

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

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



STUDENTS' HANDBOOK

UNDERGRADUATE DEGREE PROGRAMME

2024

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FOREWORD

This handbook contains useful guidelines necessary to earn B.Eng. Degree in Computer Engineering of the **State University of Medical and Applied Sciences, Igbo-eno, Enugu.**

This handbook is meant to give students of the department details structure of the programme and various procedures to follow in order not to run against any of the University regulations.

Students are also to familiarize themselves with each semester's workload in order to maximize their potentials.

I sincerely welcome you to the Department of Computer Engineering and wish you the best in your stay at the State University of Medical and Applied Sciences, Igbo-eno, Enugu.

Engr. Okozor Nkeiruka Petrolina

B.Eng, M.Eng

Ag. Head of Department, Computer Engineering

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PHILOSOPHY OF 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 endeavor 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

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

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.

PRINCIPAL OFFICERS OF THE UNIVERSITY

VICE CHANCELLOR

Prof. James Chukwuma Ogbonna
B.Sc. (Jos); M.Eng. (Yamanashi); Ph.D. (Tsukubai)

REGISTRAR

Mr. Anselm U. Onah
B.A. Ed. (Hons); FCAI; FIIA; MANUPA

UNIVERSITY LIBRARIAN

Dr. Monica E. Eze
CLN; FNLA; FCAI

BURSAR

Dr. Ozoadibe Elvis Emeka
B.Sc., MBA' M.Sc.; Ph.D.; FCA; ACTI; MILRM

A. LIST OF ACADEMIC STAFF

S/N	NAMES	STATUS	RANK	QUALIFICATION	AREA OF SPECIALIZATION
1	Prof. Mamilus Aginwa Ahaneku	Visiting	Professor	B.Eng., M.Eng., Ph.D.	Communications Engineering, Computer Engineering and Electronic Engineering
2	Prof. Mishark Nnamdi Nnabuchi	Full Time	Professor	B.Sc., M.Sc., Ph.D.	Solar Energy Devices, Photovoltaic and Modelling, Nano Materials-Synthesis
3	Prof. Pius Oziri Ukoha	Visiting	Professor	B.Sc., M.Sc., Ph.D.	Intelligent Systems and Computational Intelligence, Autonomous Systems, Computer Network Systems, Optimization
4	Dr. Frank Ekene Ozioko	Visiting	Associate Professor	B.Sc., M.Sc., Ph.D.	Machine Learning, Artificial Intelligence, Computer Networks, Computer Security and Reliability

5	Engr. Dr. Godwin Odozo Ozor	Visiting	Senior Lecturer	B.Eng., M.Eng., Ph.D.	Robotics & Control, Artificial Intelligence and Machine Learning
6	Engr. Dr. Ezekiel Nnamere Aneke	Full Time	Senior Lecturer	B.Eng., M.Eng., Ph.D.	Voltage Stability and Power System Optimization, Renewable Energy Integration and Smart Grids, Power Electronics and Electric Machines, Energy Management and Loss Minimization, Industrial Power Systems
7	Engr. Dr. Onyebuchi Nduka Asanya	Visiting	Senior Lecturer	B.Eng., M.Eng., Ph.D.	Power Systems and Power Grids, Electrical Machines and Drives, Renewable Energy Systems, Power Electronics, Machine Learning Applications in Power Engineering
8	Rev. Fr. Dr. E. Anoliefo	Visiting	Senior Lecturer	B.Eng., B.Th., M.Eng., PhD.	Digital Electronics (Renewable Energy)
9	Eugene Chijindu Ukaegbu	Full Time	Senior Lecturer	B.Sc., M.Sc., Ph.D.	Computing and Statistics, Data

					Science and Programming
10	Dr. Tochukwu Chijindu Asogwa	Visiting	Senior Lecturer	B.Sc., M.Sc., Ph.D.	Computer Programming, Artificial Intelligence, Microprocessor and Embedded Systems
11	Dr. Ogbemor Clara Ekwe	Full Time	Senior Lecturer	B.Sc., M.Sc., Ph.D.	Biotechnology, Molecular Biology, Chemical Kinetics, Chemical Thermodynamic
12	Engr. Dr. Kingsley Ifeanyi Chibueze	Full Time	Lecturer I	B.Eng., M.Eng., Ph.D.	Software and Firmware Engineering, Artificial Intelligence and Cyber Security
13	Engr. Ogbodo Joseph Uche	Full Time	Lecturer I	B.Eng., M.Eng.	Communication, Cyber Security, Artificial Intelligence & Data Science
14	Engr. Ogbonna Christopher Muoneke	Full Time	Lecturer I	B.Eng., M.Eng.	Control Systems, Soft-Computing & Artificial Intelligence
15	Engr. Okozor Nkeiruka Petrolina	Full Time	Lecturer II	B.Eng., M.Eng.	Computer & Control, Cyber Security, Artificial Intelligence

B. LIST OF NON-ACADEMIC STAFF

S/N	NAMES	STATUS	RANK	QUALIFICATION	AREA OF SPECIALIZATION
1	Mr. Anichebe Obichukwu Emmanuel	Full Time	Technologist II	B.Eng.	Hardware
2	Mr. Ndu Stanley Obinna	Full Time	Technologist II	B.Eng.	Hardware
3	Engr. Favour Chiagoziem Amadi	Full Time	Technologist II	B.Eng.	Computer and ICT
4	Mr. Ifeanyichukwu S. Nnanyelugo	Full Time	Technologist II	HND	Electrical & Electronics/IoT

C. LIST OF ADMINISTRATIVE STAFF

S/N	NAMES	STATUS	RANK	QUALIFICATION
1	Dorathy Ifeanyi Ugwu	Full Time	Secretary	NCE
2	Mrs. Onyia Linda Obianuju	Full Time	Secretary	B.Ed.
3	Odo Evelyn Chinedu	Full Time	Messenger/Cleaner	WAEC

HISTORICAL BACKGROUND OF COMPUTER ENGINEERING

The Department of Computer Engineering, under the Faculty of Engineering and Built environment, was established on 12th of April 2022 to lead the way in the area of Computer and related technological development. It was among one of 23 programs approved by the National University Commission, (NUC) in the university. The first Dean of the faculty and Acting head of the department are Prof. Linus Anih and Engr Nkeiruka P. Okozor respectively.

The Department admitted **eight (8)** students into 100 Level during 2022/2023 academic session, and **Nine (9)** students during the 2023/2024 academic session. The Department offers an undergraduate program leading to the award of Bachelor of Engineering in Computer Engineering. The courses offered in the Department for all programs are constantly reviewed to meet up with cutting-edge technologies in Computer Engineering. The teaching and research facilities are current technology to position graduates of the Department to meet the demands of modern-day cutting-edge computer technology. To achieve these, the Department has made untiring efforts to recruit very high-caliber academic and technical staff with solid background and professional experiences in research and consultancy on Computer Engineering projects. However, students are also encouraged to register with professional bodies like Institute of Electrical and Electronics Engineering (IEEE), Computer Professional (Registration Council) of Nigeria (CPN), Association of Computing Machinery (ACM), Nigeria Society of Engineering (NSE) and Council of Regulation of Engineering in Nigeria (COREN) etc.

Overview

This curriculum was prepared in compliant with the Core Curriculum and Minimum Academic Standards (CCMAS) for the education and training of students studying for first degree in the program of the Computer Engineering discipline in the Nigerian University System. The components of the minimum standards described here will enable the graduates of the program to acquire sufficient theoretical and practical knowledge to contribute to national advancement and be competitive in the globalized environment.

PHILOSOPHY OF B.ENG. COMPUTER ENGINEERING

The philosophy of the B.Eng. Computer Engineering programme is to develop highly skilled professionals for public, private, and international organizations, as well as to prepare graduates for teaching and research in tertiary institutions and for global competitiveness.

OBJECTIVES

The Department's aim and objectives are in line with those of the university and these are geared towards the realization of national needs and aspirations.

Graduates from Computer engineering Department are expected among other things to:

- a) Be job creators in their areas of specialization in particular computer engineering discipline in general.
- b) Design and construct systems and components primarily in their areas of specialization.
- c) Supervise the installation, commissioning and maintenance of computer engineering systems and components.
- 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 Computer Engineering in general.

UNIQUE FEATURES OF THE PROGRAM

There are a number of unique features that characterize computer engineering curriculum:

1. A conscious duality focuses in terms of preparing the students to ethically advance scientific knowledge
2. More student directed learning,
3. Reduction in classroom contact time by reducing student work load
4. Increased application of the computer system and computer software in the programme in both teaching and learning;
5. Early familiarization of the students with the computer engineering discipline in terms of knowledge, skills and role expectations/responsibilities
6. Recommendation of cooperative or co-teaching for a course by resource persons from other disciplines/faculties in order to maximise learning;
7. Recommendation of the use of more real-life/real-time simulation/demonstration approaches and qualified certified industry-based facilitators for the delivery of courses in order to deepen learning
8. Introduction of a capstone engineering business development and management course in the final year of the programme.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

The Computer Engineering Department established the following objectives of the programme in support of the vision and mission of the University. Graduates are expected to be able to attain the following objectives within 5 years following graduation:

PEO 1: Demonstrate sound knowledge of computer engineering principles, programming paradigms, computer hardware, software systems, and modern engineering tools for solving complex engineering problems.

PEO 2: Recommend, design, develop, and implement integrated hardware, software, embedded, and communication systems that meet industrial, commercial, and societal needs.

PEO 3: Plan, manage, and deploy computer engineering solutions and infrastructures while considering economic, environmental, social, ethical, and sustainability requirements.

PEO 4: Apply technical competence, leadership, teamwork, communication skills, and professional ethics in multidisciplinary and multicultural environments.

PEO 5: Engage in lifelong learning, research, innovation, entrepreneurship, professional development, and community service to contribute to national and global technological advancement.

PROGRAMME OUTCOMES (POS)

The Programme Outcomes (POs) of the Computer Engineering Programme were adopted from the twelve Graduate Attributes of the Washington Accord as incorporated into the COREN Core Curriculum and Minimum Academic Standards (CCMAS) for Engineering Programmes.

The Programme Outcomes (POs) for the computer engineering programme are presented in Table below.

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
PO2.1	Demonstrate ability to solve problems by concepts through the integration of mathematics, science and engineering.
PO2.2	Demonstrate skill in identifying vital information from resources in solving problems.
PO2.3	Demonstrate skill and appropriate technique and ingenuity in solving developmental or engineering problems.
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
PO3.1	Demonstrate understanding of the impact of engineering decisions and solutions to societal issues.
PO3.2	Demonstrate understanding of solutions to cultural diversity based on our local context in Nigeria.
PO3.3	Demonstrate knowledge of the implications of engineering designs and solutions to the public health and safety of all.

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
PO4.1	Demonstrate the ability to appropriately design and conduct experiments and interpret results to understand underlying engineering principles.
PO4.2	Demonstrate ability to apply statistical tools in designing and analyzing experiments.
PO4.3	Demonstrate skill in applying the appropriate research method in solving engineering problems.
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
PO5.1	Demonstrate an understanding of the inherent limitations of software (application) tools, and analytical and numerical techniques.
PO5.2	Demonstrate ability to identify and apply appropriate techniques in investigating and solving problems of engineering relevance.
PO5.3	Demonstrate capability and proficiency in using modern and ICT tools to solve engineering problems.
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
PO6.1	Demonstrate awareness of legal implications of professional engineering practice.
PO6.2	Demonstrate understanding of the required contribution of engineers to the society.
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
PO7.1	Demonstrate an understanding of the impact of engineering solutions on the society and environment.

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
PO8.1	Demonstrate knowledge and understanding of the COREN Engineers Code of Conduct.
PO8.2	Demonstrate ability to apply professional responsibilities and norms of engineering practice.
PO9	Individual and Team Work: function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings
PO9.1	Demonstrate knowledge and understanding in completing set goals and plan tasks
PO9.2	Demonstrate the ability to apply acquired skills effectively as a team member or team leader.
PO9.3	Demonstrate the ability to work with other engineering discipline or 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
PO10.1	Demonstrate the skills to communicate within the engineering society and outside engineering profession
PO10.2	Demonstrate the ability to make presentations and be able to communicate the society at large
PO10.3	Demonstrate the ability to use appropriate presentation methods for effective communication and follow 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
PO11.1	Demonstrate the ability to conduct, manager and execute projects in multi-disciplinary areas
PO11.2	Demonstrate the ability to work within the budget when executing a project for proper management

PO11.3	Demonstrate an understanding of the principles and skills required for effective project management.
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.
PO12.1	Demonstrate the ability to learn new technology or techniques that will be used for solving life problems and professional development activities
PO12.2	Demonstrate the ability to apply knowledge acquired from teaching, professional journals and industry publications to improve processes and systems

EMPLOYABILITY SKILLS

A computer Engineering to be able to function effectively in the 21st century national and global industrial, economic and societal must possess certain skills such as:

1. Application of fundamental and Specialist knowledge
2. Independent learning ability
3. Effective Communication
4. Responsibility for Decisions
5. Management of Engineering Activities
6. Engineering methods, skills, tools and information technology
7. Engineering Design
8. Data Analysis

21ST CENTURY SKILLS

1. Critical thinking and problem solving
2. Creativity and innovation
3. Collaboration and team work
4. Communication and information literacy
5. Media literacy
6. Computation and data management
7. Technology literacy
8. Flexibility
9. Leadership and ethical responsibility
10. Initiative

ADMISSION AND GRADUATION REQUIREMENTS

ADMISSION REQUIREMENTS

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

1. Indirect Entry (5 Year Degree Program)

2. Direct Entry (4 Year Degree Program)

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 less 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

Expected duration for UTME candidates shall be five (5) years and students are required to pass a minimum of 150 units, while Direct Entry students, expected duration for graduation is four years and expected to pass a minimum of 120 units which must include all compulsory courses. Candidates admitted through the Direct Entry mode at 300-Level, expected duration for graduation is 3 years and expected to pass minimum of 90 units which must also include all compulsory courses. The determination of the class of degree shall be based on the Cumulative Grade Point Average (CGPA) earned at the end of the programme. The CGPA shall be used in the determination of the class of degree.

DURATION OF PROGRAMME

For the Bachelor of Engineering (B.Engr) degree in Computer Engineering, the courses offered are for a period of four years for direct-entry students and five years for students who gain entry through UME or pre-degree programme.

CLASSIFICATION OF DEGREES

The degree of Bachelor of Engineering (B. Eng.) in Computer Engineering shall be awarded according to the following classification of final Cumulative Grade Point Average (CGPA).

Class of Degree	Range of CGPA
First Class	4.50 – 5.00
Second Class (Upper division)	3.50 – 4.49
Second Class (Lower division)	2.40 – 3.49
Third Class	1.50 – 2.39

GLOBAL COURSE STRUCTURE

100 Level

First Semester

COURSE CODE	COURSE TITLE	Units	Status	LH	PH
GST 111	Communication in English	2	C	15	45
MTH 101	Elementary Mathematics I: Algebra and Trigonometry	2	C	20	-
PHY 101	General Physics I: Mechanics	2	C	30	-
PHY 103	General Physics III: Behaviour of Matter	2	C	30	-
PHY 107	General Practical Physics I	1	C		45
CHM 101	General Chemistry I	2	C	30	-
CHM 107	General Practical Chemistry I	1	C		45
GET 101	Engineer in Society	1	C	15	
SUMAS-COS 101	Introduction to Computer Application	2	C	30	45
SUMAS-GET 109	Environmental awareness and protection	2	C	30	-
TOTAL		17			

Second Semester

COURSE CODE	COURSE TITLE	Units	Status	LH	PH
GST 112	Nigerian Peoples and Culture	2	C	30	-
MTH 102	Elementary Mathematics II: Calculus	2	C	30	-
PHY 108	General Practical Physics II	1	C	-	45
CHM 102	General Chemistry II	2	C	30	-
CHM 108	General Practical Chemistry II	1	C	-	45
GET 102	Engineering Graphics and Solid Modelling I	2	C	15	45
CPE 112	Introduction to Computer Engineering	2	C	30	-
SUMAS-PHY 104	General Physics IV (Vibration, Waves and Optics)	2	C	30	-
SUMAS-GET 106	Applied Mechanics	3	C	30	45
SUMAS-GET 108	Occupational Safety	2	C	30	
TOTAL		19			

**200 Level
First Semester**

COURSE CODE	COURSE TITLE	Units	Status	LH	PH
GST 211	Entrepreneurship and Innovation	2	C	30	-
GET 201	Applied Electricity 1	3	C	45	-
GET 211	Computing and Software Engineering	3	C	30	45
GET 203	Engineering Graphics and Solid Modeling II	3	C	45	-
GET 299	SIWES I: Students Work Experience Scheme	3	C	9weeks	
GET 209	Engineering Mathematics I	3	C	45	-
MEE 243	Measurement and Instrumentation	3	C	30	45
SUMAS-CPE 289	Laboratory Practical I	1	C	-	45
SUMAS –IFT 203	Introduction to Web Technology	2	E	15	45
Total		20			

Second Semester

COURSE ODE	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	Student Workshop Practice I	2	C	15	45
SUMAS-CPE 206	Basic Electronics	3	C	30	45
GET 210	Engineering mathematics II	3	C	45	-
SUMAS-GET 214	Engineering Economics	2	C	30	-
SUMAS-GET 208	Strength of materials	3	C	45	-
SUMAS- CPE 202	Introduction to Online Learning	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	-
CPE 301	Computer Organization and Architecture	2	C	30	-
CPE307	Assembly Language Programming	2	C	45	-
EEE 321	Analogue Electronic Circuits	2	E	15	45
SUMAS-CPE 389	Laboratory Practical II	2	C	-	45
SUMAS-GET 307	Introduction to Artificial Intelligent, Machine learning & Convergent Technology	3	C	45	
GET 399	SIWESII: Students Work Experience Scheme	4	C	9 weeks	
Total		17			

Second Semester

COURSE CODE	COURSE TITLE	Units	Status	LH	PH
GST 312	Peace and Conflict Resolution	2	C	30	-
ENT 312	Venture Creation	2	C	15	45
GET 302	Engineering Mathematics IV	3	C	45	-
GET 304	Engineering Communication, Technical Writing and Presentation	3	C	45	-
GET 306	Renewable Energy System and Technology	3	C	30	45
EEE 322	Digital Electronic Circuit	2	E	30	45
SUMAS - CPE 342	Computer Networks and Security Systems	2	C	30	45
SUMAS-CPE 398	Laboratory Practical III	1	C		45
SUMAS-CHE 312	Waste Processing Technology	1	C	30	-
Total		19			

400 Level
First Semester

COURSE CODE	COURSE TITLE	Units	Status	LH	PH
CPE 401	Microprocessor and Embedded Systems	3	C	30	45
CPE 403	Control System	2	C	30	-
CPE 405	Fundamentals of Software Engineering	2	C	30	-
CPE 411	Hardware Design Techniques and Verification	2	E	30	-
CPE 413	Research Methods	2	E	30	-
SUMAS- CPE 421	Database Design	2	E	15	45
SUMAS - CPE 489	Circuit Implementation & Prototyping Techniques	3	C	15	90
TOTAL		16			

Second Semester

COURSE CODE	COURSE TITLE	Units	Status	LH	PH
GET 299	SIWES 1	3	C	9 Weeks	
GET 399	SIWES 11	4	C	12 Weeks	
GET 499	SIWES 111	4	C	12 Weeks	
GET 404	Engineering Valuation and Costing	2	C	6 Weeks	
GET 402	Engineering Project	2	E		90
TOTAL		15			

500 Level**First Semester**

COURSE CODE	COURSE TITLE	Units	Status	LH	PH
GET 501	Engineering Project Management	3	C	45	-
CPE 501	Testing, Reliability and Maintainability	2	C	30	-
CPE 505	Digital System Design with VHDL	2	C	30	-
CPE 511	Machine Learning and Application	3	C	45	-
SUMAS - CPE 521	Cyber Security Techniques	2	E	30	-
SUMAS - CPE 523	Computer Graphics & Animation	2	E	30	
SUMAS- CPE 589	Seminar	2	C	30	-
Total		16			

Second Semester

COURSE CODE	COURSE TITLE	Units	Status	LH	PH
GET 502	Engineering Law	2	C	30	-
CPE 502	Digital Signal Processing	3	C	45	-
CPE 514	Professional Practice and Ethics	2	C	30	-
SUMAS - CPE 554	Design & Installation of Computer Security/Solar Systems And ICT Services	2	E	30	-
SUMAS - CPE 576	Fundamentals of Robotics & Automation	2	E	30	-
SUMAS - CPE 504	Embedded Systems II	3	C	45	-
GET 599	Final Year Project	6	C	-	270
TOTAL		20			

***NOTE:**

C – Compulsory, E – Electives; R – Required Course; LH – Lecture hours; PH – Practical hours

GST General Studies courses offered at the University

ENT Entrepreneurship courses offered at the University

GET Foundation courses for all the programs in the Engineering

CPE Core Courses for Computer Engineering Programs

COURSE CONTENTS AND LEARNING OUTCOMES

100 Level

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

Learning Outcomes

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

1. Identify possible sound patterns in English Language;
2. List notable language skills;
3. Classify word formation processes;
4. Construct simple and fairly complex sentences in English;
5. Apply logical and critical reasoning skills for meaningful presentations;
6. Demonstrate an appreciable level of the art of public speaking and listening; and
7. Write simple and technical reports.

Course Contents

Sounds and sound patterns in English Language (vowels and consonants, phonetics and phonology); English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations); major word formation processes; the sentence in English (types: structural and functional); grammar and usage (tense, concord and modality). Reading and types of reading, comprehension skills, 3RsQ. Logical and critical thinking; reasoning methods (logic and syllogism, inductive and deductive argument, analogy, generalisation and explanations). Ethical considerations, copyright rules and infringements. Writing activities (pre-writing (brainstorming and outlining), writing (paragraphing, punctuation and expression), post- writing (editing and proofreading). Types of writing (summary, essays, letter, curriculum vitae, report writing, note - making). etc. 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 and Corruption (WAIC), Mass Mobilization for Self-Reliance, Social Justice and Economic Recovery (MAMSER), National Orientation Agency (NOA). Current socio-political and cultural developments in Nigeria.

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

Learning Outcomes

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

1. Define atom, molecules and chemical reactions;
2. Discuss the modern electronic theory of atoms;
3. Write electronic configurations of elements on the periodic table;
4. Rationalise the trends of atomic radii, ionisation energies, electronegativity of the elements, based on their position in the periodic table;
5. Identify and balance oxidation–reduction equation and solve redox titration problems;
6. Draw shapes of simple molecules and hybridised orbitals;
7. Identify the characteristics of acids, bases and salts, and solve problems based on their quantitative relationship;
8. Apply the principles of equilibrium to aqueous systems using Le-Chatelier's prin predict the effect of concentration, pressure and temperature changes on equilibrium mixtures;
9. Analyse and perform calculations with the thermodynamic functions, enthalpy, entropy and free energy; and
10. Determine rates of reactions and its dependence on concentration, time and temperature.

Course Contents

Atoms, molecules, elements and compounds, and chemical reactions. Modern electronic theory of atoms. Electronic configuration, periodicity and building up of the periodic table. Hybridisation and shapes of simple molecules. Valence forces; Structure of solids. Chemical equations and stoichiometry; chemical bonding and intermolecular forces, kinetic theory of matter. Elementary

thermochemistry; rates of reaction, equilibrium and thermodynamics. Acids, bases and salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity.

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

Learning Outcomes

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

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

Course Contents

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

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

Learning Outcomes

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

1. State the general laboratory rules and safety procedures;
2. Collect scientific data and correctly 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, and 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.

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; kinematic 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, center 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 laws of of planetary gravitation, motion,gravitational Kepl potential energy, escape velocity, satellites motion and orbits.

PHY 102: General Physics II (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

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, and 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, and the Argand diagram. De Moivre's theorem and 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. Recognize and understand the meaning of function of a real variable, graphs, limits and continuity;
3. Solve function of a real variable, plot relevant graphs, identify limits and idea of continuity;
4. Identify the derivative as limit of rate of change;
5. Identify techniques of differentiation and perform extreme curve sketching;
6. Identify integration as an inverse of differentiation;
7. Identify methods of integration and definite integrals;
8. Solve some applications of definite integrals in areas and volumes; 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).

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: LH15; PH45)

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.

CPE 112: Introduction to Computer Engineering (2 Units C: LH 30)

Learning Outcomes

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

1. explain the profession of computer engineering;
2. the roles played by computer engineers; and
3. explain the historical development of computers.

Course Contents

Historical development of modern computing and computer engineering profession; roles and responsibilities of the computer engineer; career paths and development (public and private sectors, academic/research and industry); overview of computer engineering design; computer devices/hardware in the age of smart 'IoT's and P'; computer identification software and hardware components of Computer system and operational relationships (central processing units, input/output devices, operating systems, languages)

SUMAS PHY 104 General Physics IV [2 Units, C: LH 30]

Senate-Approved Relevance

Graduates who are highly skilled in physics is in accord with the vision of SUMAS to become a leader in the discovery, dissemination, and application of new knowledge in areas of sciences for the development of self and society. Relevance is seen in graduates of Computer Engineering from SUMAS having sufficient science, engineering and programming knowledge that will enable the graduates to adapt to working in any engineering outfit, making graduates of the institution renowned and world-class.

Overview

The study of vibrations, waves, and optics is vital to the training of Computer Engineering graduates because their applications are used in solving Computer Engineering related problems. This highlights the importance of preparing students in Computer Engineering with the knowledge and skills on how to apply the basic concepts of vibrations, waves and optics in the solution of industrial problems.

Therefore; this course will expose students on the basic concepts and analysis of vibration systems, wave energy, and optics.

Objectives

The objectives of the course are to:

1. describe and quantitatively analyze the behavior of vibrating systems and wave energy;
2. describe the propagation and properties of waves in sound and light;

3. identify and apply the wave equations;
4. describe geometrical optics and principles of optical instruments; and
5. describe Doppler effect.

Learning Outcomes

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

1. describe and quantitatively analyze the behavior of vibrating systems and wave energy;
2. describe the propagation and state at least three (3) properties of waves in sound and light;
3. identify and apply the wave equations to solving three (3) problems;
4. describe at least two (2) geometrical optics and principles of optical instruments; and
5. describe Doppler effect.

Course Contents

Simple harmonic motion (SHM). Energy in a vibrating system. Damped SHM. Q values and power response curves. Forced SHM. Resonance and transients. Coupled SHM. Normal modes. Types and properties of waves as applied to sound. Transverse and Longitudinal waves. Superposition. Interference. Diffraction. Dispersion. Polarization. Waves at interfaces. Energy and power of waves. The 1-D wave equation. 2-D and 3-D wave equations. Wave energy and power. Phase and group velocities. Echo. Beats. The Doppler Effect. Propagation of sound in gases, solids and liquids and their properties. Nature and propagation of light. Reflection. Refraction, and internal reflection. Dispersion. Scattering of light. Reflection and refraction at plane. Spherical surfaces. Thin lenses and optical instruments. Wave nature of light. Huygens's principle. Interference and diffraction.

Minimum Academic Standards

As described in CCMAS.

SUMAS-GET 104: Applied Mechanics [3 Units, C: LH 45]

Senate-Approved Relevance

Training engineers with sound knowledge of mechanics which is the building block of statics, dynamics, and strength of materials is fundamental to the vision of the State University of Medical and Applied Sciences (SUMAS) to produce graduates who are knowledgeable, creative, and innovative. Sustainable development goal 9 aims to develop quality reliable, sustainable, and resilient infrastructure, hence graduates with good knowledge and technical application of applied mechanics, as bridge between theory and practical application to technology would go a long way in the development of sustainable material for sustainable industrialization.

Overview

Applied mechanics investigates the motion of solid materials observed by humans without the assistance of instruments. It is classified into statics and dynamics. While statics deals with forces that act on a body at rest, dynamics deals with body in motion which is further subdivided into kinetics and kinematics. Different materials react differently when a load is applied, and this provides very useful information in materials selection and the expected service life of such materials.

This course fortifies the learners with the classical mechanics such as force, mass, and motion and moreover problem-solving skills via the application of principles of mechanics to basic engineering problems. It also encompasses the concepts of thermoplasticity, elasticity theory, fracture mechanics, fracture and failure mechanism, fatigue, and computational mechanics. Furthermore, material response and performance are important design consideration for engineers especially mechanical, structural, and civil engineers.

Objectives of the Course

The objectives of the course are to:

- 1) explain the theory, concepts, principles, and equations that govern the motion of solid materials;
- 2) describe the broad categories of applied mechanics;
- 3) develop the capacity to visual and create meaningful mathematical model of a body subjected to force within the context of engineering application;
- 4) differentiate between kinetics and kinematics and explain the concepts of acceleration, velocity, and the response of body due to applied external loads such as force and torque;
- 5) use interpersonal understanding, teamwork and communication skills working on group assignments;
- 6) apply several mechanics formulas derived to solve example problems;
- 7) explain shear forces and bending moments diagrams; and
- 8) explain deflection of beams.

Learning Outcomes

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

- 1) define basic concepts in applied mechanics and formulate kinetic and kinematic formula that govern rigid bodies;
- 2) list and explain the two broad categories of applied mechanics as well their sub-classifications;
- 3) identify the actual restraints and equations that govern a given engineering structure within a specified condition;
- 4) identify kinematic and kinetic problems and analyse several loading conditions;
- 5) show competence in understanding and teamwork in the given group assignments;
- 6) Solve several example problems by applying the principles learnt in the course;
- 7) Draw Shear forces and bending moments diagrams; and

8) Determine deflection of beams.

Course Contents

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

Minimum Academic Standards

As described in CCMAS.

SUMAS- GET 109 Environmental Awareness and Protection (2 Units, LH = 30)

Senate – Approved Relevance:

The world class training of students who are highly knowledgeable in a wide range of environmental challenges and opportunities in Enugu State and are adequately exposed to environmental management systems, legal framework and socio-cultural issues pertaining to utilization of natural resources are in tandem with SUMAS's mission statement of "technology for service and service for humanity". Graduates from SUMAS are therefore expected not only to become environmental protection ambassadors in their various areas of profession but to be highly aware of issues concerning our environment with relevance to sustainable economic development.

Overview

Environmental awareness and protection are cardinal in every economy for the achievement of Sustainable Development Goals (SDGs). This involves proper management of the micro and macro environment. Proponents of environmental management therefore call for a systems approach where every profession must contribute positively towards the protection of the environment. This is in accordance with Agenda 21's slogan of "Think globally, while acting locally".

The purpose of this course is therefore to ensure that graduates of SUMAS are in tune with world best practices of environmental protection and acquire skills in environmental surveillance, monitoring, planning and management for the wellbeing of the present and future generations.

Objectives

The objectives of the course are to:

- (1) Define the term "Our Environment".
- (2) Illustrate the various environmental systems
- (3) Provide a comprehensive description of urban environmental problems and their solutions

- (4) Identify rural environmental problems and their solutions
- (5) Determine the legal framework for environmental protection in Nigeria
- (6) Describe the meaning of sustainable development and sustainable development goals (SDGs)
- (7) Present the interplay between population, poverty and environment
- (8) Examine the concepts of renewable and non-renewable resources
- (9) Describe pollution and its various control measures
- (10) Explore issues and challenges of waste management including generation, collection, transportation and disposal
- (11) Show the relationship between resource depletion and environmental protection.
- (12) Describe environmental protection regulations and standards
- (13) Explain the concept of climate change.
- (14) Explain environmental degradation

Learning Outcomes

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

1. Give at least four definitions of the term “our environment”
2. Illustrate the various environmental systems
3. Provide at least five urban environmental problems and their solutions
4. Identify at least five rural environmental problems and their solutions
5. Discuss the legal framework for environmental protection in Nigeria
6. Describe the meaning of sustainable development and sustainable development goals (SDGs)
7. Illustrate the interplay between population, poverty and environment
8. Examine the concept of renewable and non-renewable resources
9. Describe the 3 types of pollution and their various control measures
10. Explore issues and challenges of waste management system including generation, collection, transportation and disposal
11. Show the relationship between resource depletion and environmental protection
12. Describe environmental protection regulation and standards by NESREA
13. Discuss with examples the concept of climate change
14. Explain environmental degradation

Course Content

Definition and meaning of environment. Environmental education. Man and environment. Environmental systems (eg. ecosystem). Urban environmental problems and mitigating measures. Rural environmental problems and mitigating measures. Renewable and non-renewable resources. Sustainable development and SDGs. Legal framework for environmental protection in Nigeria. Population, poverty and the environment. Environmental toxicology. Pollution control. Waste management. Resource depletion and environmental protection. Climate change. Environmental

protection and regulation standards. Land use planning. Landscaping and environmental design. Environmental degradation.

Minimum Academic Standards

As described in CCMAS.

SUMAS-COS-101: Introductory to Computer Application (2 Unit, C: LH 30)

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 (ICA) course is to provide students at State University of Medical and Applied Sciences, Igbo-Eno, Enugu (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

SUMAS-GET 108: Occupational Safety (2 Units, C: LH 30)

Senate-Approved Relevance

The core mandate of our university 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. State University of Medical and Applied Sciences, Igbo-Eno, Enugu take the issue of safety seriously in their operations. 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 will feel confident in their understanding of:

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. measures to reduce fatality rate at the workplace;
4. benefits of compliance with safety regulations;
5. 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, etc.; introduction to basic design and operation of digital computers (information representation).

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, entrepreneurship, 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 (3units C: LH = 45, PH-)

Senate Approved Relevance to Vision and Mission

As a competent engineer, it is important to have a good knowledge basic electricity principle. Engineering professional skills provide material needs of the entire human space. Therefore, to produce skillful human resources of engineering profession, basic electricity knowledge is required. This will produce outstanding and competent Engineers vast in areas of engineering and science field. This will promote research, education and innovation electricity generation, transmission and distribution. This is in line with the State University of Medical and Applied Science vision and mission as a university set out to serve humanity.

Overview

This course introduces students to the fundamentals of electricity including generation, transmission and distribution operations. This course discusses the quantities associated with electricity and the characteristics of DC and AC and their importance. An outstanding Engineering graduate from Enugu State University of Science and Technology, which is the first indigenous University of Science and Technology in Nigeria, should have the basic knowledge of electricity to solve existing problems of both domestic and industrial challenges.

The course introduces students to electric circuits arrangements, the principle of operation of a transformer and motors and their applications. Issues of electric shock, hazards and safety measures are covered.

Objectives

The objectives of the course are to:

1. Introduce the basic concept of electricity and electrical D.C circuits
2. List, explain and outline the applications of D.C. circuits theorems
3. Outline and describe the fundamental circuit theory
4. Give applicable solution of simple circuits.
5. Explain machine designs and discharge devices.

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.
5. Introduce machine design and discharge devices.

Course contents

Fundamental concepts: Electric fields. Electric charges. Magnetic fields. Electric current. Circuits elements, DC and AC circuits, Basic circuit laws and theorems. Resonance, power, power factors, 3-phase circuits. 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. and susceptance. Introduction to machine designs. Physics of devices Discharge devices. semi-conductors. diode and transistors. Transistor characteristics. devices and circuits. Electrical and electrical power measurements.

SUMAS-CPE 206: Basic Electronics (3 Units C: LH 30; PH 45)**Learning Outcomes**

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

#	CLO	Bloom Level	PO Mapping
1	Explain the physical basis of conduction in semiconductor materials and describe the structure and V–I characteristics of diodes, BJTs, FETs, and MOSFETs.	C2 (Understand)	PO1
2	Analyse diode and BJT circuits (rectifiers, clippers, clampers) to determine output waveform and operating region (active, cutoff, saturation).	C4 (Analyze)	PO1, PO2.1
3	Design BJT amplifier circuits (CE, CB, CC configurations) with appropriate DC biasing to achieve a specified operating point and gain.	C3/C6 (Apply/Design)	PO1, PO3.1
4	Apply FET and MOSFET operating principles to switching and amplifying circuits, including basic CMOS configurations.	C3 (Apply)	PO1, PO5.2
5	Analyse and design operational-amplifier circuits — inverting, non-inverting, summing, differential, and comparator/Schmitt-trigger configurations — for a specified transfer characteristic.	C4/C6 (Analyze/Design)	PO1, PO2.1, PO3.1
6	Construct, measure, and troubleshoot semiconductor and op-amp circuits on breadboard using standard lab instruments (multimeter, oscilloscope, function generator), and correlate measured results with theoretical predictions.	C3 (Apply — psychomotor)	PO5.3, PO9.2
7	Identify basic digital logic gates and describe their truth tables, and explain the operation of flip-flops/latches as building blocks of digital systems.	C2 (Understand)	PO1

Course Contents

Intro to Electronics & Electrical Quantities, Passive Components, Semi-conductor Physics, Free electron motion in static electric and magnetic fields; electronic structure of matter, conductivity in crystalline solids, theory of energy bands in conductors, insulators, Diodes and Applications, BJTs: Structure and Biasing, Construction, biasing, operation (active, cutoff, saturation), Amplifier configurations: CE, CB, CC. Field Effect Transistors (FETs), JFET and MOSFET operation, FET as a switch and amplifier, CMOS basics (importance in IC design). Analog Applications of Transistors, Signal amplification and gain, RC filters (low-pass, high-pass), Clippers and clampers, Multivibrators: astable, monostable (using transistors). Power Supply Systems, Operational Amplifiers (Op-Amps), Op-amp characteristics and parameters, Inverting and non-inverting amplifiers, Comparators and Schmitt triggers, Summing and differential amplifiers. Introduction to Digital Logic, systems and binary logic, Logic gates and truth tables, Introduction to flip-flops and latches. Applications in Computer Systems.

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 electron 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 for 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 polymerization reactions, their types and mechanism, and applications of polymers;
6. Define properties, types and application of composite materials and fibres (synthetic and natural);
7. Define and classify nanomaterials, demonstrate applications of nanomaterials, concept, design and classification of fracture mechanics, corrosion classification, including the five principal ways of controlling corrosion and metal finishing processes such as sherardizing, galvanizing and anodizing; and
8. Identify factors affecting the performance and service life of engineering materials/metals and metallography of metals/materials (materials anatomy), which enables metallurgical and materials engineers to prescribe appropriate solutions to test metals/materials fitness in service through structure-property-application relationships.

Course Contents

The 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 204: Students 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 hand 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 209: Engineering Mathematics I (3 Units C: LH 45)

Learning Outcomes

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

- a. Solve qualitative problems based on vector and matrix analyses such as linear independence and dependence of vectors, rank etc;
- b. Describe the concepts of limit theory and n th order differential equations and their applications to physical phenomena;
- c. Solve the problems of differentiation of functions of two variables and know about the maximization and minimization of functions of several variables;
- d. Describe the applications of double and triple integration in finding the area and volume of engineering solids, and explain the qualitative theorem;
- e. 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
- f. Analyse basic engineering models through partial differential equations such as wave equation, heat conduction equation, etc., as well as fourier series, initial conditions and its applications to different engineering processes

Course Contents

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

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

Learning Outcomes

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

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

7. Evaluate complex contour integrals directly and by the fundamental theorem, apply the Cauchy integral theorem in its various versions, and the Cauchy integral formula.

Course Contents

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

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

Learning Outcomes

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

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

Course Contents

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

GET 299; Students Industrial Work Experience I

Learning Outcomes

SIWES I : should provide opportunity for the students to:

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

Course Contents

Practical experience in a workshop or industrial production facility, construction site or special centres in the university environment, considered suitable for relevant practical/industrial working experience but not necessarily limited to the student's major.

The students are exposed to hands-on activities on workshop safety and ethics, maintenance of tools, equipment and machines, welding, fabrication and foundry equipment, production of simple devices; electrical circuits, wiring and installation, etc. (8-10 weeks during the long vacation following 200 level).

GET 203 Engineering Graphics and Solid Modeling II (3 Units C: LH 30; PH 45)

Engineering Graphics and Solid Modeling aligns with the motto, vision, and mission statements of the university by producing graduates who can compete globally and utilize technology for the service of society. Engineering graphics and solid modeling is the language of communication used by engineers to transfer ideas and information needed for the construction of technical devices and systems into innovation that enhances the quality of life of the citizenry.

Overview

Enugu is a fast-growing city with lots of development projects and manufacturing industries that requires more advanced graphic designs to meet up with the trailing technology in Engineering of the 21st century.

Engineering graphics and Solid Modeling which is a computer modeling of 3D solid objects is a veritable instrument that meets the demands of the rapid structural and industrial development of Enugu as it utilizes computer aided design (CAD) in stimulating objects from within and without as a prelude to actual construction hence enabling SUMAS graduates to be very useful in the rapid urbanization and industrialization of Enugu state

This will help SUMAS student to move from conventional engineering drawing to non-conventional and innovative forms.

Objectives

1. Demonstration of fundamental concepts and principles of engineering graphic and solid modeling as a language.
2. To generate hand-drawn multi-view technical sketches.

3. Application in methods of orthographic projection to produce detail.
4. Demonstration of fundamental concepts and principles of the computer-aided design (CAD) system.
5. Establishment of ability to read engineering drawings.
6. Creation of three-dimensional (3D) solid models on a modern CAD system
7. Optimization and recognition /understanding the practical link to excite their creativity
8. Interpretation of thoughts and excitements to produce shop drawings for multi- physical and multidisciplinary design.

Learning Outcomes

Students should be able to:

1. Demonstrate the fundamental concepts and principles of engineering graphics as a language
2. Generate hand-drawn multi-view technical sketches.
3. Apply mastery of the use of projections to prepare detailed working drawing of objects and designs.
4. Develop skills in parametric design to aid their ability to see design in the optimal specification of materials and systems to meet needs.
5. Analyze and optimize designs on the basis of strength and material minimization.
6. Get their appetites wetted in seeing the need for the theoretical perspectives that create the basis for the analysis that are possible in design.
7. Optimize and recognize/understand the practical link to excite their creativity
8. Perform and institute a concept in modeling and simulation for creative innovation.
9. Translate their thoughts and excitements to produce shop drawings for multi- physical and multidisciplinary design.

Course Contents

Projection of Lines, Auxiliary Views, and Mixed Projection. Preparation of Detailed Working Production Drawings. Semi-Detailed Drawings Using Conventional Presentation Methods. Solid, Surface, and Shell Modeling. Faces, Bodies, and Surface Intersections. Component-Based Design. Component Assembly and Motion Constraints. Constrained Motion and Animation. Introduction to Electronics Modeling. Electronics Board Layout Preparation and Component Libraries. Schematic Design. Parametric Modeling. Adaptive Design. Simulation for Material Optimization. Design for Manufacturing. Additive and Subtractive Manufacturing. Production for 3D Printing. Laser Cutting and CNC Machining. Arrangement of Engineering Components to Form a Working Plant (Assembly Drawing of a Plant).

SUMAS-CPE 289 Laboratory Practical I (Computer Hardware and Software) (1 Unit: C: PH 45)

Senate approved relevance

Computer installations and maintenance involve the installation of computer components and their maintenance processes. As technology continues to advance, the need for cloning, installation, repair and maintenance of computer system arises. This course covers the basics of computer installation, repair and maintenance and provides valuable training for those looking to improve their skills in this field of computer engineering, hence promoting the development of quality manpower that will utilize technology for service in line with the vision and mission of Senate of SUMAS.

Overview

Most computers in use both in offices and at home comprises of computer hardware. Computer hardware is the physical components that a computer system requires to function. It encompasses everything with a circuit board that operates within a PC or laptop; including the motherboard, graphics card, CPU (Central Processing Unit), ventilation fans, webcam, power supply, and so on. However, computer hardware does not specifically refer to personal computers. Instead, it is all types of computer systems. Computer hardware is in embedded systems in automobiles, microwave ovens, CD players, DVD players, and many more devices. This course will introduce to the students to cloning of computer systems and repair and maintenance of major computer hardware thereby helping in solving and computer hardware related case in Enugu State.

Objectives

The objectives of this course are to:

1. Demonstrate troubleshooting and repairing of various faults of computer systems, laptops, scanners, printers, mobile phone etc.
2. Demonstrate common repair procedure for hardware related faults.
3. Demonstrate common repair procedure for software related faults.
4. Demonstrate water damaged repair techniques.
5. Implement circuit tracing, jumper techniques and solutions.
6. Demonstrate troubleshooting through schematic diagrams.

Learning Outcomes

Upon completion of this course students should be able to:

1. Identify hardware parts of a computer
2. Assemble a computer system and install various software
3. Identify various faults in all computer systems.
4. Identify various faults in all mobile phones
5. Troubleshoot various faults in computer systems
6. Troubleshoot various faults in mobile phones
7. Repair various faults in computer systems and all mobile phones.

Course contents

Fundamentals of Hardware, handling, testing and troubleshooting of personal computer problems. Identification of all external computer peripherals and ports and motherboard. Tools for repair and maintain computer systems. Assembling and disassembling of desktop computers, casing and types. PC Power Supply Units (PSU). Types of RAM modules. Types of motherboard expansion slots. Types of serial and parallel ports. Monitors and their features. CMOS Battery and its functions. Motherboard, central processing unit (CPU) and cooling fan installation. Partitioning and formatting the hard disk. Installation of operating system, application software. Mouse and Keyboard features, maintenance and installation. Partitioning of hardisk. Installation of Operating systems software, other application software and anti-virus software. Repair and maintenance of laptops. Study of parts inside a mobile phone. Assembling and disassembling of various models of mobile phones. Study of various tools and equipment used in mobile phone repairs. Types of internet connections, network services, network security & General troubleshooting & maintenance of Networks and networking peripherals. Introduction of OS, File System, Memory Management, System Backup & Restore, Viruses and Anti Viruses. Knowledge of inbuilt Diagnostic Tools. Identify existing configuration of the computer and peripherals and to troubleshoot common problems.

Minimum Academic Standards

As described in CCMAS.

SUMAS-GET 214: Engineering Economics [2 Units, C: LH 30]

Senate-Approved Relevance

The need for engineering economy is primarily motivated by the fact that everything in engineering must be done economically and optimally, whether it is designing equipment, selecting between alternatives, operating a plant, marketing a product, or maintaining a plant, all of which involve a decision-making process. The fundamental elements of cash flows of money, time, and interest rates are all involved in the decision-making process. This course introduces the fundamental concepts and terminology required for an engineer to combine these three key elements in order to solve problems and make better decisions. Because engineering economics formulas and techniques are applicable to all types of money matters, they are equally useful in business and for individuals. Overview The course deals with the decision of where and how to invest the limited resources motivated by a primary goal of adding value as future, anticipated results of the selected alternative. It involves formulating, estimating, and evaluating the expected economic outcomes of alternatives designed to accomplish a defined purpose, normally an engineering project at the best values of decision metrics. Mathematical techniques simplify the economic evaluation of alternatives.

Course Objective

The main objectives of the course are to:

1. Equip students with grounded skill of economic decision making in engineering considerations.
2. Take students through taxonomy of engineering costs and valuation.
3. Educate students on the principle of time value of money and cash flows.

4. Introduce the economic methods for evaluating capital projects and mainstream cash flow analysis.
5. Acquaint students with the understanding of Sensitivity and Breakeven analysis.
6. Introduce the required elements of Accounting in Engineering.

Learning Outcome

At the end of the Course, Students will be able to:

1. Take economic and optimal cost decisions in Engineering.
2. Compute fixed and variable costs, recurrent and non-recurrent costs, life-cycle costs, as well as cost estimation models.
3. Compute cash flows; time value of money; simple interest, compound interest, interest formulas, economic analysis with spreadsheets.
4. Undertake economic Sensitivity and Breakeven analysis; compare alternatives and decision analysis as well as uncertainty (Risk) analysis.
5. Monitor and understand Inflation and price change, minimum attractive rate of return and other metrics of engineering economic analysis.

Course Contents

Introduction, Economic decision making in Engineering. Engineering costs and cost estimation: fixed and variable costs, recurrent and non-recurrent costs, life-cycle costs, etc; cost estimation models; estimating benefits; cash flow diagrams. Interest and Equivalence: Computing cash flows; time value of money; simple interest, compound interest, interest formulas, economic analysis with spreadsheets. Economic Methods for evaluating capital projects: Present worth analysis; Annual cash flow analysis; Rate of return analysis; Future worth analysis; Benefit-Cost ratio analysis; Payback period; Sensitivity and Breakeven analysis. Comparison of alternatives and decision analysis. Uncertainty (Risk) analysis. Taxes, tariffs and duties. Depreciation and Replacement analysis. Inflation and price change. Minimum attractive rate of return (MARR). Public Sector economic analysis. Elements of Accounting for Engineering Economy.

Minimum Academic Standard As described in CCMAS

SUMAS-IFT 203 Introduction to Web Technology (2 Units E: LH 15; PH 45)

Senate approved relevance

Web technologies refer to the various tools, languages, protocols, and standards used for building and deploying web applications. These technologies are crucial in Enugu State today where the internet has become an essential part of our daily lives. Web technologies have revolutionized the way businesses operate and how people communicate, access information, and consume media in Enugu State. For undergraduate engineers in SUMAS, understanding web technologies is critical as it is the basis for developing web-based applications and services. It also provides a foundation

for web development, software engineering, and mobile app development in line with technology for service.

Overview

Most businesses in Enugu State have no website to showcase their services or products, and generate awareness about them. Websites help in establishing the business image as a brand by letting the website visitors know about what the business represents and how it can help them.

SUMAS-IFT 203

Talks about the various techniques and tools applied in communicating different types of programs over the internet.

Web technologies cover a broad range of topics such as web development languages (HTML, CSS, JavaScript), web servers, APIs, databases, and web frameworks. It also includes topics such as web design principles, user experience, and accessibility standards. Knowing the basic categories of web technologies is essential as students will be equipped with knowledge to develop websites for most businesses in Enugu State. Having their websites being developed will be beneficial for businesses as it will act as a reference for potential investors who can get acquainted with the services and products of the business.

Course Objectives

The objectives of the course are to:

1. describe the origin of the internet and the World Wide Web.
2. describe the procedure for creating simple web content using HTML, CSS, and JavaScript.
3. highlight the simple application frameworks to develop web content.
4. highlight the impact of the World Wide Web on people's lives over time.

Learning Outcomes

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

1. state the origin of the internet and the world wide web;
2. create simple web content using HTML, CSS, and JavaScript;
3. use simple application frameworks to develop web content; and
4. appraise the impact of the world wide web on people's lives over time.

Course Contents

Introduction to the internet, the world wide web (WWW), and web development. WW as a platform for interactive applications, content publishing, and social services. The role of HTTP and HTTPS in the context of web applications. Roles and operations of web browsers and the webserver. Interacting with web applications through forms, and using style sheets to separate document structure and document formatting. Web development tools and frameworks. Build a simple website that: organizes information effectively, uses valid HTML and CSS, and applies appropriate web standards from standards bodies such as W3C. HTTP communication protocol, the mark-up languages HTML, XHTML, and XML, the CSS and XSLT standards for formatting

and transforming web content. Interactive graphics and multimedia content on the web, client-side programming using JavaScript. Impact of the world wide web on people's lives over time.

Lab Work: Using simple form-based web applications; developing simple websites using web development tools and frameworks; using the mark-up languages HTML, XHTML and XML; using JavaScript. Illustration of the use of interactive graphics and multimedia content.

Minimum standard additional to CCMAS

As stated in 70% of developed CCMAS

SUMAS-MEE 243: Measurement and Instrumentation [2 Units, C: LH 30]

Senate-approved Relevance

Training potential Computer engineers in Measurement and Instrumentation as it applies in the multidisciplinary field involving a synergy between computers, mechanical and electronic engineering. This will develop engineers with adequate knowledge, skill and ability to apply the principles of process measurement, instrumentation and process control. This is in accordance with SUMAS' mission to improve the quality of life for all through mechatronics philosophy and design thinking in developing products, processes and in the delivery of services.

Overview

The general principles of measurement and instrumentation deals with Error analysis, sensors, signal conditioning and data presentation elements, and power supplies. The role of the various elements of a measurement system is to evaluate the given inputs signals to determine the corresponding output. The course will apply common sensors and signal components to determine various instrumentation real system. Real-world case studies such as acoustic emission detection, vibration monitoring, triboelectric sensing, flow measurement and structural health monitoring are provided to illustrate the applications and significance of measurement systems in industry.

Objectives

The objectives of the course are to:

1. understand the basic working principles of electrical and electronic measuring instruments.
2. receive the skills to managing and operating analogue and digital instruments for a particular application.
3. learn the ways of presenting and interpreting results.
4. calculate the uncertainty of the direct and indirect single and multiple measurements.

Learning Outcomes

After successful completion of the course, the student will be able to:

1. analyse the performance characteristics of each instrument;
2. analyse basic metres such as voltmeters and ammeters;
3. explain different types of signal analysers;

4. explain the basic features of oscilloscope and different types of oscilloscopes;
5. apply the complete knowledge of various electronics instruments/transducers to measure the physical quantities in the field of science, engineering and technology.

Course Contents

Errors in measurements, classification and functional analysis, performance of instruments systems, calibration. Control system components, amplifiers, sensing devices, pumps and controllers, error detectors and output elements, instrumentation methods; measurements and recording of dimensions, time, weight, frequency, temperature, pressure, transducers, bridge and potentiometer methods. Synchros, Hall effects, photovoltaic and moving iron transducers. Instrument transformers, Pulse transformers, energy meters and metering, information storage techniques, electronic instrumentation, digital technique, analog/digital signal processing. Survey of modern instrumentation components. Non-linear computing elements.

Minimum Academic Standard

As described in CCMAS

SUMAS-CPE 202 Introduction to Online Learning (2 units; Core; LH=15, PH=45)

Senate-approved relevance

Experiences during the Lock-down have, more than ever, revealed the need for lecturers to engage the students remotely. Even after the lockdown, situations keep arising that compel teachers to reach the students in non-conventional ways. There is the need to prepare students with skills that will enable them profit from those non-conventional modes of lecture delivery. Introduction to Online Learning, as a course, addresses that need and this is in line with the Mission of SUMAS to train human resource with relevant hands-on, sellable and employability skills that would nurture viable man-power development for excellence and advancement in Nigeria educational system.

Overview

To engage students virtually, lecturers use Learning management Systems (LMS) and other modern technologies to achieve blended atmosphere with the ultimate purpose of breaking down the walls of the typical classroom. Students need to be acquainted with these modern devices/platforms and how they operate. Passing through State University of Medical and Applied Science, graduates should be conversant with the use of modern technologies to confront emerging challenges.

Introduction to Online Learning is a course that is closely related to the sustainable development goal, which aims at quality education for all irrespective of the circumstances. It will help students to get acquainted with demands of digitalized teaching and learning in the face of globalization, cutting across all spheres of learning and education in a fast-paced globalized world.

Objectives

The course is aimed at helping students:

1. Critique the need for the virtual learning mode in today's education enterprise
2. Identify different modern technologies used in virtual learning.
3. Access learning materials delivered remotely through technology.
4. Explain the benefits of the virtual learning mode.
5. Participate in virtual group activities for interaction with other learners.
6. Acquire skills in team work through group activities
7. Manipulate and navigate different virtual learning tools.
8. Identify the constraints associated with the virtual learning mode.

Learning Outcomes

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

1. State the need for virtual learning in the present dispensation.
2. Name the technologies that would be deployed in virtual learning
3. Access learning materials delivered remotely through technology.
4. Appraise some situations that demand virtual learning
5. List some benefits of gaining proficiency in the manipulation of virtual learning tools
6. Identify learning situations that could be tackled in groups.
7. Participate in groups using Zoom and other technologies
8. Discuss at least five (5) constraints in accessing virtual learning materials.

Course Contents

Meaning and definitions of online learning. History and requirements of online learning. Needs and situations that call for online learning. Emerging technologies for online learning. Characteristics of virtual learners. Online learning environment (Learning Management Systems, LMS and others). Requirements (knowledge and skills) for online learning by learners. Modes of online learning (synchronous, asynchronous, and hybrid). Modes of assessment of online learners. Problems associated with virtual learning, Advantages of virtual learning. Building relationships in online learning. Social media platforms. Zoom, Google classrooms, Google forms. Practicum in online learning.

Minimum Academic Standards

Introduction to Online learning with a NUC-MAS requirement facilities

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 structural systems that are stable and in equilibrium.
2. Determine the stress-strain relationship 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 use them to identify slopes and deflections in beams.
6. Use Mohr's circle to evaluate normal and shear stresses in a multidimensional stress system and transform these stresses into strains.
7. Evaluate the stresses and strains due to torsion in circular members.
8. Determine the buckling loads of columns under various end-fixity conditions.

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.

300 LEVEL

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

Learning Outcomes

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

1. Analyse the concepts of peace, conflict and security;
2. List major forms, types and root causes of conflict and violence;
3. Differentiate between conflict and terrorism;
4. Enumerate security and peace building strategies; and
5. Describe the roles of international organisations, media and traditional institutions in peace building.

Course Contents

The concepts of peace, conflict and security in a multi-ethnic nation. Types and theories of conflicts: ethnic, religious, economic, geo-political Conflicts; structural conflict theory, realist theory of conflict, frustration-aggression conflict theory; root causes of conflict and violence in Africa: indigene and settlers phenomenon, boundaries/boarder disputes, political disputes, ethnic disputes and rivalries, economic inequalities, social disputes, nationalist movements and agitations; selected conflict case studies –Tiv-Junkun, ZangoKartaf, chieftaincy and land disputes, etc. Peace building, management of conflicts and security: Peace & Human Development. Approaches to Peace & Conflict Management (religious, government, community leaders, etc.). Elements of peace studies and conflict resolution: Conflict dynamics assessment Scales: Constructive & Destructive. Justice and Legal framework: Concepts of Social Justice; The Nigeria

Legal System. Insurgency and terrorism. Peace mediation and peace keeping. Peace and Security Council (international, national and local levels). Agents of conflict resolution –Conventions, Treaties Community Policing: Evolution and Imperatives. Alternative Dispute Resolution (ADR) (dialogue,. arbitration, negotiation, collaboration, etc). The roles of international organizations in conflict resolution ((a) The United Nations, UN and its conflict resolution organs. (b) The African Union & Peace Security Council (c) ECOWAS in peace keeping). The media and traditional institutions in peace building. Managing post-conflict situations/crises: Refugees. Internally Displaced Persons (IDPs); the role of NGOs in post-conflict situations/crises.

ENT 312: Venture Creation(2 Units C: LH 15; PH 45)

Learning Outcomes

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

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

Course Contents

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

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

Learning Outcomes

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

1. Demonstrate a clear understanding of the course content, that is, possess a breadth of knowledge in the area covered;
2. 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;
3. Develop simple algorithms and use computational proficiency;
4. Write simple proofs for theorems and their applications;
5. Communicate the acquired mathematical knowledge effectively in speech, writing and collaborative group.

Course Contents

Linear Algebra, Elements of Matrices, Determinants, Inverses of Matrices, Theory of Linear Equations, Eigenvalues and Eigenvectors, 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, Derivatives and Integrals of Vectors, the Gradient of Scalar Quantities, Flux of Vectors, the Curl of a Vector Field, Gauss's, Green's, and Stokes' Theorems and Their Applications, Singularities of Analytic Functions, Cauchy's Integral Theorem, Cauchy's Integral Formula, Riemann's Theorem, Zeros of Analytic Functions, and Contour Integration, Including Applications of Cauchy's Integral Theorem and Formula.

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: Engineering Communication, Technical Writing and Presentation (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, structure Fog and 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. Construct appropriate graphical displays of data and highlight the roles of such displays in data analysis, particularly the use of statistical software packages;
 4. Plan and execute experimental programmes to determine the performance of programme-relevant industrial engineering systems, and evaluate the accuracy of the measurements undertaken; and
 5. 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, poisson 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 306: Renewable Energy Systems and Technology (3 units C: LH 30; PH 45)

Learning Outcomes

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

1. Identify the types, uses and advantages of renewable energy in relation to climate change;
2. Design for use the various renewable energy systems;
3. Recognise and analyse the current energy systems in nigeria, their impacts on development and the global energy demand and supply scenarios;
4. Appreciate the environmental impact of energy exploitation and utilisation, and pursue the sustainable development of renewable energy for various applications; and
5. Recognise the exploitation, excavation, production, and processing of fossil fuels such as coal, petroleum and natural gas, and discuss the sources, technology and contribution to future energy demands of renewable energy.

Course Contents

Current and potential future energy systems in Nigeria and globally - resources, extraction, concepts in energy conversion systems; parallels and differences in various conversion systems and end-use technologies, with emphasis on meeting 21st-century national, regional and global

energy needs in a sustainable manner. Various energy technologies in each fuel cycle stage for fossil (oil, gas, synthetic), nuclear (fission and fusion) and renewable (solar, biomass, wind, hydro, and geothermal). Energy types, storage, transmission and conservation. Analysis of energy mixes within an engineering, economic and social context. Sustainable energy; emphasise sustainability in general and in the overall concept of sustainable development and the link this has with sustainable energy as the fundamental benefit of renewable energy

Practical Contents

Simple measurement of solar radiation, bomb calorimeter determination of calorific value of fuels and biomass; measurement of the velocity of wind, waves and the energy that abound in them; laboratory production of biogas and determination of energy available in it; simple conversion of solar energy to electricity; transesterification of edible oil into biodiesel; simulation of geothermal energy; Geiger-Muller or Scintillation Coun uranium or thorium energy; simple solid or salt storage of energy; hybrid application of renewable energy.

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 Students major 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 trouble-shooting, and wooden furniture making processes.

Section B: Mechanical design with computer graphics and CAD modelling and drafting. Introduction to Solid works: software capabilities, design methodologies and applications. Basic part modelling: sketching with Solid Works, building 3D components, using extruded Base • Basic assembly modelling, and solid Works drawing drafting. Top-down assembly technique exploded view, exploded line sketch. Introduction to PDMS 3D design software; auto CAD mechanical, SPSS. A comprehensive case study design project. The student should be introduced to the concept of product/component design and innovation and then be given a comprehensive design project.

Examples of projects should include the following:

- a. Design of machine components;
- B. Product design and innovation;
- C. Part modelling and drafting in solid works; and
- D. Technical report writing.

CPE 301: Computer Organization and Architecture (3 Units C: LH 45)

Learning Outcomes

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

#	CLO	Bloom Level	PO Mapping
1	Compare Von Neumann and Harvard architectures, and CISC and RISC design philosophies, in terms of operating principle, advantages, and limitations.	C4 (Analyze)	PO1, PO2.1
2	Perform integer and IEEE-754 floating-point arithmetic operations, and describe the organization of the Arithmetic and Logic Unit (ALU).	C3 (Apply)	PO1
3	Decode machine instructions given their addressing mode, instruction format, and register organization, and trace program control flow.	C4 (Analyze)	PO1, PO2.1

4	Analyse the organization of the memory hierarchy — including cache mapping techniques and error correction — and I/O systems (programmed, interrupt-driven, DMA).	C4 (Analyze)	PO1, PO5.1
5	Explain the operation of the control unit, distinguishing <u>hardwired</u> and <u>microprogrammed</u> control implementations.	C4 (Analyze)	PO1
6	Analyse the impact of instruction pipelining, superscalar execution, and parallel/vector processing techniques on processor performance.	C4 (Analyze)	PO1, PO2.1
7	Describe the fundamental functions of an operating system, including CPU scheduling, memory management, and virtual memory.	C2 (Understand)	PO1
8	Demonstrate basic command-line proficiency in a UNIX/Linux environment as a representative contemporary operating system.	C3 (Apply)	PO5.3, PO9.1

Course Contents

Computer fundamentals: development history of computer hardware and software; hard-wired vs stored program concept; Von-Neuman architecture; Harvard architecture: principle of operation, advantages and disadvantages; single address machine; contemporary computers; computer system: block diagram, functions, examples, dataflow and control line; computer arithmetic: integer arithmetic (addition, subtraction, multiplication, division), floating-point representation (IEEE), floating-point arithmetic, arithmetic and logic unit (ALU). Introduction to CISC and RISC architecture: principle of operation, merits and demerits; storage and input/output systems: computer function (fetch and execute cycles), interrupts, interconnection structures (bus structure and bus types); overview of memory system, memory chip organisation and error correction, cache memory, and memory storage devices; overview of I/O, programmed and interrupt-driven I/Os, DMA, I/O channel and I/O processor; control unit: micro-operations, control of the CPU, hard-wired implementation, control unit operation, micro-instruction sequencing and execution, and micro-programmed control; using INTEL family, and MOTOROLA family as case study of a CISC computer system; instruction set and register: machine instruction characteristics, types of operands and operations, instruction functions, addressing modes, instruction formats, register organisation, and instruction pipelining; high performance computer systems: techniques to achieve high performance, pipelining, storage hierarchy, and units with function dedicated for I/O; RISC, introduction to superscalar processor, and parallel processor; using popular RISC processor (e.g. i960, Motorola PowerPC) as case study. Operating system: overview of operating system, dimension and type of operating system: overview of operating system, dimension and type of operating system, high level scheduling, short-term scheduling, I/O scheduling, memory management, virtual memory, UNIX/LINUX operating system: architecture, commands, programming; window-based operating systems (MS windows).

CPE 307: Assembly Language Programming (2 Units C: LH 45)

Learning Outcomes

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

#	CLO	Bloom Level	PO Mapping
1	Explain the relationship between high-level language, assembly language, and machine code, and identify the 8086 programming model — registers, flags, and addressing modes.	C2 (Understand)	PO1
2	Write and hand-assemble 8086 assembly language programs using arithmetic, logical, string, branching, and program/machine control instructions.	C3/C6 (Apply/Create)	PO1, PO5.3
3	Implement stack-based operations — push/pop, procedure calls, parameter passing — and modular, procedure-based program structures in assembly.	C3 (Apply)	PO1, PO2.1
4	Develop assembly routines that interface with C programs and handle hardware/software interrupts via interrupt service routines.	C3/C6 (Apply/Create)	PO1, PO5.2
5	Apply Intel 80x87 floating-point instructions, and describe the role of MMX/SSE extensions in numeric and vector processing.	C3 (Apply)	PO1
6	Compare 8086 (Intel) and 680x0 (Motorola) assembly programming models to explain the architecture-dependence of machine-level code.	C4 (Analyze)	PO1, PO2.1
7	Assemble, link, execute, and debug assembly language programs using MASM (Intel) and a cross-assembler (Motorola) toolchain.	C3 (Apply — tool usage)	PO5.3, PO9.1

Course Contents

Introduction: Language level of abstraction and effect on machine, characteristics of machine code, advantages, justifications of machine code programming, instruction set and dependency on underlying processor; Intel 8086 microprocessor assembly language programming: programming model as resources available to programmer, addressing modes, instruction format, instruction set—arithmetic, logical, string, branching, programme control, machine control, and input/output, etc; assembler directives, hand-assembling, additional 80x86/Pentium instructions; modular programming; interrupt and service routine; interfacing of assembly language to C; Intel 80x87 floating point programming; introduction to MMX and SSE programming; Motorola 680x0 assembly language programming; extensive practical engineering problems solving in assembly language using MASM for Intel, and cross-assembler for Motorola

EEE 321: Analogue Electronic Circuits (3 Units E: LH 30; PH 45)

Learning Outcomes

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

1. Understand the basics of semiconductor devices and their applications in different areas;
2. Understand different biasing techniques to operate transistor, fet, mos fet and operational amplifier in different modes; and
3. Analyse output in different operating modes of different semiconductor devices.

Course Contents

Single-stage transistor amplifiers using BJT and FET Equivalent circuits and calculation of current gain, voltage gain, power gain, input and output impedance. Operational Amplifiers: Description, parameters and applications. Feedback, broadband and narrowband amplifiers. Power amplifiers. Voltage and current stabilizing circuits. Voltage amplifiers, multi storage amplifiers using BJTs and FETs.

EEE 322: Digital Electronic Circuits (2 Units E: LH 30)

Learning Outcomes:

Students will be able to:

1. Classify, describe and discuss the various logic gates and flip-flops and multivibrators; and
2. design simple logic and sequential circuits using logic gates and flip-flops.

Course contents

Number Systems and Codes. Logic Gate Simplification of Logic expressions using Boolean algebra. Simplification of Logic expressions using Karnaugh Method. Design of combinational circuit. Flip-Flops. Application of Flip-Flops in the design of counter. Registers and timers. Switching and wave shaping circuits. Generation of non-sinusoidal signal (multivibrators). Introduction to ADC and DAC. Design of Logic Gates (Diode, DTL, TTL, ECL etc). Sequential circuits. Introduction to microprocessors.

SUMAS-CHE 312: Waste Processing Technology

(1 Unit C: LH 30)

Senate Approval Relevance:

This comes in recognition of the relevance to the vision and mission of the Enugu State University's strategic plan to turn out Chemical Engineers who are adequately skillful to innovate on the waste processing techniques and waste management strategies in our immediate and remote environments, and industrial or municipalities in a fast-transforming world of circular economy. Training chemical engineering students in waste processing technology is giving them knowledge and skill for self-reliance and in part preparing them for entrepreneurship and lead private and industrial consultancies in the area. This is in line SUMAS's vision of developing quality manpower using technology to serve society which is in tandem with the global practice of offering

functional education. Moreover, SUMA or the Department of Chemical Engineering could commercialize or patent innovative processes arising from the teaching of this course.

Overview

This course emphasizes processes based on anaerobic digestion of organic materials/matter in which microorganisms break down biodegradable materials in the absence of oxygen. These processes apply widely; treating wastewater sludge and organic wastes for the fact that it provides volume and mass reduction of input material. This course provides SUMAS Chemical Engineering graduates with basic understanding about conventional and natural waste water treatment technologies as well as integrated solid waste management. Knowledge about wastewater management can be used to solve the issue of environmental waste problem.

Plasma pyrolysis or plasma gasification, for example, is a waste treatment technology that gasifies matter in an oxygen-starved environment to decompose waste material into its basic molecular structure. The process demands high electrical energy for creating high temperature by an electrical arc gasifier.

Objectives

The objectives of the course are to:

1. identify sources of water pollution, priority pollutants and their impacts on water bodies as well as processes of purification and instrumentation.
2. explain protection of environment from pollution and contamination and repair and reduce the damage caused by pollution.
3. describe key biological treatment procedures such as activated sludge and biofilm, N and P removal sludge system, natural and on-site treatment systems
4. capture the waste management hierarchy and the principles of integrated waste management, the impact of wastes on health, environment and the enforcing legislation
5. recognize types of wastes, the compositions, properties and amount of waste, the collection and transportation of the wastes, optimization techniques, recycling stations and transfer stations
6. clarify mechanical processing of wastes, incineration and biological treatment procedures
7. conveniently institute sanitary landfilling process, understand the risks, hazards and nuisances as well as mitigation steps therein including bottom lies and cover materials, collection and treatment of leachate and gas

Learning Outcomes

At the end of the teaching encounter with the students, students should be able to

1. apply the skill of increasing RECYCLING, reducing carbon emissions, and attaining sustainability goals. improve air and water quality as well as reduces greenhouse gas emissions;
2. employ data-driven WASTE solutions for garbage collection in smart cities;
3. describe simple waste solutions-No litter and less costs;
4. evaluate the subject from the TECHNICAL, legal and economical points by learning of all terms related to general solid WASTE MANAGEMENT;
5. state the hierarchical structure in solid waste management and a requirement for an integrated solution;
6. examine the technical points that are required to set up a solid waste management system;

7. apply the legal legislation related to solid waste management;
8. evaluate economic analysis of the solid waste management system;
9. make route optimization for a solid waste collection and transport system;
10. plan a recycling program;
11. design a packaging waste separation facility;
12. design an incineration facility;
13. make site selection for a landfill;
14. plan a solid waste management system for decision makers.

Course Content

Sources for water pollution. Priority pollutants and their effect on water bodies. Eutrophication and self-purification processes. Characteristics and composition of wastewater. Pollution load, sewage pumps and pumping stations. Primary purification devices, mechanical treatment. Screening, sand trap, sedimentation. Biological treatment Activated sludge and biofilm, N and P removal sludge treatment. Natural treatment systems and on-site treatment systems. Waste management hierarchy and principles of integrated waste management. Impact of wastes on health and environment, legislation. Types of wastes, compositions, properties, and amount of waste. Collection and transportation of wastes. Optimization. Recycling stations, transfer stations. Mechanical processing of wastes. incineration and biological treatment. landfilling, risks, hazards, and nuisances. and their mitigation methods. Bottom lines and cover materials. Collection and treatment of leachate and gas.

Minimum Academic Standard

As described in CCMAS

SUMAS-CPE 389 Laboratory Practical II (Software Development) (1 Unit: C: PH 45)

Senate approved relevance to vision and mission

As technology continues to advance, demand for software development skills arises. Skills and competences in software development are in high demand locally and globally to support the hi-tech percentage of individuals and businesses that rely on computers for daily operation. This practical course will kick start the process of equipping the students to be job creators instead of job seekers in line with the vision and mission of the Senate of SUMAS which is “technology for service”

Overview

In recent years there has been a great expansion in the number and adoption of development tools in software development. In Enugu state adoption of this software tools will help in doing both domestic and office activities easier. Different types of tools that focussed on different development methodologies and programming languages exist, for example agile tool. The tools come in all shapes, sizes, and costs. Some are free open source tools, some are specific software engineering development tools, and some come as part of a wide suite of integrated tools as a software development kit.

As the demand for more and more applications continues to accelerate in Enugu State, the future of software development and the future of development jobs is in no doubt going to be needed.

Objectives:

The objectives of the course are:

1. Illustrate basic hands on approach on software development.
2. Describe types of programming languages like JavaScript, C++, Python, Scala etc.
3. Outline the basics of data concepts and variables of the programming languages
4. Write simple codes for various programming languages
5. Develop and implement simple projects in various programming languages.

Learning Outcome:

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

#	CLO	Bloom Level	PO Mapping
1	Distinguish low-level from high-level programming languages, and set up a working Python development environment (interpreter and code editor).	C2 (Understand)	PO1, PO5.3
2	Write Python programs using variables, data types, operators, and expressions to perform data manipulation tasks.	C3 (Apply)	PO1, PO5.3
3	Implement conditional and iterative control structures (if/else, for, while) to solve simple programming problems.	C3 (Apply)	PO1, PO2.1
4	Apply Python's core data structures — lists, tuples, dictionaries, and sets — to organize and process collections of data.	C3 (Apply)	PO1, PO2.1
5	Design and implement modular, reusable Python programs using functions and modules, including file handling for data persistence.	C3/C6 (Apply/Create)	PO2.1, PO5.3
6	Test and debug Python programs systematically to identify and correct logical and runtime errors.	C4 (Analyze)	PO2.2, PO5.1
7	Develop a complete, multi-feature Python application (e.g., a data management system) that integrates variables, control structures, data structures, functions, and file handling.	C6 (Create)	PO1, PO9.1, PO12.1
8	Compare Python's syntax with at least one other high-level language (e.g., JavaScript, C++) to illustrate that programming logic is portable across languages while syntax is language-specific.	C2 (Understand)	PO1

Course Content:

Introduction to use and types of programming languages. Javascript. Python. Ruby. PHP Java. C#. HTML. Elixir. Scala Practical application to JavaScript, C++. Python and other programming languages. Creating user interface, Setting object properties. Writing codes in Javascript. Writing codes in Python. Writing codes in Ruby. Writing codes in PHP Java. Writing codes in C#. Writing codes in HTML. Writing codes in Elixir. Writing codes in Scala. Writing codes in other programming languages. Application of Javascript. Python. Ruby. PHP Java. C#. HTML. Elixir. Scala Practical application to JavaScript, C++. Python and other programming languages in simple projects. Show graphic file project and simple animation.

CPE 398 — Laboratory Practical III (Advanced Software Development) (1 Unit: C: PH 45)
Course Objectives

The objectives of this course are to:

1. Introduce object-oriented programming principles and their application in software design.
2. Demonstrate the use of relational databases for persistent data storage in software applications.
3. Illustrate the consumption of web APIs and processing of structured data formats.
4. Develop functional web applications using a Python-based web framework (Django).
5. Apply version control practices for tracking and managing software projects.
6. Design, implement, and demonstrate a complete software project integrating multiple technologies.

Learning Outcomes

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

#	CLO	Bloom Level	PO Mapping
1	Design and implement Python programs using object-oriented principles — classes, objects, constructors, inheritance, and method overriding — including refactoring procedural code into OOP design.	C3/C6 (Apply/Create)	PO1, PO2.1
2	Design relational database schemas and perform CRUD operations using SQL, and connect Python applications to a SQLite database using the sqlite3 module.	C3/C6 (Apply/Create)	PO1, PO5.3
3	Consume and process data from external web APIs, handling HTTP requests and parsing JSON-structured data using Python's requests library.	C3 (Apply)	PO1, PO5.2
4	Build the backend of a Django web application — project/app structure, URL routing, views, and models using the Django ORM, migrations, and the admin interface.	C3/C6 (Apply/Create)	PO1, PO5.3

5	Build the user-facing layer of a Django web application — templates with template inheritance and static files, and forms handling user input, validation, and CRUD operations.	C3/C6 (Apply/Create)	PO1, PO3.1
6	Use Git for version control — initializing repositories, staging and committing changes, viewing history, and basic branching — to track and manage a software project.	C3 (Apply)	PO5.3, PO9.1
7	Independently design, develop, and demonstrate a complete, functional web application from requirements through a working product, integrating OOP, database, API, and Django components.	C6 (Create)	PO1, PO3.1, PO9.1, PO11.1
8	Apply modular design and code organisation practices throughout development, and test application functionality prior to capstone demonstration.	C3/C4 (Apply/Analyze)	PO1, PO2.2

Course Contents

Introduction to object-oriented programming: classes and objects, attributes and methods, constructors, the `__init__` and `__str__` methods. Inheritance and method overriding. Refactoring procedural code into object-oriented design. Introduction to relational databases: database concepts, tables, records, and fields. Structured Query Language (SQL): CREATE, INSERT, SELECT, UPDATE, DELETE, filtering with WHERE clauses. Connecting Python applications to SQLite databases using the `sqlite3` module. Introduction to web APIs: how the web works, HTTP request and response model, REST API concepts. JSON data format: parsing, extracting, and processing structured data. Consuming public APIs using Python's `requests` library. Web development with Django: project and application structure, URL routing, views, and the request-response cycle. Django templates: template syntax, template inheritance, passing context data, static files. Django models: defining models, database migrations, the Django ORM, the admin interface. Django forms: handling user input, form validation, POST requests, and CRUD operations. Version control with Git: initialising repositories, staging and committing changes, viewing history, `.gitignore`, and basic branching concepts. Software project development: requirements analysis, modular design, code organisation, integration of OOP, databases, and web technologies. Capstone project: independent development, testing, and demonstration of a complete web application.

As described in CCMAS

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

Senate-approved relevance

Learning Outcomes

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

#	CLO	Bloom Level	PO Mapping
1	Explain the meaning, scope, and historical development of artificial intelligence, and describe its major application domains and societal effects.	C2 (Understand)	PO1, PO7.1
2	Differentiate between search-based, logic-based, and learning-based AI paradigms and algorithms.	C4 (Analyze)	PO1, PO2.1
3	Explain the fundamental concepts of machine learning and nature-inspired algorithms, and differentiate between supervised, semi-supervised, and unsupervised learning approaches.	C2/C4 (Understand/Analyze)	PO1, PO2.1
4	Implement a basic machine learning workflow — data preparation, model training, and evaluation — using Python-based AI/ML libraries.	C3 (Apply)	PO1, PO5.3
5	Explain the structure and operation of artificial neural networks and their role in deep learning.	C2 (Understand)	PO1
6	Explain natural language processing, knowledge representation and elicitation, and the operation of expert systems and pattern recognition techniques.	C2 (Understand)	PO1
7	Describe the role of distributed systems, data and information security, and intelligent web technologies within convergent technologies.	C2 (Understand)	PO1, PO6.1
8	<i>[Provisional]</i> Explain the concept and purpose of big data analytics, and the importance of data quality and preparation issues in a machine learning context.	C2 (Understand)	PO1
9	<i>[Provisional]</i> Explain the fundamental concepts, service models, benefits, and key security and compliance challenges of cloud computing.	C2 (Understand)	PO1, PO6.1

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; big data analytics: concept and purpose,

characteristics of big data, common data quality issues, and data preparation and pre-processing prior to machine learning; cloud computing: concepts, characteristics, service and deployment models, benefits, and key security and compliance challenges; convergent technologies – definition, significance and engineering applications. Neural networks and deep learning. Introduction to python AI libraries.

Minimum Academic Standard

As described in CCMAS

SUMAS-CPE 342 Computer Networks and Security Systems (2 Units: E: LH 15: PH 45)

Senate approved relevance

As technology continues to advance, the need for computer networks has become increasingly significant. A computer network is a collection of interconnected devices that communicate with each other to share information and resources. It is a crucial part of the modern-day infrastructure that allows businesses, individuals, and organizations to connect and collaborate. For undergraduate engineers, understanding computer networks is essential as it forms the basis for many other technological fields such as cybersecurity, software development, and cloud computing. Sound knowledge of computer networks helps students is equipped in technology for service as they design and develop efficient and reliable systems that can operate in a networked environment.

Overview

Businesses in Enugu needs computer network to help in information and peripheral sharing. A computer network is a collection of interconnected devices that communicate with each other to share information and resources. A computer network covers the concepts, protocols, and technologies used to create and maintain networks. It includes topics such as network architecture, network topologies, transmission media, network protocols and routing algorithms

As technology continues to advance, the need for computer networks has become increasingly significant in network security. Exposing students to this course will give them the opportunity to solve any computer network issue in Enugu State.

Objectives

The objectives of this course are:

1. To introduce the fundamental concepts and principles of computer networks, including network architectures, protocols, technologies, and applications.
2. To develop students' skills in designing, configuring, and managing computer networks, including LANs, WANs, and wireless networks.
3. To provide students with network security and the techniques used to secure networks against cyber-attacks and other threats.
4. To enable students develop principles of network performance evaluation and optimization, including capacity planning and quality of service (QoS) management.
5. To expose students to emerging trends and technologies in the field of computer networking, including cloud computing, IOT, and SDN.

6. To provide students with opportunities to work on practical projects and assignments, allowing them to apply the knowledge and skills they have acquired in the course.
7. To develop a critical and analytical approach to network design, implementation, and management, as well as to recognize the ethical and social implications of network technologies.

Learning Outcomes:

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

1. Identify the different types of computer networks and understand the components of a network.
2. Explain the different types of network topologies and describe the advantages and disadvantages of each.
3. Explain the role of network protocols and the differences between TCP/IP and UDP.
4. Discuss the purpose of IP addressing, the difference between IPv4 and IPv6 addressing, and the concept of subnetting and supernetting.
5. Identify the role of routing in computer networks, the different types of routing algorithms, and the routing protocols used in computer networks.
6. Explain the importance of network security, firewalls' role, and encryption's importance in computer networks.
7. Clarify the role of network services, the importance of DNS and DHCP, and how they are used in computer networks.
8. Simplify the purpose of WANs, the different types of WANs, and the different WAN technologies used in computer networks.
9. Explain the basics of wireless networks, the different types of wireless networks, and the importance of wireless security.
10. Clarify the importance of network management, the role of network monitoring and troubleshooting, and the steps to optimize network performance.

Course contents

Introduction to Computer Networking. Understanding the basics of computer networks. Types of networks. Components of a network, Network Topologies. Overview of network topologies: Physical and logical topologies, Bus, star, ring, mesh, and tree topologies. Network Protocols: Overview of network protocols, Transmission Control Protocol/Internet Protocol (TCP/IP). User Datagram Protocol (UDP) IP Addressing: Overview of IP addressing, IPv4 and IPv6 addressing. Subnetting and supernetting. Routing: Overview of routing, Routing algorithms, Routing protocols. Network Security: Overview of network security, Firewalls, Encryption. Network Services: Overview of network services, Domain Name System (DNS), Dynamic Host Configuration Protocol (DHCP). Wide Area Networks (WANs): Overview of WANs, Types of WANs, WAN technologies. Wireless Networks: Overview of wireless networks, Types of wireless networks, Wireless security. Network Management: Overview of network management, Network monitoring and troubleshooting, Network performance optimization.

Minimum Academic Standard

As described in CCMAS

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.

CPE 401: Microprocessor and Embedded Systems (3 Units C: LH 45)

Learning Outcomes

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

1. Develop an ALP in 8085 microprocessor using the internal organisation for the given specification;
2. Describe the architecture and functional block of 8051 microcontroller;
3. Develop an embedded c and alp in 8051 microcontroller using the internal functional blocks for the given specification;
4. Explain various peripheral devices such as 8255, 8279, 8251, 8253, 8259 and 8237; and

5. Explain microcontroller application and basic architecture of PIC, ARM and ATMEGA processors.

Course Contents

A basic microprocessor system: the CPU, memory, I/O, and buses subsystems, basic operation of a microprocessor system: fetch and execute cycle, the architecture of some typical 8-bit, 16-bit microprocessors (INTEL, MOTOROLA) and their features; programming model in real mode: registers, memory, addressing modes; organisation of the interrupt system, interrupt vectors, and external interrupts, implementation of single and multiple interrupts in real mode; programming model in protected mode: registers, memory management and address translation, descriptor and page tables, system control instructions, multitasking and memory protection, addressing modes, and interrupt system; memory interfacing and address decoding; I/O interfacing: memory mapped i/o, isolated i/o, bus timing, i/o instructions; peripheral devices interfacing: 8255 PPI/6821 PIA, 8251 USART/6821 UART, DMA, Timer/Counter chips, etc; instruction set; assembly language Programming of INTEL and MOTOROLA microprocessors; and discussion of a typical system e.g. IBM PC, Apple Macintosh.

CPE 403: Control Systems (2 Units C: LH 30)

Learning Outcomes

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

1. State examples of simple control systems;
2. State and explain different stability criteria and compensation methods for linear control systems; and
3. Discuss non-linear control systems and their characteristics.

Course Contents

Basic concepts and examples of control systems; Feedback, Time response analysis, concept of stability, Routh-Hurwitz criterion; Root-locus techniques, Frequency-response analysis, Polar and Bode plots, Nyquist stability criteria. Nichol's chart introduction to non-linear systems.

CPE 405: Fundamentals of Software Engineering (2 Units C: LH 30)

Learning Outcomes

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

1. Identify, formulate, and solve software engineering problems, including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements;
2. Elicit, analyse and specify software requirements through a productive working relationship with various stakeholders of a software development project;
3. Function effectively as a team member;
4. Understand professional, ethical and social responsibility of a software engineer;
5. Participate in design, development, deployment and maintenance of a medium scale software development project;

6. Convey technical material through oral presentation to, and interaction with, an audience;
7. Convey technical material through written reports which satisfy accepted standards for writing style;
8. Use unified modelling language in software specification documents; and
9. Evaluate the impact of potential solutions to software engineering problems in a global society, using the knowledge of contemporary issues and merging software engineering trends, models, tools, and techniques.

Course Contents

Introduction to software engineering fundamentals; object-oriented programming; number representations; data structure and algorithms, Abstraction, modules and objects; designing for efficiency; object-oriented software design and implementation.

CPE 411: Hardware Design Techniques and Verification (2 Units E: LH 30)

Learning Outcomes

Upon successful completion of this course, students will be able to demonstrate

1. Adequate knowledge in digital electronics and digital design concepts;
2. Ability to design and implement digital circuits under realistic constraints and conditions;
3. Ability to debug, verify, simulate digital circuits;
4. Ability to devise, select, and use modern techniques and tools needed for digital design; and
5. Ability to work in a team.

Course Contents

Elements of digital computer design; control unit, micro-programming, bus organisation and addressing schemes; micro-processors, system architecture, bus control, instruction execution and addressing modes; machine codes, assembly language and high-level language programming, micro-processors as state machines; microprocessor interfacing: input/output; technique, interrupt systems and direct memory access; interfacing to analogue systems and applications to D/A and A/D converters; system development tools: simulators, EPROM programming, assemblers and loaders, overview of available microprocessor application.

CPE 413: Research Methods (2 Units E: LH 30)

Learning Outcomes

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

1. Describe and explain key research concepts, issues, types of research and the systematic process of research gap identification and documentation and use contexts;
2. Search for, assembling and critically analysing research articles, papers and reports and general literature;
3. Formulate and evaluate research objectives, questions and hypotheses;
4. Developing a research proposal or industry project plan;
5. Identify and develop appropriate data acquisition and analysis methods and instrument;
6. Design/structure and lead the research process using appropriate research designs;

7. Use appropriate tools/techniques, including computer soft- and hardware /technologies to interpret, discuss and report/present the result and conclusions derived from research data analysis in oral or written form; and
8. Prepare/format/package research results/output for academic, journal articles, technical and other reports and exhibitions/fairs (scientific, trade, etc.) as an individual or team/work group.

Course Contents

Origins and definitions of research; problem identification and formulation; research types/design; qualitative, quantitative and mixed methods of research; measurement; sampling; data analysis; interpretation of data and technical report writing; use of encyclopedia, research guides, handbooks, academic databases for computing and computer engineering discipline; use of tools/techniques for research production: referencing formats/styles and software; research management and reporting best practices; plagiarism-definitions, types, detection software; basics of document analysis, systematic review and management methods; practical documentation/presentation projects/seminars.

SUMAS-CPE 421 Database Design (2 Units: E: LH 15: PH 45)

Senate approved relevance

One of the objectives of SUMAS in establishing Computer Engineering department is to train students to acquire world class skills in database design, which is crucial in storing, retrieving and processing all the pertinent details about any organization. Good database design provides for smooth managing of large sets of data, accuracy of data, easy of data updates, security of data, data integrity, easy of data analytics etc.

Overview

Every established organization in Enugu State needs a database for their daily routine activities. The need for daily update of such database arises. Database design is the organization of data according to a database model. This is essential, to guarantee information consistency, eliminate redundant data, efficiently execute queries, and improve the performance of any company or organization, especially in terms of data accuracy and information. It is importance to teach the students of SUMAS database so as to prepare them for the world in terms of industrial best practices.

The knowledge of database is imperative to Computer Engineering students while they are in the institution and when they leave the Institution to use it in solving related problems in Enugu State. Many corporate bodies currently use huge databases, for example financial Institutions, communication companies, academic institutions etc. Knowledge of database design methods is important because nearly every digitized process or systems we interact with on a daily basis is built over a database. Websites and applications that use and store data in a structured way have databases.

Objectives:

The objectives of this course are to:

1. Describe basic understanding of the concepts and principles of database systems.
2. Describe different types of database systems, such as relational, hierarchical, and network databases etc.
3. Outline the basics of data modeling, data normalization, and database design.
4. Explain the Structured Query Language (SQL), the standard language used for accessing and manipulating data in databases.
5. Define the concepts of data security, privacy, and integrity in database systems.
6. Describe the basics of database administration, backup, and recovery.
7. Identify the different approaches for data retrieval and data warehousing.
8. Classify file structure and physical storage.
9. Describe the concept of indexing and hashing.
10. Describe recovery systems and DBMS applications

Learning Outcomes

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

1. State the basic concepts and principles of database systems.
2. Design and implement relational databases.
3. Manipulate data using SQL and illustrate the different data retrieval techniques.
4. Describe the basics of data security, privacy, and integrity in database systems.
5. State the various optimization techniques used in databases and the importance of backup and recovery strategies.
6. Apply the concepts and techniques learned in the course to real-world situations.
7. Explain the different approaches for data retrieval and data warehousing.
8. Explain physical storage media and tertiary storage devices, access and organization of records, data dictionary; explain storage structure of object oriented databases.
9. Explain the basic concepts of indexing and hashing, ordered indices, B+ and B– tree index files, explain the concept of static and dynamic hashing, multiple-key access.
10. Explain recovery system, explain log based recovery and shadow paging, recovery with concurrent transaction and DBMS applications.

Course Contents:

Introduction to Database Systems: Overview of databases, the need for database systems, history of database systems, and the different types of database systems. Data Modeling: Conceptual data modeling, entity-relationship (ER) modeling, normalization, and denormalization. Relational Database Systems: Introduction to relational databases, SQL, data definition language (DDL), data manipulation language (DML), and data control language (DCL). SQL: Basic SQL commands, data retrieval, data manipulation, and data control. Data Security, Privacy, and Integrity: Overview of data security, authentication, authorization, encryption, and privacy. Database Administration, Backup, and Recovery. Overview of database administration. Backup and recovery strategies, and disaster recovery planning. Data Retrieval and Data Warehousing. Recovery system: log-based

recovery and shadow paging, recovery with concurrent transaction. DBMS applications: Sorting and indexing, query optimization. Physical storage media and tertiary storage devices. Access and organization of records, data dictionary, storage structure of object-oriented databases. Concepts of indexing and hashing. Ordered indices, B+ and B– tree index files, Concept of static and dynamic hashing, multiple-key access.

Minimum Academic Standard

As described in CCMAS

SUMAS-CPE 489 Circuit Implementation & Prototyping Techniques (3 Units, C: LH 15, PH 90)

Senate approved relevance

As technology continues to advance, the need for Circuit Implementation & Prototyping Techniques ascends. This course covers the basics of implementation of projects from ideation to development of prototypes. The skills acquired in this field of computer engineering are the fundamentals of knowledge in promoting technology for service in line with the vision and mission of the Senate of SUMAS.

Overview

A prototype is a sample or model of a product or device built to test a concept or idea. The term prototype is used in a variety of contexts. For this course, we are going to use it in the context of electronics. Creating a Circuit Implementation & Prototyping Techniques course in Enugu State is an essential step to test and evaluate any innovation ideas that evolves. In electronics, prototyping means building an actual circuit to a theoretical design to verify that it works. An electronics designer often builds the first prototype from breadboard or stripboard or perfboard and usually uses them to test circuits.

Circuit Implementation & Prototyping Techniques teaches different electrical and electronic design, implementation tools, components and symbols used in projects designs and implementation. It introduces modelling software like proteus, multism, thinker CAD etc. Bread boarding, Printed Circuit Board techniques, and production of PCB are also known.. Use of PCB CAD packages. Vero boarding, Soldering and se-soldering techniques for pass-through and surface mount components are exposed. Outcome of this course will create a soft skill on students for solving related problems ion Enugu State.

Objectives

The objectives of this course are to:

1. State different electronic and electrical components
2. Discuss different computer aided design and modelling software
3. Demonstrate breadboard wiring of circuits
4. Prepare printed circuit board
5. Demonstrate wiring of circuits using veroboard
6. Explain and demonstrate circuit tracing, jumper techniques and solutions.

7. Illustrate troubleshooting through schematic diagrams.
8. Implement packaging of developed prototypes
9. Explain obtaining of intellectual properties and
10. Explain marketing of products

Learning Outcomes

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

#	CLO	Bloom Level	PO Mapping
1	Identify and select electronic/electrical components and standard circuit symbols using datasheet specifications.	C1/C2	PO1
2	Use CAD and circuit simulation software (e.g., Proteus, LTSpice/Multisim, TinkerCAD) to design and simulate basic analog and digital circuits prior to physical construction.	C3 (Apply)	PO1, PO5.3
3	Construct and test circuits on breadboard, applying correct wiring and prototyping practice.	C3 (Apply)	PO1, PO5.3
4	Solder and de-solder pass-through (THT) and surface-mount (SMD) components using correct technique and safety practice.	C3 (Apply)	PO5.3
5	Construct circuits on veroboard as a semi-permanent prototyping method.	C3 (Apply)	PO5.3
6	Design and fabricate a printed circuit board (PCB) from schematic to finished board using PCB CAD packages.	C3/C6 (Apply/Create)	PO1, PO3.1, PO5.3
7	Apply grounding and power decoupling practices to minimise noise in prototyped circuits.	C3 (Apply)	PO1
8	<i>[Not yet in official documents — flag for curriculum committee]</i> Integrate microcontrollers (e.g., Arduino, ESP32) with sensors, actuators, and display modules into a functioning prototype.	C3/C6 (Apply/Create)	PO1, PO5.3, PO12.1
9	Trace faults in a circuit using schematic diagrams and systematic troubleshooting techniques to diagnose and correct non-functional prototypes.	C4 (Analyze)	PO2.1, PO2.3
10	Package a completed prototype appropriately for demonstration or deployment.	C3 (Apply)	PO3.1
11	Prepare documentation for intellectual property protection and discuss strategies for commercialising/marketing a developed prototype.	C2/C3	PO6.1, PO11.3
12	Design, construct, test, and demonstrate a complete prototype project integrating multiple techniques from the course.	C6 (Create)	PO1, PO3.1, PO9.1, PO11.1

Course contents

Identification of electrical and electronic components and symbols. Introduction to modelling software like proteus, multism, thinker CAD etc. Bread boarding. Printed Circuit Board techniques, and production of PCB. Use of PCB. CAD packages. Vero boarding. Soldering techniques for pass-through and surface mount components. De-soldering. Grounding: ground plane, digital ground, analogue ground. Power decoupling. Inductance and capacitive effects, feed through capacitors. Wire wrapping techniques. Radio Frequency design and implementation techniques. Sensors, actuators, and displays; Introduction to microcontroller-based prototyping: microcontroller platforms (e.g., Arduino, ESP32); interfacing sensors, actuators, and display modules; wireless sensor integration; Basic Design Approaches. Construction exercises using different prototyping techniques. Acquiring of intellectual property. Marketing of product.

Minimum Academic Standard

As described in CCMAS

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

Learning Outcomes

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

1. Be exposed and prepared for the Industrial work situation they are likely to meet after graduation, by developing their occupational competencies;
2. Bridge the existing gap between theory and practice of programmes through exposure to real-life situations, including machines and equipment handling, professional work methods and ethics, human relations, key performance assessment methods, and ways of safeguarding the work environment –human and materials;
3. Experience/simulate the transition phase of students from school to the world of work and the environment seamlessly, and expose them to contacts for eventual job placements after graduation;
4. Be motivated to identify the industrial and practice engineering challenges of their place of engagement and the larger society and creatively devise impactful solutions to them; and
6. Exploit the opportunity to improve and utilise their acquired critical thinking and innate creativity skills, during the program and SIWES Seminar presentation respectively.

Course Contents

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

500 LEVEL

GET 501: Engineering Project Management (3 Units C: LH 45)

Learning Outcomes

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

1. explain the basics of project management as it relates to the Engineering discipline;
2. demonstrate knowledge and understanding of engineering, management and financial principles and apply these to their own work, as a member and/or leader in a team, to manage projects and in multi-disciplinary environments;
3. conduct, manage and execute projects in multi-disciplinary areas;
4. possess the skills needed for project management; and
5. work within the budget when executing a project for proper management.

Course Contents

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

GET 502: Engineering Law

(2 Units C: LH 30)

Learning Outcomes

Students will be able to:

1. Describe and explain the basic concept, sources and aspects of law;
2. Describe and explain the major differences between the various categories of law, courts and legal jurisdictions;
3. Describe and explain legal principles and their application in professional engineering design and management services and their professional liability implications; and
4. Develop reasoned analysis of real-life or hypothetical engineering scenarios using the legal principles undertake critical analysis of reliable information to develop, and practically present technical reports for use in varying judicial/quasi-judicial settings including as an expert witness.

Course Contents

Common Law: its history, definition, nature and division. Legislation, codification interpretation. Equity: definition and its main spheres. Law of contracts for Engineers: Forms of contract and criteria for selecting contractors; offer, acceptance, communication termination of contract. Terms of Contracts;—Damages suppliers' and other Remedies. duties 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.

CPE 501: Testing, Reliability and Maintainability

(2 Units C: LH 30)

Learning Outcome

Upon successful completion of this course, the student will be able to:

(Knowledge-Based)

1. Apply engineering techniques to prevent or reduce frequency of failures;
2. Identify and correct the causes of the failures on engineering systems;
3. Apply engineering techniques to estimate the reliability of new designs and analyse reliability data; and **(Skills)**
- 4..predict expected life of the specific component, product or system; and establish risk analysis and quality control on engineering systems.

Course Contents

Introduction to reliability, maintainability, availability, elementary reliability theory; application to power systems and electronic components; test characteristics of electrical and electronic components; types of fault; designing for higher reliability; packaging, mounting, ventilation; protection from humidity, dust.

CPE 502: Digital Signal Processing

(3 Units C: LH 45)

Learning Outcomes

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

1. Understand analytical tools such as fourier transforms, discrete fourier transforms, fast Fourier transforms and Z-transforms required for digital signal processing;
2. Get familiarized with various structures of IIR and FIR systems;
3. Design and realise various digital filters for digital signal processing; and
4. Understand the applications of DSP in speech processing and spectrum analysis.

Course Contents

Discrete signals and Z -transform, digital fourier transform, fast fourier transform; the approximation problem in network theory; synthesis of low-pass filters; spectral transforms and their application in synthesis of high-pass and band-pass filters; digital filtering, digital transfer function aliasing, one-dimensional recursive and non-recursive filters; computer techniques in filter synthesis, realisation of filters in hardware and software; and basic image processing concepts.

CPE 505: Digital System Design with VHDL

(2 Units E: LH 30)

Learning Outcomes

On completion of this course, the students will be able to:

1. explain VHDL as a programming language;
2. design the combinational and sequential logic circuits using VHDL;
3. design programmable logic devices (PLDs) and networks of arithmetic operations;
4. gain proficiency with VHDL software package and utilise software package to solve problems on a wide range of digital logic circuits.

Course Contents

Finite state machine: definition, mealy and Moore models, state diagram, state table, transition table; sequential circuits design using flip-flops, asynchronous and synchronous circuit design; algorithm state machine; design examples and exercises; structured design: design constructs, design levels, geometry-based interchange formats, computer-aided electronic system design tools, schematic circuit capture, hardware description languages, design process (simulation, synthesis), structural design decomposition; introduction to VHDL: VHDL language abstractions, design hierarchies, VHDL component, lexical description, VHDL source file, data types, data objects, language statements, concurrent VHDL, sequential VHDL, advanced features of VHDL (library, package and sub-programmes); structural level modelling, register-transfer level modelling, FSM with data path level modelling, algorithmic level modelling; introduction of ASIC, types of ASIC, ASIC design process, standard cell ASIC synthesis, FPGA design paradigm, FPGA synthesis, FPGA/CPLD architectures; VHDL Design: top-down design flow, verification, simulation alternatives, simulation speed, formal verification, recommendations for verification, writing RTL VHDL code for synthesis, top-down design with FPGA; VHDL synthesis, optimisation and mapping, constraints, technology library, delay calculation, synthesis tool, synthesis directives; and computer-aided design of logic circuits.

CPE 511: Machine Learning and Applications

(3 Units C: LH 45)

Learning Outcomes

On the successful completion of this unit, students should be able to:

1. Identify the characteristics of datasets and compare the trivial data and big data for various applications; Select and implement machine learning techniques and computing environment that are suitable for the applications under consideration;
2. Solve problems associated with batch learning and online learning, and the big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issues;
3. Understand and apply scaling up machine learning techniques and associated computing techniques and technologies;
4. Recognise and implement various ways of selecting suitable model parameters for different machine learning techniques; and
5. Integrate machine learning libraries and mathematical and statistical tools with modern technologies like Hadoop and MapReduce.

Course Contents

Introduction to machine learning; ; introduction to R or Python for machine learning: statistics for analytics: descriptive statistics, inferential statistics, estimation and hypothesis testing, ANOVA; machine learning: unsupervised learning – clustering, supervised learning – classification, decision trees, random forest, and model performance measures.

CPE 514: Professional Practice and Ethics

(2 Units E: LH 30)

Learning Outcomes

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

1. Have a holistic picture of professional practice in computer engineering;
2. Be abreast of the ethical and professional issues and landmines inimical to their practice and how to navigate them;
3. Be totally ready (professionally, technically, legally and emotionally) for any professional entrepreneurial, financial and managerial challenges they may encounter; and
4. Be abreast of the standards, codes and intellectual property implications of and values associated with, professional practice.

Course Contents

Engineering profession: structure and specializations (Nigeria and abroad), engineering basics, development of engineering profession, ethics and computer engineering, strands in ethical thinking, organisations and their structures: limited liability companies, private and public, partnerships, sole traders, special features of limited companies, responsibilities of directors; company finance: the need for capital; investment and working capital; sources of funds; equity capital and loan capital, cash flow and its importance, costing: fixed costs and variable costs; overheads; opportunity costs; depreciation; problems of cost allocation; budgeting; assessment of capital investment; discounted cash flow analysis, with particular reference to investment in software tools and new product development; financial accounts: balance sheets, profit and loss accounts, cash flow statements; the treatment of software in company accounts; ownership of rights in software as goodwill; anatomy of software house: the company, company structure, management of staff, producing of budget, monitoring financial performance, producing budgets, computer contracts and intellectual property rights: the nature and types of intellectual property; intellectual property law (confidentiality, copyright, trademarks, and patents) and implications for the computing, computer engineering and software industry; computer misuse and criminal law: computing and criminal activity, reform and criminal law, categories of misuse, computer fraud, unauthorized access ;data protection: data protection and privacy, the impact of the internet; sociology of data management/processing: generation, users, regulation/control and general management; Professional and industry codes of conduct(local and international).

CET 599: Final Year Project

(6 Units C: LH 270 PH)

Learning Outcomes

The student(s) will develop a technology and/or system to solve a known and significant computer engineering problem and design, and if possible/practicable, build/produce/ manufacture some relevant new hardware/device(s) representing the solution using the skills acquired in the computer engineering programme.

Course Contents

Individual student or group of students' project strengthen practical experience and encourage

creativity, entrepreneurship and independent/team work (as may be the case). The project ends in a comprehensive written report of a developed system, and/or product/service and oral presentation/defense before a panel of assessors one of whom must be external to the University awarding the computer engineering degree.

SUMAS-CPE 504: Embedded Systems II

(3 Units: C: LH 30; PH:45)

Senate approved relevance

Embedded Systems II offered in the Department is designed to provide the educational training and skills necessary for analysing, designing, implementing and maintaining the various processes and operations of electronic and electro mechanical systems. Students, after participating in this course will be able to develop indigenous computer-based solutions to our specific needs and environment which is in line with the university motto “Technology for Service”

Overview

Enugu State business owners need to have new developed devices to improve their efficiency. Embedded systems will be useful in such cases. Any computer hardware combined with software developed to provide specific functions is thought of as an embedded system. An embedded system can be an independent system or part of a large system. It is a microcontroller or microprocessor-based system which is designed to perform a specific task. For example, a fire alarm is an embedded system; it will sense only smoke. It is made up of the hardware, the application software and the real time operating system (RTOS) that supervises the application software and provide mechanism to let the processor run a process It is a self-driven system typically implemented as a component of a larger electrical or mechanical system.

They can be classified into different types based on performance, functional requirements and performance of the microcontroller. They can be highly complex or relatively simple, depending on the task for which they were designed. They may include a single microcontroller or a suite of processors with linked peripherals and networks. Today, there are billions of embedded system devices used across many industries in Enugu State including medical and industrial equipment, transportation systems, and military equipment. Many consumer devices from digital watches to kitchen appliances and automobiles also feature them. Embedded systems are small, fast, powerful, and designed for very specific use cases. Students’ knowledge in this course will be very useful in Enugu State.

Objectives

The objectives of this course are to:

- 1) Describe the basic principles and types of Embedded Systems and their functions
- 2) Explain other types of microcontrollers
- 3) Explain PIC Microcontroller Architecture And Application
- 4) Explain Arduino Microcontroller and Its Applications
- 5) Explain Raspberry Pi and its application
- 6) Explain AVR Microcontroller and its application
- 7) Explain ESP32 Microcontrollers and its application
- 8) Design and implement group projects for students using any of the microcontrollers

Learning Outcomes

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

1. Define what an embedded system and outline its features.
2. Analyze the major differences between microprocessor and microcontrollers
3. Describe the architecture and functional block of PIC Microcontroller, Arduino Microcontroller, Raspberry Pi, AVR and ESP32 microcontrollers
4. Develop an embedded C and ALP in PIC Microcontroller, Arduino Microcontroller, Raspberry Pi, AVR and ESP32 microcontrollers using the internal functional blocks for the given application.
5. Design and develop IOT and other embedded system projects using these microcontrollers

Course Contents

Overview of Embedded Systems: Architecture, Types of Embedded Systems. Background and features of Microcontroller. Criteria for choosing Microcontroller. Types of Microcontroller: PIC Microcontroller Architecture and Application. Special Features of PIC microcontrollers. Interface with the washing machine, Temperature Controller, Intruder Alert System. Arduino Microcontroller and Applications. The Arduino Family. Types of Arduino. Input and Output Interfaces of Arduino. Introduction to Raspberry Pi. Special-purpose features, General purpose input-output (GPIO) connector. AVR Microcontroller, Device Overview. Internal data memory, Instruction set, Programming interfaces. ESP32 Microcontrollers Device Overview. Internal data memory and Instruction set. Programming interfaces and its application. Implement group projects using any of the microcontrollers.

Minimum Academic Standard

As described in CCMAS

CPE 521 Cyber Security Techniques (2 Units; E; LH 30)

Senate approved relevance

Understanding cyber security is essential as it forms the foundation for developing secure and robust software and hardware systems. The significance of cyber security for undergraduate engineers is that it enables them to design and develop secure software and hardware systems that are resistant to cyber-attacks. Understanding cyber security also helps them to comply with security regulations and standards and ensures the integrity, confidentiality, and availability of data.

Overview

Cyber security is the practice of protecting computer systems and networks from malicious attacks, unauthorized access, theft, and damage to hardware, software, and data. Making business network exposed in Enugu state will make the computer network vulnerable to attack. It has become an increasingly significant field in recent years especially in Enugu State, as the number and complexity of cyber-attacks have risen exponentially. Students knowledge to this will assist to combat the problem. Cyber security covers the basic concepts, principles, and practices used to protect computer systems and networks. It includes topics such as cryptography, network security,

web security, security protocols, and security regulations. It also covers the various types of cyber-attacks, such as malware, phishing, and denial-of-service attacks.

Objectives of a Cyber security course

The objectives of this course are to:

1. Trace cyber security history, current state, and future trends.
2. Harmonize the various security threats faced by modern computer systems and networks, and the techniques used to mitigate those threats.
3. Identify the different types of security controls, including access controls, encryption, firewalls, intrusion detection and prevention systems, and others.
4. Create hands-on experience with security tools and technologies, including virtualization, firewalls, and penetration testing.
5. Develop critical thinking skills and the ability to analyze security risks and recommend appropriate mitigation strategies.
6. Outline the legal and ethical considerations involved in cybersecurity, including privacy, data protection, and intellectual property rights.
7. Identify current research trends in the field and the latest tools and technologies used to enhance cybersecurity.
8. Identify skill needed to work effectively as part of a team, collaborating with others to solve complex security problems.

Learning Outcomes

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

1. State the fundamentals of cybersecurity and the various security threats faced by modern computer systems and networks.
2. Explain the different types of security controls and the ability to analyze security risks and recommend appropriate mitigation strategies.
3. Demonstrate hands-on skills with security tools and technologies, including virtualization, firewalls, and penetration testing.
4. Demonstrate Critical thinking skills and the ability to analyze security risks and recommend appropriate mitigation strategies.
5. Explain legal and ethical considerations involved in cybersecurity, including privacy, data protection, and intellectual property rights.
6. Trace current research trends in the field and the latest tools and technologies used to enhance cybersecurity.
7. Demonstrate skills needed to work effectively as part of a team, collaborating with others to solve complex security problems.

Course contents

Introduction to Cybersecurity. Overview computer security systems. History of cybersecurity. Current state and future trends of cyber security. Threats and Vulnerabilities: Types of security threats faced by modern computer systems and networks. Techniques used to mitigate threats. Security Controls. Types of security controls. Access controls. Encryption. Firewalls. Intrusion

detection and prevention systems. Use of Security Tools and Technologies. Virtualization. Firewalls Penetration testing. Risk Analysis and Mitigation. Understanding security risks. Recommending appropriate mitigation strategies. Legal and Ethical Considerations. Privacy, data protection, and intellectual property rights. Current Research Trends. Overview of current research trend latest tools and technologies used to enhance cybersecurity. Team-Based Security Challenges. Working effectively as part of a team to solve complex security problems.

Minimum Academic Standard

As described in CCMAS

SUMAS-CPE 523 Computer Graphics & Animation 2 Units; E: LH 15: PH 45)

Senate Approved Relevance

The field of computer graphics focuses on utilizing a computer to create images, animations, or visual sequences. This covers the tools and programs used to create these photographs. the work of creating Although the field of photo-realistic images is incredibly difficult, it is one that is in high demand due to the virtually infinite variety of applications. Over the past 10 to 20 years, the field of computer graphics has expanded significantly, and numerous software systems have been created for producing various types of computer graphics. This can include the systems for creating three-dimensional models of the scene that will be illustrated, the rendering software used to create the images, and the related hardware and software used for user interfaces. The acquisition of skills in Computer graphics enable the students create images and arts with computers and provide simulations of engineering designs before going into construction and hence depicting technology for service in line with the motto of the university..

Overview

The field of computer graphics dates back to the early 1960's with Ivan Sutherland, one of the pioneers of the field. This began with the development of the (by current standards) very simple software for performing the necessary mathematical transformations to produce simple line-drawings of 2- and 3-dimensional scenes. In Enugu State, as time went on, the capacity and speed of computer technology improved, successively greater degrees of realism were achievable. Today it is possible to produce images that are practically indistinguishable from photographic images

The aim of this course is to provide an introduction to the theory and practice of computer graphics which will be useful in Enugu state. By introducing topics that deal with computer graphics rendering of primitive objects, polygon clipping algorithms, two-dimensional transformations, three-dimensional transformations, viewing camera rendering and projections, object representations, three-dimensional curve and surface rendering algorithms, and line and surface removal algorithms It introduces the student to the technical concepts behind creating synthetic computer-generated images, focusing on underlying mathematical concepts including triangles, normal, interpolation, texture mapping and bump mapping. The student will develop practical skills for using graphics libraries and tools.

Objectives

The objectives of this course are to:

- 1) Explain the overall workflow and techniques involved in computer animation production.
- 2) Identify fundamental computer graphics topics including graphics pipeline architecture, transformations, modeling, viewing, shading, and texture mapping.
- 3) To explain basic mathematical backgrounds related to computer graphics including linear algebra and geometry.
- 4) Implement computer graphic algorithms (such as object transformation, geometric representation, shading and illumination model, anti-aliasing and Ray tracing).
- 5) Describe 3-D curve and surface algorithms, in rendering, surface and line removal algorithms
- 6) Explain the abstract mathematical model describing the way colour can be represented
- 7) Explain the methods of Computing a digital image of what the virtual camera sees
- 7) Define the graphics pipeline, hardware and software basics.
- 8) Outline and describe stages of modelling transformation, 3D to 2D viewing transformation.
- 9) Explain the steps to produce usable graphics user-interfaces.
- 10) Explain ways to produce realistic graphics outputs.

Learning Outcomes

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

1. Explain the basics of computer graphics.
2. Interpret essential mathematics in computer graphics.
3. Apply mathematics to graphics systems.
4. Implement common data structures to represent and manipulate geometry.
5. Demonstrate common approaches to model light and materials.
6. Apply basic shading techniques.
7. Apply basic image-processing techniques.
8. Explain how the human visual system plays a role in interpretation of graphics.
9. Perform color and light representation and manipulation in graphics systems

Course Contents

Computer Graphics and Applications: Hardware, Software and Display Devices. Graphics Data Structure. Colour Theory. Image Representation. Geometric Modelling. Basic Line drawing. Mathematics of CG. Curve and Surface Design. RayTracing. Texture Mapping. 3D Graphics Rendering: Geometric Transformation. Scan Conversion. Three-dimensional Viewing. 3D Transform and Animation. Hidden Surface Elimination. Overview of 3D animation. Application and types. Coordinate system. Vertex. Faces and object. Concept of wireframe. Surface and solid modeling. Construction planes. Differences between object space and world space. Principles of making characters alive. Polygonal Modeling. Box Edit Mesh. Smoothing Techniques. Subdivision Surfaces. Nurbs Modelling techniques. Utilizing NURBS toolbox. Surface points and CVs. Importing and attaching NURBS surfaces. Rebuilding surfaces. Curve and surface approximation. Graphic animation process. Camera & Animation Camera. Set & Background (Image Plane). Light Linking. Animation Techniques: Walk Cycle. Facial Expression using Blend

Shape. Dynamics animation: Rigid Bodies, Soft Bodies, constraint, Particles. Tips and tricks on rendering.

Minimum Academic Standard

As described in CCMAS

SUMAS-CPE 554 Design & Installation of Computer Security/Solar Systems and ICT Services (2 Units: E: LH: 15: PH 45)

Senate approved relevance

Design & Installation of Computer Security/Solar Systems and ICT Services will expose the students to acquiring soft skills in design and installation of CCTV and other security systems, in Installation of Solar Panel systems and other electrical system, in knowing health and safety work act in Nigeria and demonstrating electrical installation design in domestic, commercial and industry and thereby equipping the students to technologically provide services to the public on graduation hence promoting technology for service to the public.

Overview

In Enugu state there is need for installation of Computer Security/Solar Systems and ICT Services. Design & Installation of Computer Security/Solar Systems and ICT Services deals with design and installation of CCTV and other security systems, Installation of Solar Panel systems and other electrical safety, Health and safety work act in Nigeria., installation design in domestic, commercial and industry and other practical installation knowledge.

Electrical design involves planning, creating, testing, or overseeing the improvement and installation of electrical equipment, including lighting equipment, power systems, power distribution, fire and life safety systems, electronic components, and voice and data communications infrastructure. Students' knowledge and application of its outcome in Enugu State will assist in averting the problem of insecurity and lack of constant power supply.

Objectives

The objectives of this course are:

1. To expose students to design and installation of CCTV and other security systems.
2. Illustrate and implement designs in Alarm and emergency systems.
3. To let students recognize the techniques in Installation of Solar Panel systems and other electrical systems.
4. To explain Health and safety work act in Nigeria. Electrical safety.
5. To demonstrate installation design in domestic, commercial and industry.

Learning Outcomes:

Students at the end of this course should be able to:

1. Design CCTV and other security systems
2. Install Solar Panel systems and other electrical installation.

3. Practice Wireless LAN design and installation.
4. Recognise ICT services, NCC and FCC codes of practice and standards.
5. Implement electrical installation design in domestic, commercial and industry.

Course Content

Design Installation of CCTV and other security systems. Alarm and emergency systems. Computer networking, design and installation. Wireless LAN design and installation. Telecommunication design and installation of Satellite, VSAT, etc. Telephone design and installation. Electricity supply regulations. Electrical Installation design in domestic, commercial and industry. Earthing system: Earthing and Protection, Faraday cage, rod electrodes and earth electrode resistance. Earth fault loop impedance. Lighting and Illumination. Types of light source and calculation of lighting requirements. Installation Materials, cables, junction box, terminations, joints. Conduits and conduiting. Truck and trucking. Installation of Solar Panel systems and Electrical Installation. Introduction to Health and safety at work act in Nigeria. Electrical safety and First aid.

Minimum Academic Standard

As described in CCMAS

SUMAS-CPE 576 Fundamentals of Robotics & Automation 2 Units: E: LH 30

Senate approved relevance to vision and mission

Robotics is an interdisciplinary field of engineering and science that focuses on the design, construction, and operation of robots. It is a rapidly evolving field that has the potential to transform many industries, including manufacturing, healthcare, transportation, and entertainment. For undergraduate engineers, understanding robotics is essential as it forms the foundation for developing robotic systems that can perform a wide range of tasks in various settings. The significance of robotics for undergraduate engineers is that it provides them with the skills and knowledge necessary to design and develop robotic systems that can perform tasks that are dangerous, repetitive, or impractical for humans. Robotics also enables them to automate industrial processes, improve healthcare services, and enhance human-robot interaction in line with technology for service.

Overview

Robotics engineering is a relatively new area of study in Enugu State, so there are only a handful of formal programs designed to prepare learners for a career in this field. It is a complex field built on advanced mathematics, engineering, and computer science concepts, so it's important to have a solid foundation in these subjects.

For many, the first step toward a robotics career is an undergraduate degree focused on mathematics, engineering, or computer science. Robotics covers the basic concepts, principles, and practices used to design and build robots. It includes topics such as robotics hardware, sensors, actuators, control systems, and machine learning. It also covers the various applications of

robotics, such as industrial robots, service robots, medical robots, and autonomous vehicles. Students knowledge to this course will encourage them to develop robots to assist in day to day activities in Enugu State.

Objectives:

The objectives of this course are:

11. To introduce students to the fundamental principles of robotics, including kinematics, dynamics, and control systems.
12. To provide hands-on experience in the design and construction of robots, using industry-standard tools and techniques.
13. To provide hands-on experience in the programming of robots, using industry-standard tools and techniques.
14. To prepare students for careers in the rapidly growing field of robotics, where they can apply their skills to real-world problems in manufacturing, healthcare, transportation, and other sectors.
15. To prepare students to engage in independent research and innovation, exploring new frontiers in robotics technology and applications.

Learning Outcomes:

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

1. Apply a comprehensive understanding of fundamental principles and practices of robotics.
2. Develop practical skills in the design, construction, and programming of robots, using industry-standard tools and techniques.
3. Develop critical thinking skills, enabling them to analyze and solve real-world problems in robotics.
4. Apply their knowledge and skills to independent research projects, exploring new frontiers in robotics technology and applications.
5. Design projects for careers in the rapidly growing field of robotics, where they can make a positive impact on society by developing innovative solutions to real-world challenges

Course Content

Introduction to Robotics: history, definitions, and applications of robotics. Robotics Hardware: actuators, sensors, microcontrollers, and other components used in robotics. Robotics Kinematics: geometry of motion, forward and inverse kinematics, and trajectory planning. Robotics Dynamics: Newton's laws of motion. Lagrangian and Hamiltonian formalisms. Impedance control. Robotics Control Systems: feedback control. State-space representation. Linear quadratic regulators. Robotics Programming: programming languages. Algorithms, and software tools used in robotics. Mobile Robotics: navigation, mapping, and localization of mobile robots. Manipulator Robotics: manipulation and grasping, force control, and adaptive control. Human-Robot Interaction: human perception, cognition, and behavior. Their implications for robot design and control. Robotics

Applications: case studies. Examples from manufacturing, healthcare, transportation, and other domains.

Minimum Academic Standard

As described in CCMAS

SUMAS-CPE 589 Seminar 2 Units; C: LH 30

Senate approved relevance

Seminar is a course designed to deliver the abilities of students in searching, knowing and updating themselves in the trending computer engineering related technologies. The students' application of that knowledge in innovation and providing technology for service in line with the vision and mission of the Senate of SUMAS. After taking this course, indigenous projects based solutions which are appropriate for our specific need and environment can be developed and defended by students.

Overview

In this course small group of students meeting regularly under the guidance of an academic staff to exchange information, discuss theories in relation to computer engineering. This is to encourage outcome-based education, hence students applying the knowledge acquired thus far in the field of computer engineering in preferring solutions to domestic industrial and environmental problem in Enugu State.

The seminar design and implementation is useful and relevant to hardware and/or software system) in Enugu State, giving room to know the new technological knowledge existing. Student initiates and defends the new knowledge identified under the supervision of a member of academic staff. This is followed by the development of a bound report in partial requirement for the award of Bachelor Degree in Computer Engineering. Lastly a defense of the knowledge identified is defended before the Academic Board.

Objectives

The objectives of this course are to:

1. Apply knowledge of Science, Technology, Engineering and Mathematics (STEM) fundamentals to the solution of Computer Engineering related problems.
2. Design solutions for Computer Engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental and other ethical considerations.
3. Conduct investigations of 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.
4. Use modern computer engineering models, tools, and information technologies to improve computer system.

5. Undertaking research, and laboratory and real-life and real-time experiments by using computers and computer-based devices/systems and having the ability to acquire, analyse, and interpret data and to solve engineering and other problems locally and globally;

Learning Outcomes

At the end of the course the student 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 computer 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 computer 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

Individual students or groups of students will undertake a seminar or project aimed at developing their practical skills, creativity, and problem-solving abilities. The work may be carried out individually or as a team, as appropriate, and should also encourage entrepreneurship and independent thinking. The project will involve the design, development, and deployment of computer-based systems, as well as the design of devices or processes that address specific computer engineering needs. Students will apply critical thinking, reasoning, and logical approaches to identify and solve computer engineering problems.

Students will also apply research knowledge and appropriate research methods, including setting up experiments, collecting and analyzing data, interpreting results, and using the findings to develop new knowledge, products, or services. They will learn to select and apply suitable techniques, resources, engineering methods, and modern ICT tools such as prediction, modelling, and optimization in solving developmental and complex engineering problems, while considering their theoretical and practical limitations.

The project will conclude with a comprehensive written report on the developed system, product, or service. Students will also present and defend their work before a panel of departmental assessors. Each project must be carried out under the guidance of a designated project supervisor.

Minimum Academic Standard

As described in CCMAS

EQUIPMENT

Recommended List of Minimum Equipment

Basic Computer Laboratory

S/N Name of Equipment/Brief Specification

1. Computer System (with latest configurations)
2. Software
3. Microsoft Windows
4. Red Hart Linux
5. Oracle
6. Page Maker Professional (latest version)
7. Corel Draw (latest version)
8. Adobe Photoshop
9. Microsoft Office Suite (latest version)
10. Antivirus Software (licensed for at least 200 users)

Programming Laboratory

1. Computer System (with latest configurations)
2. Turbo C and C++ Compilers (latest versions)
3. VB.Net (latest version)
4. Javas Compiler (latest version)
5. Python compiler (latest version)
6. R Compiler (latest version)
7. Antivirus Software (licensed for at least 50 users)

Digital Electronics And Microprocessor Laboratory

1. Computer System (with latest specifications)
2. Online UPS (5 KVA) OR 625 VA UPS for each Computer System
3. Assembler for 8085 programming
4. Antivirus (10 user License)
5. 8085-based Trainer Kits
Add on Cards
6. Add on card to study interfacing of LED display control using 8255
7. Add on card to study interfacing of LCD with 8085-based microprocessor
8. Add on card to study speed control of stepper motor using 8085-based microprocessor including stepper motor
9. Familiarization of ICs trainer (7400),(7402), (7432), (7486), (7408), (7404), (7483), (7485), (74157), (74151), (74138
10. EX OR, and EX-NOR Gates realisation kit (using NAND OR NOR Gates)
11. Realisation of Truth Table for OR and NAND Gates using NAND Gates and NOR Gate
12. 8 bit digital multiplexer
13. 1:8 line de-multiplexer
14. Multiplex two BCD numbers to seven segment display

15. Study of Flip Flop or RS, D,J-K and T
16. 3 bit asynchronous up-counter3 bit synchronous down counter
17. Universal shift registers having SISO, SIPO, PIPO, PISO
18. Study of D-latch and D flip flop trainer
19. Encoder/decoder trainer
20. Digital IC testers
21. Digital Laboratory with modules
22. Logic Probe
23. Logic Pulser
24. Pulse Generator upto (3MHz)
25. Digital Frequency Metre
26. Digital IC Programmer
27. Digital IC power supplies (+/- 5V/1A, +/-12V/1A/+15V, 1A)
28. 15 Macs
29. 2 Calliope autonomous robots with camera and robotic arm
30. Apple iPads and Samsung tablets.
31. Digitised oscilloscopes with spectrum analysers
32. Digitised function generators
33. Digitised power supplies
34. Digital circuit design and microcontroller boards (EasyAVR and BigAVR microprocessor boards. Easy 8501 development boards).
35. Raspberry PIs.
36. Protoboards.

Advanced Computer Laboratory

1. Multimedia computer systems with latest specifications
2. Online UPS (5 KVA)
3. Multimedia projector with accessories
4. 24 Port Switch
5. Digital camera
6. Scanner
7. Laser printer
8. Touch screen
9. Laptop with latest configurations
10. Adobe Creative Suit (latest Version)
11. Visual Studio 6.0 or (latest Version)
12. Adobe Flash Professional
13. Adobe Flex (latest version)
14. Adobe Dreamweaver
15. Web camera
16. Antivirus (licensed for at least 50 users)

Hardware Laboratory.

1. Trainer board to demonstrate assembling and working of multimedia computer system
2. Trainer boards to study mother boards with different chipsets and processors
3. Hard disk trainer board (SATA and IDE)
4. CDROM trainer board
5. Mouse trainer board
6. Keyboard trainer board
7. Trainer board to study construction and working of colour CRT monitor
8. Trainer board to study construction and working of colour LCD Monitor
9. Trainer board to study working of dot matrix printer, Inkjet printer and colour laser printer
10. Trainer board to study switch mode power supply
11. Trainer board to study working of UPS
12. Trainer board to study construction and working of floppy disk drive
13. Computer repair and assembly tool kits
14. Computer system with latest specifications
15. Online UPS (3 KVA)
16. PC tools
17. Antivirus (5 users)
18. USB hard disk

Data Communication and Networking Laboratory

At least 2Mbps Internet facility should be available in Laboratories.

1. Computer system with latest specifications
2. 19” rack
3. 24 port switch
4. Windows 2003 server or latest version (10 user license)
5. Red hat linux (20 user license)
6. Data backup utility software
7. Data communication trainer board
8. LAN trainer system
9. Amplitude modulation/demodulation trainer board
10. Frequency modulation/demodulation trainer board
11. Pulse code modulation/emodulation trainer board
12. CRO 25 MHz (minimum)
13. Trainer board to study frequency division multiplexing/ demultiplexing
14. Trainer board to study time division multiplexing/ demultiplexing
15. Digital multimeter
16. Wireless access points
17. Wi-Fi LAN cards
18. Network/bandwidth management software (cybernetra or equivalent)

19. Trainer board to study the working of MODEM
20. LAN cable tester
21. Crimping tool
22. Display boards of various types of cables and connectors used in computer networks
23. Tool kits
24. Online UPS (5 KVA)
25. Network printer
26. Antivirus(10-user license)

Operating System Laboratory

1. Computer system with latest specifications
 2. Online UPS (7 KVA) OR 625 VA UPS for each PC
 3. Server with latest specifications
- Software
1. Windows 98/XP/2000/Vista/Windows 7/Windows 10
 2. Windows 10 server or latest version
 3. Oracle academic version (latest version with at least 20- user license)
 4. SQL server
 5. Antivirus (with at least 20-user License)

Central Computer Laboratory

1. Multimedia computer system with latest specifications
2. Online UPS (7 KVA)
3. 24 port switch
4. Network printer
5. Scanner
6. Dot matrix printer
7. Antivirus (20 user license)
8. LCD projector

Electronics/Signal Processing Laboratory

1. Digitised Oscilloscopes with Spectrum Analysers
2. Digitised Function Generators
3. Digitised Power Supplies
4. Digital Circuit Design and Microcontroller Boards
5. Computers for Data Acquisition and Computer Aided Design (CAD)
6. 40 work stations
7. Software includes: AutoCAD
8. MatLab
9. Comsol
10. STAAD
11. Other engineering design software

STAFFING

Academic Staff

There should be a minimum of six full-time academic Staff in Computer Engineering department.

Student/Staff Ratio

Determination of the number of academic staff required for an academic programme is contingent on the approved staff-student ratio for each discipline. 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 1 and below. The professorial cadre should constitute a maximum of 20 percent of staff strength while the remaining two should constitute 35 and 45 percent respectively

Academic Support Personnel

Teaching Assistant/Demonstrators to help lecturers in the conduct of tutorials, practicals and field work.

Administrative Support Staff

The faculty shall have the following senior administrative staff that shall be responsible to Dean:

- Faculty Officer – not below Assistant Registrar
- Two Executive Officers
- A Secretary

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 staffs that are computer literate. Each department should have Secretary to each Head of Department.

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.

Junior Staff

The faculty shall have non - teaching support staff that shall be responsible to the Dean such as the Secretary, Clerical Officer, Driver, etc. Each Department shall have secretary, Clerical Officer and other support staff as may be required.

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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

Universities should have available technology in place, rich databases and other electronic or digital library and information resources. In addition, well stock and current hardcopies of reference and other textual materials should be provided centrally at the level of the faculty. A well

network digital library should serve the entire university community. Availability of wireless facilities (wifi) with adequate bandwidth should enhance access to these electronic resources. In any case, there should be internet ready workstations available in the library for least 25 percent of the total student enrolled in each academic programme. The funding of the library should be in line with NUC guideline.

CLASSROOMS, LABORATORIES, WORKSHOPS, AND OFFICES

Classrooms Accommodation

The NUC standard requirement of 0.65m^2 per full- time student is maintained. Thus, the minimum total space requirement of a Faculty or Department shall be the product of its total Full-Time Equivalent student enrollment (FTE) and the minimum space requirement per full- time equivalent i.e. $(\text{FTE})0.65\text{m}^2$

The NUC recommends the following physical space requirement:

Academic	m2
Professor's Office	18.50
Head of Department's Office	18.50
Tutorial Teaching Staff Space	13.50
Other Teaching Staff Space	7.00
Technical Staff Space	7.00
Science Staff Research Laboratory	16.50
Engineering Staff Research Laboratory	14.50
Seminar Space per student	1.85
Drawing Office Space (A.O. Board) (Per Student)	4.60
Drawing Office Space (A.I. Board) (Per Student)	3.70
Laboratory Space	7.50
Non-Academic	
Secretarial Space	7.00

Office Facilities

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

Laboratories and Equipment

To achieve the benchmark statements for any program, there should be:

- i. Minimum number of identifiable laboratories for each programme which should be in accordance with the recommended space requirements and, in addition, be adequately equipped:
- ii. At least one large and reasonably equipped central laboratory for teaching

APPENDIX

List of Sumas CCMAS Technical Reviewer Committee for Engineering & Built Environment

1. Prof. E. I. Ugwuja	Biological Sciences	Senate Chairman CCMAS
2. Prof. L. U. Anih	Electrical & Electronics Engineering	Chairman Technical Reviewer
3. Dr. S. O. Ogbonna	Mechanical Engineering	Faculty Chairman
4. Dr. D. C. Ezema	Electrical & Electronics Engineering	Member
5. Engr. N. P. Okozor	Computer /Biomedical Engineering	Member
6. Engr. B. C. Ezea	Civil Engineering	Member
7. Engr. M. O. Ugwoke	Chemical Engineering	Member
8. Arch. J. O. Ezugwu	Architecture	Member