing capacity of shallow and deep foundations using established geotechnical design methods and relevant engineering standards
5. Conduct laboratory and field investigations to determine engineering properties of soils and interpret geotechnical data for engineering decision-making.
6. Recommend appropriate foundation solutions based on site investigation data, soil properties, safety, economy, constructability, and sustainability considerations.

Course contents

Stresses in Soils. Elements of stress analysis. Pore-water pressure. Effective stress. Consolidation Settlement. Shear Strength of soils. Shear in cohesionless and cohesive soils. Mohr-Coulomb theory of failure. Shear strength parameters. Earth-Pressures and retaining structures. Lateral earth pressure. Types and stability analysis of retaining wall. Bearing Capacity of Soils. Ultimate bearing capacity, allowable bearing capacity, factor of safety. General shear, local shear failure, and punching shear. Shallow foundation (strip footings, spread footings, mat foundation, pad foundation). Deep foundation (piles, drilled shafts and caissons).

Minimum Academic Standards

Civil Engineering laboratory with NUC-MAS requirement facilities.

SUMAS-CEE 551: Environmental Pollution

(2 Units E: LH 45)

Senate-approved relevance

Training of well skilled graduates that can apply the knowledge gained in the study of environmental pollution to better the lives of various individual and the society by reducing water, air and noise pollution. This is in line with SUMAS' mission statement of producing graduates that are globally competitive and locally relevant. Knowledge of environmental pollution will help to reduce both water and air pollution. Graduates from Civil Engineering programme in SUMAS will be relevant as well as competent engineers in the society.

Overview

Most urban dwellers have been exposed to unsafe air, leading to 4.2 million deaths yearly. It is pathetic to note that the quality of air in major cities across the world is plaguing human existence at an alarming rate. The United Nations Sustainable Development Goals [SDGs] Good Health & Well-being [SDG 3] and Sustainable Cities & Communities [SDG 11] aim to reduce the number of deaths from environmental pollution, including those from the impact of cities, by 2030.

However, it is unlikely that developing countries would meet these targets unless concerted measures are applied.

Knowledge of environmental pollution will help to reduce both water and air pollution. Environmental pollution pertains to the dispersal of pollutants in streams and estuaries. The effects of atmospheric pollution on various forms of life including both direct and secondary effects, control devices of air pollution are also involved. The course also encompasses sources of noise and control measures. Students will be able to understand the theory, principles and practices related to engineering control of particulate and gaseous emissions. They will also be able to identify the sources of noise pollution and control measures.

The following objectives of the course, learning outcomes, and contents are provided to address this need:

Objectives:

1. Understand the theory, principles and practices related to engineering control of particulate and gaseous emissions;
2. Identify the types of sources of water pollution.
3. Determine the effects of pollutants on the chemical quality and the ecology of receiving streams.
4. Know the analysis of dispersal of pollutants in streams and estuaries.
5. Understand the theory, principles and practices related to engineering control of particulate and gaseous emissions from sources of atmospheric pollution.
6. Know the effects of atmospheric pollution on various forms of life including both direct and secondary effects, control devices of air pollution.
7. Identify the sources of noise pollution
8. Understand the control measures of noise pollution,

Learning Outcomes

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

1. Analyze the principles, sources, transport mechanisms, and environmental impacts of air, water, and noise pollution using accepted environmental engineering concepts.
2. Evaluate the effects of pollutants on the chemical quality, ecological integrity, and self-purification capacity of streams, rivers, estuaries, and other receiving water bodies.
3. Design and recommend appropriate engineering measures for controlling particulate and gaseous emissions from industrial, agricultural, commercial, and municipal pollution sources
4. Assess the environmental and public health impacts of atmospheric pollutants and recommend suitable air quality monitoring and pollution control technologies
5. Evaluate sources of environmental noise and recommend engineering noise control and mitigation strategies in accordance with environmental standards and regulations.

6. Interpret environmental monitoring data and prepare professional reports that support pollution prevention, environmental compliance, and sustainable engineering practice.

Course Contents

Water pollution. Types of sources of water pollution. Self-purification of streams. Analysis of the dispersal of pollutants in streams. Analysis of the dispersal of pollutants in estuaries. The effects of pollutants on the chemical quality of receiving streams. The effects of pollutants on the ecology of receiving streams. Europlification and control of water pollution. Stream and effluent standards. Air pollution. Theory, principles and practices related to engineering control of particulate and gaseous emissions from natural, individual, agricultural, commercial and municipal sources of atmospheric pollution. The effects of atmospheric pollution on various forms of life including both direct and secondary effects. Air quality measurements. Control devices of air pollution. Noise Control. Sources of noise and control measures. Measurement and standard.

Minimum Academic Standards

Civil Engineering laboratory with NUC-MAS requirement facilities.

SUMAS-CEE 541: Traffic and Highway Engineering

(2 Units E: LH 15 PH 45)

Senate-approved relevance

Training of well skilled graduates that can apply the knowledge gained in the study of highway engineering to better the lives of various individual and the society. This is in line with SUMAS' mission statement of producing graduates that are globally competitive and locally relevant. Knowledge of highway engineering and their designs will help to improve the design, construction and maintenance of roads to meet up with standard. In addition, to build a more durable, convenient and less expensive road. Graduates from Civil Engineering programme in SUMAS will be relevant as well as competent engineers in the society.

Overview

Traffic engineering pertains to the analysis of the behavior of traffic and its facility design for a smooth, safe and economical operation. Traffic flow, like the flow of water, has several parameters associated with it. The traffic stream parameters provide information regarding the nature of traffic flow. This helps the analyst in detecting any variation in flow characteristic.

This course teaches highway planning and traffic surveys. Students will be exposed to administration and finance of highways. Coordination of all transportation media will also be dealt with in this course. Students will be able to do transportation planning and economics. They will be able to design of traffic signals, control systems and safety devices. Furthermore, students will be exposed to parking and parkways. They will be able to carry out practical exercises on each of the topics treated above and perform laboratory tests on different types of road construction materials.

The following objectives of the course, learning outcomes, and contents are provided to address this need:

Objectives:

1. understand the fundamental parameters of traffic flows and its relations
2. be able to know how to coordinate various transportation information
3. understand the principles of planning on transportation system
4. understand the principles of economics on transportation system
5. understand the administrative role and source of finances for a highway project
6. be able to identify parking surveys
7. recognize good road construction material

Learning outcomes

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

1. Conduct traffic surveys and analyze traffic flow characteristics, speed studies, capacity studies, and level of service for highway facilities.
2. Evaluate highway planning alternatives by considering transportation demand, economic analysis, environmental impacts, and sustainable mobility principles.
3. Design and evaluate traffic management systems, traffic signal installations, road safety devices, and intersection control measures in accordance with accepted engineering standards.
4. Assess pavement materials, construction methods, and maintenance strategies for flexible and rigid pavements under varying traffic and environmental conditions.
5. Apply transportation engineering principles to parking studies, public transport planning, freight movement, and multimodal transportation systems
6. Demonstrate professional competence in highway engineering through field investigations, laboratory testing, technical reporting, and teamwork

Course Contents

Highway planning. Traffic surveys. Traffic studies. Traffic flow characteristic. Speed study. Traffic capacity studies. Administration and finance of highways. Coordination of all transportation media. Transportation planning. Transportation economics. Traffic management. Design of traffic signals. Control systems. Safety devices. Parking and parkways. Different types of road construction materials. Construction methods. Laboratory works.

Minimum Academic Standards

Civil Engineering laboratory with NUC-MAS requirement facilities.

Senate-approved relevance

Training of well skilled graduates that can apply the knowledge gained from structural analysis to determine the support forces (reactions), displacement and member forces resulting from the external excitations. These structural responses are used to design the structural elements such that the structures which can resist all the applied loads without failure during its serviceability state. This is consistent with SUMAS' stated mission of producing graduates who are both globally competitive and locally relevant. The number of building collapses in Nigeria is alarming, and most of these collapses are attributed to structural failure caused by inadequate or under-designed structures. Knowledge of structural design will aid in determining the most appropriate steel sections with adequate proportions, dimensions, and production of the steel section provided. Graduates of SUMAS Civil Engineering program will be useful in training future engineers to provide structural enhancement programs to the society.

Overview

Structural analysis is a part of Structural Engineering which is a sub-division of Civil Engineering. Structural analysis deals with a calculation of load coming on the structure and analyzing them. It is a procedure followed to find and measure the effect of external forces on physical objects like built structure elements. Structural analysis is the main tool that structural engineers use to assure that a structure can withstand various types of forces that it will encounter during its normal operation. It is used to predict the behaviour of the structure upon loads acting on them.

Role of structural analysis is to calculate displacements, strains, shear forces, bending moments, different stresses, support reactions etc. due to different loads. Although, earlier it was done by hand calculation, now almost in every practical purpose, analysis software is available. Basic analysis technique is Finite Element Analysis. In this course, student will be able to learn about the analysis of indeterminate structures with application to beam, frames and trusses using stiffer and flexibility matrix methods. Learn about partial differential equation, membrane theory, analysis of thin-stretched membrane. Understand the theory of thin shells with application to membrane theory. Be acquainted with the knowledge of folded plate structures, different types and structural behavior as well as understand structural dynamics with curved members and non-prismatic structures.

The following objectives of the course, learning outcomes, and contents are provided to address this need:

Objectives:

1. Learn about the analysis of indeterminate structures with application to beam, frames and trusses using stiffer and flexibility matrix methods.
2. Knowledge of computer application to practical structures.
3. Knowledge of application of finite difference and finite element methods.
4. Learn about partial differential equation, membrane theory, analysis of thin-stretched membrane.
5. Understand the theory of thin shells with application to membrane theory.

6. Knowledge of folded plate structures, different types and structural behavior. Structural dynamics.
7. Understand structural dynamics with curved members and non-prismatic structures.

Learning Outcomes

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

1. Apply matrix structural analysis techniques to determine displacements, internal forces, support reactions, and member stresses in indeterminate structural systems
2. Develop and analyze structural models using the direct stiffness method for beams, trusses, frames, and other structural systems.
3. Formulate and apply finite element models for solving engineering problems involving beams, trusses, plates, and plane stress or plane strain conditions
4. Evaluate structural behavior, elastic stability, plate bending, torsion, and stress distribution using appropriate computational and numerical methods.
5. Interpret computer-generated structural analysis results and recommend appropriate engineering design decisions based on safety, serviceability, economy, and relevant design standards
6. Prepare professional structural analysis reports that effectively communicate modelling assumptions, analytical procedures, engineering results, and design recommendations.

Course contents

Analysis of Indeterminate structure using stiffer matrix methods. Analysis of Indeterminate structure using flexibility matrix methods. Computer applications to practical structures. Continuum of plane strain. Elastic flat plates. Solution by series. Finite differences. Finite element methods. Beam on elastic foundation. Partial differential equation. Membrane theory. Analysis of thin-stretched membrane. Theory of thin shells. Classification, structural action, shells of revolution and shells of translation. Cylindrical shells. Application and limitations of membrane theory. Introduction to folded plate structures, different types and structural behavior. Structural dynamics. Introduction to curved members and non-prismatic structures.

Minimum Academic Standards

Civil Engineering laboratory with NUC-MAS requirement facilities.

SUMAS-CEE 555: Transportation Engineering

(2 Units E: LH 30)

Senate-approved relevance

Training of well skilled graduates that can apply the knowledge of transportation engineering to their day-to-day activities to make life convenient for other in the society. This is in line with SUMAS' mission statement of producing graduates that are globally competitive and locally relevant. Knowledge of various modes and means of transportation will allow various farmer and manufactural convey goods to their consumer at the cheapest cost, thereby making food available

and at a reasonable price. In addition, the knowledge of transportation helps to connect various communities, nation and individual together. Graduates from Civil Engineering programme in SUMAS will be relevant as well as competent engineers in the society,

Overview

The importance of transportation in the development of country is multidimensional. A country's economic status depends upon how well served the country is by different modes of transport. All human being are interacting over distance and time for food, shelter, work, business, recreation and security. All agricultural and industrial raw materials, products, equipment are needed to be transported from one place to another.

Students will be taught coordination of all transportation media. They will be exposed to railway and airfield design and construction. Transportation planning and economics will be extensively dealt with. They should be able to management and design of traffic signals. Other thing to learn include parking, geometric design, construction methods, construction materials and Laboratory Tests. Knowledge of various modes and means of transportation will allow various farmer and manufactural convey goods to their consumer at the cheapest cost, thereby making food available and at a reasonable price. In addition, the knowledge of transportation helps to connect various communities, nation and individual together.

The following objectives of the course, learning outcomes, and contents are provided to address this need:

Objectives:

1. develop an understand about transportation Engineering
2. understand the advantages of road transportation over other modes of transportation
3. design various transportation network connecting all transportation modes
4. develop an understanding about road development process
5. understand the administrative role and source of finances for a highway project
6. understand the principles of planning on transportation system
7. understand the economics of transportation system

Learning outcomes

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

1. Analyze transportation systems, modes, planning principles, and network operations for efficient movement of passengers and freight.
2. Design integrated transportation networks, including highway, railway, airport, and multimodal transport facilities, using accepted engineering principles and standards.
3. Evaluate transportation demand, traffic flow characteristics, traffic control systems, and transportation economics for effective planning and operational decision-making.
4. Assess highway construction materials through laboratory testing and recommend appropriate material improvement and stabilization techniques for transportation infrastructure

5. Conduct traffic engineering studies, including speed, capacity, parking, origin–destination, and safety analyses, and recommend suitable traffic management strategies
6. Demonstrate professional competence in transportation engineering through technical reporting, teamwork, laboratory investigations, and engineering presentations

Course contents

Coordination of all Transportation Media. Railway. Airfield. Transportation Planning. Transportation economics. Traffic management. Design of traffic signals. Traffic studies. Traffic flow characteristic. Speed study. Traffic capacity studies. Control systems. Safety devices. Parking. Geometric design. Construction methods. Construction materials. Laboratory works.

Minimum Academic Standards

Civil Engineering laboratory with NUC-MAS requirement facilities.

SUMAS-CEE 561: Drainage and Irrigation

(2 Units E: LH 45)

Senate-approved relevance

Training of well skilled graduates that can apply the knowledge gained in the study of Drainage and Irrigation Engineering to better the lives of various individual and society at large. This is in line with SUMAS' mission statement of producing graduates that are globally competitive and locally relevant. Knowledge of drainage and irrigation engineering will help in the analysis and design of surface and combined drainage systems, collectors, storages and pumps. Graduates from Civil Engineering programme in SUMAS will be relevant as well as competent engineers in the society.

Overview

The removal of excess water either from the ground surface or from the rootzone, is called drainage. Excess water may be caused by rainfall or by using too much irrigation water but may also have other origins such as canal seepage or floods. A drainage engineer is responsible for designing systems that move water or sewage from one place to another, as safely and efficiently as possible. This can involve visiting sites to gain an understanding of project requirements, as well as designing and overseeing the installation of these systems. Irrigation and Drainage Systems Engineering is very important since it helps determine future Irrigation expectations. Irrigation has been a central feature of agriculture for over 5000 years.

This course focuses specifically on the combined topics of irrigation and drainage engineering. It emphasizes both basic concepts and practical applications of the latest technologies available. Drainage and Irrigation Engineering pertains to the analysis and design of surface and combined drainage systems, collectors, storages and pumps. It involves methods of overflow protection of large areas, analysis and design of irrigation systems, soil-plan-water relationships as well as water supplies, water delivery systems and water distribution systems. The course draws from the fields of fluid mechanics, soil physics, hydrology, soil chemistry, economics, and plant sciences to

present a broad interdisciplinary view of the fundamental concepts in irrigation and drainage systems design.

The following objectives of the course, learning outcomes, and contents are provided to address this need:

Objectives:

1. understand the analysis and design of surface drainage systems, collectors, storages and pumps;
2. understand the analysis and design of combined drainage systems, collectors, storages and pumps;
3. identify the methods of overflow protection of large areas;
4. understand the analysis and design irrigation systems; and
5. understand soil-plant-water relationships,
6. understand water supplies and water delivery systems,
7. understand water distribution systems.

Learning Outcomes

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

1. Analyze soil-water-plant relationships and determine crop water requirements for the design and management of irrigation systems
2. Design surface, sprinkler, drip, and subsurface irrigation systems using appropriate hydraulic principles, engineering standards, and water-use efficiency criteria.
3. . Design surface and subsurface drainage systems for agricultural lands, highways, and urban developments to control waterlogging and improve land productivity
4. Evaluate irrigation and drainage system performance and recommend appropriate operation, maintenance, rehabilitation, and water conservation strategies
5. . Assess the impacts of irrigation and drainage projects on soil quality, water resources, and the environment and recommend sustainable engineering solutions
6. Prepare professional engineering reports for irrigation and drainage projects using appropriate design procedures, field data, and engineering standards

Course Contents

Analysis and design of surface drainage systems, collectors, storages and pumps. Analysis and design of combined drainage systems, collectors, storages and pumps. Methods of overflow protection of large areas. Analysis and design of irrigation systems. Soil-plan-water relationships. Water supplies. Water delivery systems. Water distribution systems. Irrigation economics. Soils. Reference evapotranspiration. Crop evapotranspiration. Pipe flow. Pumps. Open-channel flow. Groundwater, center pivots, turf and landscape. Soil water movement. Drainage systems.

Minimum Academic Standards

Civil Engineering laboratory with NUC-MAS requirement facilities.

SUMAS-CEE 532: Foundation Engineering

(2 Units E: LH 30)

Senate-approved relevance

Training of well skilled graduates that can apply the knowledge gained by Foundation Engineering to improve the foundation subjected to dynamic forces and to promote its stability for heavy machines for the industry in the society. This is in line with SUMAS' mission statement of producing graduates that are globally competitive and locally relevant. In Nigeria, heavy machines were used in industries, and their weight had a negative impact on the foundation. The geotechnical engineers provide structural supports to ensure that the foundation is strong enough to withstand the heavy loads used by the industries. Graduates from SUMAS Civil Engineering programme will be relevant and to train future engineers to offer various engineering structures enhancement programmes to society.

Overview

In Nigeria, industries used heavy machines for the manufacturing of their goods, and these machines were placed on the foundation. Often, most of the foundation provided for the machine is unable to withstand the load caused by the heavy machine. Geotechnical engineering provides foundation types for industries to accommodate their heavy machines. Knowledge of foundation engineering will be used to improve the foundation subjected to dynamic forces. Also, to promote its stability for heavy machines for the industry in the society.

This course teaches foundations including normal and deep foundations. Students will be exposed to knowledge of foundation subjected to dynamic forces maintenance; avoiding failures in construction materials and foundation. Slope stability will be dealt with as well as review of slope stability of circular ship surfaces. Slope stability of non-circular ship surfaces is also involved and will be taught by the students. Students will be exposed Earth Dams; planning, design, construction, instrumentation, sub-surface exploration scope, site reconnaissance, boring test pile, sampling, field test, soil report. Lastly, site investigations will be carried out.

The following objectives of the course, learning outcomes, and contents are provided to address this need:

Objectives:

1. Describe the foundation types based on design
2. Explain the foundation subjected to dynamic forces
3. Explain various way to avoid foundation failure using constructional materials
4. Describe slope stability of foundation
5. Explain earth Dams; planning, design, construction, instrumentation, sub-surface exploration scope
6. Describe site investigation
7. Explain compaction and stabilization as a soil improvement technique

8. Explain settlement of consolidation theory
9. Demonstrate soil tests in the laboratory.

Learning outcomes

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

1. Analyze the behavior and stability of shallow and deep foundation systems subjected to static and dynamic loading conditions.
2. Design appropriate shallow foundations, deep foundations, and earth-retaining systems using geotechnical principles and relevant engineering standards.
3. Evaluate slope stability and recommend suitable stabilization measures for natural and engineered slopes under different loading and environmental conditions
4. Design earth dams by considering site conditions, seepage control, stability requirements, construction procedures, and instrumentation systems
5. Conduct site investigations, including reconnaissance, borehole logging, sampling, field testing, and interpretation of geotechnical investigation reports for foundation design.
6. Recommend appropriate foundation solutions based on geotechnical data, structural loading, constructability, safety, durability, sustainability, and economic considerations.

Course contents

Foundations. Normal foundations. Deep foundations. Foundation subjected to dynamic forces maintenance. Avoiding failures in construction materials and foundation. Slope Stability. Review of slope stability of circular ship surfaces. Slope stability of non-circular ship surfaces. Earth dams planning. Design of earth dams. Earth-dams construction. Earth-dams instrumentation. Sub-surface exploration scope. Site reconnaissance. Boring test pile. Sampling, field test and soil report. Site investigations.

Minimum Academic Standards

Civil Engineering laboratory with NUC-MAS requirement facilities.

SUMAS CEE 552: Advanced Strength of Structural Materials (2 Units E: LH 30)

Senate-approved relevance

Training of well skilled graduates that can apply the knowledge gained the use of strength of structural materials to investigate the stability, strength and rigidity of structures based upon the physical requirement of the structure to ensure that the structure perform satisfactorily during its ultimate and service conditions. This is in line with SUMAS' mission statement of producing graduates that are globally competitive and locally relevant. Cases of building collapse in Nigeria is alarming and these collapses are in most cases attributed to structural failure resulting from faulty design and wrong selection of construction materials in terms of quality and quantity. Knowledge of strength of structural materials will help to deal with the forces, stresses, moments,

deformations and behaviours of several materials which in turn very useful in designing structures capable of resisting all applied loads without failure during its intended life. Graduates from Civil Engineering programme in SUMAS will be relevant as well as to train future engineers to offer the society this structural enhancing programmes.

Overview

Strength of Structural Materials is a basic subject for Civil and Mechanical Engineering. It provides the Engineers with the means of analyzing various machine and load bearing structures. The parameters revealed by the analysis of structures are the stresses or stress resultants such as axial forces, shear forces, and bending moments; deflections; and supports reactions. These parameters are essential in the structural design of structures elements like beams, slabs, steel structures, machine and machine parts. The output from structural design will help in determining the most suitable materials, their proportions, dimensions and details of the structural elements and connections.

As cases of structural failures in the society are on the rise, there is need to equip the students of Civil Engineering to utilize the knowledge of strength of Structural Materials. Hence, this course teaches 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 will be dealt with. Students will be able to determine stresses in thin and thick cylinders, and rotating disks. Multi-dimensional stress systems, Mohr's circle and failure theories are also covered. Other thing to learn in the course include, thin shells under internal pressure, torsion of circular shafts and thin-walled tubes, lateral deflections of circular plates as well as torsion of non-circular sections.

The following objectives of the course, learning outcomes, and contents are provided to address this need:

Objectives:

1. Describe and solve problems on axial, lateral, and torsional loading of shafts and beams
2. Estimate the reactions and moments in beams using slope and deflection method
3. Describe and understand the applications of unsymmetrical bending and shear centre
4. Analyze determinate structures such as beams and trusses using analytical and graphical methods.
5. Understand application of bending moment and shear force on engineering problems.
6. Determine the deflection of statically determinate structures using direct integration, unit load, moment area methods and Williot Mohr diagram.
7. Identify and analyze statically indeterminate structures.

Learning Outcomes

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

1. Analyze stress distributions, beam deflections, and deformation behavior of structural members subjected to axial, bending, shear, and torsional loading using advanced mechanics of materials principles.
2. Evaluate the behavior of structural members subjected to unsymmetrical bending, shear center effects, torsion, and combined loading conditions.
3. Apply failure theories, Mohr's Circle, and multi-axial stress analysis to predict the failure behavior and safety of engineering materials under complex stress states.
4. Assess the effects of creep, fatigue, fracture, and stress concentration on the durability, reliability, and service life of engineering structures and components
5. Analyze stresses and deformations in thin cylinders, thick cylinders, rotating discs, pressure vessels, thin-walled tubes, and shell structures using appropriate engineering methods.
6. Recommend suitable engineering materials and structural design approaches based on strength, stiffness, durability, safety, and relevant engineering standards

Course Contents

Advanced topics on axial, lateral, and torsional loading of shafts and beams. Slope and deflection of beams. Unsymmetrical bending and shear centre. Springs. Creep. Fatigue. Fracture and stress concentration. Stresses in thin cylinders. Stresses in thick cylinders. Stresses in rotating disks. Multi-dimensional stress systems. Mohr's circle and failure theories. Thin shells under internal pressure. Torsion of circular shafts. Torsion of thin-walled tubes. Lateral deflections of circular plates. Torsion of non-circular sections.

Minimum Academic Standards

Civil Engineering laboratory with NUC-MAS requirement facilities.

SUMAS-CEE 554: Water Resources and Environmental Engineering II (2 Units C: LH 15; PH 45)

Senate-approved relevance

Training of well skilled graduates that can apply the knowledge gained from Water Resources and Environmental Engineering to design of hydraulic structures which will be built and capable of resisting all the applied loads without failure during its serviceability state. This is in line with SUMAS' mission statement of producing graduates that are globally competitive and locally relevant. Drought in Nigeria is alarming, and these are in most cases attributed to shortage of water in reservoir. Knowledge of water supply and treatment will help in design water treatment plant to avoid drought. Graduates from Civil Engineering programme in SUMAS will be relevant as well as to train future engineers to offer the society this structural enhancing programmes.

Overview

Water/environmental design is a highly specialized area of civil engineering. Water resources and environmental engineering II involves understanding the work of the sanitary engineer, water supply, treatment and design. It also describes waste-water collection, treatment, disposal and

design. Furthermore, solid waste collection, treatment, disposal and design of systems are included. Finally, air pollution and control is included. Cases of pandemic in Nigeria are in most cases attributed to drinking of untreated water and indiscriminate disposal of solid and liquid wastes.

Knowledge of hydraulic structure design will help in determining the most appropriate flow channels with adequate dimensions to avoid flooding. Water Resources and Environmental Engineering will teach students how to design of hydraulic structures. These hydraulic structures must be capable of resisting all the applied loads without failure. Drought in Nigeria is alarming and these are in most cases attributed to shortage of water in reservoir. Knowledge of water supply and treatment will help in design water treatment plant to avoid drought.

The following objectives of the course, learning outcomes, and contents are provided to address this need:

Objectives:

1. Describe water supply and treatment;
2. Design water treatment plant;
3. Understand waste-water collection;
4. Know waste-water treatment and disposal methods;
5. understand the methods of solid waste collection, treatment and disposal;
6. Design of systems of solid waste collection, treatment and disposal;
7. Recognize air pollution and control;
8. Perform experimental tasks involving water resources testing.

Learning Outcomes

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

1. Design water treatment plants and associated hydraulic structures using appropriate engineering principles, design standards, and public health requirements
2. Design wastewater collection, treatment, and disposal systems that meet environmental regulations and sustainable engineering practices
3. Evaluate solid waste collection, treatment, recycling, and disposal systems for sustainable environmental management.
4. Assess air quality, identify sources of pollution, and recommend appropriate pollution prevention and control measures.
5. Conduct laboratory investigations and field studies related to water quality, wastewater treatment, and environmental monitoring using standard engineering procedures.
6. Prepare and present professional technical reports on water resources and environmental engineering projects using accepted engineering communication standards

Course Contents

The work of the sanitary engineer. Water supply. Water resources testing. Water treatment. Design water treatment plant. Wastewater collection. Wastewater treatment. Wastewater disposal. Design of wastewater collection and treatment plant. Solid waste collection. Solid waste treatment. Solid waste disposal. Design of solid waste collection and treatment plant. Air quality. Measurement of air quality. Air pollution and control. Laboratory works.

Minimum Academic Standards

Civil Engineering laboratory with NUC-MAS requirement facilities.

SUMAS-CEE 556: Unit Processes Water and Waste-Water Resources Engineering (2 Units E: LH 30)

Senate-approved relevance

Training of well skilled graduates that can apply the knowledge gained in the study of Unit Processes Water and Waste-Water Resources Engineering to better the lives of various individual and society at large. This is in line with SUMAS' mission statement of producing graduates that are globally competitive and locally relevant. Knowledge of unit processes water and waste-water resources engineering will help in the application of theory of physical, chemical and biological operation and processes in water and waste-water treatment. Graduates from Civil Engineering programme in SUMAS will be relevant as well as competent engineers in the society.

Overview

The unit processes involved in wastewater treatment include physical processes such as settlement or flotation and biological processes such oxidation or anaerobic treatment. Some wastewaters require specialized treatment methods. Physical unit operations in wastewater treatment include sifting, mixing, agglomeration, sedimentation and gravity separation. Various physical unit operations are applied to separate materials such as sand, stones and PET bottles. Water disinfection is of critical importance in preventing the spread of waterborne disease.

Unit Processes Water and Waste-water Resources Engineering pertains to the theory and application of physical, chemical and biological operation and processes in water and waste-water treatment including reactor engineering. It also involves treatability studies including activated sludge process, biological filtration, stabilization ponds, anaerobic sludge digestion, thickening and disposal removal. Knowledge of unit processes water and waste-water resources engineering will help in the application of theory of physical, chemical and biological operation and processes in water and waste-water treatment.

The following objectives of the course, learning outcomes, and contents are provided to address this need:

Objectives:

1. Understand the theory of physical operation and processes in water and waste-water treatment;
2. Understand the theory of chemical operation and processes in water and waste-water treatment;
3. Understand the theory of biological operation and processes in water and waste-water treatment
4. Know the treatability studies.
5. Learn about iron removal and manganese removal in wastewater.
6. Identify water softening methods.
7. Learn about taste removal and odour removal in water and wastewater.

Learning Outcomes

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

1. Apply the principles of physical, chemical, and biological unit operations and processes in the design and operation of water and wastewater treatment systems
2. Analyze reactor hydraulics, mass transfer mechanisms, and treatment process performance for water and wastewater engineering applications
3. Evaluate the performance of activated sludge systems, biological filtration, stabilization ponds, anaerobic digestion, and other biological treatment processes.
4. Design appropriate treatment processes for iron removal, manganese removal, water softening, taste and odour control, equalization, flotation, and sludge management.
5. Conduct treatability studies and interpret laboratory and pilot-scale treatment data for engineering decision-making
6. Prepare professional engineering reports and recommend sustainable treatment solutions that comply with environmental regulations and public health standards.

Course Contents

Theory and application of physical operation and processes in water and waste-water treatment.
 Theory and application of chemical operation and processes in water and waste-water treatment.
 Theory and application of biological operation and processes in water and waste-water treatment.
 Reactor engineering. Completely mixed flow. Plug flow. Dispersed of mass transfer. Oxygen transfer coefficients. Equalization. Flootation. Iron removal. Manganese removal. Water softening. Taste removal. Odour removal. Introduction to treatability studies. Activated sludge process, biological filtration. stabilization ponds, anaerobic sludge digestion, thickening and disposal removal. Site visit to water and waste treatment plants.

Minimum Academic Standards

Civil Engineering laboratory with NUC-MAS requirement facilities.

SUMAS-CEE 558: Terotechnology in Civil Engineering (2 Units E: LH 30)

Senate Approved Relevance

Producing civil engineers with sound knowledge of terotechnology is in line with the vision of State University of Medical and Applied Sciences to rank among the best universities in learning, research and community service in Nigeria. Terotechnology is the branch of engineering concerned with the repair and maintenance of civil engineering structures and infrastructures. It involves the study of the costs associated with an asset throughout its life cycle from acquisition to disposal, and can be applied to equipment, machines, buildings, plants, and structures and includes the expenses and revenues of the organization that acquires them.

The course supports the sustainable development goals that call to action to provide decent work and economic growth, protect earth, environment and climate, provide sustainable cities and community, ensure industry innovation and infrastructure, enhance affordable and clean energy, and end poverty. Understanding this course in civil engineering education will equip civil engineering graduates with the needed maintenance skills to monitor and service the health of civil engineering structures and infrastructures.

Overview

This course introduces terotechnology as a means of salvaging civil engineering structures and infrastructures. It highlights the importance of structural health monitoring to the life of a civil engineering structure. It will introduce the concept of some financial analysis tools like Net Present Value (NPV), Discounted Cash Flow (DCF), and Internal Rate of Return (IRR). The goal is to minimize the costs associated with civil engineering assets in the future. These costs can include maintenance, engineering, wages payable to operate the equipment, operating costs and also disposal costs.

The students will study maintenance principles and system approaches to maintenance management. The needs to identify, locate, and quantify failures and damages in civil engineering structures will be emphasized in the course. The students will study how to conduct fault analysis.

Course Objectives

The objectives of this course include to:

1. provide an introduction to terotechnology as relevant to civil engineering.
2. develop students' ability to conduct health monitoring of civil engineering structures and infrastructures.
3. discuss maintenance principles, and system approach to maintenance management.
4. describe terotechnology system, process, and strategies.
5. discuss maintenance of civil engineering structures and infrastructures.
6. develop students' ability to conduct life cycle costing of projects.
7. develop students' ability to conduct fault analysis.

Learning Outcomes

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

1. Apply maintenance principles and asset management strategies to improve the performance, reliability, and service life of civil engineering structures and infrastructure.
2. Analyze terotechnology systems, processes, and maintenance strategies for effective management of engineering assets throughout their life cycle.
3. Evaluate maintenance management systems, replacement policies, and total productive maintenance techniques for civil engineering facilities
4. Perform life-cycle costing analyses to support engineering decisions relating to infrastructure maintenance, rehabilitation, replacement, and asset optimization.

5. Assess structural deterioration, identify failure mechanisms, quantify damage, and recommend appropriate rehabilitation and maintenance measures for civil engineering infrastructure.
6. Conduct fault analysis and reliability assessments using engineering diagnostic techniques to improve infrastructure safety, performance, and sustainability

Course Contents

The Salvaging of structures. Repair of structures. Maintenance and demolition. Evaluation of building performance. Health monitoring of civil engineering structures and infrastructures. **Terotechnology and Total Productive Maintenance:** Introduction to terotechnology system. Terotechnology process. Strategies for terotechnology. Training in terotechnology. Practice of terotechnology. Terotechnology and total productive maintenance. **Maintenance Management and Terotechnology:** Objective of maintenance. Maintenance principles. The maintenance strategies. Replacement strategy. System approach to maintenance managements. Impact of terotechnology on maintenance management. Maintenance costing. Life cycle costing. **Fault Analysis:** Logical fault finding. Failures and their causes. Failure modes and effect analysis. Terotechnology analysis.

SUMAS-CEE 520: Building Services Engineering (2 Units E: LH 30)

Senate Approved Relevance

Producing civil engineers with sound knowledge of building services engineering is in line with the vision of State University of Medical and Applied Sciences to rank among the best universities in learning, research and community service in Nigeria. Building services engineering strives to achieve a safe and comfortable indoor environment.

The course supports the sustainable development goals that call to action to provide decent work and economic growth, protect earth, environment and climate, provide sustainable cities and community, ensure industry innovation and infrastructure, enhance affordable and clean energy, and end poverty. Understanding this course in civil engineering education will equip civil engineering graduates with right skills for repairing faults, servicing equipment, creating preventive maintenance strategies, and updating user manuals.

Overview

Building services engineering plays a central role in contributing to the design of a building, not only in terms of overall strategies and standards to be achieved, but also in façade engineering, the weights, sizes and location of major plant and equipment, the position of vertical service risers, routes for the distribution of horizontal services, drainage, energy sources, sustainability, and so on. In Building Services Engineering, students will be taught the materials and equipment used in mechanical and electrical services of buildings.

The students will learn how to design building services components, and install and service drainage, plumbing and sewage systems. They will learn how to install and service elevators, and escalators. They will study building acoustics.

Course Objectives

The objectives of this course include to:

1. explain the materials and equipment used in mechanical and electrical services of buildings.
2. describe how to design building services components.
3. describe how to install and service drainage, plumbing and sewage systems.

4. explain how to install and service elevators, escalators.
5. discuss building acoustics principles and strategies.

Learning Outcomes

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

1. Identify and evaluate the materials, equipment, and systems used in mechanical, electrical, plumbing, and environmental services of modern buildings
2. Design building service systems, including water supply, drainage, plumbing, fire protection, lighting, ventilation, and environmental control, in accordance with relevant engineering standards
3. Analyze the installation, operation, maintenance, and performance requirements of plumbing, drainage, sewage disposal, elevators, escalators, and other building service facilities
4. Evaluate heating, ventilation, air-conditioning (HVAC), illumination, thermal comfort, and climate control systems for occupant safety, health, comfort, and energy efficiency.
5. Recommend appropriate building service solutions that integrate sustainability, safety, maintainability, energy conservation, and regulatory compliance into building design and operation

Course Contents

Engineering study of the materials and equipment used in mechanical services of buildings. Engineering study of the materials and equipment used in electrical services of buildings. Design of building services components. Modern building operation. Selection of necessary equipment. Illumination of building. Building comfort. Heat loss. Heat gain. Air-conditioning. Climate control. Water supply. Fire protection. Drainage systems. Plumbing and sewage disposal. Elevators. Escalators. Building acoustics.

Minimum Academic Standards

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.

3. 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° cold bend, double shear, punching and brinel 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 extensometers, arch frames, suspension bridge frame and pin-jointed frame work.
6. Concrete batching and making equipment:
Multi-flow mixers, 112 Dm³ (4ft³) and 56 Dm³(2ft³) 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, capacity 1.3 kg
9. Graduated twine beam scale complete with two stainless steel pans 0 to 200 g x 10g
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 diameter 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 cm³ 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 150oC range

27. Hand-operated extruder – screw type sample extruder for 38mm dia. Complete with built-in 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 dm³ capacity
31. Long stem soil hydrometre graduated 0.995 to 1.030 g/ml
32. Sieving extractor complete with clamps and clamping 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. Surveyor's scales a. Various graph paper b. French curves c. Log tables
11. Planimetres
12. Plumbulbs
13. Arrows
14. Field books
15. 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 Personnel

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. They should possess a minimum of school certificate and National Diploma in Laboratory Technology or its equivalent and occupy the various cadre as listed below:

Chief Technologist

Assistant Chief Technologist

Senior Technologist Technologist I

Technologist II

Student/Staff Ratio

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

Staff – Mix by Rank

Academic staff in the Universities are broadly classified into three categories; Professorial (Professor/Reader), Senior Lectureship and Lecturers Grade I and below. The Professorial cadre should constitute a maximum of 20 percent of the staff strength while the remaining two should constitute 35 and 45 percent respectively.

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 with internet connectivity (postgraduate and undergraduate sections)
14. Discussion Rooms

Classroom, Laboratories, Workshops and Offices

Classroom Accommodation

The NUC standard requirement of 0.65m² per full-time student is maintained.

Description	Size m²
Professor's Office -	18.50
Head of Department's Office -	18.50
Tutorial Teaching Staff's Office -	13.50
Other Teaching Staff Space -	7.00
Technical Staff Space -	7.00
Secretarial Space -	7.00
Staff Research Laboratory -	16.50
Seminar Space/per student -	1.85
Laboratory Space per FTE	7.50
Conference Room	37.0