DEPARTMENT OF MECHATRONICS ENGINEERING

FACULTY OF ENGINEERING

BAYERO UNIVERSITY, KANO

UNDERGRADUATE STUDENTS HANDBOOK

2020/2021 SESSION

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THE UNIVERSITY CREST

The Crescent and the Star.

The Crescent: (Symbol & Unit of Time) — **Jāmiatu Bayero bi Kano (Bayero University, Kano)**

The Star: (Guiding Light). — ***Motto:*** **WA FAWQA KULLI DHI 'ILMIN 'ALĪM i.e**

"----- but over all Endued with Knowledge is One, the All- knowing" HQ. 12:76.

The University Colour: **Blue.**

N/B Transliteration/Translation is from Arabic.

PHILOSOPHY, VISION AND MISSION OF THE UNIVERSITY

Philosophy

The University shall be rooted in its community and act as a symbol of the spirit of the community, a guardian of its morals and a formulator of its hopes and aspirations. Therefore, it shall cultivate a distinct tradition and character that reflect those essential values and nuances that give the host community its identity. The university shall ensure respect for human values as accepted by the host community, safeguard the objectives of a united, fair and just nation, promote the universality of knowledge and pursuit of academic excellence.

Vision

To lead in research and education in Africa

Mission

Committed to addressing African developmental challenges through cutting-edge research, knowledge transfer and training of high quality graduates.

LIST OF VISITOR AND PRINCIPAL OFFICERS OF THE UNIVERSITY

Professor Adamu Sagir Abbas, BSc., M.Ed. (BUK), Ph.D. (ABU); FMAN	VICE-CHANCELLOR
Prof. Sani Muhammad Gumel, Bsc. (ABU), Msc., PhD. (BUK); FCSN, FPIN, FTRAN, FCAI, MICCON	DEPUTY VICE-CHANCELLOR (ACADEMIC)
Prof. Mahmoud U. Sani, MBBS, Ph.D, FWACP, FACP,FACL, FNCS, FESC, FRCP	DEPUTY VICE-CHANCELLOR (MANAGEMENT SERVICES)
Prof. Abdullahi Sule-Kano, Bsc., Msc., PhD. (ABU)	DEPUTY VICE-CHANCELLOR RESEARCH & DEVELOPMENT)
Jamil A. Salim; B.A, PGDPPA, MBCL	REGISTRAR
Dr. Suleiman Mohammed Bello; CAN (BUK), MBA (BUK), Ph.D (UUM)	BURSAR
Dr. Musa A. Auyo, BA.LS, DLS (BUK), MLS(ABU), Ph.D (BUK); CLN	LIBRARIAN
Professor Hashim M. Alhassan B.Eng., MSc., Ph.D.,MNSE, MNES, MMSN, COREN	Dean, ENGINEERING

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CHAPTER ONE: INTRODUCTION

1.1 HISTORICAL BACKGROUND

Mechatronics Engineering is an emerging field that combines mechanics, electronics and computer Engineering. Modern technology involves an increasingly complex and challenging range of research, development and design skills applied in a variety of industries as diverse as automotive, aerospace automation, medical instrumentation, domestic and leisure products. Graduates aspiring to a professional career in such industries find it more useful to have a multi-disciplinary knowledge base, rather than the traditional single discipline one. It has become increasingly popular for two reasons. Mechatronics is often associated with robotic systems but can also be found in applications ranging from automobiles to household products. As more and more industries are expanding their implementations of mechatronic systems, there is an increasing demand for engineers with the multidisciplinary experience necessary to design these types of systems.

In June 2010, the National Universities Commission (NUC) selected six universities including Bayero University Kano to establish and run undergraduate programmes in Mechatronics Engineering. Consequently, the Dean of Engineering at the instance of the Vice-Chancellor set up an interdepartmental committee to work out modalities for the commencement of the programme. The committee proposed the establishment of a new department to house the Bachelor of Engineering degree in Mechatronics Engineering and any other Mechatronics-related programme that may be introduced in future. In addition, the

committee drafted a curriculum for the Bachelor degree programme in line with NUC benchmark.

In September 2011, the senate of Bayero University approved the establishment of the Dept. of Mechatronics Engineering and the programme of Bachelor of Engineering in Mechatronics Engineering. In October, 2011 the Vice-Chancellor appointed a coordinator for the new department. The coordinator was upgraded to the status of Head of Department in May, 2012.

1.2 PHILOSOPHY

To achieve national goals and objectives of industrialization and self-reliance, the Mechatronics Engineering education should be geared towards:

i. The development of a thorough practice in Engineering and Technology training.

ii. Broad - based training in general engineering and Technology at the early stages of the programme.

iii. Practical application of Engineering, Technology and Manufacturing processes.

iv. Adequate training in human, organizational behavior and management.

v. Introduction to entrepreneurial education and training.

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

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

1.3 AIM AND OBJECTIVES

The general aim and objectives of Engineering and Technology training should be in consonance with the realization of national needs and aspirations vis-à-vis industrial development and technological emancipation. The benchmark statements give the minimum academic standards required to meet these needs and to produce graduates in Mechatronic Engineering with sufficient academic background and practical experience who would be able to rise to the challenges of a developing economy. Such graduates must therefore be resourceful, creative, knowledgeable and able to perform the following functions:

i. To design engineering projects and supervise their construction.

ii. To design and make components, machines, equipment and systems.

iii. To design and develop new products and production techniques in industries.

iv. To install and maintain complex engineering systems so that they can perform optimally in our environment.

v. To adapt and adopt exogenous technology in order to solve local engineering problems.

vi. To be able to exercise original thought, have good professional judgment and be able to take responsibility for the direction of important tasks.

vii. To be able to manage people, funds, materials and equipment.

viii. To improve on indigenous technology to enhance local problems solving capability.

The specific objectives of the programme of the Mechatronic Engineering department are:

i. To offer internationally competitive and locally responsive undergraduate training.

ii. To provide training for students to be able to function effectively in multidisciplinary teams and projects.

iii. To provide students with the necessary training, entrepreneurial skills and capability in a competitive job market.

iv. To train the students to acquire verbal and written communication skills and the ability to use up- to-date techniques and tools of Mechatronics and other related engineering equipment.

v. To train students to analyze, design and produce manufacturing facilities.

vi. To develop in the students the capability to install, maintain and troubleshoot manufacturing facilities efficiently.

The Faculty of Engineering seeks to be a world-class centre of Engineering training that meets the growing need for expertise in engineering field.

Our mission is to train and produce Engineers with the required qualities and capabilities to meet the increasing demand for professional Engineers in Nigeria and beyond.

1.4 EMPLOYMENT OPPORTUNITIES

Mechatronic Engineering is a synergy of mechanical, electrical, electronics and computer engineering. It involves basic training in mechanics, electrical, electronics, pneumatics, hydraulics, sensors, controllers, robotics, CAD/CAM/CNC and ICT as well as a combination of previous technologies to form factory or process automation manufacturing facilities. The graduates therefore have opportunities of getting employment in a wide range of engineering based concerns such as in production and manufacturing industries i.e. pharmaceutical, cement, automotive, aviation, food and beverages, printing, textile, oil and gas, etc. They can also find employment in defense industries.

CHAPTER TWO: LIST OF COURSES

2.1 LEVEL 100 COURSES

The level 100 courses are common to all students of Faculty of Engineering. They are part of core courses for students of the Faculty.

S/No.	Course Code	Course Title	Credits Units
1	CHM1230	Inorganic Chemistry	2
2	CHM1240	Organic Chemistry	2
3	CHM1250	Physical Chemistry	2
4	CHM1270	Practical chemistry	2
5	CSC1201	Introduction to Computer Science	2
6	GSP1401	Use of English	4
7	MTH1301	Elementary Mathematics I	3
8	MTH1302	Elementary Mathematics II	3

9	MTH1303	Elementary Mathematics III	3
10	STA1311	Probability I	3
11	PHY1170	Physics Practical I	1
12	PHY1180	Physics Practical II	1
13	PHY1210	Mechanics	2
14	PHY1220	Electricity and Magnetism	2
15	PHY1230	Behaviour of Matter	2
Total Number of Credits			34

2.2 LEVEL 200 COURSES

All the level 200 courses are common and core courses for all students of faculty of Engineering. Apart from GSP2202 and GSP 2202 which are university courses, all the courses are conducted in the Faculty of Engineering.

S/No.	Course Code	Course Title	Credits Units
1	GSP2201	Foundation of Nigerian Culture	2
2	GSP2202	Nigeria government and Economy	2
3	GSP2222	Peace & Conflict Resolution	2
4	GSP2401	Use of English	4
3	EGR2101	Engineer in Society I	1
4	EGR2102	Students Work Experience Programme	1
5	EGR2103	Experimental Methods and Analysis	1
6	EGR2201	Fluid mechanics	2
7	EGR2202	Solid Mechanics	2
8	EGR2203	Engineering Drawing I	2
9	EGR2204	Workshop Practice	2
10	EGR2205	Thermodynamics I	2
11	EGR2206	Materials Science I	2
12	EGR2207	Principles of Electrical	2

		Engineering I	
13	EGR2208	Principles of Electrical Engineering II	2
14	EGR2301	Mathematics I	3
15	EGR2302	Mathematics II	3
16	EGR2304	Laboratory A	3
17	EGR2305	Laboratory B	3
18	EGR2306	Applied Mechanics	3
19	EGR2313	Computer Programming	3
Total Number of Credits			43/47

2.3 LEVEL 300 COURSES

First Semester

S/NO	Course Code	Course Title	Credit Units
1	EGR 3101	Engineer in Society II	1
2	EEP 3201	Entrepreneurship and Innovation Studies	2
3	EGR	Engineering Mathematics I	3

	3301		
4	MCS 3201	Mechanical Engineering Design	2
5	MCS 3202	Materials Technology	2
6	MCS 3208	Fluid Mechanics II	2
7	MCS 3203	Computer Software Engineering I	2
8	MCS 3307	Electronics I	3
9	MCS 3301	Control engineering I	3
10	MCS 3209	Principles of Mechatronics Systems	2
11	MCS 3305	Laboratory I	3
12	MCS 3210	Electromagnetic theory	2
TOTAL			***27***

Second Semester

S/NO	Course Code	Course Title	Credit Units
1	EGR 3102	Technical Writing and Presentation	1
2	EGR 3203	SIWES I	2
3	EGR 3311	Computer Applications	3
4	EGR 3302	Engineering Mathematics	3
5	MCS 3302	Heat and Mass Transfer	3
6	MCS 3304	Electromechanical Devices	3
7	MCS 3303	Manufacturing Technology	3
8	MCS 3207	Elect. Circuit Theory	2
9	MCS 3306	Laboratory II	3
10	MCS 3205	Signals and Systems	2
11	MCS 3211	Introduction to Digital Electronics	2
TOTAL			***27***

2.4 LEVEL 400 COURSES

First Semester

S/NO	Course Code	Course Title	Credit Units
1	EGR 4101	Engineer In Society III	1
2	EGR 4201	Engineering statistics	2
3	MCS 4206	Control Engineering II	2
4	MCS 4203	Sensors and actuators	2
5	MCS 4204	Measurement and Instrumentation	2
6	MCS 4202	Computer Hardware Engineering	2
7	MCS 4303	Electronics II	3
8	MCS 4302	Mechanics of Machines	3
9	MCS 4305	Laboratory III	3
10	EEP 4201	Business creation and growth	2
11	MCS 4201	Introduction to Robotics	2
12	MCS 4205	Group Project	2
	TOTAL		***26***

Second Semester

S/NO	Course Code	Course Title	Credit Units
1	EGR 4401	SIWES II	4

2.5 LEVEL 500 COURSES

First Semester

S/NO	Course Code	Course Title	Credit Units
1	MEC 5405	Engineering Management	4
2	MCS 5202	Control Engineering III	2
3	MCS 5303	Digital signal processing	3
4	MCS 5305	Microcomputers and microprocessor systems	3
5	MCS 5203	Process automation	2
6	MCS 5307	Automation Laboratory	3
7	MCS 5601	Final year project	6
TOTAL			**23**

Second Semester

S/NO	Course Code	Course Title	Credit Units
1	MCS 5302	Automation and Robotics	3
2	MCS 5304	MEMS & VLSI	3
3	MCS 5205	Computer software engineering II	2
4	MCS 5306	Systems modeling and simulation	3
5	MCS 5301	Power Electronics and drive	3
6	MCS 5212	Computer aided manufacturing	2
7		Two electives	4
	TOTAL		***20***

Electives (Students are required to select two electives, one per semester)

S/NO	Course Code	Course Title	Credit Units
1	MCS5207	Machine Vision	2
2	MCS5208	Micro-fabrication Technology	2
3	MCS5209	Mobile Robotics	2
4	MCS5210	Control Engineering IV	2
5	MCS5211	Microcontrollers and embedded systems	2

6	MCS5212	Computer Aided Product Modeling	2
7	MCS5213	Renewable Energy Resources	2
8	MCS5214	Lean Production Mgt. & Ind. Logistics	2

CHAPTER THREE: DESCRIPTION OF COURSES

3.1 100 LEVEL COURSES

CHM1230: Inorganic Chemistry

Principles of atomic structure, isotopes, empirical and molecule formulae. Electronic configuration, periodicity and building up of Periodic Table. Hybridization and shapes of simple molecules. Extraction of metals. Comparative chemistry of groups IA, IIA and IVA elements. Preparation, properties, structure and application of some of the selected compounds. Introduction to transition metal chemistry and nuclear chemistry.

CHM1240: Organic Chemistry

Historical survey of the development and importance of organic chemistry; IUPAC Nomenclature and classification of organic compounds; homologous series: Covalent bonds and hybridization to reflect the tetravalency of carbon in Organic Compounds, Electronic theory in Organic chemistry. Qualitative and quantitative Organic chemistry, Determination of empirical and molecular formulas; isolation and purification of Organic compounds; saturated hydrocarbons; structural isomerism, properties and reactions of alkanes and cycloalkanes, mention of their chemistry and uses in petroleum; unsaturated hydrocarbons; alkenes; alkynes; cycloalkenes; cis-trans isomerism, simple electrophilic addition reactions, polymerization.

CHM1250: Physical Chemistry

Principles of atomic structure; Isotopes, empirical formular, Nuclear structure, atomic fission and nuclear energy. The electronic structure and arrangement of electrons and atoms. Electronic configuration 1st and 2nd rows of elements. Properties of gases: equation of state, kinetic and molecular theory of gas and Heat capacities of a gas. Equilibrium and Thermodynamics; Thermochemistry, Enthalpy of reactions, bond energies, thermodynamics cycles, Hess's law Born Herber cycle, the meaning of Ka, K and K LeChatelier's principle pH, ionic equilibrium, buffers, indicators, solubility product, common ion effect, redox reaction. Electrode potentials, electrolytes and electrolysis. Kinetics: the position of equilibrium and the rate at which is attained. Factors influencing rate of reactions. Introduction to activation and catalysis.

CHM1270: Practical Chemistry

Laboratory instruction and Experimental products shall be conducted for the candidates from the following subject areas:

Physical: Determination of heat of reaction, effects of solute on boiling point of solvents, partition coefficient. Determination of molecular mass by Dumas and VictoMeyer methods. Measurements of rate equation and activation energy. Other experiments based on the scope of the lectures and as approved by the Department.

Organic: Safety precaution instructions, classification of Organic compounds by their solubility's in common solvents. Qualitative analysis analysis for common elements in Organic compounds. Identification and classification of acids and bases functional groups. Identification of the following: Natural

function groups; alcohols; aldehydes, ketones, esters, anhydrides and ethers. Acetylation of aniline as an example of the preparation of solid aniline derivative. An electrophilic addition reaction.

Inorganic: Qualitative and quantitative analysis, molarity, concentration and percentage purity.

CSC1201: Introduction to Computer Science

History of computers, functional components of computer, characteristics of computer, problem solving; flow charts, algorithms. Computer programming. Statements, symbolic, names; arrays, subscripts, expressions and control statements. Introduction to BASIC or FORTRAN programming language, computer applications.

MTH1301: Elementary Mathematics I (Algebra & Trigonometry)

Elementary set theory: subsets, union, intersection, complements, Venn diagram; Real numbers: algebra of complex irrational numbers; complex numbers algebra of the complex numbers, the Argand diagram, De Moiver's theorem, n-th roots; Mathematical induction; real sequences and series; theory of quadratic equations; binomial theorem; circular measure; trigonometric functions of angles of any magnitude, addition and factor formulae.

MTH1302: Elementary Mathematics II (Vectors, Geometry & Dynamics)

Geometric representation of vectors in 1, 2 and 3 dimensions, components, direction cosines, addition, scalar multiplication of

vectors, linear independence. Scalar and vector product of vectors. Differentiation and integration of vector functions with respect to scalar variables. Two dimensional coordinate geometry: straight lines, circles, parabola, ellipse, hyperbola, tangents, normal. Kinematics of a particle: components of velocity and acceleration of a moving particle in a plane. Force momentum, laws of motion under gravity, projectiles, resisted vertical motion, elastic string, simple pendulum impulse. Impact of two smooth spheres, and of a sphere on a smooth surface.

MTH1303: Elementary Mathematics III (Calculus 1)

Function of real variable, graphs, limits and idea of continuity. The derivatives, as limit of rate of change. Techniques of differentiation. Extreme curve sketching; integration as an inverse of differential. Methods of integration, Definite integrals. Application to areas and volumes.

STA1311: Probability I

Generation of statistical events from set theory and combinational methods. Elementary principles of probability. Types and distribution of random variables; the binomial, Poison, hypergeometric and normal distributions. Expectations and moment, random variables; probability sampling from table of random numbers; selected applications.

PHY1210: Mechanics

Space and time, frames of reference, units and dimension, kinematics; fundamental laws of mechanics, statics and dynamics; Galilean invariance, universal gravitation; work and energy; rotational dynamics and angular moment; conservation laws.

PHY1220: Electricity and Magnetism

Electrostatics, conductors and currents; dielectrics, magnetic fields and induction; Maxwell's equations; electromagnetic oscillations and waves; applications.

PHY1230: Behaviour of Matter

Molecular treatment of properties of matter elasticity; Hooke's law; Young, shear and bulk moduli. Hydrodynamics; streamlines, Bernoulli and continuity equations, turbulence, streamlines, Bernoulli and continuity equations, turbulence, Reynolds's number, viscosity, laminar flow, Poiseulle's equation. Surface tension, adhesion, cohesion, capillarity, drops and bubbles, temperature; zeroth law of thermodynamics; heat; gas law; laws of thermodynamics; kinetic theory of gases. Applications

PHY1170/1180: Physics Practicals I/II

This introductory course emphasizes quantitative measurements, the treatment of measurement errors and graphical analysis. A variety of experimental techniques will be employed. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity, etc covered in the above physics courses.

3.2 200 LEVEL COURSES

EGR2301: Mathematics I

Vector and matrix algebra; Basic definitions and operations. The inverse of a non-singular matrix. Theory of linear equations,

Eigenvalue and Eigen-vectors. Consistency dependence, and solution of simultaneous equations (including Cramer's rule). Analytic geometry: Coordinate transformation, solid geometry, polar, cylindrical and spherical coordinates, curves and surfaces, plane curves and quadric surfaces. Multivariable calculus: Vector functions, continuity and derivatives, elementary partial differentiation, multiple integrals. Various applications including maxima, minimum, volumes, tangent planes and normal lines.

EGR2302: Mathematics II

Vector analyses: Vector theory, dot product, cross product, vector fields, line and surface integrals. Grad. div, and curl green's and stoke's theorems. Series and sequence: Basic definitions, test for convergence. Power series and Taylor's expansion of various elementary functions. Complex numbers, their representation and algebra. Fourier series. Euler coeff. Even and odd functions; sine and cosine functions. Calculus: Complex analysis. Element of complex algebra, trigonometric, exponential and logarithmic functions. Analytic and harmonic functions. Integration of complex variables, Cauchy theorem. First order equations, special types of second order equations.

EGR2306: Applied Mechanics

Statics: Laws of statics; system of forces and their properties; application and simple theorem. Friction and its applications: Nature and types of friction; application of friction in machines-wedges, belt derives, screws and simple problems. Virtual works: Works principle of virtual work, application and simple problems. Particle Dynamics: Kinematics of plane motion, kinetics of particles (equation of motion, momentum and energy

method); Kinematics of rigid bodies; types of rigid bodies; velocity and acceleration diagrams for simple mechanisms; kinetics of rigid bodies; two dimensional method of rigid bodies. Energy and momentum. Moment of inertia and simple problems. Simple harmonic motion.

EGR2206: Materials Science I

Structure of the Solid State: Review of the theory and structure of atom; primary and secondary bonds in solids. Crystalline solids; common crystal structures in elements; Miller notation for crystallographic planes and directions. Crystal Defects: Point defects (vacancy, substitutional and interstitial stems); Line defects (dislocations); Plane defects (grain boundries). Single – phase and Multi – phase materials: Solid, solutions and intermediate phases; Equilibrium diagrams; Some important commercial alloy systems. Deformation in solids: Elastic deformation, plastic deformation and motion of dislocations. Properties of Materials: Mechanical properties; Thermal properties; Electrical properties; Magnetic properties; Optical properties.

EGR2202: Solid Mechanics

Fundamentals of equilibrium. Statically determinacy with reference to pin-jointed frames. Force analysis of pin-jointed plans and space frames. Shear force and bending moment. Normal stress and strain: The stress-strain relationship, Poisson's ratio. Thin cylinders and spheres. Shear stress: Complementary shear stress. Shear strain, torsion of circular section. Bending theory. Deflection of beams, Macaulay's method. The moment area method. Simple application of strain energy to single load systems. Closed coiled helical springs.

EGR2203: Engineering Drawing I

Introduction: The importance of drawing in the engineering process; Standards, units and paper sizes; equipment and drawing instruments; scales; lettering and dimensioning; good draughts-manship and drawing procedure. Representation of three-dimensional objects: Free hand sketching; first and third angle orthographic projections; isometric drawing and projectional representation of hidden details and sections; Construction and dimensioning of circles and areas; oblique (cavalier and cabinet) drawing; axonometric perspective projections. Engineering practice: Introduction to various branches of engineering drawing; common engineering terms, conventions, abbreviations and symbols; electrical engineering symbols and circuit diagrams.

EGR2204: Workshop Practice

Workshop hazard: Hazard process and bench work. Joining and fastening, welding, hand tools, Measurement systems and devices, Marking out, Sheet carpentry and joinery, Electrical tools and usage, Simple electrical installation. Cement and concrete preparation. Concrete block making. Shuttering and concrete casting. Wall building. Introduction to machine tools: Practicals, Marking out and filling exercise, Manufacture of a simple bolt, Construction of a simple amplifier, Exercise in battery maintenance and charging. Cement and concrete preparation. Block making: Column casting, Block and brick wall building.

EGR2101: Engineer in Society I

Historical background: The development of engineering as the response to the increasingly complex problems of the individual,

the community and society. Significant technological discoveries which have affected the process of civilization. The industrial revolution and the harnessing and exploitation of various fuel sources: coal, oil and generation of electricity, nuclear power and renewable sources (solar energy, wind power, etc). The impact of engineering activities on the environment and its resources. The engineering profession: The evolution of the different branches of engineering, and the structure, organization and ethics of the profession, the specific responsibilities to society of the civil engineer, electrical engineer, and the mechanical engineer. Other engineering disciplines and their interrelationships; multidisciplinary projects. The contrast between the Engineer and the Scientist, and the engineering approach to the solution of practical problems. Engineering Projects: The role of engineering activities and industry in the nation's economy. Introduction to economics, management and law as relating to engineering and industrial practice. The planning, construction and operation of engineering projects and facilities.

NOTE: Films and seminars by practicing engineers will comprise part of the above lecture course, which will also be supplemented by work visits to illustrate the major branches of engineering as far as local opportunities allow.

EGR2313: Computer Programming

Introduction to programming languages. Operating Systems (DOS and Windows). Introduction to Microsoft DOS: Copy, Delete, Dir, MD, RD commands etc. creation of batch files. AUTOEXE. BAT and CONFIG. SYS files. Windows desktop (Task bar, Start a program, Switch between running programs, Openning a file or folder, copy a file or a folder, create a folder,

change the name of a file or folder, Searching for files, back up your files. Customizing windows desktop (change he background of the desktop, change the ways items on the desktop look, set up a screen saver, to show all files and file name extension, to add a program to the start or program menu). Using Windows Accessories (Calculator, Games, Notepad, Entertainment, Using scan disk, Multimedia). The concept of a program, preparation, execution. Algorithms, Flow charts and Pseudo codes. Characters, Symbolic names, types of variables, Arithmetic expressions, Logical expressions, assignment. Control within a program unit: Simple loops, logic IF, unconditional transfer, (GO Assigned GO To). Arrays: Types of Arrays, subscripts, simple functions, basic external functions, statement functions. Function and subroutine programs: Functions program, subroutine subprograms, external, use and abuse of local variables and arguments. Common storage: Common statement, stacks, equivalence statement. Initialization: Data, Block Data, Characters. Input/output: Read, write, general, I/O list, format, FW.d, Ew.d, GW.d, IW, AW, Banks, Free format input. Files: Formatted files, unformatted files, end file, REWIND and backspace. Exercises: Numerical calculations; Solution of certain equations, numerical integration, vectors and matrices, linear equations. Introduction to PASCAL.

EGR2201: Fluid Mechanics

Properties of Fluid: Characteristics of liquids, mass and the "ideal" fluid. Viscosity, compressibility; surface tension and capillarity; vapour pressure and solubility of gases. Dimensions and units. Static Fluids: Intensity of pressure and hydrostatic pressure on plane and non-plane surfaces; forces on floating and immersed objects; stability and height. Fluid in motion:

Definitions, steady, unsteady, uniform and non-uniform flow; steady; unsteady, uniform and non-uniform flow; velocity distribution and discharge, the concepts of a fluid particles; streamlines and stream tube. The continuity (conservation of mass) equation. The energy (Bernoulli's) equation for incompressible steady flow: application to orifices, nozzles, venture meters, pilot tubes, notches and weirs, time of emptying tanks. Fluid friction: Laminar and turbulent flow, and the experiments of Reynolds. Head loss due to friction in pipes and closed conduits: the Darcy equation and the concept of hydraulic gradient: other losses in pipe appurtenances. Introduction to flow in open channels: the Chezy formula.

EGR2103: Experimental Methods and Analysis:

Principles of measurement, standard deviation, method of least squares and its application. Curve fitting, theory of errors. Binomial and other distributions, goodness of fit, Chi-squared test. Experimental Methods: Displacement and strain measurement. First and second order system. Dynamic response.

EGR2205: Thermodynamics I

Fundamental concepts: Introduction to thermodynamics. The system. Thermodynamic properties, heat and work, energy resources, heat sources and heat sinks. The first law of thermodynamics: The cycle. The statement of the first law of thermodynamics. Corollaries of first law. The non-flow energy equation application of the I to various processes. The steady Flow Energy Equation: The derivation of the steady flow energy equation from first law. Simple applications of the steady flow energy equations. The second law of thermodynamics: Cycle efficiency: Definition of a heat engine. Statement of the first law

of thermodynamics. Reversibility. Carnot cycle and other cycles. Corollaries of the second law. Properties of substances: Definition of pure sentence. Phase changes. Relationship between properties. The perfect gas and semi-perfect.

EGR2207: Principles of Electrical Engineering I

Fundamentals of Electrical Engineering: Electric current. Coulomb's law. Potential difference. Faraday's law of electromagnetic induction. Ohm's law. Kirchhoff's laws. Ampere's law. Circuit elements: Energy and power. Resistance. Capacitance and inductance parameters. Circuit elements in practice. Construction, colour-code and preferred values. Series and parallel combination of resistors, capacitors and inductors series-parallel circuits. Elementary Network Theory: Superposition theorem. Norton's theorem. Network analysis by Mesh current and node par voltages conversion of voltage sources to current source. Network reduction by Delta-star (D-Y) transformations. Steady State Sinusoidal Response: Sinusoidal functions. 1 stantenous and average power. Power factor. Phasor representation of sinusoids. Steady State Sinusoidal Response of single element. R-L, R-C and R-L-C circuits. Applications network theorems to complex inductances. Balanced three phase circuiuts. Semiconductor devices: Conductors. Insulators and semiconductors. Types of semiconductors. Charge carrier density insemi-conductors. Semiconductor, diodes-characteristics and equivalent circuits. The diode equation. Zener diode, tunnel diodes. Varicap diodes, schottky (Hot carrier) diodes (LEDds), liquid crystal displays (LCDS). Junction Transistors: Transistors characteristics. C.B., CE and CC configurations. Transistors biasing, the operating point, load line, stability factors, design of DC bias circuits, phototransistors. Introduction to Measurement: Units and

standards. Direct and comparative measurements. Analogue and digital measurements. Measurements of current, voltage, resistance, capacitance and inductance.

EGR2208: Principles of Electrical Engineering II

Electromechanical Energy Conversion: Magnetic theory and circuits. Permeability magnetic flux, magnetic field intensity, derived relationships. Theory of magnetism. The magnetic circuit, concepts and analogies. Units for magnetic calculations. Magnetic circuits computations. Hysterisis and Eddy current loss. Transformers: Theory of operation and development of phasor, the equivalent circuit, parameters from no load tests. Efficiency and voltage regulation; mutual inductance. Basic Analysis of Electromagnetic Torque: Analysis of induced voltages. Construction features of electric machines. Practical form of torque and voltage formulae. Single Phase Motors: Types, principle of operation. Characteristics and typical applications. Three-Phase Induction Motor: The revolving magnetic field. The induction motor as a transformer, the equivalent circuit. Computation of performance torque-speed characteristics. Three-phase Synchronous Machine: Generation of three-phase voltage system. Synchronous generator-phase diagram and equivalent circuit. The synchronous motor-operator diagram and equivalent circuit. Computation of performance. Applications. D.C. Machines: D.C. generator analysis, D. C. motor analysis, motor speed torque characteristics, speed control. Application. Starters.

EGR 2104 Introduction to Mechatronic Engineering

Overview of Mechatronics Sytems. Classification of Mechatronics systems. Basic components of Mechatronics

systems, viz sensors, actuators, controllers, etc. Applications of Mechatronics sytems.

3.3 300 LEVEL COURSES

MCS 3209 Principles of Mechatronic systems

Introduction to mechatronics systems-Measurement Systems – Control Systems – Microprocessor based Controllers. Sensors and Transducers – Performance Terminology – Sensors for Displacement, Position and Proximity; Velocity, Motion, Force, Fluid Pressure, Liquid Level. Temperature, Light Sensors – Selection of Sensors. Pneumatic and Hydraulic Systems – Directional Control Valves – Rotary Actuators. Mechanical Actuation Systems – Cams – Gear Trains – Ratchet and Pawl – Belt and Chain Drives – Bearings. Electrical Actuation Systems – Mechanical Switches – Solid State Switches – Solenoids – DC Motors – AC Motors – Stepper Motors.

EGR3101 Engineer in Society I (Basic Economics)

Business organization, industrial combinations, public utilities and finance, industrial concentration and Government Control. The Location of West African industry and trade. The background of the West African economy, planning of development, financing of development. The banking system, Money and Capital markets, inflation, cost benefit analysis.

EEP3201 Entrepreneurship Studies

Common syllabus course for all Level 300 Engineering Students

EGR3301Engineering Mathematics I

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. Runge Kutta and other methods in the solutions of ODE and PDEs. Numerical integration and differentiation.

MCS3201Mechanical Engineering Design

The design process, design concepts, sensors and actuators, computer vision, digital data acquisition and processing. The Analysis and Design of individual machine components; shafts, gears, chain linkages, bearing keys. Keyways, belts, clutches, etc. Components assemblies and machine systems.

MCS3202 Materials Technology

Metals: deformations, alloys, state diagrams, iron and non-iron alloys;
Contact materials; damage of materials.
• Plastics: production and processing; characteristics and fields of applications.
• Magnetic materials: structure, characteristics and applications.
• Others: composite materials, ceramics, glasses, semiconductor materials.
• Testing of materials.
• Protection of the environment.
• Waste disposal and recycling.

MCS3208 Fluid Mechanics II

Physical properties of fluids. Fluid statics. Fluid motion; conservation laws and mass, momentum and energy. Introduction of fluid friction energy equation in viscous flow. Laminar flow; steady flow in pipes, flow between parallel plates. Viscous flow theory and applications. Mechanical power systems and operations. Drive requirements for mechanical equipment. Thermal and hydraulic power systems. Introduction to heat exchangers.

MCS3203Computer Software Engineering I

Introduction to software engineering fundamentals. Object oriented programming. Number representations. Data structure and algorithms. Abstraction, modules and objects. Designing for efficiency.

MCS3307 Electronics I

Audio and RF electronics; Biasing and stability. Actual circuit and noise. Tuned load and differential amplifiers. Oscillators, mixers, modulators and demodulators. Low noise amplifiers. Power amplifiers. Phase-locked loops. *D.C Bias design.* Analysis and design of single stage and multiple stage amplifiers at low and high frequencies. Dealington pair, Cascoe amplifiers. Bootstrapping. Negative feedback concepts and feedback amplifiers.

MCS3210 Electromagnetic Theory

Review of vector analysis. Electrostatic and magnetostatic. Simple boundary value problems. Field marking. Dielectric and magnetic media. Time varying fields and Maxwell's equations, plane waves. Phenomena of reflection, refraction, standing waves and transmission of energy.

MCS3301Control Engineering I

Introduction; Concepts of feedback control. Mathematical model of physical systems. Block diagrams. Reduction techniques. Block diagram algebra. Signal flow graphs. Mason's rule. Analysis and design in S-plane. Steady state and transient response to step and ramp input. Use of P+ I, P + D lag, lead and tacho compensators for improvement of overall response. Negative velocity and positive acceleration feedback. Error rate damping. Stability analysis; Routh's stability criterion.

MCS3305Laboratory I

Laboratory Experiments on first semester level 300 courses designed to illustrate topics covered in MEC 3204 (Fluid mechanics II), MCS 3203 (Computer Software Engineering I), ELE 3305 (Electronics I), MCS 3301 (Control Engineering I) and MCS 3209 (Principles of Mechatronics Systems)

EGR3102 Technical Writing & Presentation

Principles of effective communication. Professional use of the English language. Principles of technical writing. Oral presentation of technical ideas. Technical correspondence, technical proposals, field trip reports.

EGR3311 Computer Applications

Revision of operating systems and programming concepts (3 hrs), Word Processing (6 hrs + 3 hrs of exercises), Types and Uses, Details of Microsoft word: ile Management (Starting MS-Word, Open, Saving, Exiting, Editing (Select text, Inserting symbols not on the keyboard, Formatting (Font selection, Bold, Italic and Underline formats, Paragraph Spacing, Indent, Page setup (Page Margin, Paper Size, Page Orientation, Page Numbers etc. Graphics (adding Auto shapes, Grouping Resizing, Moving and Rotating objects, Crop or Trim portions, Introduction to Spreadsheets (9 + 3 hrs of exercises hrs), Types and Uses of Spreadsheets, Details of Microsoft Excel, Creating Worksheets (Opening, Saving and Closing Workbook, Data Entry, Cell and range Selection, Series Entries, Editing Worksheets (Worksheet Data Copying, Data , Management, Column, Row and Cell insertion and deletion, Worksheet insertion and deletion, Formatting Worksheets (Cell formatting, Numerical formatting, Column , width and Row Height formatting, Data Alignment etc), Formulas and functions (Formula Creation, Formula Operators, Debugging, Range Names, Creating Functions. Charts (Creating a Chart, Using Chart Wizard, Change a Chart Placement, Editing Charts. Printing (Printing a particular area, Inserting and Removing Page break, Modifying the Page Setup, Creating Headers and Footers, Printing Worksheet by page. Data Management (9 + 3 hrs of exercises hrs). Types and Uses of Database

Details of Microsoft Access. Starting MS-Access Creating, Opening and Saving Database, Quitting MS-Access. Microsoft Database (Tables, Field Names, field and Records Tables (Creating a new Table, Modify Table Design, Set File Properties, Set Table Properties, Set Relationships, Viewing and Editing Data (Datasheet view, Perform Basic data entry tasks, Locate, sort and filter data,

Import and Export data, Change the Datasheet Layout), Forms (Creating Forms, Uses of Forms and Planning a form Design, Modify a Form Design, Set Control and Form Properties, Query (Create and Save a Query, Perform Query calculations, Specify Query criteria, Modify data with Action Query, Reports (Creating a new Report, Use Report Wizards, Modify sections of a Report, use groups and subtotals, Introduction to Computer , Communication (6 + 3 hrs of exercises hrs), LAN, WAN. Internet, Terms and Usage (ISP, Sever, WWW, Cookies etc. E-mail,

EGR3302 Engineering Mathematics II

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.

MCS3302 Heat and Mass Transfer

Conduction: Steady and unsteady conduction; Numerical methods. Convection; Free and forced convection for laminar and turbulent flows. Thermal radiation. Heat exchangers. Mass transfer processes.

MCS3205 Signals and Systems

System modelling. Analog signals. Convolution and correlation. Fourier and Laplace Transforms. Random Processes. Sampled signals and systems. Discrete Fourier transforms. Z transforms, Analog and Digital filters. Control strategies; Open-loop, feed forward and feedback control systems. Stability, performance and sensitivity analyses. Lag and Lead compensation. Frequency domain design. PID controllers. Elements of nonlinear control.

MCS3303 Manufacturing Technology

Basic manufacturing industries and process including casting, forging, assembling, inspection/testing and certification, packaging, warehousing and forwarding. Metal working operations: shaping, planing, milling, drilling, turning, reaming, broaching, abrasive machining and chipless machining processes. Metal cutting tools and cutting fluids, cutting forces and power. Threads, gears, selection of materials, processing methods and equipment for manufacturing. Fabrication methods

including welding, soldering, brazing, adhesive bonding and mechanical fastering. Quality control in manufacturing.

MCS3304 Electromechanical Devices

Magnetic circuits and magnetic materials, Transformers, Electromechanical-energy-conversion principles; Rotating machines; Synchronous machines; Induction machines; DC machines; Variable Reluctance machines and Stepping motors; Introduction to Power electronics; speed and torque control.

MCS3211 Introduction to Digital Electronics

Digital representation of information and binary arithmetic. Position number system, binary coding of alpha numeric characters in the computer, simple error detecting and correcting codes. (parity bits, Hamming codes). Arithmetic in various radio systems. Binary arithmetic in combination logic. Boolean algebra, switching function, truth tables, Karnaugh maps etc; Properties of switching functions; canonical forms, N and Nar designs; “don’t cares” minimization of multiple output switching functions; introductory minimization of multiple output switching functions; simple combinational circuit design; encoders, decoders, multiplexer, serial and parallel half and full adders, etc. Hazards in combinational circuit and other design problems. Notion of feedback state and delay in logic circuit; basic difference synchronous sequential circuits; illustration of the use of state transition equations, diagrams, tables etc in sequential logic by their use in defining the operation of

sychronized or clocked flip flops (such as r.s, JKT etc flip flops). Edge triggered and master flip-flops.

MCS3207 Electrical Circuit Theory

Network theorems. Network topology, General network solutions. Network transformations. Time and frequency domain analysis of networks. Application of Fourier series in network analysis. Fourier and Laplace Transforms and their applications. Transfer function concepts. Two port networks and their parametric representations. Characteristic impedance. Two port network synthesis. Foster and Causer's methods of synthesis. Application of computers in the analysis of linear and nonlinear circuits.

MCS3306 Laboratory II

Laboratory Experiments on Second semester level 300 courses designed to illustrate topics covered in MCS 3304 (Electromechanical Devices), MCS 3207 (Elect. Circuit Theory) and MCS3211 (Introduction to Digital Electronics).

3.4 400 LEVEL COURSES

EGR 4101: Engineer in Society III (Law)

A brief introduction to the following topics:

The Nigerian Legal System:

Industrial Safety Laws:

Engineering Bye Laws:

Electricity Supply Laws. Water and Public Health Laws.

Company and Partnership Law:

Nature and functions of companies. Formation and floatation of companies. Nature and type of partnership.

Copyrights, Patents and Trademarks:

The Law relating to employers and employees Contract Law:

Formation of contract. Discharge of Contracts. Remedies. Land Acquisition Law.

EGR4201 Engineering Statistics

Sampling, frequency tables and their graphs, center of distribution, spread of distribution, outcomes and their probabilities, conditional probability. Independence and standard deviation. Random variables. Expectation, variance, specific discrete and continuous distributions. Higher dimensional random variables. Multinomial and Bivariate normal probability distributions. Correlation and regression. Law of large numbers and central limit theorem. Sampling and sampling distributions. Test hypothesis and quality control.

MCS 4202 Computer Hardware Engineering

Microprocessor system design and programming. Simple and complex programmable logic devices. Hardware description

languages and introduction to VHDL. CPU design and field programmable gate arrays (FPGAs)

MCS 4206 Control Engineering II

Review of basic control theory. Analysis and design using Root's locus. System optimization using error criteria. Non linear systems. Frequency response methods using polar, Bode and Nichol's methods. Nyqyist compensation. Design of system with lead, lag, lead-lag compensators in frequency domain. System identification from experimental data. Analog computing; basic computing element. Solutions of linear ODE. Simulation of simple transfer functions.

MCS4201 Introduction to Robotics

Automation and Robotics. Robot Classification. Robot Specifications.

Direct Kinematics: Mathematical background. D-H representation. The Arm equation. Examples

Inverse Kinematics: The inverse kinematics problem and its solution. Tool configuration. Examples of various robots. Introduction to Manipulator Dynamics: Lagrange's Equation, Lagrange-Euler Dynamic Model.

Use of Sensors and Vision System in Robotic System

MCS 4203 Sensors and Actuators

Electrical Actuators: Review of Electrical Motors and their types, Motor Equations, Drivers, and Control of DC Motors, Induction Motors, Synchronous Motors, and Stepper Motors.
Hydraulic Actuators: Pumps and its Different Types, Hydraulic Motors and Its Different Types, Valves and Its Different Types, Power Supplies, Cylinders, Accumulators, Intensifiers, Lifts, Couplings, Torque Converters. Hydraulic Circuit Design and Analysis.
Pneumatic Actuators: Compressors, Fluid Conditioners, Pneumatic Cylinders, Valves and Plugs, Basic Pneumatic Circuit Design & Analysis, Accumulator system Analysis
Motion Transducers: Potentiometer, Variable Inductance Transducers, Permanent Magnet Transducers, Variable Capacitance Transducers, Piezoelectric Transducers, and Proximity Transducers
Effort Sensors: Strain Gages, Torque Sensors, Tactile Sensors

MCS4204 Measurement and Instrumentation

Errors in measurements, classification and functional analysis, performance of instruments systems, calibration. Control system components, amplifiers, sensing devices, pumps and controllers, error detectors and output elements, instrumentation methods; measurements and recording of dimensions, time, weight, frequency, temperature, pressure, etc. transducers, bridge and potentiometer methods. Sychros, Hall effects, photovoltaic and moving iron transducers. Instrument transformers, Pulse

transformers, energy meters and metering, information storage techniques, electronic instrumentation, digital technique, analog/digital signal processing. Survey of modern instrumentation components. Nonlinear computing elements.

MCS4303 Electronics II

Constructional details and characteristics of JFET and MOSFET.

Operation of FETs as Amplifies and switches.

Feedback oscillators and the Berkhausen criterion. Practical oscillator circuits; phase-shift, wien bridge, Hartley, Colpitt, Crystal, etc. Frequency stability of oscillators. Ideal operational Amplifier. Connection as non-inverting and inverting amplifier. The differential amplifier, transfer characteristics of the differential amplifier (Differential amplifier asa modulator and multiplier). Operational amplifier parameters (common-mode rejection ratio, offset voltages and currents etc.) Class A, AB, B and push-pull power amplifiers. Analysis of power amplifiers and head sinks. Thermal stabilization. Complimentary and quasi-complimentary output stages. Application of analogue integrated circuits such as wideband amplifiers, instrumentation amplifiers, multiplier circuits, voltage controlled oscillators and phase locked loops. Design techniques for advanced analogue circuits containing transistors and operational amplifiers.

MCS4302 Mechanics of Machines

Vibrations of Linear System with one degree of Freedom. Undamped free and forced vibration. Damping (viscous). Damped free and forced vibration. Vibration isolation and transmitted force.

The centrifugal pendulum. Torsional damped vibration at critical speed.

Vibration of Linear System with Two or More degrees of Freedom: Equations of motion and solution. Undamped free and forced vibrations. Dynamic vibration absorber. Transmission of force and motion.Torsion Vibration: Discrete systems. Undamped free and forced torsional vibration. Oscillation of geared systems. Transverse Vibration: Natural frequency of distributed system in transverse vibration whirling shafts. Exact and approximate method. Introduction to Non-linear Vibrations. Computer solutions: Vibration Isolation and absorption. Machine balancing.

MCS4205 Group Project

Identifying problem requirements. Generating and evaluating design concepts; design and fabrication. Design control software. Testing and debugging of systems. Documentation of design and results.

MCS4305 Laboratory III

Laboratory Experiments on first semester level 400 courses designed to illustrate topics covered in MCS 4206 (Control Engineering II), MCS 4203 (Sensors and Actuators), MCS 4204 (Measurement and Instrumentation), MCS 4206 (Computer Hardware Engineering I) ELE 4303 (Electronics II), MCS 4302 (Mechanics of Machines) and MCS 4201 (Introduction to Robotics)

EGR4401 SIWES II

Students Industrial Work Experience Scheme II

3.5 500 LEVEL COURSES

MEC5405: Engineering Management

Productivity: Definition, factors affecting productivity in industry, how to increase productivity, measurement of productivity in industry. Work study: (a) Motion study: Method study objectives, basic procedure of method study, recording technique process chart, time chart, multiple activity chart, process examination procedure, human factors, work study report and installation. (b) Time study: Recording information, dividing the operation into elements numbers of cycles, the rating factor, allowance, norm and standard time.

Wage Incentives: Incentive plans, day rate plan, full participation plans, less than full-participation plan, the step plan. Production Planning and Control: Production control in intermittent manufacturing, production control in continuous manufacturing, Planning and controlling in project management - PERT.

Statistical Quality Control: Kinds of control, acceptance sampling by attributes, operating characteristics curves, sampling, control charts for attribute, control charts for variables. Cost Data for Decision:

Fixed and variable costs, break-even analysis and construction of break-even chart. Capital costs and investment criteria:

Capital costs, common criteria of comparing economic alternatives, present value criterion, average investment criterion, rate of return criterion, pay off periods.

MCS5303 Digital Signal Processing

The Concepts of sampling, quantization and aliasing. Discrete time signals and systems, discrete convolution, Z transforms, Z plane poles and zeros. Discrete Fourier transforms. Fast Fourier Transform. Concept of digital filtering, types of digital filters and properties. Digital transfer functions. One dimensional recursive and non recursive filters. Spectral transforms and their application in synthesis of high-pass and band-pass filters. Computer techniques in filter synthesis. Realization of filters in hardware and software. Basic image processing concepts.

MCS5305 Microcomputers and Microprocessor Systems

Hardwired logic contrasted with program logic. Microcomputer applications. Elements of microcomputer architecture; bus, microprocessor, memory, input-output, peripherals. Single chip and multichip micro computers. Overview of available microcomputer systems. Internal architecture; 3-bus concept, microprocessor operation. Microprocessor instruction set; instruction format, addressing modes; instructions execution. Comparison of available microprocessors. Machine language, assembly language and high level language programming. Synthesis of combinational logic circuits with ROMS and PLAs. Review of classical approach to sequential circuit design. The algorithmic state machine chart (ASM) method of representing

sequential problems. Realization of sequential circuits using MSI and LSI. Register transfer languages.

MCS5202 Control Engineering III

State space description of linear systems. Concepts of controllability and observability. Canonical realization of systems having specified transfer functions. Stability in the sense of Lyapunov. State feedback, modal control, pole assignment and the optimal quadratic regulator. Full-order state observers. Multi-lateral systems. Introduction to sampled-data systems. Digital compensation. Introduction to microprocessor-based Control.

MCS5203 Process Automation

PLC programming higher functions
- PLC-programming analogue in/outputs
- 2-step controller
- Basics in closed loop control
- Closed loop temperature control
- Closed loop pressure control
- Closed loop flow control
- Closed loop level control

MCS5307 Automation Laboratory

Partial Automation :- Factory Automation
Factory Automation study fields:

- PLC programming level 1 - 3
- Industrial communication - Fieldbus
- DC/AC motor
- SCADA - Touch panel
- Assembly/disassembly or Mechatronics part Systems

Full Automation Study fields:
- Material/signal flow in a networked system
- Installation and commissioning of a Mechatronics system
- Programming and communication in a Mechatronics system
- Maintenance and Trouble Shooting in a Mechatronics system

MCS5302 Automation and Robotics

Introduction to automation: Economics of Automation, Flow Lines, Mathematical Models, Storage Buffers, Partial Automation, Balancing, Group Technology and Flexible Manufacturing.

Programmable Logic Controllers

Introduction to PLCs, Advantages of PLCs, Ladder Logic Diagrams, Switching Logic.

Components of PLC, PLC Operating Cycle, Additional Capabilities of a PLC, Latches, Design Cases (Deadman Switches, Conveyor, Accept/Reject Sorting), Addressing.

PLC connection, PLC operation, Numbering, Event based logic, sequential logic design, Advanced ladder logic functions.

PLC Programming, Structured text programming, Instruction list programming, Function block programming, Continuous control, PLC data communication, Human Machine Interfaces (HMI), selecting a PLC.

CNC Machines

General information, Operation, Control panel descriptions, Tool function, Practical application of tool wear offset, feed function, spindle function, programming of CNC in absolute and incremental systems, program creation, preparatory functions, CNC Programming, Computer assisted part programming, automatically programmed tools (APT Programming System), CAD/CAM approach to part programming, CAD/CAM application (turning problem, surface milling, machining of curved surfaces.)

MCS5304 MEMS and VLSI

Basic microelectronic devices a brief review of the physics involved. Fabrication technology of microelectronic devices. IC fabrication technology (CMOS). Silicon crystal growth, epitaxy. Ion implantation, etching, chemical vapour deposition and photolithography. Silicon bulk and surface micromachining technology for micro systems or MEMS. *Integration of MEMS with VLSI*

MCS5205 Computer Software Engineering II

Object oriented software design, implementation and testing. Team software specification and management. Cross-platform

tools and GUI development. Advanced software algorithms and architecture. Software engineering practice and methods.

MCS5306 Systems Modelling and Simulation
Mathematical modelling of physical systems. Models of mechanical, electrical, thermal, fluid and mixed systems. Model representation using differential equations, transfer functions and difference equations. Linearization. Solution of differential and difference equations using Computer. *system identification from experimental* ***data***

MCS5301 Power Electronics and Drives
Characteristics of semiconductor switches. Power conversion from AC to DC, DC to DC, DC to AC, AC to AC. Applications of SCR and other thyristor devices: motor control, control of drives, heating and lighting. Mechanical relays, solid state relays and stepping motors.

MCS5601 Project
Undergraduate Final Year Project

MCS5207 Machine Vision
Advanced techniques and algorithms used in real-time computer vision and image processing design.

MCS5208 Microfabrication Technology
Crystal growth, thermal oxidation, photolithography, etching, diffusion, iron implantation, film deposition, metallization,

layout, process integration, IC manufacturing, MEMS, CAD tools for microfabrication (eg. SUPREM, PROLITH etc.). Future trends and challenges

MCS5209 Mobile Robotics

Artificial intelligence programming techniques, basic problem solving techniques, knowledge acquisition and representation; artificial intelligent language (LISP and PROLOG). Computer interface, machine learning, natural language understanding, knowledge-based and expert systems, computer vision, robotics, relationship AI to software engineering and database methodology. Societal impact of AI and robotics. Machine vision and pattern recognition. Applications of identification trees, neural nets, genetics algorithms and other learning paradigms.

MCS5210 Control Engineering IV

Types of systems nonlinearities, small perturbation methods, describing functions, phase plane analysis. Principles of sampled systems. Application of Z transforms. System performance and stability. State space analysis of controlled systems. On line computer control. Derivation of digital control algorithms. Microprocessor applications. Introduction to adaptive control; Hill climbing and model reference, adaptive systems. Lyapunov analysis. Stability in non linear systems.

System identification and testing methods. Application of statistical correlation techniques.

MCS5211 Microcomputers and Embedded Systems

Microprocessor organization and interfacing: Memory interfacing. Hardware-software design of microprocessor systems. Introduction to Embedded Microcomputer Systems. Architectures of programmable digital signal processor. Programming for real-time performance. Design and implementation of data scrambler and interfaces to telecommunications.

MCS5212 Computer Aided Product Modeling

Geometric reasoning. Solid modelling, feature extraction, grasping, tolerancing.

MCS5213 Renewable Energy Resources

Possible future scenarios for energy from conventional to renewable sources. Energy conservation principles, energy distribution and system integration. Solar energy, hydro, wind and geothermal energies. Biofuels and biomass, energy storage options in form of hydrogen, batteries, liquid fuels, compressed gas by the use of heat exchangers.

MCS5214 Lean Production Management and Industrial Logistics

Material and information flows within a company, providing practical experience for all employees involved in lean

production projects, inventory minimisation as an important basis for increased productivity, the principle of pull production control, advantages compared to conventional production control methods, types and function of different pull production control methods, application of methods, Kanban – the classic pull principle, introduction to Value Stream Mapping (VSM).
Lean manufacturing, flow production, throughput time and inventories while increasing flexibility, analysis of workplaces with the Standard Operation Sheet, adjusting the cycle times of individual workplaces, flow and takt time production, avoidance of material transport with linear and U layouts, • Structure and development of open-plan production, Line Back system, integration of logistic processes with kanban, flexible employee systems: relay and caravan systems, multimachine operation. Quality control.

MCS 5215 Computer Aided Manufacturing

Indepth study of some advanced technologies adopted by leading design and manufacturing industries worldwide. Exploring rapid product development and technologies aimed at reducing product development lead-time within a Design For Manufacture (DFM) context.

CHAPTER FOUR: ACADEMIC REGULATIONS

4.1 ACADEMIC ATMOSPHERE

The Department encourages and supports conduct of and participation in seminars, workshops and conferences within and outside the Country. Students are encouraged to participate in various academic programmes relevant to their discipline.

4.2 ADMISSION REQUIREMENTS

Candidates seeking admission into the Mechatronics Engineering can be admitted at the 100 or 200 level as follows:

Level 100: Candidate must possess the Secondary School Certificate Examination (SSCE), West African Examination Council Examination (WAEC), National Examination Council (NECO) or equivalent with a minimum of credits in at least five subjects (including Mathematics, English, Chemistry, Physics, and any other science subject) all obtained at not more than two sittings. This is in addition to the above, an acceptable performance in the Unified Tertiary Matriculation Examination (UTME) in the relevant subjects which include Physics, Chemistry, Mathematics and English Language and an acceptable pass in the Bayero University Kano's post-UTME examination.

Level 200 (Direct Entry): Candidates must possess a minimum of ten (10) points in GCE Advanced Level/IJMB or equivalent in Physics, Chemistry and Mathematics in not more than one sitting. Or possess a National Diploma in Mechatronics, Mechanical, Electrical Engineering or equivalent with a

minimum of Upper Credit. This is in addition to having the Secondary School Certificate Examination (SSCE), West African Examination Council Examination (WAEC), National Examination Council (NECO) or equivalent with a minimum of credits in at least five subjects (including Mathematics, English, Chemistry, Physics, and any other science subject) all obtained at not more than two sittings.

4.3 SEMESTER SYSTEM

The Department, in line with the University Regulation operates a semester system which is defined as a quantitative organization of the curriculum where courses are divided into examinable units and for which a student earns credit if passed. The courses are arranged in a well-defined order that indicates the credits load as well as the semester in which they are taken. For instance, a course coded MCS 3201 where 3 indicates a 300 level course, 2 indicate credit units, and 01 indicates the course is taken at first semester. Usually odd numbers are assigned to courses in the 1st semester, while even numbers are assigned for 2nd semester courses.

4.4 BASIC CONCEPTS

The main concepts used in the semester system are: Credit Unit (CU), Grade Points Average (GPA), Cumulative Grade Points Average (CGPA), Probation, Carry-over, Withdrawal, Spill over and Grading System.

4.5 CREDIT UNITS (CU)

Credit Unit (CU) represents the weight assigned to the course, and is recorded in credit hours. One credit is considered as one hour of classroom lecture per week or two hours of laboratory time per week. Thus, CU consists of specified number of student teacher hours/week/semester.

4.6 GRADE POINTS (GP)

This involves assigning numerical or alphabetical letter to the scores of students at examinations, reports, projects or papers. Letter systems generally run from A (5 points), to B (4 points), C (3 points), D (2 points), and F (0 point).

4.7 GRADE POINT AVERAGE (GPA)

This refers to the evaluation of students' performance in any semester. It is the average of weighted grade points earned in the courses offered by a student in a semester. The GPA is calculated as follows:

$$GPA = \frac{TCE}{TCR}$$

Where;
TCR = Total Credits Registered
TCE =Total Credits Earned

4.8 CUMULATIVE GRADE POINT AVERAGE (CGPA)

The CGPA represents an up to date average (i.e. cumulative) of the GPA earned by the student in at least two semesters. It is an indication of the student's overall performance at any point in

his training at the university. CGPA is attained after two semesters or more in an academic programme.

4.9 ACADEMIC PROBATION

A student who fails to earn a minimum of GPA of 1.50 point at the end of two semesters would be placed on probation for another academic session. Probationary status is removed if a student placed on probation attains a minimum CGPA of 1.50 or above in the following academic session. He will be notified by his level coordinator.

4.10 INCOMPLETE STATUS

If a student earns 75% lectures attendance in a course but due to sickness or accident or other acceptable reasons is unable to write the semester examination, he/she should apply for incomplete status to retain his/her CA and be allowed to write the examination for that course at a later date.

4.11 WITHDRAWAL

A student, who is placed on probation the previous year and fails to earn a CGPA of 1.50 the following year, would be considered unfit for the course; accordingly, he/she would be advised to withdraw from the University. A student who fails to sit for examination scheduled for a particular semester without valid reason(s) would be considered to have voluntarily withdrawn from the University.

4.12 CARRY OVER

A student who fails to earn a minimum of 45 marks in a course (continuous assessment and examination) will be asked to carry over the course to the next available period and get it registered bearing in mind that he/she will be allowed to register a maximum of 20 credit courses per semester. Continuous assessment (CA) carries 40 marks while examination carries 60 marks.

4.13 SPILL OVER

A student who fails to pass a registered CORE course at the end of regular years of studies in the University will not graduate. i.e. he/she has exhausted the approved years of the programme by the University.

4.14 DEFERMENT

If a student falls sick or suffers an accident after registering for a programme in the University, such a student should apply with relevant medical reports (subject of satisfaction of the Director, University Health Services) to the Dean of his/her faculty through the Head of Department for deferment of a semester or a session (as the case may be) to enable him/her fully recover. However, such request will be counted within his/her maximum allowable period of stay for a degree (7 years for students admitted into 100 level and 6 years for those admitted into 200 level).

4.15 ATTENDANCE REQUIREMENT

Students must attain at least 75% attendance of lectures, tutorial and practical work before being allowed to sit for examination.

Students who did not attain **75% attendance** of lectures in any course of the Department will not be allowed to sit for examination.

4.16 CALCULATION OF CGPA/GPA

CGPA is calculated as follows:

$$\frac{CE}{CR} = CGPA$$

Where;
CE stands for credits earned.
CR is credits registered

4.17 DEGREE CLASSIFICATION AND ACADEMIC STANDING

Degree is classified based on the CGPA at the point of graduation. However, it is important for a student to consider, at the end of each semester, that the CGPA he/she gets stands for the classification of his/her final degree. The table below gives an example of degree classification.

S/N	CGPA	CLASS OF DEGREE
1.	4.50 – 5.00	First Class
2.	3.50 – 4.49	2nd Class Upper Division
3.	2.40 – 3.49	2nd Class Lower division
4.	1.50 – 2.39	3rd class
5.	0.00 - 1.49	Fail

CHAPTER FIVE: GENERAL CONDUCT AND DISCIPLINE

The Department of Mechatronics and the university as a whole expect students to conduct themselves in an exemplary manner during their interactions with members of the university community and to live peacefully with them.

Misconduct is any action that is contrary to University Regulations, some of which are as follows:

a) belonging to, or participating in the activities of unregistered/illegal associations including secret cults;
b) physical assault and/or causing bodily harm on any other person, whether a student or not;
c) fighting;
d) rioting and unauthorized assembly;
e) organizing and/or taking part in demonstration by any student without permission;
f) examination related misconduct;
g) drug abuse and the use of prohibited substances;
h) persistent rowdy and/or anti-social behaviour;
i) reckless and/or dangerous driving;
j) insulting and/or attacking university officials in the pursuit of their legitimate duties; and
k) Willful damage to university property.

5.1 EXAMINATION REGULATIONS

Credible examination is the only measure used in determining the success or failure of any University system. That is why students found to be engaged in examination irregularities are out rightly disciplined.

The University has drawn examination regulations to clarify the legitimate expectations and corresponding responsibilities of all staff and students. It is intended to ensure that the University's examinations are organized and conducted in a consistent and professional manner. These regulations apply at all examinations/assessments in the University (including continuous assessment test, tutorials and take home assignments.)

Some of the regulations are as follows:

a) Students are expected to read all notice boards, bulletins and other related media in the University to keep them abreast with what is the happening. REFUSAL TO READ NOTICES from the designated media is not an excuse for not performing any academic activity.
b) Attendance at lectures, practical's and examinations are compulsory, and anyone who does not attend a lecture, practical and examination at the time and place published in the examination time table will be deemed to have failed in that part of the assessment.
c) Students who have clashes in examinations based on the timetable should immediately inform their departmental examinations officer before the commencement of the examination. Students who fail to inform the appropriate officers of the University of likely clash in examinations

shall blame themselves for any difficulty or eventuality that may arise.

d) It will be the responsibility of each student to make sure that he is aware of the final examination timetable. Students are to expect changes of date, time and venue of examination before the examinations start.

5.2 EXAMINATION PROCEDURE AND DISCIPLINES

a) It shall be the responsibility of each student to make sure that she/he is registered for the appropriate examinations and be sure of the dates, times and places of the examinations for which he is registered, also to ensure that he is in possession of any identity document prescribed for the examination.

b) Each candidate should be at the examination venue at least fifteen minutes before the commencement of the examination. Lateness will not be tolerated.

c) Each candidate is required to supply his own drawing instruments and any other examination aids for which provision is prescribed. A student shall bring his identity document to each examination and display it in a prominent position on his desk.

d) Any book, paper, document, examination aid, handbag or briefcase which is brought to the examination room must be deposited at the invigilator's desk, or a place designated for the purpose before the start of the examination. In no circumstances must it be placed on or near any candidate's writing desk.

e) Each student shall write in the attendance register his/her registration number, name, answer booklet number and department and then sign. Students are advised to note their serial number and attendance register number (in case there are more than one registers) for ease of signing out.

f) Student shall write his examination number, but not his name, distinctly on the cover and on every page of the answer book, as well as on any extra sheets used.

g) The use of scrap paper, question paper, toilet tissue, etc. for rough work is not permitted. All rough work must be done in answer booklets and crossed neatly or in supplementary answer booklets which must be submitted to the invigilator.

h) A student leaving the examination hall must sign out and hand his script to the invigilator before leaving if he does not intend to return.

i) A student who leaves the examination room shall not be readmitted unless throughout the period of his absence, he has been continuously under the supervision of an invigilator or examination attendant.

j) No student shall be allowed to leave during the first thirty minutes or the last ten minutes of the examination.

k) No student shall speak to any other student or make any noise or disturbance during the examination. A student must not indirectly give assistance to any other student or permit any other student to copy from or otherwise use his/her papers. A student must not directly or indirectly accept assistance from any other student or use any other student's paper.

l) A student shall entre the examination hall with a handset.

m) A student is responsible for protecting his work so that it is not exposed to other students.

n) Smoking is forbidden in the examination hall during any examination and in the university premises.

o) At the end of the time allotted, each student shall stop writing. He shall gather his scripts together and remain seated until all candidates' scripts have been collected. It shall be the candidate's responsibility to ensure that his answer scripts are collected. Except for the printed question paper, a student must not remove from the examination room or mutilate any paper or other materials supplied.

5.3 EXAMINATION AND ACADEMIC MISCONDUCT

Misconduct as mentioned earlier is any action that is contrary to University regulations. Therefore, candidates for any examination are to conduct themselves properly in and around the examination halls. Deviations from proper conducts may constitute examination misconduct.

The vicinity of an examination hall is considered to be part of the examination hall. Thus, any student caught with unauthorized materials or writing in the vicinity of the examination hall (after the student has seen the question paper) shall be treated as if the materials are found on him/her in the examination hall. Similarly, any student caught cheating in any way in students' hostels or other areas shall be appropriately treated.

Examination misconduct discovered during the marking of the examination scripts are also subject to appropriate investigations and further necessary action.

5.4 CATEGORIES OF EXAMINATION MISCONDUCT

The following are some of the categories of examination misconduct.

i. Impersonating another student, or being impersonated by another student at an examination.
ii. Exchanging names and/or numbers on answer scripts/sheets.
iii. Introduction and use of relevant unauthorized materials into the examination hall.
iv. Exchange of materials (such as question papers, examination cards) containing jottings which are relevant to the ongoing examination in the examination hall.
v. Theft and/or illegal removal of examination scripts.
vi. Any kind of mischief likely to hinder the smooth conduct of the examination, e.g. engaging in physical violence.
vii. Collaborating with, or copying from, another candidate.
viii. Cheating outside the examination hall, such as in toilets, hall of residence, etc.
ix. Destruction of exhibit by candidates.
x. Facilitating/abetting/aiding cheating by another candidate.
xi. Acts of misconduct (such as speaking/conversation) during the examination which is likely to disrupt the conduct of the examination.

xii. Writing on the question paper.
xiii. Any other misconduct deemed by the senate to warrant appropriate punishment.

These misconducts carry punishments ranging from written warning, to rustication or outright expulsion.

5.5 MISCONDUCTS RELATED TO PROJECTS, ESSAYS, ETC.

Students of the Department of Mechatronics Engineering and the University as a whole are reminded to strictly adhere to the universally accepted high standards of academic integrity while writing any work related to their programmes. Deviations from these high standards may constitute misconducts which are punishable by expulsion, rustication or warning depending on the nature of the misconduct. Some of the offences include the following:

a) Submitting a final year project that was written by someone else.
b) Submitting, as final year project, a work submitted earlier for another purpose by her or by others, at the university or somewhere else.
c) Repackaging a whole project as his or her product.
d) Substantial plagiarism of the work of others in final year projects.
e) Fabrication or intentional misrepresentation of data used in final year projects.
f) Intentional sabotage of the final year project (or part thereof) of other students.
g) Failure to credit sources in final year projects
h) Faking of citations in final year projects.

5.6 DRESSING AND DRESS CODE

Dress Code is here defined as any appropriate or formal or informal dress and dressing style in which there is no attempt or will to expose the body's intimate parts. A dress should have sleeves and extend from the neck to just below the knees. Students of the Department of Economics and the University as a whole are required to dress decently at all times.

The following types of dresses are prohibited

1. Transparent dress that highlights or emphasizes the bodies, sensual parts, such as the thighs, breasts, etc.
2. Unbuttoned shirts without a t-shirt or a singlet, or an under wear cloth.
3. Clothes that illustrate, enhance, or depict drugs, alcohol or have offensive and violent messages.
4. Clothes that display weapons or any gang-related illustrations and messages.
5. T-shirts or clothes with obscene captions.
6. Shorts and skimpy dresses e.g. body hugs, show-one-your-chest, and dresses exposing sensitive parts.
7. Tights, shorts and skirts that are above the knees (except for sporting purposes).
8. Wearing of ear-rings by male students,
9. Plaiting or weaving of hair by male students.
10. Wearing of colored eye glasses, not on medical grounds in the classroom.

5.6 PENALTIES FOR VIOLATION OF THE DRESS CODE

1. Violators will not be allowed into classrooms, lecture halls, laboratories, and offices of the university.
2. Violators will not be allowed in examination halls.
3. Repeated offenders will face disciplinary action**.**

CHAPTER SIX: ADDITIONAL INFORMATION

6.1 ORIENTATION

At the beginning of the session, the Department of Mechatronics Engineering usually organizes an orientation programme for new students. This is in addition to the orientation programme that is organized by the university. The purpose of the programme is to acquaint the new students with the peculiarities of the Department and introduce the officers of the Department. Fresh students also freely interact with lecturers and are encouraged to ask questions on anything they would like to know about the Department Programme and its programmes.

6.2 ADD/DROP OF COURSES

At the discretion of Heads of Programmes and course lecturers, a student may be allowed to make minor changes in registration at the beginning of a semester as long as these changes do not contravene any current University, Faculty, and Departmental Regulations. No course change will be allowed if more than one-fifth of the course material has been covered.

6.3 CHANGE OF DEPARTMENT/PROGRAMME

The university does not allow interfaculty transfer. However, a student may be allowed by the Dean of the Faculty to change

from one programme to another programme within the Faculty on the following conditions:

- Not later than the 2nd week in level 300
- The appropriate is obtained from the MIS (Management Information Services) and duly completed after paying the necessary fees.
- Approval of the two Heads of programmes involved;
- The student was not admitted on the basis of OND or HND qualifications.
- The student has spent more than a year in the current programme.

6.4 SUSPENSION OF STUDIES

Where a student misses a substantial part of a semester for health reasons, the Faculty board shall recommend 'suspension of studies' for senate approval. Where a student is given suspension of studies, he/she shall be required to take courses afresh (but not as carry-overs), or undertake alternative ones where applicable on his/her return. No GPA shall be computed for a semester where the student is on suspension of studies. However, if the suspension is only for one semester, performance in the other semester shall be used in computing the Cumulative Grade Point Average (CGPA).

6.5 WITHDRAWAL FROM STUDIES

Withdrawal from studies may be either compulsory or voluntary.

6.5.1 Compulsory

i. Compulsory withdrawal from a programme shall be recommended by the Faculty to the Senate on any of the following grounds.
ii. Failure to register for the prescribed number of credits within the prescribed period.
iii. Failure to attain the required standard in English language within the stipulated time limit
iv. Failure to attend classes for a period, which exceeds 30 consecutive days except on, certified medical grounds.
v. Failure to get a CGPA of 1.50 or better at the end of the probation period.
vi. Failure to complete the programme within the maximum permissible period of study i.e. 4 semesters beyond the minimum allowable period.

6.5.2 Voluntary Withdrawal

A student may withdraw voluntarily from the programme by applying to the Faculty, stating the reasons for the withdrawal. The Faculty Board will then make the appropriate recommendations to the University Senate for its final approval.

6.6 LECTURE AND EXAMINATION TIME TABLE

Before the commencement of each semester, a lecture Time Table containing the lecture timings and venues for all Faculty courses is released by the Faculty Time Table Officer. Departments thereafter produce their Time Tables in accordance with the Faculty Time Table.

6.7 TRANSCRIPT/PARTIAL TRANSCRIPT

Transcripts of examinations results shall be signed and stamped by Deans of Faculties and countersigned by the Registrar or his/her representative and shall be in such a form as may be approved from time to time. Numerical marks in individual courses shall not be given but letter grades, GPA and GCPA.

A student who applies for a change of institution and has his/her application approved shall be entitled to collect a partial transcript showing the courses taken up to the time of leaving institution and the results obtained thereof.

6.8 NOTIFICATION OF RESULTS

No results of examinations may be normally announced until after they have been approved by the Senate Business Committee (SBC) or Senate, as the case may be. However, the Chairman of Senate may give approval in advance for the earlier announcement of results on a provisional basis and subject to Senate approval, to be made where special urgency exists.

The results of semester examinations for all levels is usually released after the approval of senate for final year examinations, or SBC in case of lower level examinations.

6.9 CORRECTION OF RESULTS

If an incorrect result of a student is mistakenly submitted and approved by the senate, the Department shall, after having detected the mistake correct the result and reflect the correction in the semester of the course taken. Normal approval process shall thereafter be followed to get the corrected results approved and recorded in all concerned units.

6.10 VERIFICATION OF RESULTS

Where a student observes that an incorrect result has been recorded for him/her (for example, he/she is reported absent after having sat for an examination) he/she should report the matter to his/her level coordinator. The level coordinator shall then follow the laid down verification process to ascertain the correct result. Where a mistake is confirmed, the process of correction of result shall then be started.

6.11 GRADUATION REQUIREMENTS

Before graduation a candidate must satisfy the following:

1. Pass all the core courses.

2. Attempt at least two elective courses and pass at least one.
3. Obtain a minimum total of credit units depending on programme entry point as follows:

Level 100 entry point	34+44+52+30+48	**= 205 credit units**
Level 200 entry point	48+52+30+48	**= 175 credit units**

CHAPTER SEVEN: STAFF PROFILE

7.1 ACADEMIC STAFF

S/NO.	NAME	QUALIFICATIONS	RANK	SPECIALIZATION
1	Dr. Mustapha Muhammad	BEng, (2001), MEng,(2007), PhD, UTM (2013), MNSE, R Eng (COREN)	Assoc. Professor/ HOD	Automatic control, T-S fuzzy, modeling and control, ANN control, Robotics
2	Prof. A. U. Alhaji	B.Eng (Mech), 1987 M. Eng (Production) 1992 PGD (Management) 1993 Ph.D (Industrial Engineering) 2001.	Professor	Industrial Engineering, Production Technology
3	Prof. Abdussamad Umar Jibia	B.ENG, (1991), M.Sc, (1998), Ph.D (2010), (IIUM), MNSE, R Eng (COREN)	Professor	DSP and Digital electronics
4	Prof. Haruna Musa	B.ENG, (1988), M.Sc, (1990), (UNILAG), Ph.D (2014), (B.U.K), : MNSE, Reg. COREN,	Professor	Electronics and Industrial Engineering
5	Prof. Ibrahim Abdullahi	B.Eng, M.Sc , PhD(B.U.K), MNSE, R Eng (COREN)	Professor	Production Engineering (Composite

				Technology)
6	Dr. Yusuf Tijjani	B.Eng, (2004), (BUK), M.Eng, (2010), (UNIBEN), PhD, (2018) (UPM), MNSE, R Eng (COREN)	Senior Lecturer	Material Science and Engineering
7	Dr. Mubarak Muhammad Danladi	BEng (2006), B.U.K, MSc (2008), PhD (2013), UK, MNSE	Senior Lecturer	Energy Engineering, Control and automation
8	Dr. Hassan Bashir	BEng (2004), MSc (2008), BUK, PhD Manchester (2014)	Senior Lecturer	System Optimization, Control and Automation
9	Dr. Amir Bature	BEng (2004), B.U.K, M.Eng (2010), PhD (2016), UTM, Reg. COREN	Senior Lecturer	Robotics and Control
10	Dr. Isyaku Abubakar	B.Eng, (2001), (BUK), M.Eng, (2008), (BUK), PhD, (2018) (UTM), MNSE, R Eng (COREN)	Senior Lecturer	Renewable Energy, Energy Management and Energy Monitoring
11	Dr. Bala Boyi Bukata	HND, (1992), PDGEE (BUK), M.Eng, (2007), (BUK), PhD, (2012) (Glasgow), MNSE, R Eng (COREN)	Senior Lecturer	Smart Distribution Grid Control, Artificial Intelligent Application to Power Systems Control

12	Dr. Muazu Abubakar	B.Eng, (2005), (ABU), M.Eng, (2010), (ABU), PhD, (2016) (UTM), MNSE, R Eng (COREN)	Senior Lecturer	Ceramics, Metal alloys and waste water treatment
13	Dr. Ibrahim Rafukka	B.Eng, (2004), (BUK), M.Eng, (2010), (Uniben), PhD, (2017) (UPM), MNSE, R Eng (COREN)	Senior Lecturer	Material/automotive Engineering
14	Dr. Binta Usman	B.Eng, (1994), M.Eng, (2000), (BUK),MRes. (2013) Scortland, PhD, (2018) (BUK), MNSE, R Eng (COREN)	Senior Lecturer	New and Renewable Energy
15	Dr. Mukhtar Fatihu Hamza	BEng (2008), M.Eng (2013), B.U.K, PhD (2017), UM, Reg. COREN	Lecturer I	Control, Automation and Robotics
16	Dr. Ado Haruna	BEng (2005), B.U.K, MSc. (2010) Manchester, PhD (2018), UTM, Reg. COREN	Lecturer I	Automation and Control, Non-linear systems
17	Dr. Auwalu Muhammad Abdullahi	BEng (2011), B.U.K, M.Eng (2014), PhD (2017), UTM, Reg. COREN	Lecturer I	Control and Robotics

18	Amina Ibrahim Khalil	B.ENG, (2011), M.Sc, (2014), , (UK), R Eng (COREN)	Lecturer I	Automation and Robotics
19	Dr. Najib Kabir Dankadai	BEng, (2010), (BUK), MEng (2014), (UTM), PhD (2021) Newcastle	Lecturer II	Nonlinear Control
20	Lubabatu Baballe Ila	BEng, (2011), (BUK), MSc (2015), (UM).	Lecturer I	Control and robotics
21	Musa Muhammad Bello	B.ENG, (2009), M.Sc, (2015), (IIUM), R Eng (COREN)	Lecturer I	Vibration Control
22	Muhammad Attahir	B.ENG, (2010), M.Eng, (2015), (BUK)	Lecturer II	Production Engineering
23	Fatima Abdullahi Muhammad	BEng, (2010), (BUK), MSc (2013), (UK),	Lecturer I	System Modelling and simulation
24	Aisha Muhammad	B.ENG, (2010) BUK, M.Eng, (2018), (UM)	Lecturer II	Robotics and Automation
25	Adamu Yusuf Abdullahi	B.ENG, (2013) BUK, M.Eng, (2019), (UM)	Assistant Lecturer	AI and Robotics

7.2 TECHNICAL STAFF

S/NO	NAME	QUALIFICATIONS	RANK	SPECIALIZATION
1	Abdulrahman Shehu	PGDEE, HND, ND	Chief Technologist	Industrial Automation
2	Abdullahi Aliyu	ND, HND, PGDME	Senior Technologist	Fluidics Operations
3	Muhammad Aliyu Zang	ND, HND, PGDEE	Senior Technologist	Electronics
4	Umar Ali Mohammed	ND, HND, PGDME	Senior Technologist	CAD/CAM
5	Abdulmajid Lawal Aliyu	B.ENG	Technologist II	Production and Manufacturing Processes