BENSON IDAHOSA UNIVERSITY

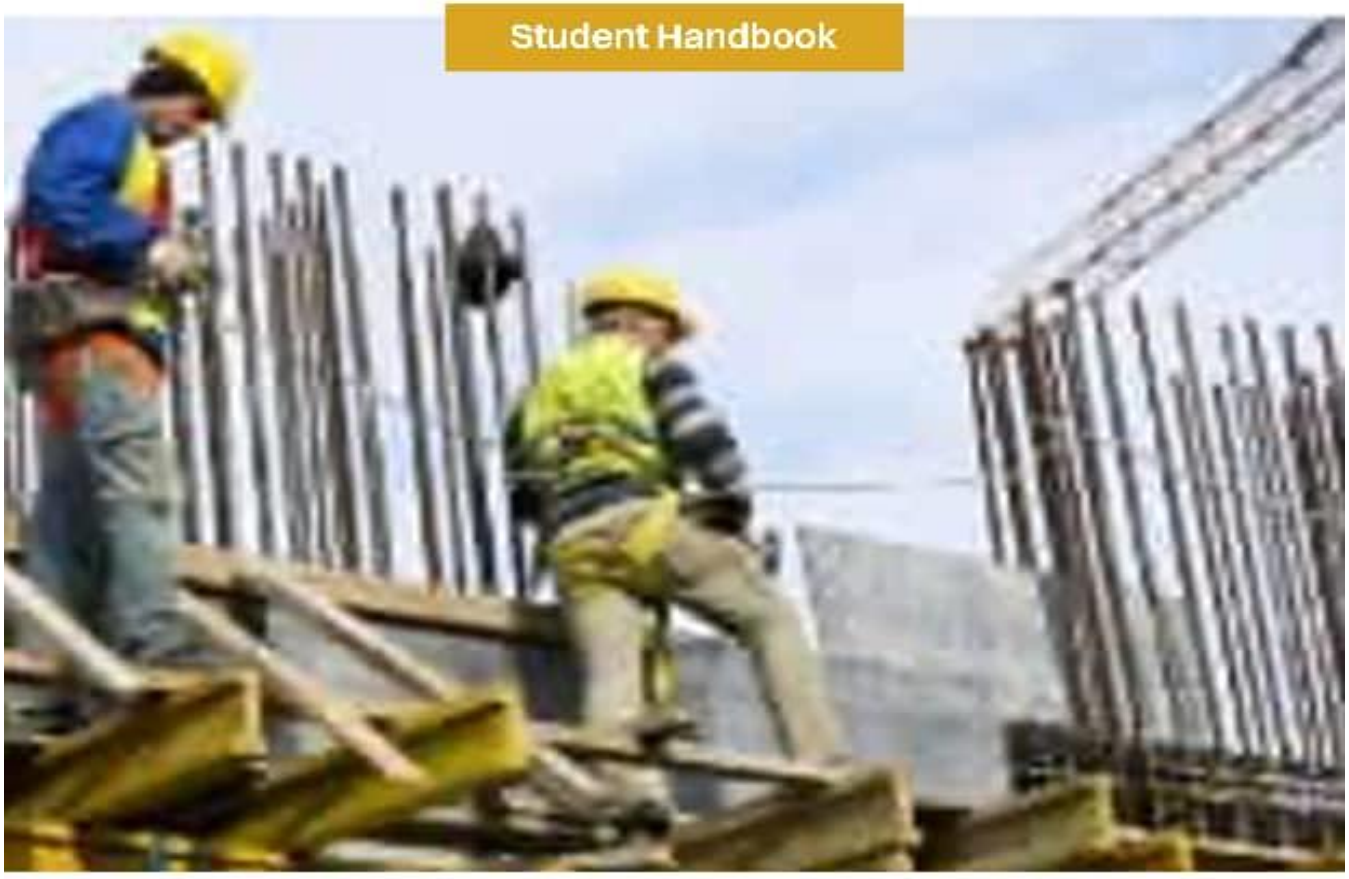
Core Curriculum & Minimum Academic Standards
for the Nigerian University System (CCMAS)

Faculty of Engineering

Department of Civil Engineering

B.ENG. Civil Engineering

Student Handbook



2023-2028

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BENSON IDAHOSA UNIVERSITY

Mandate

The vision of Benson Idahosa University flows from its divine mandate which was God's spoken words to its founder, Archbishop B.A. Idahosa: to raise for Him Africa's first Charismatic Christian University. It was to be a centre of excellence where leaders would be raised to take God's name to places of prominence in Nigeria, Africa, and the world. His vision was to raise up an army of professional and academics who would go in Christ name to the ends of the world with the fire of the Holy Ghost to impart truth by precept and example.

Vision Statement

Benson Idahosa University aspires to be model for ***Academics, Professionals and Entrepreneurs, who will be effective disciples for Christ by excelling in their professional fields***. It will be distinguished by high performance in interdisciplinary research, addressing national and international problems, eliminating wrong behavioural patterns among students and becoming a storehouse of knowledge to be used for benefit of mankind on Christian ethical principles designed to change the nation and the continent by changing one student's life at a time.

Mission Statement

Benson Idahosa University is a private Christian University providing state-of-the-art undergraduate, postgraduate and professional education. We are committed to the mission of ***raising leaders for the nation, who are complete in spirit, mind and body, thus contributing to the production of high-level leadership and quality manpower for the nation and the world.*** We perform these functions by judiciously utilising current information and communication technology, networking with similar institutions worldwide, putting people first in operations and emphasising Christian ethical values. The beneficiaries of the University's service are students, employers of labour, present and future generations, Nigeria and the global community.

Our Core Purpose

Change Nigeria

Our Core Values (TOP-TIAA)

Teamwork
Ownership Mentality
People Matter
Transparency & Integrity
Innovation
Accountability
Academic excellence with Godliness

LIST OF PRINCIPAL OFFICERS

S/N	NAME	QUALIFICATIONS	POSITION
1	Prof. Sam Guobadia	B. Sc. - (Economics) M. Sc. - (Economics) Ph. D - (Economics)	Vice Chancellor
2	Prof. Johnson Oyedeji	B.Sc. - Agric. M.Sc. - Animal Science Ph.D. - Animal production & Management.	Deputy Vice-Chancellor
3	Mr. Vinton Itoya	Dip. Lib. -Library Science. B. Lis. - Lib & Info. Science. M.Td. - Educational Management.	Registrar
4	Dr. Gladday Igweagbara	B. Sc. – Botany MBA - Accounting MPhil/Ph.D. - Accounting	Bursar
5	Dr. Mrs. Rosemary Odiachi	B. Sc. - Library Science M. Sc. - Library Science Ph. D. - Library Science	Librarian

LIST OF STAFF IN THE DEPARTMENT

S/N	NAME OF STAFF	DESIGNATION	QUALIFICATION	STATUS
1	Engr. (Dr.) Mrs. J.S. Okpoko	Senior Lecturer	ND, (Fed. Poly Ado Ekiti),1982, HND, Fed. Poly Ado Ekiti), 1985 B.Eng, (UNIBEN) 2004, M.Eng,(UNIBEN) 2008 Ph.D, (UNIBEN) 2018 MNSE, COREN Reg. (R17,788)	Full Time
2	Engr. (Dr) Adedayo Aladenika	Lecturer I	B.Eng. (UNILORIN) 1997 M.Eng.(UNIPORT) 2007 PhD, (UNIBEN) 2021 COREN Reg (R.12,297)., MNSE	Full Time
3	Engr. Godwin Enoyoze Odiase	Lecturer I	B.Sc. (Manila) 1982 M.Sc (Cum Laude, Manila) 1984 MNSE , COREN Reg. (R,5456) MNICE	Full Time
4	Engr S.O. Ikri	Lecturer I	B. Eng.(AAU, Ekpoma) 2010, M. Eng. (FUTA) 2016, MNSE, COREN Reg. (R,45,284)	Full Time
5	Onosigho Aghogho	Technologist II	ND (Ozoro) 2013, HND (Ozoro) 2016, member (NATE)	Full Time
6	Urhude Maxwell O.	Technologist II	ND (Ozoro) 2012, HND (Ozoro) 2015, PGD (COOU) 2021,	Full Time
7	Osaikhuiwuomwan Bridget B.	Personal Secretary I	ND (Uniben) 1999, OND (Auchi) 2000, HND (Auchi) 2004, PGD (BIU) 2021.	Full Time

B.Eng. Civil Engineering

Overview

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

Philosophy

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

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

Objectives

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

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

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

Employability Skills

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

21st Century Skills

The 21st century skills includes the innovative skills:

1. creativity and innovation;
2. critical thinking/problem solving/decision making;
3. communication;
4. collaboration (team work);
5. learning to learn/metacognition;
6. citizenship 9local and global);
7. general computer literacy and mastery of relevant information technology;

Unique Features of the Programme

1. sound exposure to all areas of civil engineering, including environmental engineering;
2. good exposure to allied areas such as law, economics and management;
3. Familiarity with general knowledge, including philosophy, entrepreneurial skills and history;

4. ability to communicate ideas effectively using modern tools involving computers, internet and telecommunication; and
5. capacity of graduates to establish their own businesses and go into paid employment with government or in industry; or pursue further studies.

Admission and Graduation Requirements

Admission Requirements

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

1. Unified Tertiary Matriculation Examination (UTME) Mode (5 Year Degree Programme)
2. Direct Entry (DE) Mode (4 Year Degree Programme)

Unified Tertiary Matriculation Examination (UTME) Mode

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

Direct Entry (DE) Mode

For four-year Direct Entry, in addition to five (5) Senior School Certificate (SSC) credit passes which must include English Language, Mathematics, Physics and Chemistry, candidates with at least two passes in relevant subjects (Mathematics, Physics and Chemistry) at the GCE Advanced Level or IJMB or JUPEB may be considered for admission. Candidates who have good National Diploma (ND) result in relevant Engineering Technology programmes may also be considered for admission into 200 level. Holders of upper credit pass and above at Higher National Diploma (HND) level, are eligible for consideration for admission into 300 level.

Graduation Requirements

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

1. Candidates admitted through the UTME mode shall have registered for a minimum of 150 and maximum of 180 units of courses during the 5–year engineering degree programme. Such candidates shall have spent a minimum of ten academic semesters.
2. Candidates admitted through the direct entry mode shall have registered for minimum of 120 and maximum of 150 units of courses during a 4–year engineering degree programme. Such candidates shall have spent a minimum of eight academic semesters.

3. HND holders who enter the degree programme at 300 level should register for a minimum of 90 units of courses and a maximum of 120 units of courses.
4. The minimum and maximum credit load per semester is 15 and 24 credit units respectively.
5. A student shall have completed and passed all the Courses registered for, including all compulsory courses and such elective /optional courses as may be specified by the university/faculty or department; obtained a minimum Cumulative Grade Point Average (CGPA) specified by the university but not less than 1.00.
6. A student shall also have earned the 15 credit units of Students Industrial Work Experience Scheme (SIWES), 8 credit units of University General Study courses and four credit units of Entrepreneurship courses.

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

Prerequisite courses must be taken and passed before a particular course at a higher level. Furthermore, if a student fails to graduate at the end of normal academic session, he or she would not be allowed to exceed a total of 15 semesters in the case of students admitted through UTME and 13 semesters in the case of Direct Entry students.

Global Course Structure

Level	GST/ENT	Basic Science	Discipline/ GET	Programme (CEE)	SIWES*	Total Units
100L	4	13	3	2	-	22
200L	4	-	26	2	3	32
300L	4	-	18	12	4	34
400L	-	-	-	3	8	3
500L	-	-	5	9	-	14
Total	**12**	**13**	**52**	**28**	**(15)**	**105**

*Not included in Total 105 units of 70% NUC CCMAS Component

100 Level

Course Code	Course Title	Units	Status	LH	PH
GST 111	Communication in English	2	C	15	45
GST 112	Nigerian Peoples and Culture	2	C	30	-
CHM 101	General Chemistry I	2	C	30	
CHM 102	General Chemistry II	2	C	30	-
CHM 107	General Practical Chemistry I	1	C	-	45
CHM 108	General Practical Chemistry II	1	C	-	45
GET 101	Engineer in Society	1	C	15	-
GET 102	Engineering Graphics and Solid Modelling I	2	C	15	45
MTH 101	Elementary Mathematics I	2	C	30	-
MTH 102	Elementary Mathematics II	2	C	30	-
PHY 101	General Physics I	2	C	30	-
PHY 102	General Physics II	2	C	30	-
PHY 107	General Practical Physics I	1	C	-	45
PHY 108	General Practical Physics II	1	C	-	45
CEE101	Introduction to Civil Engineering	2	C	15	
BIU-IDS 101	Rudiment of Christian Life	1	C	15	--
BIU-MTH 103	Elementary Mathematics III (Vectors, Geometry and Dynamics)	2	C	30	--
BIU-PHY 102	General Physics II (Electricity and Magnetism)	2	C	30	--
BIU-PHY 104	General Physic Iv (Vibration, Waves and Optics)	2	C	30	--
BIU-STA 112	Probability I	2	C	30	--
BIU-IDS 111	Christian Life	1	C	15	--
Total		**32**			

200 Level

Course Code	Course Title	Units	Status	LH	PH
GST 212	Philosophy, Logic and Human Existence	2	C	30	-
ENT 211	Entrepreneurship and Innovation	2	C	30	-
GET 201	Applied Electricity I	3	C	45	-
GET 202	Engineering Materials	3	C	45	
GET 204	Students Workshop Practice	2	C	15	45
GET 205	Fundamentals of Fluid Mechanics	3	C	45	-
GET 206	Fundamentals of Thermodynamics	3	C	45	-
GET 208	Strength of Materials	3	C	45	-
GET 209	Engineering Mathematics I	3	C	45	-
GET 210	Engineering Mathematics II	3	C	45	-
GET 211	Computing and Software Engineering	3	C	30	45
CEE 201	Civil Engineering Drawing	2	E	15	45
*GET 299	SIWES I: Students Work Experience Scheme	3	C	9 Weeks	
BIU-GET 207	Applied Mechanics	3	C	45	--
Total		**33**			

300 Level

Course Code	Course Title	Units	Status	LH	PH
ENT 312	Venture Creation	2	C	15	30
GST 312	Peace and Conflict Resolution	2	C	30	-
GET 301	Engineering Mathematics III	3	C	45	-
GET 302	Engineering Mathematics IV	3	C	45	-
GET 304	Engineering Communication, Technical Writing and Presentation	3	C	45	-

GET 305	Engineering Statistics and Data Analytics	3	C	45	-
GET 306	Renewable Energy Systems and Technology	3	C		
GET 307	Introduction to Artificial Intelligence, Machine Learning and Convergent Technologies	3	C	45	-
CEE 301	Fluid Mechanics	3	C	30	45
CEE 303	Engineering Geology	2	E	15	45
CEE 304	Civil Engineering materials	3	E	30	45
CEE 307	Structural Mechanics I	2	E	30	-
CEE 308	Engineering Surveying and Photogrammetry I	2	C	15	45
*GET 399	SIWES II: Students Work Experience Scheme	4	C	12 Weeks	
BIU-CEE 302	Strength of Structural Materials	2	C	30	-
BIU-CEE 303	Civil Engineering Practices	2	C	30	-
BIU-GET 314	Engineering Economics	3	C	45	-
Total		**34**			

400 Level

Course Code	**Course Title**	**Units**	**Status**	**LH**	**PH**
CEE 406	Engineering Surveying and Photogrammetry II	3	E	30	45
*GET 499	SIWES III	8	C	24 Weeks	
BIU-CEE 401	Hydraulic and Hydrology Engineering	3	C	30	45
BIU-CEE 402	Design of Structures	2	C	30	--
BIU-CEE 403	Soil Mechanics II	2	C	15	45
BIU-CEE 404	Structural mechanics II	2	C	30	--
BIU-CEE 405	Highway Engineering	2	C	30	--
Total		**14**			

*SIWES Courses

GET 299	SIWES I	3	C	9 weeks	
GET 399	SIWES II	4	C	12 weeks	
GET 499	SIWES III	8	C	24 weeks	
Total Siwes Units		**15**			

*****All credited in second semester of 400 level

500 Level

Course Code	**Course Title**	**Units**	**Status**	**LH**	**PH**
GET 501	Engineering Project Management	3	C	45	-
GET 502	Engineering Law	2	C	30	-
CEE 506	Construction Engineering	3	E	30	45
CEE 599	Project	6	C	-	270
BIU-CEE 501	Design of Structures III	2	C	30	--
BIU-CEE 504	Environmental Engineering I	2	C	30	--
BIU-CEE 508	Highway and Transportation Engineering	2	C	30	--
BIU-CEE 512	Geotechnical Engineering	2	C	15	45
Elective courses: Select two (2) Electives					
BIU-CEE 502	Structural Mechanics III	2	E	30	--
BIU-CEE 503	Water Recourses Engineering	2	E	30	--
BIU-CEE 505	Drainage and Irrigation Engineering	2	E	30	--
BIU-CEE 507	Design of Hydraulic Structures	2	E	30	--
BIU-CEE 509	Advance Pavement design	2	E	30	--
BIU-CEE 514	Environmental Engineering II	2	E	30	--
BIU-CEE 515	Coastal Engineering	2	E	30	--
Total		**23**			

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). Mechanics of writing. Information and Communication Technology in modern language learning. Language skills for effective communication. The art of public speaking.

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

Learning Outcomes

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

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

7. identify the acceptable norms and values of the major ethnic groups in Nigeria; and
8. list possible solutions to identifiable Nigerian environmental, moral and value problems.

Course Contents

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

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

Learning Outcomes

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

1. define atom, molecules and chemical reactions;
2. discuss the modern electronic theory of atoms;
3. write electronic configurations of elements on the periodic table;
4. 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 Lech atelier's principle to predict the effect of concentration, pressure and temperature changes on equilibrium mixtures;

9. analyse and perform calculations with the thermodynamic functions, enthalpy, entropy and free energy; and
10. determine rates of reactions and its dependence on concentration, time and temperature.

Course Contents

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

CHM 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.
10.

Course Contents

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

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

Learning Outcomes

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

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

Course Contents

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

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

Learning Outcomes

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

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

Course Contents

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

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

Learning Outcomes

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

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

Course Contents

Elementary set theory, subsets, union, intersection, complements, 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, the argand diagram. De-Moiré's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition and factor formulae.

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

Learning Outcomes

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

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

Course Contents

Functions of a real variable, graphs, limits and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation, maxima and minima. Extreme curve sketching, integration, definite integrals, reduction formulae,

application to areas, volumes (including approximate integration: Trapezium and Simpson's rule).

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

Learning Outcomes

On completion, the students should be able to:

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

Course Contents

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

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

Learning Outcomes

On completion, the students should be able to:

1. explain the concepts of heat and temperature and relate the temperature scales;
2. define, derive and apply the fundamental thermodynamic relations to thermal systems;

3. describe and explain the first and second laws of thermodynamics, and the concept of entropy;
4. state the assumptions of the kinetic theory and apply techniques of describing macroscopic behaviour;
5. deduce the formalism of thermodynamics and apply it to simple systems in thermal equilibrium; and
6. describe and determine the effect of forces and deformation of materials and surfaces.

Course Contents

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

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

Learning Outcomes

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

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

Course Contents

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

curriculum overview, technical, soft and digital skills. Guest seminars and invited lectures from different engineering professional associations.

GET 102: Engineering Graphics and Solid Modelling I

(2 Units C: LH 15; PH 45)

Learning Outcomes

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

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

Course Contents

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

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

Learning Outcomes

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

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

Course Contents

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

BIU-IDS 101 Rudiment of Christian Life (1 Unit C: LH 15)

Senate– Approved Relevance

Benson Idahosa University is a Christian University whose core value is not just to raise academics but professionals and entrepreneurs who will be effective disciples for Christ by excelling in their chosen professional fields. Therefore, this course is aimed at providing every student admitted into the university with the fundamental knowledge of the Christian faith. The relevance of the course is seen in the area of enhancing the Christian knowledge of the students, ethical and spiritual values so they can become responsible and productive members of the Nigerian society.

Overview

From biblical point of view, life outside God is mere existence. For anyone to experience purposeful and meaningful life such must be equipped with the basic knowledge of Christianity. The rudiments of Christian faith affords one the opportunity of understanding the doctrine of salvation, the Christian personal life, Christian marriage, its uniqueness and the Bible as God's eternal word.

Furthermore, various views on the state of man at creation will be evaluated. The three aspects of salvation, Divine means of salvation are explained, In addition, the Christian personal life, his personal walk and required responsibilities are unveiled. This course also emphasizes the nitty-gritty of Christian marriage and historical development of the Bible.

Objectives

The basic objective of the course in specific forms are to:

1. identify the various definitions or meanings of salvation and other salvific concepts;
2. identify other aspects of salvation and divine means of salvation;
3. identify divergent views about the original state of man at creation;
4. examine the Christian personal life and required responsibilities;
5. examine the uniqueness of Christian marriage vis-à-vis the other forms of marriages in Africa;
6. examine the concept of Christian youth and marriage;
7. identify God's order for various categories in the family;
8. examine the Bible and its historical development.

Learning Outcomes

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

1. discuss the doctrine of salvation and mention at least two different definitions on salvation;
2. state at least three variant views of the original state of man at creation;
3. identify the Christian personal life and state at least four of the required responsibilities;
4. discuss at least two areas of the uniqueness of Christian marriage vis-à-vis the other types of marriages in Africa;
5. discuss the concept of Christian youth and marriage;
6. define the concept of Christian marriage and family and state at least two major reasons for divorce and re-marriage;
7. identify God's order for at least four various categories in the family; and
8. state the origin of the Bible, three specific years of its historical development, biblical inspiration and canonicity.

Course Contents

The doctrine of salvation. The state of man. Three distinct views of the state of man: the protestant view, the catholic view, the rationalist view. The way of salvation (THE ORDO SALUTIS): repentance and faith. The three aspects of salvation: Justification, Regeneration and Sanctification. The Divine means for salvation: the blood of Jesus Christ, the Holy Spirit, the Word of God. The Christian Personal Life: a personal walk, obedience to his word, serving with talents, preaching the gospel, worshipping with his money, responding with his time, showing hospitality and walking in the Holy Spirit. Christian marriage and family: what is Christian marriage? The Christian youth and marriage. God's order for various members of Christian family. Divorce and Re-marriage. The content of the Bible, Old and New Testament. Biblical translations from antiquity: the Septuagint, the Targum. The division of Hebrew scripture into both Old and New Testament. The Hebrew division of the Old Testament which include the law, the prophets and the writings. The English division of the Old Testament include: the Law, the Historical Books, the Wisdom Books subdivided into the major and Minor Prophets. The History, style of writing and type of material used for writing the New Testament such as the ostraka, the papyrus, the uncials, the miniscules and the lectionaries. The writings of the Church Fathers. The Division of the New Testament: The Gospels, the Pauline Epistles, the General Epistles and the Apocalypse. The History of English Translation, the Canon of the Bible, the Apocrypha Books, the inspiration of the Bible.

Minimum Academic Standards

In accordance with the NUC- MAS requirement facilities.

BIU-MTH 103: Elementary Mathematics III (2 UNITS: C LH 30)

(Vectors, Geometry and Dynamics)

Senate-approved relevance

Training of quality graduates who are highly skilled and knowledgeable in mathematics will enhance the development of engineering and technology in Nigeria and the world at large.

Engineers must be able to solve problems involving objects of different shapes and sizes. Mathematics makes student to problem solving and analytical skills. This is in agreement with BIU's mission to raise academics, professionals and entrepreneurs, who are Disciples of Christ, and excelling as transparent engineering graduates. Relevance is seen in engineers from BIU being able to acquire skills that would enhance their ability to contribute positively in the public and private sectors of the economy, as well as in Nigeria's rapid industrialization and development.

Overview

One of the skills needed in engineering practice is the possession of problem solving and analytical skills. Engineering involves significant solving different types of problems that require knowledge of mathematics. This also involve the ability to analyse and make mathematical calculations. In engineering practice, we come across objects that are of different shapes, that are in motion and that are being acted upon by different types of forces.

This course covers vectors, geometry and dynamics. Analysis of vectors, solving forces and momentums of particles in motion. This course is expected to assist the students to develop skills to differentiate and integrate vectors. Analysis of different geometrical objects will also be discussed. Engineering systems involve moving objects, parts in same or different directions. We must be able to analyse and resolve these interrelated motions and forces. This is the focus of the third aspect of this course.

Objectives

The objectives of this course are to:

1. solve some vectors in addition and multiplication;
2. calculate force and momentum of particles in motion;
3. solve differentiation and integration of vectors;
4. analyse problems involving co-ordinate geometry;
5. analyse and solve problems involving various geometric shapes;
6. analyse and calculate forces acting on a particle;
7. analyse and solve forces and momentum of particles in upward motion;
8. solve problems involving elasticity, pendulum and impact of objects.

Learning Outcomes

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

1. solve at least 3 vectors in addition and multiplication;
2. calculate force and momentum of particles in motion;
3. solve at least 5 problems involving differentiation and integration of vectors;
4. calculate at least 5 problems involving co-ordinate geometry;
5. analyse and solve at least 5 problems involving various geometric shapes;
6. evaluate and calculate at least 3 forces acting on a particle;
7. analyse and solve forces and momentum of particles in at least 2 types of upward motion; and
8. solve at least 3 problems each involving elasticity, pendulum and impact of obje

Course Contents

(Pre-requisite –MTH 101)

Geometric representation of vectors in 1-3 dimensions, components, direction cosines. Addition, scalar, multiplication of vectors, linear independence. Scalar and vector products of two vectors. Differentiation and integration of vectors with respect to a scalar variable. Two-dimensional co-ordinate geometry. Straight lines, circles, parabola, ellipse, hyperbola. Tangents, normals. Kinematics of a particle. Components of velocity and acceleration of a particle moving in a plane. Force, momentum, laws of motion under gravity, projectiles and resisted vertical motion. Elastic string and simple pendulum. Impulse, impact of two smooth spheres and a sphere on a smooth surface.

Minimum Academic Standards

In accordance with the NUC- MAS requirement facilities.

BIU-PHY 102 General Physics II (Electricity & Magnetism) (2 Units: C LH 30)

Senate-Approved Relevance

Training of quality graduates who are highly skilled and knowledgeable in the General Physics to enhance the development of engineering and technology in Nigeria and the world at large. This is in agreement with BIU's mission to raise academics, professionals and entrepreneurs, who are Disciples of Christ, and excelling as transparent mechanical engineering graduates. Relevance is seen in engineering General Physics from BIU being able to develop techniques that would enhance analytical knowledge in engineering facilities in the public and private sectors of the economy, as well as in Nigeria's rapid industrialization and development.

Course Overview

Electricity and magnetism are two related phenomena produced by the electromagnetic force. Together, they form electromagnetism. A moving electric charge generates a magnetic field. A magnetic field induces electric charge movement, producing an electric current. Electricity is the phenomenon associated with either stationary or moving electric charges.

The source of the electric charge could be an elementary particle, an electron (which has a negative charge), a proton (which has a positive charge), an ion, or any larger body that has an imbalance of positive and negative charge. Positive and negative charges attracts each other (e.g., protons are attracted to electrons), while like charges repel each other (e.g., protons repel other protons and electrons repel other electrons). Magnetism on the other hand, is defined as the physical phenomenon produced by moving electric charge. Also, a magnetic field can induce charged particles to move, producing an electric current. An electromagnetic wave (such as light) has both an electric and magnetic component. The two components of the wave travel in the same direction, but oriented at a right angle (90 degrees) to one another.

Objectives

The objectives of the course are to:

1. apply the knowledge of electricity in the everyday aspect of life;

2. learn the concepts of charge and how charges interact with each other;

3. distinguish between conductors, insulators, semiconductors and superconductors;

4. quantify charge interactions using Coulomb's Law and apply to problems in both one and two dimensions;

5. understand electricity and magnetism on a level that uses standard mathematical tools;

6. develop a conception of space and time adequate for understanding electrodynamics;

7. develop and train problem-solving skills; and

8. establish the foundation for higher-level courses in physics and engineering.

Learning Outcomes

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

1. describe the electric field and potential, and related concepts, for stationary charges;

2. calculate electrostatic properties of simple charge distributions using Coulomb's law, Gauss's law, and electric potential;

3. describe and determine the magnetic field for steady and moving charges;

4. determine the magnetic at least 3 properties of simple current distributions using Biot-Savart and Ampere's law;

5. describe electromagnetic induction and related concepts and make calculations using Faraday and Lenz's laws;

6. explain the basic physical significance of Maxwell's equations in integral form;

7. evaluate DC circuits to determine the electrical parameters;

8. determine the characteristics of AC voltages and currents in resistors, capacitors, and Inductors.

Course Contents

Forces in nature. Electrostatics (electric charge and its properties. Methods of charging. Coulomb's law and superposition. Electric field and potential. Gauss's law. Capacitance. Electric dipoles. Energy in electric fields. Conductors and insulators. DC circuits (current, voltage and resistance). Ohm's law. Resistor combinations. Analysis of DC circuits. Magnetic fields. Lorentz force. Biot-Savart and Ampère's laws. Magnetic dipoles. Dielectrics. Energy in magnetic fields. Electromotive force. Electromagnetic induction.
Self and mutual inductances. Faraday and Lenz's laws. Step up and step down transformers. Maxwell equations. Electromagnetic oscillations and waves. AC voltages and currents applied to inductors, capacitors, and resistance.

Minimum Academic Standards

Engineering workshop and laboratory with NUC-MAS requirement facilities.

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

Senate-Approved Relevance

Training of quality graduates who are highly skilled and knowledgeable in Vibration, Waves and Optics to enhance the development of engineering and technology in Nigeria and the world at large. This is in agreement with BIU's mission to raise academics, professionals and entrepreneurs, who are Disciples of Christ, and excelling as transparent mechanical engineering graduates. Relevance is seen in Vibration, Waves and Optics from BIU being able to develop techniques that would enhance adequate knowledge in engineering facilities in the public and private sectors of the economy, as well as in Nigeria's rapid industrialization and development.

Course Overview

Waves and oscillations characterize many different physical systems, including vibrating strings, springs, water waves, sound waves, electromagnetic waves, and gravitational waves. Quantum mechanics even describes particles with wave functions. Despite these diverse settings waves exhibit several common characteristics, so that the understanding of a few simple systems can provide insight into a wide array of phenomena.

In this course begin with the study of oscillations of simple systems with only a few degrees of freedom. This is followed by study transverse and longitudinal waves in continuous media in order to gain a general description of wave behaviour. The rest of the course focuses on electromagnetic waves and in particular on optical examples of wave phenomena. In addition to well-known optical effects such as interference and diffraction, a number of modern applications of optics such as short pulse lasers and optical communications is studied.

Objectives

The objectives of the course are to:

1. apply knowledge and skills in Physics to the solution of theoretical and practical problems;
2. acquire skills allowing the student to identify and apply formulas of optics and wave physics using course literature;

3. identify and illustrate physical concepts and terminology used in optics and to be able to explain them in appropriate detail;
4. describe the nature of a wave and explain the distinction between wave motion and particle motion;
5. identify and distinguish between contrasting types of waves;
6. utilize the definition of wave speed to solve simple computational problems involving speed, distance and time; and
7. mathematically analyse standing wave patterns.

Learning Outcomes

At the end of the course, students should be able to:
1. describe and quantitatively analyse the behaviour of vibrating systems and wave energy;
2. explain the propagation and properties of waves in sound and light;
3. identify and apply at least 3 wave equations;
4. explain geometrical optics and principles of optical instruments;
5. define the concept of wave, describe the wave motion and derive the wave equation;
6. describe the propagation of elastic waves in a solid rod, in a spring and an ideal gases and solve related exercises/ problems;
7. derive the laws of reflection and refraction of light waves using the huygens' and fermat's principles;
8. use the principle of superposition for waves to explain the phenomena of interference of waves, standing waves and resonance;
9. describe standing waves on a string and in a vibrating column of air and solve related exercises / problems;
10 explain the Classical and relativistic Doppler effects and solve related exercises/ problems; and
11. analyse the formation of images in spherical mirrors, thin – lenses and optical instruments and solve related exercises/problems.

Course Contents

Simple harmonic motion (SHM). Energy in a vibrating system. Damped SHM. Resonance and transients. Coupled SHM. Q values and power response curves. Normal modes. Waves (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 wave equation. 2-D and 3-D wave equations. Wave energy and power. Phase and group velocities. Echo and beats. The Doppler-effect. Propagation of sound in gases, solids and liquids and their properties. Optics: Nature and propagation of light. Reflection and refraction. Internal reflection. Scattering of light. Reflection and refraction at plane and spherical surfaces. Thin lenses and optical instruments. Wave nature of light. Dispersion. Huygens's principle (interference and diffraction).

Minimum Academic Standards

Engineering workshop and laboratory with NUC-MAS requirement facilities.

BIU-STA 112 Probability I (2 Units C: LH 30)

Senate-Approved Relevance

Training of quality graduates who are highly skilled and knowledgeable in probability of the occurrence of alternative events will enhance the development of construction engineering in Nigeria. Engineers must be able to solve problems involving different data and sampling methods. A course in probability will help the student tell the time in which a particular phase in construction will finish. This is in agreement with BIU's mission to raise academics, professionals and entrepreneurs, who are Disciples of Christ, and excelling as transparent engineering graduates. Relevance is seen in engineers from BIU being able to acquire skills that would enhance their ability to contribute positively to the construction industry in Nigeria.

Overview

Probability is a numerical measure of the likelihood that an event occurs relative to a set of alternative events that do not occur. It involves estimation and tests of hypotheses. Representation and characterization of data is a necessary tool to achieving set objectives in Civil engineering.

This course will equip the students during their study and afterwards, in the aspect of design of experiment (DOE) by applying statistical methods in testing and constructing models for Civil engineering data analysis.

Objectives

The objectives of the course are to:

1. identify the basic concepts in probability;
2. explain the concept of probability;
3. identify quantitative, qualitative, discrete and continuous data;
4. identify random, stratified, systematic and cluster sampling;
5. explain the probability of compound events;
6. explain the probability of simple events; and
7. analyse the probability of complementary events.

Learning Outcomes

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

1. define the principal concepts about probability;
2. discuss at least three types of data analysis;
3. list at least three types of sampling;

4. outline at least 3 attributes of random, stratified, systematic and cluster sampling;
5. describe the probability of compound events;
6. calculate the probability of simple events; and
7. use appropriate statistical methods to collect, organize, display and analyse relevant data.

Course Contents

Representation and characterization of data. Probability theory. Elements of probability. Probability distribution. Rules for computing probabilities. Conditional probability and independence of events. Discrete random variables and their probability distribution. Estimation and tests of hypotheses concerning the parameters of the distribution. Expectation value of a discrete random variable. Regression, correlation and analysis of variance contingency table.

Minimum Academic Standards

Engineering classroom with NUC-MAS requirement facilities.

BIU – IDS 111: Life and Times of Archbishop Benson Idahosa (1 unit C: LH 15)

Senate – Approved Relevance

Archbishop Benson Idahosa was a spiritual colossus known in several parts of the world for his exceptional missionary exploits and outstanding evangelistic ministry. Therefore, the need to study his visionary, goal oriented and purpose driven life cannot be over emphasized. This course is very relevant because it will afford every student the opportunity of having a first-hand knowledge of the life and times of Archbishop Benson Idahosa. It will also enable the student to imbibe his salient qualities spiritual values and dogged faith in God.

Overview

In Christian history, few men have traversed the world with the message of the gospel like the Archbishop Benson Idahosa. An examination of the life of the Archbishop reveals a man saddled with the singular goal of saving and reaching humanity with the message of the gospel. The Archbishop Benson Idahosa's ministry was also characterized by outstanding miracles including the raising of dead back to life. Apart from his evangelistic outreaches he was also a voice to reckon with within the Nigerian political space. Furthermore, his business acumen led him to establish hospitals, primary, secondary and tertiary institutions of higher learning such as Benson Idahosa University.

An encounter with the historical details of his phenomenon life will help the students to be visionaries, goal oriented and trigger in every student the will to win in every sphere of their endeavour in life.

Objectives

The fundamental objectives of the course in specific forms are to:

1. examine the phenomenal life and times of the Archbishop Benson Idahosa;
2. identify some of his worldwide missionary efforts and worldwide ministry;
3. examine his early years and some challenges he scaled by his dogged faith in God;
4. identify his unique spiritual values and purpose driven life;
5. identify some of his contributions to societal peace and development in Nigeria;
6. examine his contributions to the spiritual growth of some famous ministers and ministry within Nigeria and across the globe;
7. expatiate on the relevance of theological (biblical) concepts such as evangelism, missions and Discipleship; and
8. explain the meaning of vision, goal setting and time management.

Learning Outcomes

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

1. discuss at least five specific areas on the life and times of Archbishop Benson Idahosa, his exceptional life history, and worldwide evangelistic ministry;
2. discuss his days of 'little beginnings', mention at least two of his major challenges and his eventual victory and progress in the midst turmoil;
3. Discuss at least three of his peculiar characteristics such as: unprecedented faith, his visionary life and unwaning missionary exploits;
4. mention at least two major ways he positively impacted the society through his business prowess and his influence in Nigerian governance (politics);
5. identify at least four of his outstanding legacies and imbibe some of his salient qualities (spiritual values) and appropriate his exemplary faith and Christian life;
6. state at least three methods of evangelism and two variant definitions and meaning of Evangelism, Missions and Discipleship;
7. discuss at least three ways to sustain one's vision and mobilize people to buy into it;
8. state clearly at least two major ways to be goal oriented; and
9. discuss at least two secrets to life and time management.

Course Contents

The definition of evangelism. The aim in evangelism. The 4C's of evangelism. New Testament concept of evangelism. Motivations for evangelism. Methods of evangelism. Literature of evangelism. The meaning of 'Disciple'. Jesus concept of Discipleship. The demands of discipleship. Definition of missions. Origin of modern missionary movement and characteristics. Missionary work in the 20th century. Studying the Life and Times of Archbishop Benson Idahosa through the work book FIRE IN HIS BONES. How to sustain your vision and mobilize people to buy into it. How to set and reach your goals. Taking your community by storm. Time and life management and how to invest your life.

Minimum Academic Standards

In accordance with the NUC- MAS requirement facilities.

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 asses the rationality or otherwise of human conduct under different existential conditions;
7. develop the capacity to extrapolate and deploy expertise in logic to other areas of knowledge, and
8. guide his or her actions, using the knowledge and expertise acquired in philosophy and logic.

Course Contents

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

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

Learning Outcomes

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

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

Course Contents

The concept of entrepreneurship (entrepreneurship, intrapreneurship/corporate entrepreneurship); theories, rationale and relevance of entrepreneurship (Schumpeterian and other perspectives, risk-taking, necessity and opportunity-based entrepreneurship, and creative destruction); characteristics of entrepreneurs (opportunity seeker, risk-taker, natural and nurtured, problem solver and change agent, innovator and creative thinker); entrepreneurial thinking (critical thinking, reflective thinking and creative thinking).

Innovation (The concept of innovation, dimensions of innovation, change and innovation, knowledge and innovation). Enterprise formation, partnership and networking (basics of business plan, forms of business ownership, business registration and alliance formation, and joint ventures). Contemporary entrepreneurship issues (knowledge, skills and technology, intellectual property,

virtual office and networking). Entrepreneurship in Nigeria (biography of inspirational entrepreneurs, youth and women entrepreneurship, entrepreneurship support institutions, youth enterprise networks and environmental and cultural barriers to entrepreneurship). Basic principles of e-commerce.

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

Learning Outcomes

Students will be able to:

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

Course contents

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

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

Learning Outcomes

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

1. demonstrate the role of atoms and molecules (aggregates of atoms) in the building of solid/condensed matter known as engineering materials, the electrons quantum numbers and how the electrons are arranged in different atomic elements, and explain the role of electronic configuration and valence electrons in bonding;
2. define metals, alloys and metalloids, demonstrate mental picture of the solid mineral resources development as a relay race among four 'athletes': geologist, mining engineer, mineral processing technologist, process metallurgical engineer, and classify metallurgical engineering into 3Ps: process, physical and production;
3. explain the relationship between structure and properties of materials, characteristics, components and compositions of phase diagrams and phase transformations of solid solutions;
4. define ceramics, glass and constituents of glasses and understand application of ceramics in mining, building, art and craft industries;

5. define and classify polymers as a class of engineering materials and polymeric materials, demonstrate polymerisation reactions, their types and mechanism, and applications of polymers;
6. define properties, types and application of composite materials and fibres (synthetic and natural);
7. define and classify nanomaterials, demonstrate applications of nanomaterials, concept, design and classification of fracture mechanics, corrosion classification, including the five principal ways of controlling corrosion and metal finishing processes such as sherardising, galvanising and anodising; and
8. identify factors affecting the performance and service life of engineering materials/metals and metallography of metals/materials (materials anatomy), which enables metallurgical and materials engineers to prescribe appropriate solutions to test metals/materials fitness in service through structure-property-application relationships.

Course Contents

Basic material science; atomic structure, atomic bonding and crystal structures. Engineering materials situating metals and alloys; metals and alloys, classifications of metals, metal extraction processes using iron and steel (ferrous) and aluminium (nonferrous) as examples, phase diagrams/iron carbon diagrams, and mechanical workings of metals. Selection and applications of metals and alloys for specific applications in oil, aerospace, construction, manufacturing and transportation industries, among others. Ceramics (including glass); definition, properties, structure and classifications of ceramics. Bioactive and glass – ceramics. Toughing 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: Student Workshop Practice (2 Units C: LH 15; PH 45)

Learning Outcomes

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

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

Course Contents

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

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

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

Learning Outcomes

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

1. explain the properties of fluids;
2. determine forces in static fluids and fluids in motion;

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

Course Contents

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

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

Learning Outcomes

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

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

11. evaluate thermodynamic applications using second law of thermodynamics;
12. calculate thermal efficiency and coefficient of performance for heat engine, refrigerators and heat pumps; and
13. restate perpetual-motion machines, reversible and irreversible processes.

Course Contents

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

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

Learning Outcomes

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

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

Course Contents

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

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

Learning Outcomes

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

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

Course Contents

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

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

Learning Outcomes

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

1. describe physical systems using ordinary differential equations (ODEs);
2. explain the practical importance of solving ODEs, solution methods, and analytically solve a wide range of ODEs, including linear constant coefficient types;
3. numerically solve differential equations using MATLAB and other emerging applications;
4. perform calculus operations on vector-valued functions, including derivatives, integrals, curvature, displacement, velocity, acceleration, and torsion, as well as on functions of several variables, including directional derivatives and multiple integrals;

5. solve problems using the fundamental theorem of line integrals, Green's theorem, the divergence theorem, and Stokes' theorem, and perform operations with complex numbers;
6. apply the concept and consequences of analyticity and the Cauchy-Riemann equations and of results on harmonic and entire functions of complex variables, as well as the theory of conformal mapping to solve problems from various fields of engineering; and
7. evaluate complex contour integrals directly and by the fundamental theorem, apply the Cauchy integral theorem in its various versions, and the Cauchy integral formula.

Course Contents

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

GET 211: Computing and Software Engineering

(3 Units C: LH 30; PH 45)

Learning Outcomes

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

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

Course Contents

Introduction to computers and computing; computer organisation – data processing, memory, registers and addressing schemes; Boolean algebra; floating-point

arithmetic; representation of non-numeric information; problem-solving and algorithm development; coding (solution design using flowcharts and pseudo codes). Data models and data structures; computer software and operating system; computer operators and 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 (3 Units C: 9 weeks)

Learning Outcomes

SIWES I should provide opportunity for the students to:

1. acquire industrial workplace perceptions, ethics, health and safety consciousness, inter-personal 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. (8-10 weeks during the long vacation following 200 level).

NOTE: **Each programme to indicate additional details of programme-specific activities for their students.**

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

Learning Outcomes

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

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

Course Contents

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

BIU-GET 207 Applied Mechanics (3 Units C: LH 45)

Senate-approved relevance

Training of quality graduates who are highly skilled and knowledgeable in the Applied Mechanics is necessary to enhance the development of engineering and technology in Nigeria and the world at large. This is in agreement with BIU's mission to raise academics, professionals and entrepreneurs, who are Disciples of Christ, and excelling as transparent civil engineering graduates. Relevance is seen in Applied Mechanics from BIU being able to develop techniques that would enhance mathematical analysis in civil engineering facilities or structures in the public and private sectors of the economy, as well as in Nigeria's rapid industrialization and development.

Course Overview

Engineering problems are generally tackled with applied mechanics through the application of theories of classical mechanics and fluid mechanics. Because applied mechanics can be applied in engineering disciplines like civil engineering, mechanical engineering, aerospace engineering, materials engineering, and biomedical engineering, it is sometimes referred to as engineering mechanics. Science and engineering are interconnected with respect to applied mechanics, as researches in science are linked to research processes in civil, mechanical, aerospace, materials and biomedical engineering disciplines.

In civil engineering, applied mechanics' concepts are applied to structural design and a variety of engineering sub-topics like structural, coastal, geotechnical, construction, and earthquake engineering. In mechanical engineering, it can be applied in mechatronics and robotics, design and drafting, nanotechnology, machine elements, structural analysis, friction stir welding, and acoustical engineering. In aerospace engineering, applied mechanics is used in aerodynamics, aerospace structural mechanics and propulsion, aircraft design and flight mechanics. In materials engineering, applied mechanics' concepts are used in thermo-elasticity, elasticity theory, fracture and failure mechanisms, structural design optimization, fracture and fatigue, active materials and composites, and computational mechanics. Research in applied mechanics can be directly linked to biomedical engineering areas of interest like orthopaedics; biomechanics; human body motion analysis; soft tissue modelling of muscles, tendons,

ligaments, and cartilage; biofluid mechanics; and dynamic systems, performance enhancement, and optimal control,

Objectives

The objectives of the course are to:

1. explain basic concepts and system of forces;
2. describe the relationship of physical processes, kinetics and kinematics;
3. develop skills to use the basic principles of mechanics in engineering applications;
4. apply engineering design principles to produce solutions that meet specified needs of the society;
5. analyse kinetic energy using momentum principles.

Learning Outcomes

Students will acquire the ability to:

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

Course Contents

Forces. Basic introduction to moments and couples. Equilibrium of simple structures and machine parts. Friction. First and second moments of area. Centroids. Kinematics of particles and rigid bodies in plane motion. Newton's laws of motion. Analysis of Newtonian Physics. Kinetic energy and momentum analysis. Engineering design principles.

Minimum Academic Standards

In accordance with the NUC- MAS requirement facilities.

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

Course Contents

Linear Algebra. Elements of Matrices, Determinants, Inverses of Matrices. Theory of Linear Equations. Eigen Values and Eigen Vectors. Analytical Geometry. Coordinate Transformation.

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

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

Learning Outcomes

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

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

Course Contents

Series solution of second order linear differential equations with variable coefficients. Bessel and Legendre equations. Equations with variable coefficients. Sturn-Louville boundary value problems. Solutions of equations in two and three dimensions by separation of variables. Eigen value problems. Use of operations in the solution of partial differential equations and linear integral equations. Integral transforms and their inverse including Fourier, Laplace, Mellin and Handel Transforms. Convolution integrals and Hilbert Transforms. Calculus of finite differences. Interpolation formulae. Finite difference equations. RungeKutta and other methods in the solutions of ODE and PDEs. Numerical integration and differentiation.

GET 304: Technical Writing and Communication

(3 Units C: LH 45)

Learning Outcomes

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

1. demonstrate the concept of clear writing, common pitfalls and unambiguous language in engineering communication, including technical reporting for different applications and emotional comportment;

2. demonstrate the skills of language flexibility, formatting, logic, data presentation styles, referencing, use of available aids, intellectual property rights, their protection, and problems in engineering communication and presentation; and
3. demonstrate good interpersonal communication skills through hands-on and constant practice on real-life communication issues for engineers in different sociocultural milieu for engineering designs, structural failure scenarios and presentation of reports.

Course Contents

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

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

Learning Outcomes

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

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

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

Course Contents

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

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

Learning Outcomes

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

1. explain the meaning, purpose, scope, stages, applications and effects of artificial intelligence;
2. explain the fundamental concepts of machine learning, deep learning and convergent technologies;
3. demonstrate the difference between supervised, semi-supervised and unsupervised learning;
4. demonstrate proficiency in machine learning workflow and how to implement the steps effectively;
5. explain natural languages, knowledge representation, expert systems and pattern recognition;
6. describe distributed systems, data and information security and intelligent web technologies;

7. explain the concept of big data analytics, purpose of studying it, issues that can arise with a data set and the importance of properly preparing data prior to a machine learning exercise; and
8. explain the concepts, characteristics, models and benefits, key security and compliance challenges of cloud computing.

Course Contents

Concepts of human and artificial intelligence; artificial/computational intelligence paradigms; search, logic and learning algorithms. Machine learning and nature-inspired algorithms – examples, their variants and applications to solving engineering problems; understanding natural languages; knowledge representation, knowledge elicitation, mathematical and logic foundations of AI; expert systems, automated reasoning and pattern recognition; distributed systems; data and information security; intelligent web technologies; convergent technologies – definition, significance and engineering applications. Neural networks and deep learning. Introduction to python AI libraries.

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

Learning Outcomes

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

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

The experience is to be graded and the students must pass all the modules of the attachment and shall form part of CGPA.

Course Contents

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

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

Section B: Mechanical design with computer graphics and CAD modelling and drafting. Introduction to Solid works: software capabilities, design methodologies and applications. Basics part modelling: sketching with SolidWorks, building 3D components, using extruded Bose base · Basic assembly modelling, and solid Works drawing drafting. Top-down assembly technique exploded view, exploded line sketch. Introduction to PDMS 3D design software; AutoCAD mechanical, SPSS.

A comprehensive case study design project. The student should be introduced to the concept of product/component design and innovation and then be given a comprehensive design project.

Examples of projects should include the following: a. Design of machine components;

b. Product design and innovation;
c. Part modelling and drafting in SolidWorks; and
d. Technical report writing.

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

Learning Outcomes

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

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

Course Contents

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

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

Learning Outcomes

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

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

Course Contents

Advanced topics on axial, lateral, and torsional loading of shafts and beams; slope and deflection of beams; unsymmetrical bending and shear centre; applications.

Springs. Creep, fatigue, fracture and stress concentration. Stresses in thin and thick cylinders, and rotating disks. Multi-dimensional stress systems, Mohr's circle and failure theories.

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

Learning Outcomes

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

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

Course Content

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

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

Learning Outcomes

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

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

Course Contents

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

CEE 305: Soil Mechanics I (3 Units C: LH 30; PH 45)

Learning Outcomes

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

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

Course Contents

Mineralogy of soils and soil structures. Formation of soils, soil classification, engineering properties of soils. Soil in water relationships - void ratio, porosity, specific gravity, permeability and other factors. Atterberg limits, particle size distribution, Shear strength of soils and Mohr's stress circle. Compaction and soil stabilisation, settlement, theory of consolidation. Laboratory work.

CEE 306: Design of Structures I (2 Units C: LH 30)

Learning Outcomes

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

1. applying fundamental mechanics to the design of reinforced concrete structural elements using elastic design and limit state principles.

Course Contents

Fundamentals of design process, materials selection, building regulations and codes of practice; design philosophy. Elastic design, limit state design, of structural elements in reinforced concrete.

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

Learning Outcomes

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

1. explain the concept of statical determinacy of structures;
2. estimate the forces and deflections in statically determinate trusses;

3. estimate the shear forces, bending moments, slopes and deflection in statically determinate beams and portal frames; and
4. derive the influence lines for moving loads on trusses and beams.

Course Contents

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

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

Learning Outcomes

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

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

Course Contents

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

BIU-CEE 302 Strength of Structural Materials (2 Units C: LH 30 PH 45)

Senate- Approved Relevance

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

Strength of materials involves drawing the free body diagram to determine force equilibrium and considering effects of temperature, pressure, moment and shear on the member. It's

worthy to note that during bending of structure due to external load, stresses are induced internally. These stresses are required to be analysed to reduce its negative effect on the safety of the structural member.

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

Objectives

The objectives of the course are to:

1. explain some advance cases in bending moment, shear force and axial force diagrams;
2. recognize fundamental beam theories;
3. distinguish between symmetrical and unsymmetrical bending and shear center in beam;
4. explain failure theories and its application in the analysis of deflection, springs, creep, fatigue, fracture and stress concentration;
5. explain the different state of stresses and deformation of axially loaded member;
6. describe Mohr's circle method of stress analysis; and
7. explain strain energy, strings and strength factors.

Learning Outcomes

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

1. determine force reactions, internal stresses and plot the axial force diagram, shear force diagram and effects of bending moment diagram of at least three (3) types of beams under various loading;
2. analyse the unsymmetrical bending and explain elementary bending theory in beam;

3. derive expression of stresses and strains in an axially loaded element and analyse the deformation of biaxial and triaxial loaded members, composite bars, and indeterminate structural member;
4. use Mohr's circle to evaluate the normal and shear stresses in a multi-dimensional stress system and transformation of these stresses into strains;
5. apply concepts of stress and strain in determination of internal forces, point of shear center and stress in a solid structure;
6. explain the concepts of creep, fatigue and their implications in the use of structural materials as failure process; and
7. determine the stresses and strains due to internal pressure on thin and thick cylinder walls.
8.

Course Contents

Advanced topics on axial. Lateral and torsional loading of shafts. Beams. Advanced topics on the effects of bending moment and shear force diagrams in structures. Theory of bending of beams. Unsymmetrical bending and shear centre. Applications. Slope and deflection of beams. Strength theories stress concentration spring. Creep. Fatigue. Fracture. Stress concentration. Stresses in thin and thick cylinders. Rotating disks. Biaxial and Triaxial state of stress. Multi-dimensional stress systems. Mohr's circle. Transformation of stress. Strain energy. Closed-coiled Helical springs. Other types of springs.

Minimum Academic Standard:

Strength of Structural Materials Laboratory with a NUC-MAS requirement.

BIU – CEE 303 Civil Engineering Practice (2 Units C: LH 30)

Senate- Approved Relevance

The life of cycle of a project in a nut shell involve the feasibility study, design and construction. A project is not complete until is constructed and handed over to the promoter or the owner. At the construction state the management team is headed by the Professional Engineer and/ or Architecture. One of the reason for the high rate of failure of structures particular buildings is to inadequate trained Professional, Professional knowledge in the construction industry where men, materials, machinery, money and management work together to build a facility. In keeping with the University aspiration to produce excellent Professionals, the senate is desirous of the course, Civil Engineering Practice in Civil Engineering Curriculum of Benson Idahosa University.

Overview

Ever since dawn of civilization, man has indulged in some form of construction activities. Even in ancient times, man created architectural marvel which came to be regards as the wonders of the world for example, the pyramids of Egypt, the Grad wall of Chan, the Tower of Babel et.c. Modern construction area includes high rise building, dam, irrigation network, industrial plant e.t.c. These are realize be a team of profession and supporters. The construction team include the promoter, consulting firm, Architect/Engineer, Contractor, contracting firm and others. In general, major construction works are time bound and employ huge resources. They require high level of technology and need effective management of the resources. The overall aim of the management team is to create within the enterprise an environment which will facilitate the accomplishment of the set objective which is to complete the project on schedule and within the budget. The course involve the discussion on the scope of construction Engineering job, the standard methods of measurement of work, the type of civil engineering contract, tender and tender procedure, code of client, consultant, Engineering and contractor building regulation and safety requirement, job schedule, PERT/CPM, Cost and budgetary control, low of contractors e.t.c.

The effective supervision of construction project during construction is a very important aspect of civil engineering practice. The institution additional course BIU-CEE is design to teach some topics relating to construction project management and practice in Nigeria and the world at large. This course will discuss the various principles of contracts and the contract document. It will also cover tendering and selection of contractors and roles of key personnel involved in a civil engineering project. Site safety issues will be highlighted.

Objectives

This course intends to:

1. identify the area where civil engineering can be practiced;
2. discuss civil engineering work standard and measurement;
3. define contract, essence, nature, form, validity, type and enforcement of contract;
4. discuss general principles of contract, Civil engineering contract document, contract type and sub-contract;
5. explain tender and tendering process and selection of contractors;
6. explain the role of client, consultants, contractors and other key personnel in Civil engineering project;
7. explain building regulations, acts, safety requirements, accident and fire prevention at site.

Course learning outcomes

On completion of the course students should be able to:

1. list at least ten (10) areas were Civil Engineering can be practiced;
2. prepare Civil Engineering Standard of Measurement, Bill of Quantities (BOQ) or Bill of Engineering Measurement and Evaluation (BEME);
3. explain at least four (4) types of contracts;
4. describe at least five (5) types of Civil Engineering contract and Civil Engineering contract documents;
5. distinguish between the clients, consultant and contractor;
6. explain the tender and tendering processes of Civil Engineering contracts;

7. explain at least five (5) requirements for building regulation, safety and accident prevention in work environment; and
8. discuss at least three (3) job planning tools and techniques.

Course Contents

Introduction to areas where Civil Engineering can be practiced. Civil Engineering works standards and Measurements Definition contracts. Essence for contracts. Nature and form of contracts. Types of contract Validity and enforceability of contracts. General principles of contracts. Contract documents. Civil Engineering contracts, sub-contracts. Tenders and tendering procedures: types of tender, opening of tenders, criteria for selecting contractors, contractor motivation. Client, consultant and contractor in civil engineering projects, Requirements of building regulations and bye-laws. Factory Acts, safety requirements in building and construction sites. Fire and Accidents protection. Works construction and supervision. Role of resident and site engineers. Job planning and control: programme charts, bar charts, critical path method (CPM) and Programme Evaluation and Review Technique (PERT). Construction machinery and equipment: selection and economics in use. Applications/Case study-dams, foundations, bridges, highways, industrial buildings, sewage works. Introduction to Law and Building Contracts, Common Law-Equity statute. Area of legal Liabilities. Law of Contract, Law of Torts, Land Law, Administrative law. Principles of Law of Contract

Minimum Academic Standard:

In line with NUC-MAS requirement.

BIU-GET 314 Engineering Economics (2 Units: C LH 30)

Senate-Approved Relevance

The course is designed to fulfill the application of economics principles in the Engineering practice. Engineering Economics is a collection of mathematical techniques which simplify economic comparison to evaluate the economic aspects of different methods to accomplish a set objective. In keeping with the University desire to produce excellent professionals, the course is designed to equip the students with the economic knowledge to evaluate Engineering projects in Nigeria.

Overview

Efficient function of any business organization would enable it to provide goods and services at an economic price. In the process of managing organization, the managers at different levels should take appropriate economic decision which will help in optimizing investment, operating and maintenance expenditures besides increasing the revenue, savings and such other gains of the organization. These can be achieved through the course, Engineering Economics which deals with the methods that enable one to make economic decision towards minimizing cost and /or maximizing benefit to the business organization.

The Institutional additional course BIU-GET 314, Engineering Economics is designed to teach basic economic principles, financial management and accounting. The course cuts across all Engineering Programmes.

Course Objectives

This course intends to:
1. define and explain the importance of engineering economics;
2. explain the economic and cost analysis of engineering projects;
3. explain some techniques and methods used in economic feasibility studies and implementation of engineering projects;
4. explain the financial management of engineering projects, capital financing and investment;
5. explain the elements of cost planning, budget and budgetary control in engineering project;
6. discuss element of cost; direct and indirect cost in project implementation; and
7. explain depreciation, replacement cost and concept of value engineering in project management.

Learning Outcomes

On completion of the course, the students should be able to:
1. define and explain the importance of engineering economics;
2. explain the theories of interest, annuities and profit;
3. perform Break-Even analysis as a decision-making tool;
4. list and explain at least five (5) accounting methods;
5. explain budget and budgetary control as tools for management planning;
6. explain the element of cost; direct and indirect expenses, depreciation and replacement;
7. explain at least four (4) methods of capital financing and Investment; and
8. discuss the need for value engineering in project management.

Course Content

Definition of Engineering Economy. Interest. Annuities. Sinking fund and profit. Break-Even analysis. Financial management. Accounting methods. Book keeping and balance sheet. Profit and loss statement. Cost planning and control. Budget and budgetary control. Element of cost. Indirect expenses, depreciation and replacement. Accounting, Valuation of Asset and capital financing. Investment. Value Engineering.

Minimum Academic Standards

In line with NUC-MAS requirement.

400 Level

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

Course Contents

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

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

Learning Outcomes

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

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

Course Contents

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

BIU-CVE 401: Hydraulics and Hydrology (2 Units C: LH 30 PH 45)

Senate – Approved Relevance

Hydraulics and Hydrology course is an extremely important field of study, dealing with one of the most valuable resources on Earth: water. All aspects of the Earth's available water are studied by engineers, to obtain the information needed to manage this vital resource. It is an important field where the people who study hydraulics and hydrology use their knowledge and expertise to combat water pollution, protect the earth's water resources, and provide engineering hydrology – which is an engineering specialty focusing on water resources. In Benin City where BIU is situated witnesses the increase population and rising standards of living which greatly increased the demands of water. Hydraulics and Hydrologic studies are of utmost importance for planning and development of water resources to meet these demands. The course seeks to train civil engineers who can best contribute to national development. The training of high-quality graduates who are equipped with the tools to understand and analyse hydrology for the design and construction of all possible hydraulics structures that can possibly promote appropriate development by conceiving and adapting techniques, processes and materials as necessary. This course shows great benefit to mankind, BIU in Nigeria and the world at large.

Course Overview

Hydraulics engineering consists of the application of fluid mechanics to water flowing in an isolated environment (pipe, pump) or in an open channel (river, lake, ocean). Civil engineers

are primarily concerned with open channel flow, which is governed by the interdependent interaction between the water and the channel.

Hydraulics Structure involves extensive contents like hydrology, meteorology, water resources, geology, mechanics, mathematics, chemistry, materials, engineering and management, which is a backbone professional course for undergraduates of hydraulic engineering to learn basic knowledge and train basic skills for hydraulic and hydropower engineering. Therefore, it has always received considerable attention.

Objectives

The objectives of the course are to:

1. describe dimensional analysis;
2. explain energy equation and hydraulic lines;
3. explain the major and minor losses in a pipes;
4. discuss the capacity and operational performance of pumps and turbines;
5. describe energy and hydraulic grade lines across pump and turbine installations;
6. explain the principles of hydrologic circle and its applications;
7. obtain hydrological and meteorological data to estimate information over catchment areas;
8. obtain hydrological data to solve land drainage and inland navigation problems; and
9. explain probability and statistical methods to flood routing, unit hydrograph theory, volume runoff, storage routine and surface-water hydrology.

Learning Outcomes

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

1. explain dimensional analysis, purpose, requirements and application to pipe flow;
2. explain energy equation and hydraulic lines in a closed conduit;
3. analyse and calculate the major and minor losses, in open and closed pipe of different diameter;
4. explain the capacity and operational performance of pumps and turbines;
5. apply energy and hydraulic grade lines across pump and turbine installations;
6. explain the principle of hydrologic circle and its applications;

7. obtain hydrological and meteorological data to estimate information over catchment areas; and

8. utilise probability theory and statistical methods in flood routing, unit hydrograph theory, volume runoff, storage routine and surface-water hydrology.

Course Contents

Dimensional Analysis: Definition, purpose, and basis of dimensional analysis and requirements: dimensionless parameters, their significance and application; Model studies of flow with and without free surface. Steady Flow in Closed Conduits: Energy equation, energy and hydraulic lines; primary and minor losses. Incompressible theory, compressible theory for rigid and elastic pipe lines. Pumps: Applications and types; Energy and hydraulic grade lines in pump systems; work done, power and efficiencies. Pump characteristics, specific speed and performance; choice of pumps; Multiple pump systems. Turbines: Applications and types; Energy and hydraulic grade lines across turbine installations; Work done, power efficiencies; Inlet and Outlet velocity diagrams; Turbine characteristics, specific speed, and performance; choice of turbines. Introduction to Hydrology: Hydrology and applications; hydrologic cycle, Principles of surface water hydrology.

Meteorological data and instrumentation, Methods for estimating meteorological information over catchments. Analysis of hydrographic data. Land Drainage and inland navigation problems. Hydrometeorology principles. Probability and statistical methods in hydrology. Flood routing techniques. Qualitative hydrology analysis, unit hydrograph theory, volume runoff, storage routine, surface-water hydrology; Physical and statistical analysis related to hydrological processes.

Minimum Academic Standards

A well-equipped civil engineering hydraulics laboratory with NUC-MAS requirement facilities.

BIU-CEE 402: Design of Structures II (2 Units C: LH 30)

Senate Approved Relevance

This course teaches students the design of structural steel members of frames, trusses, and other structures encountered in typical civil engineering projects. The university senate is committed and places emphasis on the teaching and learning that will promote development of physical infrastructures and eliminate failure of structures due to inaccurate designs and construction.

Overview

This course introduces students to the behaviour and design of elements in steel structures using current design specifications. The BS Code is the choice of design specifications and is used in this course. Students apply their knowledge from statics, mechanics of solid, and structural analysis to gain further understanding in the relationship between analysis and design of steel structures.

Students will acquire the skills for the design of steel structural elements including tension members, compression members, and beams, members under combined loads, beam-column members, and connections between these elements.

Objectives

This course intends to:

1. perform appropriate structural analyses based on the loads designed for the structure;
2. design structural connections that are integrated parts of the overall structural design;
3. explain the use of computer software for structural analysis;
4. discuss the advantages of using steel as a structural material;
5. identify various loading conditions that are important in structural design;
6. design structural members of steel using relevant codes; and
7. design structural elements using timber.

Learning Outcome

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

1. identify at least three (3) loading conditions that are important in structural design;
2. determine or select critical loads in structures;
3. perform structural analyses based on at least two types of loads designed for the structure;

4. Use at least three (3) computer software for structural analysis and design;
5. discuss at least five (5) advantages of using steel as a structural material;
6. design structural members of steel using BS 5950 code; and
7. design structural members in timber.

Course Contents:

Limit state philosophy and design in steel. Elastic and plastic moment design. Design of structural elements in steel. Connections and joints. Design of pressed steel tanks. Limit state philosophy and design in timber. Elastic methods and design in timber. Design of structural elements in timber and timber connectors. Laboratory tests on structural elements in concrete, timber and steel.

Minimum Academic Standards

Structural Laboratory with NUC-MAS requirement.

BIU-CEE 403 Soil Mechanics II (2 Units C: LH 15 PH 30)

Senate-Approved Relevance

Before a structure is erected, particularly heavy engineering structure on the ground, the integrity of the soil on which the structure is to be erected must be ascertained. Soil mechanics is the study of the physical properties and utilization of soil especially used in planning foundations for structures and subgrades for highway. Accordingly, the course is design to the study of the physical and mechanical properties of soil for the solution to practical engineering problem. Acquisition of knowledge of this course will equip the students in their professional development in keeping with the University's aspiration of producing excellent professionals The Senate is desirous of this course in the Civil Engineering curriculum of Benson Idahosa University.

Overview

Soil mechanics is the study of the fundamental principles governing the behaviour of all subsoil, and a branch of Civil Engineering (Subsoil being the "earth") we are interested in as oppose to topsoil which we do not use for building of engineering structures.

In the true Engineering sense, there was no "Soil Engineering" prior to the 18th century. For years the art of soil Engineering and geotechnical engineering was based on only past experience through a succession of experimentation, many structure were built – some of which have crumbled while others are still standing. There has been pre-classical period of soil mechanics between (1600–1759), the classical period between (1773 -1846) and modern period between (1840- 1948) when various scientist performed various experiment on soil mechanics and propounded various theories on soil mechanics. The importance of soil mechanics in the design and construction of infrastructure has engaged the attention of the University in the formulation of the additional 30% of the curriculum to the CCMAS in Civil Engineering. The institutional additional course, BIU-CEE 403 is design to teach some of these topics relating to soil mechanics in the design and construction of heavy infrastructural projects.

Course Objectives

The course is intended to:

1. explain the need for soil stabilization before a structure is constructed on it;
2. explain the mechanism of soil stabilization and compaction;
3. describe the type of stabilization – mechanical and chemical stabilization;
4. describe compaction procedure;
5. carry out laboratory test on soil;
6. explain the objectives of site investigation as well as the process; and
7. identify the various types of soil in the field.

Learning Outcomes

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

1. identify the need for soil stabilization;

2. explain at least three (3) methods of soil stabilization;
3. determine the optimum moisture content for compaction of soils;
4. estimate the settlement of soils due to compaction and consolidation;

5. carry out compaction test using modified proctor and standard compaction test method;
6. carry out field compaction and CBR test;

7. explain at least three (3) methods of site investigation and its objectives;

8. explain the sequence of site investigation; and

9. carry out field identification of soil and field test.

Course Contents

Soil Stabilization: Need for soil stabilization, mechanisms of effecting soil stabilization mechanical stabilization: compaction and improving gradation. Chemical stabilization of soils, lime, cement, bitumen and other stabilizers. Soil Compaction: Dry density – moisture content curves, laboratory compaction; standard proctor, modified proctor, West African standard compaction and other standard compaction procedures, CBR and the laboratory determination. Field compaction and CBR tests. Compaction control and monitoring. Settlement theory of consolidation.. Shear Strength of Soil and Morh's stress circle. Site Investigations: Objectives of site investigations cost of site explorations. Sequence of investigations: Desk study of available data, site visit and visual assessment, preliminary report and fieldwork plan; Main stage: field work involving geological mapping if necessary, geophysical survey where applicable; Trial pits, trenches and boreholes, sampling methods and sample types, field identification of soils, field testing and laboratory testing; Review stage involving monitoring, testing and appraisal during excavation. Laboratory and Coursework.

Minimum Academic Standard

Standard soil laboratory with NUC-MAS required facilities.

BIU-CEE 404: Structural Mechanics II (2 Units C: LH 30)

Senate- Approved Relevance

Structural Mechanics II is a course designed to enhance the knowledge of students in the area of analysis of structural members. The university senate is committed and places emphasis on the teaching and learning that will promote development of physical infrastructures and eliminate failure of structures due to inaccurate designs and construction.

Overview

This course is intended to provide students with a thorough understanding of the theory and application of structural analysis as it applies to trusses, beams and frames. Emphasis is placed on developing the student's ability to both model and analyse statically determinate and indeterminate structures and to provide realistic applications encountered in professional practice.

Topics to be chosen from: influence lines; calculation of deflections in statically determinate structures; force method of analysis for indeterminate structures; displacement methods of analysis for indeterminate structures including the slope-deflection method, method of moment distribution, and the stiffness method; an introduction to finite element modelling; and plastic analysis.

Objectives
This course intends to:

1. use the principle of virtual work to calculate the deflections of truss, beam and frame structures;
2. identify points of certainty regarding a structure deformation/rotation to qualitatively construct shear force and bending moment diagrams for both statically determinate and indeterminate structures;
3. demonstrate the analysis of both sway and no-sway frame structures using the slope-deflection equations;
4. construct influence diagrams and equations to characterise how the positioning of live load will affect the reactions, shear forces and/or bending moment at a given point on a structure;
5. apply plastic theory in stress analysis;
6. formulate the direct stiffness method and create a computer program to solve truss problems; and
7. determine stress grading of timber through mechanical and electronics methods.

Learning Outcome:

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

1. Formulate the direct stiffness method and create a computer program to solve truss problems;
2. apply the principle of virtual work to calculate the deflections of truss, beam and frame structures;
3. employ at least four (4) principles of virtual work and compatibility to evaluate the internal forces and deflections of truss, beam and frame structures;
4. analyze both sway and no-sway frame structures using the slope-deflection equations;
5. analyze indeterminate structures using at least four (4) methods;
6. apply plastic theory in stress analysis; and
7. determine stress grading of timber through mechanical and electronics methods.

Course Contents:

Indeterminate structural analysis. Energy and virtual work methods. Matrix method. Slope deflection and moment distribution methods. Elastic instability. Simple plastic theory of bending. Collapse loads. Stress-Grading of Timber. Visual, mechanical and electronic stress grading of timber.

Minimum Academic Standards

Structural Laboratory with NUC-MAS requirement.

BIU-CEE 405: Highway Engineering (2 Units C: LH 30 PH 45)

Senate-Approved Relevance
Highway engineering is currently undergoing an unprecedented expansion fueled by worldwide economic growth in which Nigeria is no exception. There is an expanding need for highly skilled highway engineering professionals. Highway engineering is the process of using engineering techniques to safely and efficiently move people and vehicles over roadways. The BIU senate is committed to training highly skilled highway engineers.

Overview
Highway engineering is a multidisciplinary field with interconnected sub disciplines that include planning, safety, operations, design, and related fields such as structural, hydraulic, and geotechnical engineering. Highway engineering is a subset of transportation engineering, which itself is typically a component of civil engineering. The presence of more than four million miles of public roads in the Nigeria serving widely varying traffic volumes and trip purposes emphasizes the need for qualified and capable professionals to address problems and improve the system.

Two primary metrics of quality of highways are efficiency (measured by delay, travel time, speed, or other operational characteristics) and safety (measured by collisions or fatalities). An inefficient highway can have detrimental effects on local and regional economies and drivers, by burdening the movement of goods and people with additional costs and loss of productivity. The continual improvement of highways is also essential to reduce deaths resulting from collisions on roadways. Highway engineering is a vital approach used to improve the road infrastructures in terms of quality of road construction for sustainable development in the country. This course will equip students with the skill to design and maintain durable and sustainable highway system in Nigeria.

Objectives
The objectives of the course are to:
1. introduce highway engineering and its importance as its effect socio-economic development of a country;
2. identify Nigeria road network system;
3. identify types and processes of soil stabilization;
4. carry out soil tests and borehole analysis for effective compaction;
5. design for individual elements of highway geometry;
6. identify and analyse the components of traffic management;
7. conduct experiments for ascertaining the quality of highway materials; and
8. identify various stages in construction of pavements.

Learning Outcomes
Upon completion of the course, students should be able to:
1. explain the importance of highway engineering in relation to socio-economic development of a country;
2. describe Nigeria road network system;
3. explain at least three types of soil stabilization;

4. perform soil test and borehole analysis;
5. design geometric and structural pavements using analysis of geometric element;
6. explain the two types of geometric elements; and
7. distinguish between flexible, rigid and composite pavements using the concept of structural layers.

Course Contents

Early roads development. Importance of Highway Engineering in relation to socio-economic development of a country. Soil engineering aspect of highways. Soil tests and borehole analysis; compaction and effective compaction equipment. Soil stabilization and various soil stabilization processes. Soil and highway drainage. Railways and airfields. Highway Geometrics. Factors controlling alignments, geometric plan elements – sight distances, design speed. Horizontal alignment. Simple circular and transition curves, Horizontal curves super-elevation and pavements widening. Vertical alignment – gradient limits, curve types, summit curves and valley curves; co-ordination of horizontal and vertical alignment –highway cross-section elements, cross slopes and shoulders. Design of roundabouts or rotary intersections. Pavement structure and design. Pavement types, (Flexible, rigid and composite), pavement layers and their functions. Highway flexible pavements – factors affecting design, CBR method for flexible pavements, Asphalt institute method of design of flexible highway pavements. Current British method of flexible pavement design. Portland Cement Association method for airport rigid design. Current British method of rigid pavement design. Laboratory tests.

Minimum Academic Standards

A well-equipped civil engineering soil laboratory with NUC-MAS requirement facilities.

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; suppliers' duties – Damages and other Remedies. Termination/cancellation of contract Liquidation and Penalties; exemption clauses, safety and risk. Health and Safety. Duties of employers towards their employees. Duties imposed on employees. Fire precautions act. Design for safety. General principles of criminal law. Law of torts: definition, classification and liabilities. Patents: requirements, application, and infringement. Registered designs: application, requirements, types and infringement. Company law. Labour law and Industrial Law. Business registration.

CEE 506: Construction Engineering (3 Units C: LH 30; PH 45)

Learning Outcomes

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

1. plan construction activities incorporating the most appropriate combination of equipment and manpower;
2. manage construction to achieve quality construction at minimum cost and in least time; and
3. procure appropriate finance and insurance for construction projects at the least cost for the expected benefit.

Course Contents

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

CEE 599: Project (6 Units C: PH 270)

Learning Outcomes

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

1. initiate worthwhile projects of a research or professional nature;
2. analyse the project problem and develop creative proposals for the solution;
3. execute the proposal for the solution to the problem; and
4. clearly and persuasively communicate solutions orally and in writing

Course Contents

For proper guidance of the students, projects will depend on the available academic staff expertise and interest but the projects should be preferably of investigatory

nature. Preferably, students should be advised to choose projects in the same area as their option subjects.

Minimum Academic Standards

BIU-CEE 501: Design of Structures III (2 Units C: LH 30)

Senate-Approved Relevance

Training high quality graduates who are highly skilled and knowledgeable in the design and analysis of structures is of paramount importance to the senate of Benson Idahosa University, creative design abilities in various ways that can contribute to the development of a more satisfying life and environment for the benefit of mankind. This will help to mitigate the incidences of building collapse in our country, which is in accordance with the vision and mission of BIU.

Overview

An important aspect of the analysis and design of structures relates to the deformations caused by the loads applied to a structure. This course involves composite design of structures with steel and concrete. The structural design is based on the result of the analysis which helps to obtain the maximum bending moment. The structural design is performed to re-enforce the point at which the bending moment is maximum and to check for maximum deflection. This will be done with design codes of practice (BS8110 and BS 5950), specifications using the established formulas to produce the required concrete cubic meters and re-enforcement bars to achieve structural stability. This course is to provide students with advanced knowledge of structural design in high rise structures for reinforced concrete and steel structures. Also in the design and construction of other Civil Engineering structures such as dams, bridges, culverts, water retaining structures and retaining walls.

Objectives

The objectives of the course are to:

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

Learning Outcomes

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

1. perform modelling of structural drawing from architectural drawing for residential considering all the dimensions and specification;

2. perform a composite design of steel and reinforce concrete for long columns, short columns, one-two ways spanning slabs, beams, water retaining structures and retaining walls;
3. perform column load transfer and analysis of building system and multi-storey building project design;
4. design strip and pad foundation based on the result of the soil analysis;
5. explain the theory of pre-stressing and losses of pre-stressing in steel and reinforced concrete;
6. produce a complete design and detailing of steel, reinforced and pre-stressed concrete structures; and
7. perform computer programming using excel, form5, qbasic, Fortran and matlab.

Course Contents

Composite design and construction in steel and reinforced concrete. Design of structural foundation. Modern structural form. Tall buildings. Lift shafts and shear walls. System building. Philosophy, methods and systems and pre-stressing. Serviceability limit state design of structured elements: cable curve fitting; losses of pre-stress; shear, bond and deflection; cable extension; anchorages. Ultimate limit state design of structural elements – strength in flexure and shear. Composite construction. Design projects.

Minimum Academic Standards

In line with NUC-MAS requirement.

BIU-CEE 504: Environmental Engineering I (2 Units C: LH 30)

Senate-Approved Relevance

There is so much pollution affecting water bodies, the land, air and total environment as a result of human activities. This course is to ensure societal development and sustainable water, land and air resources. Benson Idahosa University core value is to raise academics, professionals and entrepreneurs excelling in their chosen professional fields. Thus, this course is to trained proficient environmental engineers that will manage water, air and land resources so that environmental pollution and degradation can be minimized both in BIU and Nigeria at large.

Overview

Environmental Engineering is the application of science and engineering principles to the design of environmental protection and remediation strategies using physical, chemical and biological treatment methods, all within a regulatory frame work.

Millions of people worldwide have been affected by pollution from the various domestic, municipal and industrial activities of man. The need to apply the principles of engineering, soil science, biology and chemistry to develop solutions to environmental problems through improved recycling, waste disposal, and water and air/noise pollution control is of paramount importance to BIU community.

Objectives

This course is intended to:

1. define the responsibilities of environmental engineer;
2. discuss the categories of solid wastes and their sources;
3. explain waste management and control;
4. analyze solid waste so as to identify the ones for final disposal;
5. identify the sources of wastewater, its composition and effects on the environment;
6. explain the microbiology of wastewater;
7. explain air and noise pollution, their sources, effects and control;
8. explain environmental management tools.

Learning Outcomes

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

1. distinguish between the different at least three(3) types of environmental pollution;
2. list at least four (4) techniques for environmental monitoring and control;
3. list at least six (6) types of solid wastes, their sources and effects;
4. identify at least three (3) sources of wastewater and its effects on the environment;
5. conduct microbial analysis on wastewater
6. design effective waste management system; and
7. explain the transnational impact of environmental pollution and at least three (3) ways of minimizing the effects on the local to global scale.

Course Contents

Definition and responsibilities of Environmental Engineer. Basic concepts, theory and design of Solid waste collection and disposal systems. Analysis of municipal, industrial and agricultural solid wastes. Sources, composition and effects of solid waste. Solid waste collection, handling and disposal methods. Wastewater, Sources, characteristics of waste water from different sources. Microbiology of waste water, waste water collection, treatment, and disposal. Design of Septic Tanks, Soak away and waterless toilets. Water quality characteristics and analysis. Water pollution abatement and control. Water supply, treatment and design. Air Pollution, classification of air pollutants, sources, types and effects of air pollutants on the atmosphere, human beings, animals and plants. Analysis of particulate and gaseous pollutants by classical and instrumental methods. Meteorological phenomena affecting dispersal or deposit of pollutants. Wind and Air borne pollutants. Methods of air pollution control including cleaning of gas. Noise Pollution, classes, sources, effects on environment and control. Environmental modeling techniques for solid, liquid and air pollution. Environmental Impact Assessment (EIA).

Minimum Academic Standards

In line with NUC-MAS requirement.

BIU–CEE 508 Highway and Transportation Engineering (2 Units: C LH 30 PH 45)

Senate-Approved Relevance

The fact that Benson Idahosa University is located off Benin – Warri road, a third degree damaged Federal government highway in Benin city, Edo State, Nigeria, commits the senate

of BIU to emphasize on the teaching and learning of Highway and Transportation which affect the overall growth of the institution and the general development of Edo State and the country. A course designed to understand the effect of poor Engineering infrastructures on the people, is in agreement with Senate's desire to incorporate a sustainable transportation components in the curricula which are used for academic purposes at the Benson Idahosa University.

Overview

The history of transport in Nigeria started as far back as 1904 in the days of Lord Luggard when he attempted to construct a mule road linking Zaria and Zungeru, which was later extended to Sokoto, Katsina and Maiduguri. The first road for motorized vehicles in Nigeria, was built in 1906 from Ibadan to Oyo, Road transport is the dominant mode of transportation in Nigeria, moving over 90% of internal goods and passengers across the country; hence it is the highest contributor to the nation's GDP.

But sadly, for over a decade now Highway and Transportation engineering in Nigeria has experienced total neglect, leading to loss of hundreds of thousands of lives and properties.

The deplorable state of road infrastructures in Nigeria has created thousands of death spots as well as crime spots in Nigeria, which should attract the attention of Universities in Nigeria, such as the Benson Idahosa University in their formulation of the additional 30%of the curriculum to the CCMAS in civil engineering. This additional course, BIU-CEE-508, Highway and Transportation Engineering is designed to expose students to the various components of Highway and Transportation Engineering in Nigeria, their total neglect and their effects on the overall economy. This course is very important in meeting the desired sustainable development goals in the Highway and Transportation infrastructures as it affects Nigeria economy.

Objectives

This course is intended to:

1. define highway and transportation engineering in Nigeria;
2. describe the importance of highway and transportation in relation to the socio-economic development;
3. describe the various modes of highway and transportation facilities and their relationships;
4. identify major transportation networks in Nigeria;
5. describe various types of material for pavement design, construction and maintenance;
6. discuss traffic management and design of traffic signals;
7. describe the construction methods of various types of pavement;
8. explain the form of administration and financing of highway and transportation;
9. explain the various types of pavement failure and maintenance; and
10. describe the construction of hill road, geometics and drainage.

Learning Outcomes

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

1. list at least five (5) importance of highway to the socio-economic development of Nigeria;

2. state at least four (4) major roads connecting Edo state to other parts of the country;
3. state the three (3) types of highway and transportation facilities;
4. describe at least four (4) types of materials use in pavement construction;
5. describe at least three (3) types of test on highway construction materials;
6. explain the traffic management system and at least four (4) types of traffic signals;
7. explain at least three (3) construction method for pavement;
8. list the three (3) modes of transportation;
9. explain the form of administration and financing of highway and transportation;
10. explain at least three (3) types of pavement failure and mitigation measures; and
11. enumerate at least four (4) new material that can be used for the construction of highway.

Course Contents

Definition of terms relating to highway engineering. Basic principles of transportation engineering. Application to various modes of transportation facilities and their relationships. Theoretical and design methods. Field trip. Highway materials and pavements. Pavement management. Highway planning and traffic survey. Pavement design, construction and maintenance. Administration and finance of highways. Condition of all transportation media. Traffic management and design of traffic signal. Parking Geometrics design. Construction methods. Construction materials and laboratory test. Transportation planning and economics. Role and importance of transport. Introduction to different modes of transportation: highways, railways, airports, docks and harbours, conveyors belts. Special characteristics of road transportation in relation to other modes (rail, sea and air). The application of economic theory to transportation policy. Coordination between the different modes of transportation land, sea, air). Administration and finance of highway systems, evaluation of pavements, surface conditions. Pavement failures, maintenance and overlays. Strengthening of existing pavements. Design of flexible and rigid overlays for highways. Highway economics and finance. The laboratory work on traffic studies on a given area. Highway Construction materials and Testing. Bituminous materials-origin and use of bituminous materials; manufacture of asphalt, tar, cut-back and emulsions .Aggregate for bituminous mixes; design and principles of mixes, different test and evaluation. Mix design methods use of additives, P.V.C, and newer materials. Geosynthetics, Hill Roads: Special features of hill roads, geometrics, constructions and drainage. Laboratory test on plastic and liquid limits of soil classification; aggregate crushing strength, impact, abrasion and soundness test, cements test. Coordination of all transportation media (land, sea, air modes). Rail and air transport systems.

Minimum academic standards

Provision of standard highway materials testing laboratory with NUC-MAS requirement facilities.

BIU-CEE 511: Water and Waste Water Engineering

(2 Units C: LH 30; PH 45)

Senate-Approved Relevance

Man cannot do without use of water or generation of wastewater that carries with it harmful and toxic elements. Water and wastewater engineering is a complete process of taking water

from the environment and making it safe for domestic consumption and also, treatment of wastewater to protect humans and the ecosystem from harmful and toxic elements found in it. Thus, as environmental standards for water quality and pollution free ecosystem increase, and pressures for water supplies continue to grow, BIU Senate sees the need to train highly proficient civil engineers that will proffer solutions to the issues of safe water delivering and wastewater pollution in the local and national environment, and the world at large.

Overview

Water and waste water is water which physical, chemical or biological properties has been changed as a results introduction of certain substances which render it on safe for some purposes such as drinking. The day to day activities of a man is mainly water depended and therefore discharge waste into the water bodies**.**

Water and wastewater engineering provides a real difference to delivering reliable water supplies. It is also concerned with maintaining and enhancing river and ground water quality. It involves the design and supervision of the construction of infrastructures that processes and delivers water efficiently and safely. It also includes the design and construction of infrastructures for water and wastewater treatment.

Objectives

This course is intended to:

1. give an introduction to basic definition for water and wastewater;
2. explain the sources of water and wastewater;
3. discuss methods of developing water supplies;
4. describe the means to treat water for consumptive use;
5. explain the methods and equipment used to purify and transport water;
6. explain the science to solve and analyse engineering problems related to water and wastewater collection, transport, quality and treatment; and
7. discuss the use of mechanical, biological and chemical operations to achieve and maintain acceptable water quality.

Learning outcomes

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

1. list at least five (5) microbial and chemical contaminants of water;
2. state the local, national and international laws, regulations and guidelines on water and sewage treatment processes;
3. select at least two (2) water treatment methods to remove certain pollutants in water and wastewater;
4. apply at least two (2) technologies for physical and chemical treatment of drinkable water;
5. apply at least two (2) technologies for physical, chemical and microbiological treatment of wastewater;
6. explain water shortage, wastewater reuse and emerging contaminants; and
7. list at least three (3) sources of water and wastewater.

Course Contents

Introduction to water supply. Occurrences, uses and sources of water. Physical, chemical and bacteriological standards for potable water. Effects of various chemical substances and micro-

organisms found in water. Water quality standards and controls. Appropriate technology of water supply and treatment. Further methods of treatment of water. Aeration methods and applications. Softening- Lime Soda Ash methods. Adsorption, isotherms, packed bed reactors and regeneration. Ion exchange, Reverse osmosis and Electro-dialysis. Water Management. Design of biological wastewater treatment systems. Introduction to tertiary wastewater treatment. Wastewater disposal. Storm water calculations. Laboratory examination of water.

Minimum Academic Standard

Water and wastewater laboratory with NUC-MAS requirement facilities.

BIU-CEE 512: Geotechnical Engineering (2 Units C: LH 15 PH 45)

Senate –Approved Relevance

Although geotechnical engineering shares several common themes with Structural Engineering in general, including its reliance on fundamental mechanics principles and its essentiality in the design of civil infrastructure systems. It is well known fact that there is demand for a degree at the undergraduate level in terms of both student interest and the local/international market. This course provides students a career in geotechnical engineering practice with the necessary training to analyze, simulate, and design geotechnical-related infrastructure.
The Nigerian Institution of Civil Engineers (NICE) is encouraging new engineers pursuing a career in civil engineering disciplines to have the zeal to practice in this area. Soil-structure interaction is critical to consider when addressing the response of built environment to stability and deformation of slopes and retaining walls, etc. With the committed BIU senate to train students in other to meet local demand for geotechnical engineering. Surely, this course will produce a leader in this specialty area in Nigeria and beyond.

Course Overview

Geotechnical engineering is the branch of civil engineering that focuses on earth materials: soil, rocks, minerals and water. Geotechnical engineers apply principles from geology and hydrology to the practical challenges of modern construction projects.

Geotechnical engineering is the study of the behavior of soils under the influence of loading forces and soil-water interactions. Geotechnical engineering is a sub-discipline of civil engineering and can be defined as the use of earth material (soil and rock) for improving and defending society and life. Until about the last 100 years geotechnical engineering was largely empirical and based on observation and careful reflection. Remarkable scientific advancement in this specialty within civil engineering has been achieved in the post-World War II era and continues till today with the aid of high-performance computers, sensors, data visualization, and advanced soil testing. This knowledge is applied to the design of foundations, retaining walls, earth dams, clay liners, and geosynthetics for waste containment.

Geotechnical engineering can be applied to many fields including: oil and gas, mining (including lithium mining and lithium extraction technology), construction, agriculture, water utilities, transportation, landfill, coastal restoration, dredging, and many more. Fundamental to geotechnical engineering are the study and practice of engineering geology, geomechanics (rock mechanics and soil mechanics), the design of foundations, the stabilization of slopes, the

improvement of ground conditions, the excavation of tunnels and other underground openings, the analysis of ground behaviour, and the assessment of ground movements.

Objectives

The objectives of the course are to:
1. describe bearing capacity of soil and factors that influence it;
2. outline the types and choice of foundation;
3. identify characteristics of pile foundation;
4. describe the importance and efficiency of pile group;
5. describe earth pressure and computation of earth pressure using various theories;
6. identify and analyse retaining wall;
7. describe slope stability and effect of tension cracks on slope stability; and
8. identify the theoretical and graphical solutions of slope stability problems.

Learning Outcomes

Upon completion of the course, students should be able to:
1. describe bearing capacity of soil and list at least four factors that influence it;
2. explain at least three (3) type and choice of foundations;
3. explain at least three (3) characteristics of pile foundation;
4. evaluate the importance and efficiency of pile groups;
5. compute earth pressure using at least three (3) theories;
6. identify and analyse retaining wall;
7. describe slope stability and effect of tension cracks on slope stability; and
8. evaluate the theoretical and graphical solutions of slope stability problems.

Course Contents

Bearing Capacity: Ultimate, safe and allowable bearing capacities. Bearing capacity factors. Case of shallow and deep foundations, factor of safety, shape effect. Footings under eccentric and inclined loads. Foundations types (footings, rafts and pile) and choice of foundations. General characteristics of piles, pile in sand, piles in clay, Negative skin friction. Pile groups, bearing capacity and settlement of pile groups. Efficiency of pile groups. Earth Pressure, Pressure equilibrium, active, passive and at-rest pressure. Earth pressure coefficients. Computation of earth pressures using the Rankine and the Coulomb wedge theories, and Cullman's method. Earth pressures on retaining walls. Types and analysis of retaining walls. The use of bracings as lateral support in open cuts. Anchored bulkheads, free earth support method of analysis. Slope stability. Types and mechanics of slope failures. Theoretical and graphical solutions of slope stability problems. Effect of tension cracks on slope stability. Ordinary method of slices.

A well-equipped civil engineering geotechnical laboratory with NUC-MAS requirement facilities.

BIU-CEE 502: Structural Mechanics III (2 Units; E: LH 30)

Senate-approved relevance

Structural Mechanics III is a course designed to enhance the knowledge of students in the area of analysis of structural members, the course deals with complex analysis of structures. The university senate is committed and places emphasis on the teaching and learning that will promote development of physical infrastructures and eliminate failure of structures due to inaccurate designs and construction.

Course Overview

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

Different types of solid materials require vastly different mathematical descriptions. The safety of any structure is dependent on the methods and accuracy of analysis. When the loadings of a structure are accurately estimated and modeled, the incidences of building collapse will be minimized in the country.

Objectives

The course is intended to:

1. describe a coherent development to the students for the courses in area of structural mechanics iii;
2. explain finite element method in solving engineering problems;
3. describe yield line analysis for slab design;
4. explain strip method for slab design;
5. involve the application of scientific and technological principles of analysis;
6. involves students to feel how real-life structures behave; and
7. outline the various computational techniques and software used for structural analysis.

Learning Outcomes

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

1. apply finite element method in solving engineering problems;
2. apply yield line analysis for slab design;
3. carryout plate analysis of structures;
4. use matrix method for structural analysis;
5. apply theory of elasticity in engineering problems solving;
6. apply strip method for slab design; and
7. apply plastic method of structural analysis.

Course Contents

The Finite Element Method in Engineering. Solutions of finite element equations. General procedure of finite element method. Higher order and isoperimetric element formulations, isoperimetric element. Numerical integrations. Yield line analysis for slabs. Strip method of design of slabs, the simple strip method. Radial and tangential moments in circular slabs with polar symmetrical and support conditions. Solutions including torsional moments. Special rationalized design procedure for point-supported slabs. Comparison with yield line theory, plastic methods of structural analysis. Basic theorems and simple examples. General methods

for plastic design. Estimates of deflections. Minimum weight design. Variables repeated loading. Matrix methods of structural analysis. Elastic instability. Continuum of plane strain, elastic flat plates and torsion, Application of the theory of elasticity in engineering problems. Beams having initial curvature, stresses, deformations loaded rings, buckling and local yield. Stress concentrations.

Minimum Academic Standard

In line with NUC-MAS requirement.

BIU-CEE 503: Water Resources Engineering (2 Units E: LH 30)

Senate – Approved Relevance

The fact that water is very important to all living things, the Senate of BIU sees the need to extensively train students to become skilled engineers in water resources engineering. The course is necessary, considering the world's sustainable development goal of providing potable water in sufficient quantity for various uses.

Thus, to ensure water quality and water supply suitability, BIU Senate sees the need to train highly proficient water engineers that will proffer solutions to the issues of water scarcity and delivering in our communities.

Overview

Water resource engineering is huge field which involves managing available water resources from the standing point of both water quantity and water quality to meet the water needs of humanity and habitat at the local, state, national or international al level. Managing water require a sound understanding water distributing systems such as rivers, culvert, pipelines, ground water wells and water storage systems.

Water resources engineering focuses on the provision of water to man, animals, plants, and the environment; removal of used water from the environment and ways of avoiding or preventing damage to life and property from excess water (flooding). But unfortunately this has not been achieved in our society and the world at large, hence universities like BIU emphasizes the need for water resources engineering in formulating their additional 30% of the curriculum to the CCMAS in civil engineering.

Objectives

This course is intended to:

1. identify the sources of water and determine water quality;
2. explain the methods of developing water supply scheme;
3. describe water treatment for consumptive use;
4. discuss sustainable management of natural water bodies;
5. explain the modalities for development and harnessing of water resources for various uses;
6. explain the hydrologic cycle, its structures and their relevance in water resources engineering; and
7. explain wastewater, its management and disposal.
8.

Learning outcomes

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

1 list at least three (3) sources of water;
2. develop sustainable water supply system;
3. carry out at least two (2) stages of water treatment;
4. develop water storage systems and reservoirs;
5. effectively evaluate water resources and develop water resources projects;
6. develop at least five (5) control measures against water pollution; and
7. explain at least three (3) hydraulic structures and their uses.

Course Contents

Introduction to water resources engineering. Current issues in water resources engineering. The hydrological processes. Measuring fluxes and calculating catchment water balances. The hydraulics of open channels and wells. Hydrograph analysis and hydrological forecasting. Hydraulic structures. Embankment dam engineering. Principles of analysis and design for earth and rock fill dams. Introduction to groundwater resources management, resource exploration and evaluation. Well pumping tests for yield assessment and hydrogeological parameter determination. Use of modelling techniques for aquifer management. Groundwater quality and contaminant transport. Groundwater vulnerability and source protection. Ground-water

hydrology, occurrence and aquifer types. Groundwater movement. Calculation of drawdown, radius of influence, well hydraulics and various tests. Analytical and analysis of well pumping tests. Equations governing flows in aquifer. Design and development of water resources projects. Water resources systems analysis. Water allocation. Engineering economy in water resources planning. Water Resources evaluation.

Minimum Academic Standard

In line with NUC-MAS requirement.

BIU-CEE 505: Drainage and Irrigation Engineering (2 Units E: LH 30)

Senate – Approved Relevance

Agricultural field drainage activity became prevalent towards the end of the 19th century. Farmlands need to have just the right amount of water for optimum production of crops and livestock. Inadequate agricultural drainage results in poor yields which can cause financial disaster for farmers. Draining away excess water after heavy rains significantly limit damage to land or crops.

In view of the effects of climate change and the uncertainty of rainfall, there is need for all year round farming through irrigation system to provide adequate food for the populace, and reduce price fluctuation of food items as is presently seen in Nigeria. In the present day world, more than one out of ten people do not have enough food to eat. Food scarcity may result from flooding of farmlands or due to drought, hence BIU Senate sees the need to train proficient graduates on irrigation and drainage engineering.

Overview

Irrigation and drainage engineering will educate students in the application of engineering principles to support useful plant life, with minimum degradation of soil and water resources. Irrigation and drainage is the artificial application of water to land and artificial removal of excess water from land to ensure optimum farm yield. In this way this course will help to contribute to food security as the land can be made more productive.

Irrigation and drainage engineering is very important since its helps determine future irrigation expectation. Irrigation has been a centre features of agriculture for some centuries, though not

fully adopted by developing countries. Irrigation and drainage engineering are used for dirt suppression, disposal of waste and in mining.

Objectives

This course is intended to:

1. discuss the proper growth of plants;
2. explain the need for the maintenance of the right level of moisture for the soil;
3. explain the methods of providing crop insurance against short duration of drought;
4. discuss how to supply water partially or fully for crop need;
5. explain how to maintain landscapes, and vegetate disturbed soils in dry areas and during times of below-average rainfall;
6. list the techniques of preventing or reducing waterlogging; and
7. list and explain the different types of land, their uses, land drainage and reclamation.

Learning outcomes

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

1. explain the concepts of irrigation;
2. estimate the quantity of water required by crops;
3. plan and design at least one (1) irrigation project;
4. identify at least four (4) usefulness of drainage in agriculture;
5. provide information for at least three (3) drainage systems;
6. plan and design effective drainage system; and
7. estimate the water requirement for at least three (3) types of irrigation scheme.

Course Contents

Land classification. Crop water requirement. Farm delivery requirement. Soil-plant-water relationships. Consumptive use of water and evaporation. Nutrient and water requirements and use efficiencies. Irrigation water quality and water management. Types of irrigation systems and performance of irrigation systems. Irrigation methods and farm irrigation practices. Analysis and design of surface and combined drainage systems. Collectors, storages and pumps. Water supplies. Water delivery and distribution systems. Water quality and treatment.

Urban storm drainage. Land drainage. Land reclamation. Course work on a typical design of irrigation system.

Minimum Academic Standard

In line with NUC-MAS requirement.

BIU-CEE 507: Design of Hydraulic Structures (2 Units: E LH 30)

Senate – Approved Relevance

Common topics of design for hydraulic engineers include hydraulic structures such as dams, levees, water distribution networks including both domestic and fire water supply, distribution and automatic sprinkler systems, water collection networks, sewage collection networks, storm water management, sediment transport, and various other topics related to transportation engineering and geotechnical engineering.

Equations developed from the principles of fluid dynamics and fluid mechanics are widely utilized by other engineering disciplines such as mechanical, aeronautical and even traffic engineers. Related branches include hydrology and rheology while related applications include hydraulic modelling, flood mapping, catchment flood management plans, shoreline management plans, estuarine strategies, coastal protection, and flood alleviation in Benin City and Niger Delta Area at large.

Course Overview

Hydraulic Engineering is to designs all waterway projects including, but not limited to, bridges, culverts, storm sewers, and detention ponds. Hydraulic Structure involves extensive contents like hydrology, meteorology, water resources, geology, mechanics, mathematics, chemistry, materials, engineering and management, which is a backbone professional course for undergraduates of hydraulic engineering to learn basic knowledge and train basic skills for hydraulic and hydropower engineering.

Therefore, it has always received considerable attention. The curricula include Natural Science, Engineering Science, Humanities and Social Sciences, and other basic courses, as well as professional courses like Water Resource Engineering, Hydraulic and Hydropower

Engineering, Base and Underground Engineering, Port and Waterway Engineering to implement overall undergraduate and graduate training mode.

Objectives

The objectives of the course are to: introduction to

1. analyse large scale hydraulic structures;
2. analyse culvert, channel, and reservoir;
3. analyse municipal storm drainage system;
4. analyse multiple structures;
5. analyse the processes of modelling hydraulics structures;
6. identify problems of hydraulics structure and remedies; and
7. analyse transition structures with guiding regulations and standard.

Learning Outcomes

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

1. design large scale hydraulic and water retaining structures such as dam and spillway;
2. design at least one (1) culvert, channel and reservoir;
3. design at least one (1) municipal storm drainage system;
4. design multiple structures involving flood control, erosions, water supply, and irrigation;
5. model at least three (3) types of hydraulics structures;
6. enumerate at least five (5) problems of hydraulics structure and proffer solution; and
7. design transition structures to mitigate hydraulics structure problems.

Course Contents

Design of large scale Hydraulic and water retaining structures. Design of Dams, Spillways, weirs, gates, outlet works and stilling basins. Design of culverts and channel transitions. Reservoir design studies. Design of irrigation projects. Hydraulic models. Criteria, problem of reservoirs, river training and regulations, transition structures, Cofferdams, breakwaters, models and surge tanks. Design of municipal storm drainage inlets, manholes and catch basin.

Introduction to multiple purpose designs involving flood control, water supply, Irrigation. Recreation, drainage, navigation and erosion control. Course work on a typical design.

Minimum Academic Standard

In line with NUC-MAS requirement.

BIU-CEE 509: Advanced Pavement Design (2 Units E: LH 30)

Senate -Approved Relevance

This course covers advanced topics in the design and analysis of pavement materials and structures; it is of great relevance in the design of airport pavement.

The university senate is committed and places emphasis on the teaching and learning that will promote development of physical infrastructures and eliminate failure of structures due to inaccurate designs and construction.

Overview

This course brings further understanding in pavement design and analysis. This course enables students to use the analytical methods in the design and analysis of various pavement types so that they will be prepared for involvements in various pavement projects. Moreover, students will learn about behaviour and performance of standard and marginal materials, airport pavement design, overlay design. Pavement roughness, pavement maintenance and life-cycle cost analysis.

This course presents various analytical/computer tools for the design and analysis of various heavy-duty pavements. The course develops the principles and techniques of pavement design and analysis to the post graduate level. More advanced concepts are explored in the areas of pavement materials characterization, mechanistic pavement design, pavement evaluation and pavement maintenance.

Objectives

This course intends to:

1. explain pavement overlay;
2. determine pavement roughness and measure deflection;

3. explain pavement structures and analyse stresses for both flexible and rigid pavements;
4. explain the concepts of equivalent axle load and equivalent single wheel load;
5. describe highway and airport pavements;
6. describe continuous reinforced pavement, pre-stressed concrete pavement and composite pavement; and
7. outline construction materials and carryout pavement maintenance.

Learning Outcome:

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

1. explain at least two (2) types of pavement and analyse their stresses;
2. design at least one (1) highway and airport pavements;
3. design continuous reinforced pavement, pre-stressed concrete pavement and composite pavement;
4. explain the concepts of equivalent axle load and equivalent single wheel load;
5. determine pavement roughness and measure deflection;
6. design at least one (1) pavement overlay; and
7. list at least four (4) construction materials.

Course Contents

Pavement structure and stress analyses for both flexible and rigid pavements. Design of highway and airport pavements; Corps of Engineers method, CBR method extended to airport pavement design, Continuous reinforced concrete pavement, pre-stressed concrete pavement. Composite pavements and their design. The concepts of equivalent axle load (EAL) and equivalent single wheel load (ESWL). Design of asphaltic concrete. Highway and pavement maintenance. Pavement evaluation – pavement. Construction Materials, Mass-haul diagram; Flexible and rigid pavements materials; semi-rigid pavement materials; stabilized soil. New materials, pavement roughness and deflection measurements. Pavement overlay design.

Minimum Academic Standard

In line with NUC-MAS requirement.

BIU-CEE 514: Environmental Engineering II (2 Units E: LH 30)

Senate – Approved Relevance

We all need safe drinking water and a safe environment. Environmental engineers proffer solutions to getting safe drinking water, reduce water pollution as well as facilitate proper waste disposal to ensure healthy environment.

To ensure the general wellbeing of all living things and the ecosystem, BIU Senate is desirous of training skilled environmental engineers that will proffer solution to the environmental issues of our nation and the world at large.

Overview

Environmental engineering ii is concerned with the protection of living things from the effects of adverse environmental pollution, by improving the quality of the environment through recycling, waste disposal, and water and pollution control.

The course is intended to help reduce the effects of natural disaster, hence BIU Senate sees the relevance of training highly skilled environmental engineers that will be concerned in remediating existing environmental pollution and preventing future occurrence. This course will cover a number of environment concerns such as solid waste handling, disposal and treatment.

Objectives

The objectives of the course are to:

1. discuss basic engineering principles, ecosystem processes; transporting organic contaminants, air quality control technologies and principles of sustainability;
2. explain environmental engineering practices;
3. identify the sources of wastewater and solid waste;
4. explain the management of water, land and air resources to minimize environmental pollution and degradation;
5. discuss effective management of solid wastes;
6. explain wastewater management and its pollution control; and

7. explain air pollution matters, sources of air pollutants and control.

Learning outcomes

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

1. Discuss at least four (4) sources of wastewater;
2. explain at least two (2) wastewater collection and treatment processes;
3. Discuss at least six (6) types of solid waste, their sources and effects on the environment;
4. describe solid waste generation, storage, collection and disposal;
5. design engineered sanitary land fill;
6. perform a proper solid waste sorting;
7. outline at least three (3) sources of air pollution; and
8. explain at least four (4) effects each of air pollution on human, animals and plant.

Course Contents

Waste water Collection. Storm water Sewerage. Preliminary Treatment. Flow measurement, flow separation, screening and storm water settlement. Grit removal. Design of Radial and Rectangular tank. Biological kinetics, kinetics of enzyme reaction and bacterial growth and their applications to treatment systems. Secondary Treatment - activated sludge process, percolating (trickling) filters, and oxidation (stabilization) ponds. Application of biological kinetic in sludge treatment and disposal. Anaerobic digestion. Effluent standards. Solid Waste surveys, planning, storage, collection and transportation. Solid Waste Treatment and Disposal. Mechanical compaction, incineration, pyrolysis, composting, and sanitary landfill, river and ocean dumping. Design of Solid Waste Disposal systems. Air Pollution and Control. Effects of air pollution on the physical properties of the atmosphere. Effects of air pollution on humans, animals and plant life. Effects of air pollution on economic materials and structures. Course work.

Minimum Academic Standard

In line with NUC-MAS requirement.

BIU – CEE 515 Coastal Engineering (2 Units: E LH 30)

Senate-Approved Relevance

Recently, concerns about coastal hazards coupled with the rapidly increasing populations in coastal zones and the potential for widespread losses of life and property in the Niger Delta region of Nigeria, have stimulated the need for coastal engineering. Civil engineers are increasingly becoming involved in design, construction and operation of many types of coastal facilities. In the future, coastal engineers will be faced with new challenges arising from the increasing concentration of Nigeria coastal region population and investment in the coastal zone. Also, the challenges of the presence of diverse stakeholders in the coastal zone and the large risks associated with inappropriate designs and actions have created an urgent need for more authoritative information on which coastal engineers can base designs and on which decision makers can rely for developing long-range strategies for hazard reduction, sand management, port development, protection and restoration of habitat, and education of the public about the importance of managing coastal areas effectively.

These challenges required more coastal engineers in the field as presently they are inadequate due to few universities in Nigeria offering the course at undergraduate level.

It is apparent that the coastal engineering activities will continue to expand in the future and that there will be a concurrent increased demand for civil engineers to work in the coaster environment. Most specialized coastal engineering education is, and should continue to be at the undergraduate level in program which build on the traditional engineering programs.

Overview

Eroding coastlines throughout the world, particularly in large population centers where human dwellings and their way of life and infrastructure are at risk, were historically mitigated using coastal structures; which led to the development of a relatively new engineering discipline – coastal engineering. Coastal engineering is a division of civil engineering responsible for the organization, conception, development, and preservation of works along shorelines.

Coastal erosion is a naturally occurring process that can be exacerbated and becomes a significant problem when the dynamic coastline impinges on the fixed human infrastructure and uses within the coastal zone. Despite the potential risk of coastal erosion or flooding within the coastal zone, the majority of the world's human population resides there, and in fact, numbers continue to grow as people migrate to coastal cities. Coasts continue to support the economic centers of the world, while at the same time critically ecologically important and sensitive natural habitats are supported by coastal zones. Coastal zones support a wide variety of human land uses. Tourist resorts, fishing communities, farming, aquaculture, and other land uses all vie for space on the coasts of the world, and often come into conflict with each other and with the dynamic interface between land and water. While inland areas are undoubtedly less vulnerable to coastal hazards, the coastal zone has been historically rich in resources and uniquely suited to support economic activities such as trade, industry, and tourism, attracting settlement and migration despite the elevated risks.

Objectives

The objectives of the course are to:

1. identify various types of coastal morphology as they affect the coastal zone;
2. describe the impact of human activities within the coastal zone;
3. examine more closely the mechanics of coastal erosion process through the concept of a sediment budget in a coastal cell;
4. describe how erosion disrupt sediment transport along coastal lines;

5. employ engineering strategies to mitigate coastal erosion;
6. develop approach in terms of sustainability in the context of the dynamics of the coastal zone; and
7. differentiate between soft and hard mitigation strategies and state advantages and disadvantages associated with each.

Learning Outcomes

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

1. identify four (4) types of coastal morphology as they affect the coastal zone;
2. predict waves and water Level;
3. list at least four (4) Coastal Protection Methods;
4. explain mechanism of wave motion;
5. explain wave climate and how often it occurs;
6. perform calculation of transported Sediments;
7. explain river engineering as related to coastline erosion; and
8. list four (4) coastal hazard mitigation strategies and state three (3) advantages and disadvantages each.

Course contents

Introduction to coastal engineering. National coastal morphology. Mechanics of wave motion (small amplitude wave theory), propagation, velocities and acceleration. Particle displacement and subsurface pressure. Wave and water level predictions. Statistics and wave forecasting. Coastal protection methods. Regular waves, irregular or random waves. Wave statistics, wave transformations and wave breaking. Wind waves (physics, fetch graph, spectral models). Wave climate (observations, probability summaries, intensity-duration-frequency). Tides (observations, harmonic analysis, and propagation). Storm tides (historical storms, evolution, frequencies). Wave evolution (diffraction, combined refraction-diffraction). Near shore circulation (surf zone, undertow, long shore current, edge waves). River engineering. Calculations of transported sediments, i.e. load in suspension, bed load. Bed formation. Coastline Erosion. Soft and hard coastal hazard mitigation strategies.

Minimum Academic Standard

In line with NUC-MAS requirement

APPENDIX I

LIST OF REVIEWERS (NUC-CCMAS)

Title	Surname	First Name	Institution	Programme
Professor	FABORODE	Michael O.	Obafemi Awolowo University, Ile-Ife	**Discipline Chairman**
Professor	OLOCHE	O. B.	University of Abuja, Abuja	Mechanical Engineering
Professor	EKECHUKWU	Onyemaechi Valentine	University of Nigeria, Nsukka	Mechanical Engineering
Engineer	ALI	Kashim	COREN	Mechanical Engineering & General Discipline
Professor	OLORUNMAIYE	John Adesiji	University of Ilorin,	
Lt. Col. Dr	IMAM	A.S.	Nigerian Defence Academy, Kaduna	Mechatronics Engineering
Professor	ASERE	Abraham	Elizade University, Ilara-Mokin.	Automotive Engineering
Professor	EDOKPIA	Raphael Olumese	University of Benin, Benin-City	Industrial and Production Engineering
Professor	FUBARA-MANUEL	Isoteim	Rivers State University, Port Harcourt	Marine Engineering
Professor	FAKINLEDE	O. A.	University of Lagos, Lagos	Systems Engineering
Professor	OGBONNA	Chibueze Achimba	Babcock University, Ilishan Remo	Computer Engineering
Professor	BOYI	Jimoh	Ahmadu Bello University, Zaria	Electrical Engineering
Professor	ADEDIRAN	Yinusa Ademola	University of Ilorin	Electrical and Electronics Engineering
Professor	AZUBOGU	Augustine Chukwuemeka O.	Nnamdi Azikiwe University, Awka	Electronics Engineering
Professor	NYITAMEN	Dominic Saaityo	Nigerian Defence Academy, Kaduna	Telecommunication Engineering

Professor	LETON	Tambari Gladson	University of Port Harcourt	Environmental Engineering
Professor	ITODO	Isaac Nathaniel	Joseph Sarwan Tarka University, Makurdi	Agricultural and Biosystems Engineering
Professor	OKAFOR	Gabriel Ifeanyi	University of Nigeria Nsukka	Food Science and Technology
Professor	HASSAN	Suleiman Bolaji	University of Lagos, Lagos	Materials and Metallurgical Engneering
Professor	AJAYI	John Ade	Federal University of Technology, Akure	Metallurgical Engineering
Professor	IKHU-OMOREGBE	Daniel	Benson Idahosa University, Benin-	Chemical Engineering
Professor	ADEMILUYI	Falilat Taiwo	Rivers State University, Port Harcourt	Petrochemical Engineering
Professor	ONYEKONWU	Mike	University of Port Harcourt	Petroleum Engineering
Professor	IKIENSIKIMAMA	Sunday Sunday	University of Port Harcourt	Petroleum and Gas Engineering
Professor	JOEL	Ogbonna Friday	University of Port Harcourt	Petroleum and Gas Engineering
Professor	YELEBE	Zakieni Robert	Niger Delta University, Bayelsa	Natural Gas Engineering
Professor	WAZIRI	Baba Shehu	University of Maiduguri	Water Resources Engineering
Professor	AIYESIMOJU	Kola Oluyomi	University of Lagos	Civil Engineering
Professor	OGUNTI	Erastus O.	Federal University of Technology, Akure	Structural Engineering
Professor	OLUFEMI	Babalola	Federal University of Technology, Akure	Wood Products Engineering
Professor	AISIEN	Felix A.	University of Benin, Benin-City	Biomedical Engineering
Professor	ODETUNDE	Christopher	Augustine University, Illara, Epe.	Aerospace Engineering

Professor	ATAYERO	Aderemi A.	Covenant university, Ota	Information and Communication Engineering
Professor	AIBINU	Musa Abiodun	Federal University of Technology, Minna	Information and Communication Engineering

APPENDIX II

LIST OF 30% DEPARTMENTAL REVIEWERS

Title	Surname	First name	Position
Dr	Okpoko	Juliana	Ag Head of Department, Senior Lecturer
Dr	Aladenika	Adedayo	Lecturer I
Engr	Odiase	Godwin	Lecturer I
Engr	Ikri	Samuel	Lecturer I

APPENDIX III

LIST OF 30% FACULTY REVIEWERS' COMMITTEE

Title	**Surname**	**First name**	**Position**
Professor	Ikhu-Omoregbe	Daniel	Dean
Dr	Okpoko	Juliana	Ag Head of Department
Dr	Olodu	Dickson	Ag Head of Department
Dr	Aibangbee	Johnson	Ag Head of Department

APPENDIX IV

LIST OF SENATE COMMITTEE ON 30% INSTITUTIONAL ADDITION

Title	Surname	First name	Position
Professor	Oyedeji	Johnson	Chairman
Professor	Obasi	Rosemary	DAP, Member
Dr (Mrs.)	Odiachi	Rosemary	Ag. Librarian, Member
Professor	Oboh	Fred O. J.	Member
Professor	Ikhu-Omoregbe	Daniel	Member
Professor	Esimaje	Alexandra	Member
Professor	Obahiagbon	Kingsley Osaimiamiomwan	Member
Professor	Ajayi	Helen Inikpi.	Member
Professor	Oboh	Godwin	Member
Professor	Akpoghome	Theresa	Member
Professor	Enabulele	Stephen Amadin	Member
Professor	Asekome	Mike	Member
Professor	Enagbonma	Osato	Member
Dr	Erhunmwunse	Rapheal	Member
Dr	Ekwe	Joseph. N	Member
Dr	Okpoko	J.S.	Member
Dr	Imouokhome	James.I.	Member
Dr	Ajanwachukwu	W.	Member
Mr.	Ogbonna	Wilson	Member
Mrs.	Adekoya	Preye	Member
Mrs.	Eseiwi-Edokpolor	Eseiwi.G	Member
Mr.	Aruevbose	Enoma	Secretary