

## MATHEMATICS (MTH 001) COURSE CONTENT

S/N	TOPICS	TOPICS
1.	Number bases	Operations in different number bases from 2-10. Conversion from one base to another including
2.	Indices, Logarithms	Laws of indices, logarithms of any positive number to a given base. Change
3.	Ratio, Proportion, Rate and Averages	Financial partnerships, ratio of work, costs, taxes, distance, time and speed.
4.	Percentage	Simple and Compound interest.
5.	Algebraic processes	Factorization, change of subject, solution of quadratic equations, quadratic graphs sum and product of roots of quadratic equations.
6.	Linear inequalities	Solution of linear inequalities in one variable and representation on the number line, quadratic inequalities.
7.	Variation	Direct, partial and joint variations.
8.	Triangle and polygon	Types of triangles and other polygon, area of triangles Theorems on sum of angles in a triangle, relationship between exterior and interior angles of triangles. Quadrilaterals: types and properties, sum of angles of a regular polygon. Theorem on parallelogram on the same base and between the same parallel
9.	Circles	Properties, equation of circles, Circle theorems.
10.	Sets	Equation of tangent and normal. Operations on sets. The use of Venn diagram. commutative and associative laws.
11.	Matrices.	Types, basis arithmetic operations on matrices.
12.	Logic	The truth table using not P or Q, P and Q, P implies Q, Q implies P, Rule of syntax; true or false statements, validity of statements using truth table Rules of logic applied to arguments.

		Implications and deductions.
13.	Elementary Trigonometric	Trigonometric ratios of the angles $30^{\circ}$ , $45^{\circ}$ , $60^{\circ}$ , $90^{\circ}$ , $360^{\circ}$ , Quadrant of angles.
14.	Co-ordinate Geometry.	Height and distance, Angles of elevation and depression Distance between two points, gradient of lines, parallel and perpendicular lines, equation of lines both in intercepts and gradient form.
15.	Differentiation	Derivatives of basic factions. Methods of differentiation. Idea of limit. Application of differentiation.
16.	Integration	Methods of integrating basic functions (Indefinite integrals) definite integrals. Application of integration (area between curves).
17.	Statistic and Probability	Pie char, bar chart histogram and frequency polygon, mean, medium and mode both direct and grouped data. Cumulative frequency curve. Median and standard derivation, experimental and theoretical probability.
18.	Permutations and combinations	Simple cases of combination of objects and simple cases of number of arrangement of a line
19.	Operations	Binary operations: closure, commutatively, Associativity and distributivity of elements and inverse element.

### **ENGLISH (GNS 001) COURSE CONTENT**

English is the medium of instruction from upper primary school in Nigeria and throughout all higher levels of education.

A very good pass in it is therefore a basic requirement for Admission into all higher education institutions. This pre-degree course in use of English endeavours to:

- (i) Provide a general review of the major aspects of the major aspect of English Language that all students should master;

- (ii) Highlight students' common problem areas provide remedial techniques.
- (iii) Measure students' mastery of English Language usage and comprehension at post-secondary school level;
- (iv) Intimate students with structure and functions of the English Language;
- (v) Introduce to students different varieties of English; e.g. standard, regional, Nigerian English etc. for better performance in the language.
- (vi) Provide students with writings skills in letters, essays and other forms of writing that may be useful to their academic career.

### **1. CONCEPT FORMATION**

A general survey of word, group, clause and sentence. All the parts of speech i.e. noun; verb, adjective, adverb, conjunction, preposition, article and interjection would be treated in great detail, while the group, clause and sentence would be cursorily discussed to reflect in conjunction with parts of speech the network of relationship existing between them, and their corporate role in idea development.

### **2. WORD FORMATION**

The concept, Word, Formation, Morpheme, Free and bound morphemes, Derivations and inflexions, Processes of word formation affixation, blending compounding, clipping, back-formation, idiomaticity, Morphemic segmentation, Importance of word formation and its relevance to textual comprehension and writing types. Contextual exploration.

### **3. WORD COLLOCATION**

The concept. Types: fixed, adjectival, prepositional and idiomatic. Importance to oral and written expressiveness

### **4. BASIC OF MEANING IN ENGLISH**

The concept TYPES: Denotative, emotive, collective and thematic, Utterance Meaning: Speech acts, presupposition and implicatures Sense relations: Synonymy antonymy, polysemy etc. Meaning in second Language context of English, Nigerianisms us standard English, Register.

## **5. SYNTAX**

The concept, The Phrase The clause, The sentence, The phrase: NP, VP, PP, adv p, Gerund, p part, p, inf. P. The Clause: Main, Subordinate: NC, adj c, adv, Cls. The sentence: types by structure, types by function. Structural analysis of clauses.

## **6. MECHANICS**

Punctuations, Spelling, Capitalization Graphological Variation (and idiosyncrasy).

## **7. GRAMMAR**

The concept, Grammatical and content words, Basic grammatical rules, Subjunctive mandative, Informal Varieties of English and grammar, Elements of poetic grammar.

## **8. COMPREHENSION**

Reading comprehension, Reading problems, Reading speed and comprehension, Vocabulary development for reading comprehension. The topic sentence. Subject matter and theme. Passage types, Question types, Practical exercises.

## **9. SUMMARY**

The concept, Types, Techniques, Demonstration, Exercise

## **10. LETTERS & ESSAYS**

Type, Structure. Content-style, Language, Exercise.

## **PHYSICS (PHY 001) COURSE CONTENT**

### **UNITS AND DIMENSIONS:**

Fundamental units namely metre, kilogram and seconds (MKS) and their quantities – length, mass and time, Derived units e.g.  $MS^{-4}$ ,  $MS^{-5}$  and derived physical quantities such as velocity, acceleration, force etc. Dimensions – Length (L), mass (m) and time (T) with simple examples such as dimension of velocity ( $MT^{-4}$ ); pressure ( $ML^{-4}T^{-2}$ ); and other derived quantities.

**SCALARS AND VECTORS:**

Definition of scalar and examples. Definition of vectors and example. Vector representation, preferably, rectangular Cartesian coordinate representation (i, j, k) with illustrative diagram, Vector operations-addition of vectors including the law of parallelogram of forces; difference of vectors; vector multiplications (vector product and scalar product). Resolution of vectors and resultant of vectors. Concept of direction as a way of locating a point (bearing)

**MOTION:**

Definition and qualitative treatment of types of motion namely curvilinear random, rectilinear, translational, rotational, circular spin and oscillatory; cause or concept of speed, velocity, and acceleration, Equations of uniformly accelerated motion with emphasis on gravitational acceleration as a special case (free fall), Distance time graph. Interpretation of the slope, intercept and area under the velocity-time graph. Interpretation of the slope, intercept acceleration. Newton's laws of motion. Simple ideas of circular motion using a string tied to a stone at one end and whirled around in order to (i) demonstrate motion in a vertical/horizontal circle; (ii) show the difference between angular speed and velocity; and (iii) show centripetal force. Projectiles treating calculation of range, maximum height and time of flight. Simple harmonic motion-illustration, explanation and definition of simple harmonic motion; speed and acceleration; period frequency and amplitude; and energy of simple harmonic motion Impulse and Linear momentum:- consequence and concept mechanics in Newton's second law of motion (definition of linear momentum,  $P=mv$ ; Impulse force =  $p \, dt$ ) and Newton's third law of motion (conservation of linear momentum  $P_{12} = -P_{21}$  and application to collision of elastic bodies in a straight line with emphasis on scattering i.e. body scattered along straight line or stick together after collision; recoil of a gun; and jet and rocket propulsions). Newton's law of universal gravitation.

**WORK, ENERGY AND POWER:**

Definition of work, energy and power, Forms of energy-mechanical energy (potential energy and kinetic energy), gravitational energy (gravitational potential heat, chemical, light, sound, nuclear and electrical energy-; principles of conservation of energy; quantitative treatment of transformation between different forms of energy and applications e.g. energy changes in simple harmonic motion; Interpretation of area under the force – distance curve and integral representation of work i.e.  $W=$ ; work – energy theorem.

**STATICS:**

Friction – static and dynamic friction, coefficient of limiting friction and its determination, advantages and disadvantages of friction, reducing friction (use of ball bearings and rollers, lubrication) and friction fluid (viscosity). Equilibrium of forces – equilibrium of a particle (coplanar forces, triangles of forces and Lami's theorem). Conditions for equilibrium of rigid bodies under the action of parallel and non-parallel forces (treatment should include resolution and composition of forces in two perpendicular directions, resultant and equilibrium with application of law of parallelogram of forces), principle turning of a corkscrew, suspended uniform and non-uniform mere rule), center of gravity and center of mass (distinction definition and computation), stability (stable, unstable and neutral equilibrium), Simple machines such as levers, pulleys (single string) inclined plane, wheel and axle with emphasis on their force ratio (Mechanical Advantage, M. A.). Velocity Ratio (V. R.) and efficiency.

**PROPERTIES OF MATER:**

Elastic limit, yield point, breaking point, Hooke's law and young's modulus. Work done in strings and elastic strings, Surface tension – definition: effects e.g. capillarity, cohesion and adhesion; and applications as in the use of grease and detergents. Structure of matter and kinetic theory – atoms and molecules, molecular theory, explanation of Brownian motion and diffusion assumptions of the kinetic theory and is use to explain pressure exerted by a gas.

**PRESSURE:**

Definition and SI units of measurement. Atmospheric pressure definition and measurements using simply mercury barometer, aneroid barometer and manometers, Variation of pressure with height, the use of barometer as an altimeter and the relationship between of pressure and its application in the hydraulic pressure the foot brake of a motor car, lift and force pumps and syringe.

**FLUIDS AT REST:**

Determination of density of solids and liquids. Definition of relative density. Upthrust on a body immersed in a fluid. Archimedes's principle, law of floatation and applications.

**THERMODYNAMICS:**

Temperature – definition and measurements using temperature scales such as Celsius, Kelvin, Fahrenheit and Remur. Conversion from one scale of temperature to another. Types of thermometers – liquid-in-glass, resistance and constant-volume-gas thermometer-illustrate with

worked examples. Effect of heat – Thermal Expansion namely solid expansion, (definition and determination of linear, area and volume expansivity and relationship between them, effects and applications in buildings, bridges, thermostat, bimetallic strips and railway lines; and liquids expansion (volume expansivity, real and apparent expansivity and determination of volume expansivity, real and apparent expansivity and determination of volume expansivity). Gas laws- Boyle's law, Charles's law pressure law, General gas equation ( $=\text{constant}$ ) and ideal gas equation ( $PV = nRT$ ). Heat – definition of heat, definitions of specific heat capacity and heat capacity of solids and liquid, change of state (specific latent heats of fusion and vaporization), melting, evaporation and boiling, the influence of pressure and of dissolved substances on boiling and melting points, Heat transfer – (conduction, convection and radiation as modes of heat transfer), temperature gradient, thermal conductivity, effect of the nature of a surface on the energy radiated and absorbed by it. Laws of thermodynamics.

### **WAVES:**

Concept, production, and propagation of waves. Distinction between particle motion and wave motion and waves as mode of energy transfer. Mathematical representation of progressive wave motion ( $y = A \sin (\omega t - kx)$ ) and mathematical relationship between frequency, wave length and wave velocity ( $V = f\lambda$ ), classification – longitudinal, transverse, plane, spherical, stationary and progressive waves with examples from springs, stretched strings and the ripple tank -; types – mechanical and electromagnetic waves -; and characteristics/properties of waves (Reflection, reflection, interference, diffraction, polarization and superposition of waves).

### **SOUND WAVES**

: Propagation of sound waves. Speed of sound in solids, liquids and air. Effect of temperature, pressure and wind on the speed of sound in air. Reflection of sound – echo and reverberations – their applications and disadvantages. Characteristics of sound waves noise and musical note. Quality, pitch, intensity and loudness of sound and their applications to musical instruments. Simple treatment of overtones produced by vibrating string and air columns. Resonance. Frequency of a note emitted by an air column in a pipe. Closed at one end, open at both ends in relation to its length and application.

### **LIGHT WAVES:**

Sources of light waves (natural and artificial). Luminous and non luminous light as electromagnetic wave. Speed and wavelength of light. Rectilinear propagation of light and its

consequences namely formation of shadows and eclipses. Reflection and laws of reflection. Reflection of light at plane and curved (concave and convex) surfaces. Formation (using ray diagrams and mirror formula) and characteristic of images formed by plane and curved surfaces. Linear magnification. Refraction – explanation of refraction in terms of velocity of light in the media and the definition of refractive index of a medium. Refraction of light at plane and curved surfaces (concave and convex lens), and magnification. Real and apparent depth. Lateral displacement. Critical angle. Total internal reflection and applications in periscope, prism binoculars and mirage. Refraction of light through glass prisms involving the use of minimum deviation formula. Optical instruments compound microscopes, astronomical telescopes, cameras and human eye – principles, formation of image, properties and magnification. Sight defects and their corrections. Dispersion of light – dispersion of white light by a triangular prism, production of pure spectrum and recombination of the components of the spectrum. Electromagnetic spectrum.

### **ELECTROSTATICS:**

Existence of electric charges (positive and negative charges) in matter and the diagrammatic illustration of their field lines. Definition of electric field and electric field due to point charges, electrostatic force (Coulomb's inverse squared law), electric potential and electrical energy capacitors – definition, measurements, uses, configurations (series and parallel connection). Between capacitance, area and separation of plates and medium between the plates. Energy stored in a capacitor. Magnetic fields – concept of magnetic fields. Poles; magnetic field around a current – carrying straight conductor (long wire), circular wire and solenoid; magnetization; magnetic materials (ferromagnetic, paramagnetic); and the earth's magnetic field. Force on a current – carrying conductor in a magnetic field with quantitative treatment of force between two parallel current – carrying conductors and force on a charge moving in a magnetic field.

### **CURRENT ELECTRICITY:**

Electromotive force (e.m.f.), potential difference electricity: Electromotive force (e.m.f.), potential difference (p.d.) and internal resistance of a cell. Types of cells (Wet and dry e.g. Daniel cell and Leclanche cell: Lead – acid accumulator ohms law and application to measurement of resistance. Resistors and resistance. Resistors configurations – series and parallel – combinations and characteristics. D. C. circuits resistivity and conductivity. Factors governing the resistivity of a long wire. The potentiometer method of measuring instruments. Conversion of galvanometer to ammeters and voltmeters using shunts and series resistors. Electrical energy and power definitions and applications.

**ELECTROMAGNETIC INDUCTION:**

Laws of electromagnetic induction (Faraday's law), Lenz's law, Induced e.m.f., Induction coil and transformers, Explanation of Inductor and inductance. Henry as unit of inductance. Self and mutual inductance. Energy stored in an inductor. A. C. generators, motors and dynamos.

**SIMPLE A. C. CIRCUITS:**

Peak and r.m.s. values. Series circuits containing resistor, inductor and capacitor. The concepts of impedance in a. c. circuitry – phasor representation consisting resistance and reactance components-, forms of reactance namely inductive reactance and capacitive reactance and distinction between an inductive reactance and capacitive circuit, resonance and resonance frequency; and power in a.c. circuits – instantaneous power, average power and power factor.

**ELEMENTARY MODERN PHYSICS:**

Particles nature of matter, wave – particles paradox (duality of matter) Nucleus, radioactivity, stable and unstable nuclei; isotopes, half – life and decay constants, fusion and fission process. Models of the atom, Bohrs theory, energy quantization, energy levels and spectra. Thermionic emission and photoelectric emission, energy levels and spectra. Thermionic emission and photoelectric emission Introductory Electronics: Distinction between metals, semi-conductors and insulators. Semi conductors – forms (intrinsic and extrinsic semi conductors. Semi conductors – forms (intrinsic and extrinsic semi conductor. Types (p-type and n-type), carriers (electrons and holes), doping process and applications of semi conductors. Diodes (I-V characteristics of diodes and uses of diodes in rectification); Transistors (I-V characteristics of transistors and uses of transistors in amplification).

## CHEMISTRY CHM 001 COURSE CONTENT

### PHYSICAL CHEMISTRY SECTION

Contents	Notes
(a) Errors and statistical treatment of data	Measurements, theory of errors, precision and Accuracy, significant figures, rounding off.
(a) Errors and statistical	Measurements, theory of errors, precision and Accuracy, significant figures, rounding off.
(b) The Atomic theory	(1) Short account of Dalton's atomic theory and J.J. Thompson's experiment; (2) Outline description of Rutherford's alpha particle scattering experiment to establish the structure of the atom; (3) Atomic number/proton number; number of neutrons; nuclide and isotopes (4) Mass spectrometry fundamental particles, Relative atomic mass ( $A_r$ ) and relative molecular mass ( $M_r$ ) based on carbon-12 scale. (5) Electronic configuration of the element and periodic table
c. States of matter	1. Kinetic theory of matter, gases and kinetic theory. 2. The laws of Boyle's Charles, Graham and Dalton law of partial pressure, combined gas laws simple calculations based on these laws. 3. The relationship between the vapour density of gases and its relative molecular mass, molar volume and atomicity of gases.

<p>d. Stoichiometry</p>	<ol style="list-style-type: none"> <li>1. Chemical formula and equations</li> <li>2. Empirical and molecular formulars</li> <li>3. Quantitative analysis-mole concept, Avogadro's number; mole fraction</li> <li>4. Limiting reagents and percentage yield</li> <li>5. Titrimetric analysis-definition of standard solution, Acidimetric standard, Alkalimetric standard, Acid-base titration, redox titration.</li> <li>6. Gravimetric analysis.</li> </ol>
<p>e. Solution and non-ideal solution.</p>	<ol style="list-style-type: none"> <li>1. Types of solutions the solution process.</li> <li>2. Henry's law</li> <li>3. Colligative properties of solutions – saturated vapour pressure, Raoult's law-ideal</li> <li>4. Vapour pressure lowering, molecular mass from vapour pressure, boiling point and freezing point and osmotic pressure measurements.</li> </ol>
<p>f. Oxidation-Reduction Equilibria.</p>	<ol style="list-style-type: none"> <li>1. Definition of oxidation, reduction, oxidation number, rules for assigning oxidation numbers and their applications.</li> <li>2. Redox reactions, balancing of redox reactions in acidic and basic medium</li> <li>3. Calculations involving redox reactions.</li> </ol>
<p>g Electrochemistry</p>	<ol style="list-style-type: none"> <li>1. Electrolysis – A simple electrolysis; non-electrolytes. Electrolytes, electrodes – cathode and anode</li> <li>2. Electrolytic conduction, Faraday's laws of electrolysis; simple calculations based on these laws;</li> <li>3. Electrochemical cells – electrochemical process involved in the rusting of iron; prevention of rusting by cathodic protection;</li> <li>4. Standard hydrogen electrode (SHE) and standard electrode potential; Experimental</li> </ol>

	determination of standard electrode potential; 5. Cell notation and calculation of e.m.f. of a cell and $E_{\text{cell}}$ value, prediction of the feasibility of Redox reactions.
H      Chemical Equilibrium	6. The Nernst equation. 1. The Equilibrium law, reversible reaction and equilibrium 2. Factors affecting chemical reactions in equilibrium; Le Chatelier principles 3. Homogeneous and Heterogeneous equilibria 5. Calculation of $K_c$ and $K_p$ for gaseous equilibria (5) Conversion of solubility product and vice versa to; solubility and the common ion effect; criterion for precipitation.
I.      Acid-Base Equilibria	(1) Acid-base concepts, Arrhenius concept of acid and base. Bronsted-Lowry theory of acids and base. (2) Strengths of Acids and Bases; application of equilibrium law to dissociation of acids and bases, and definition of acid and base equilibrium constants (i.e. $K_a$ and $K_b$ ) Use of $K_a$ and $K_b$ for determination of strengths of acids and bases respectively. (3) Ostwald dilution law, ionic product of water ( $K_w$ ); pH scale, calculation of pH of strong acids and bases; calculation of pH for weak acids and bases. (4) Buffer solutions – Acid buffers; Alkali buffers, calculation of pH and pOH of an acid and alkali buffers respectively, theory of indicators. Acid-Base titrations. (5) Hydrolysis of salt
J.      Thermochemistry	(1) First law of thermodynamics; exothermic

	<p>and endothermic reactions</p> <p>(2) Enthalpy and Enthalpy changes</p> <p>(3) Definitions of standard enthalpy changes for some physical and chemical changes</p> <p>(4) Relationship between temperatures and heat</p> <p>(5) The Born-Haber cycle</p> <p>(6) Average Standard Bond Energy</p> <p>(7) Entropy and free Energy, calculation for Entropy change, entropy change for phase transition</p> <p>(8) Gibb's free energy and its applications to the prediction of spontaneity of reaction.</p>
K. Chemical Kinetics	<p>(1) Definition of Reaction rates; - factors affecting rates of chemical reactions.</p> <p>(2) Order and molecularity of reactions – based on the effect of concentrations</p> <p>(3) Effects of Maxwell-Boltzman distribution of molecular energies.</p> <p>(4) Effect of catalysts – Activation Energy</p> <p>(5) theories of reaction kinetics</p> <p>(6) Energy profile showing activation energy and enthalpy change</p> <p>(7) Rate laws and reaction mechanisms</p>
L. Nuclear Chemistry	<p>(1) Types and Nature of Radiation, balancing of simple nuclear equations,</p> <p>(2) Stable and unstable isotopes – Natural and artificial radioactivity; Detection of radiation by Geiger-Muller Counter</p> <p>(3) Nuclear Reactions – fission and fusion in nuclear reactors.</p> <p>(4) Effects and application of radioactivity – carbon dating (qualitative treatment only) use of radioactivity in agriculture, medicine and industry</p>

	(5) Kinetics of radioactive decays
<b>ORGANIC CHEMISTRY SECTION</b>	
<b>CONTENTS</b>	<b>NOTES</b>
(A) Physical and Fundamental Principles of Organic Chemistry (i) Separation of mixtures and purification of chemical substances	Separation processes – evaporation, simple and fractional distillation, sublimation, filtration, crystallization, precipitation, and chromatography.
ii. Qualitative analysis of Organic	Compounds Estimation of the proportion of elements present in an organic compound by combustion microanalysis, simple calculations based on this concept.
iii. Hybridization	$sp^3$ , $sp^2$ and $sp$ hybridization sigma and pi bonds, bond length and bond strength of carbon-carbon bonds
iv. Breaking and forming of bonds	Homolytic and heterolytic fissions
v. Factors influencing organic reactions	Inductive effects, mesomeric effect, steric effect and steric hindrance, steric inhibition of resonance and stereoselectivity
vi. Organic Acids and Bases	Strength of Organic acids, factors affecting the relative strengths of organic acids; strength of organic bases and factors affecting the strength of organic bases; basic strength of aromatic amines
vii. Classification of reagents used in chemical reactions	Electrophilic and Nucleophilic reagents
viii. Types of organic reactions	Substitution, Addition, elimination and rearrangement reactions
ix. Isomerism	Classification of isomerism, chain branched isomerism; metamerism positional, functional group, Tautomerism; stereoisomerism, geometric and optical isomerism
(B) Hydrocarbon Chemistry	1. Saturated Hydrocarbons – Alkanes,

i. Aliphatic Hydrocarbons	<p>Homologous series in relation to physical properties</p> <p>2. Petroleum – Composition, fractional distillation and major products, meaning of octane number</p> <p>3. Alkenes-Structural and geometric isomerism, polymerization of alkenes: Markownikoff rule, simple tests for unsaturation; role of simple alkenes in the petrochemical industry;</p> <p>4. Alkenes- ethyne production from action of water on carbide; simple reactions and</p>
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Contents	Notes
	Properties of ethyne; metal derivative of alkenes. Distinguishing tests between the classes of hydrocarbons.
(ii) Aromatic hydrocarbons	Structure, properties and uses; Benzene as representative of aromatic hydrocarbons. Distinction between aromatic and aliphatic hydrocarbons
(iii) Natural sources and uses of	Petroleum and natural gas,
(c) Functional Groups Chemistry (1) Alkanol	<p>(1) Primary secondary and tertiary, production of ethanol by fermentation and from petroleum by- products, local examples of fermentation, e.g. gin from palm wine, Glycerol as a polyhydric alkanol.</p> <p>(2) Chemical reactions of - OH groups. Oxidation as a distinguishing test between</p>



	<p>covalent bonds, covalent character of ionic bond</p> <p>pauling electronegativity scale</p> <p>(6) Intermolecular forces and hydrogen bonding; properties of molecules.</p>
(ii) Influence of Bonding on Size, shape, structure and properties	<p>(1) Covalent radius, ionic radius, Vander waals radius, metallic radius.</p> <p>(2) Variation of atomic and ionic radii in the Periodic table-within and across the period; isoelectronic series.</p> <p>(3) Shapes of simple molecules and ions using valence shell electron pair repulsion model.</p> <p>(4) Influence of bond</p>
<b>Contents</b>	<b>Notes</b>
	<p>Characteristics on structure and physical properties.</p> <p>(5) Influence of intermolecular forces on structures and properties.</p>
(iii) Chemistry of the main group elements – Group A – Group VIIA	<p>(1) Occurrence, preparation, properties, reactions and uses of Groups IA – VIIA,</p> <p>(2) Anomalous properties of lithium, (Group IA) beryllium (IIA) and boron (Group IIIA)</p> <p>(3) Oxidation states of Groups IA – VIIA; inert pair effect as applicable to Group IIIA, IVA and VA</p> <p>(4) Chemistry of halogen, halogen oxoacids, and hydrogen halides. Special reference should be given to chemistry of Xenon.</p>
(vi) Chemistry of Noble gases (Group VIIIA) (v) Chemistry of Transition metals.	<p>(1) Characteristic properties of Transition elements variable oxidation states, paramagnetism, coloured ions catalytic activity, interstitial compound formation, isomorphism</p> <p>(2) Coordination Chemistry – complex ion, ligands coordination number, Nomenclature</p>

	system for coordination compounds. (3) Chemistry of chromium, Manganese and iron.
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## BIOLOGY (BIO 001) COURSE CONTENT

### PREAMBLE:

The revised curriculum for Biology 001 is designed to upgrade the knowledge of Biology of Senior Secondary School Certificates students undergoing pre-degree programme at LAUTECH in order to prepare them for first year undergraduate studies in Biology.

The syllabus is divided into five sections:

1. Diversity of Plants
2. Diversity of Animals
3. Structure and Physiology of Animals
4. Physiology of Plants
5. Ecology, Genetics and Evolution

Contents	Notes
<p><b>DIVERSITY OF PLANTS</b></p> <p>a. (i) Introduction to taxonomy;</p> <p style="padding-left: 40px;">(ii) Systems of Classification;</p> <p style="padding-left: 40px;">(iii) Major divisions of plant kingdom</p>	<p>Structure, characteristics and life histories of plants, from Bacteria to Fungi, Algae, Lichens, Bryophytes, Pteridophytes and Spermatophytes, Evolutionary trends in plants as shown by a study of the characteristics of these groups should be emphasized. The study should illustrate the trend from simple to complex structural organizations and from aquatic to terrestrial habitats using selected examples.</p>
<p>b. Morphology and Anatomy of plants (flowering plants)</p> <p style="padding-left: 40px;">(i) External morphology,</p> <p style="padding-left: 40px;">(ii) Internal structure and functions of the root, stem, leaf and</p>	<p>Different types of supporting tissues flower in plants e.g. turgid parenchyma, collenchymas, xylem (wood) and sclerenchyma; and their functions (strength, rigidity, flexibility, resilience etc). Pollination and fertilization;</p>

	<p>products of sexual reproduction in angiosperms (i.e. fruits and seeds); their classification, structure and disposal; i.e. simple (dry indehiscent, dry indehiscent and succulent), aggregate and multiple. The internal structure of a drupe, a berry, a caryopsis, a bean seed and a castor oil seed.</p>
<p><b>DIVERSITY OF ANIMALS</b>  a.(i) Cell structure  (ultra structure)</p>	<p>The cell as a living unit. Cells:-  Functions of cell components. Variety of cells and forms in which living cells exist i.e. single and free living (e.g. Amoeba, Paramecium), colony (e.g. volvox); filament (e.g. Spirogyra) Cell as par of a living organism (e.g. Cheek cell). Cell and its environment: physical and biophysical processes – diffusion, osmosis, plasmolysis etc: their significance and the factors which affect cell activities in its environment. Properties and functions of living cells. Cell division and cell growth mitosis and meiosis.</p>
<p>b. Levels of Organization in Animals  (i) Cell: in single celled animals e.g. Amoeba, Paramecium.  (ii) Tissue: in certain lower animals e.g. Hydra Sponges.  (iii) Organ: as components of higher animals e.g. Heart, lung etc.  (iv) System: in mammals e.g. reproductive, transport, skeletal etc.</p>	<p>These and other examples should be used to illustrate the differentiation and specialization in animals. The significance of different levels of organization including volume/surface area ratio should be mentioned.</p>

<p>c. Evolutionary trends in Animals shown by a study of the characteristics of the following groups.</p> <p>(i) Protoza</p> <p>(ii) Coelenterates</p> <p>(iii) Playhelminhes</p> <p>(iv) Nematoda</p> <p>(v) Annelida</p> <p>(vi) Arthropoda</p> <p>(vii) Mollusca</p> <p>(viii) Echinodermata</p> <p>(ix) Vertebrata</p>	<p>Familiarity with the principal features as indicated against each group is required, rather than detailed knowledge of the systematic or of particulars examples. The study should illustrate the trend from simple to complex structural organization and from aquatic to terrestrial habitat as. Advantages and disadvantages of complexity.</p> <p>Characteristics, including habitat and examples to corroborate evolutionary position.</p> <p>General characteristics; classification, structure and mode of life of a selected example</p> <p>General characteristics; classification, mode of life and economic important of selected example.</p> <p>General characteristics; economic important and mode of life a selected example.</p> <p>General characteristics; mode of life; economic importance.</p> <p>General characteristic; classification with examples; Economic importance.</p> <p>General characteristics, Economic importance.</p> <p>General characteristics, mode of life a selected example.</p> <p>General characteristics; classification with examples i.e. Pisces, Amphibian; Reptilia, Aves and Mammals.</p>
<p>d. Comparative structure and function of the Animal Kingdom</p> <p>(i) Nutrition</p>	<p>Alimentary system of different animals e.g. earthworm, cockroach Modification of parts for their functions. Feeding habits.</p>
<p>(i) Mechanism of transportation of materials</p>	<p>Protoplasmic streaming, pumping of blood in higher animals, open circulatory systems in invertebrates, closed system in vertebrates.</p>

<p>(iii) Respiratory system</p> <p>(iv) Excretory systems and Mechanism</p>	<p>Body surface (protozoa), cutaneous, gills (Amphibians and fish), trachea (insects), lungs (adult stage &amp; amphibians, reptiles. Etc.)</p> <p>Contractile vacuole, female cells, malpighian tubules, kidney, Excretory products and mechanism is earthworm and insects in relation to that of a name mammal (a brief account).</p>
<p><b>PHYSIOLOGY OF ANIMALS (FORMS &amp; FUNCTIONS)</b></p>	
<p>a. Animals Nutrition</p> <p>(i) Food substances; class</p>	<p>Carbohydrates, proteins, fats and oils, vitamins, mineral salts and water as components of diet. The concept of balanced die and it importance. Food tests, digestive enzymes; classes, characteristics and functions, Digestion, Absorption and Assimilation.</p>
<p>(ii) The structure of tooth; types, their functions.</p>	<p>The relationship between dentition and diet as illustrated by a named omnivore and a herbivore and a carnivore.</p>
<p>(iii) Modes of nutrients</p>	<p>Heterotrophic: - (holozonic, parasitic, symbiotic and saprophytic) The alimentary system for a named mammal. Modification of parts for their functions. Functions of the liver in the general metabolism.</p>
<p>b. Tissues and System in Mammals and their functions</p> <p>(i) Skeletal and supporting systems</p> <p>(ii) Transport system in mammals:</p>	<p>The skeleton – bones and vertebral column; Biological significance; Types of skeleton (exoskeleton, endoskeleton). Mechanism of support in animals; functions of the skeleton (protection, support, locomotion, respiratory movement)</p> <p>Need for transportation; surface area/volume ratio; substances having to move greater distances etc. Composition and functions of blood and lymph; materials for transportation and their sources; for ms in which they are</p>

	transported and where they are transported to.
c. Respiration in Animals:	Respiratory system: The gill and the lungs. Mechanism of gaseous exchange in fish, toad and mammals. Respiratory movements in these animals should be stressed.
d. The Mammalian Excretory system and Mechanism:	Structure of the kidney, the lung and the skin. Structure of kidney in relation to filtration and reabsorption. The excretory products; significance of excretion.
e. Co-ordination and Control	Importance of co-ordination and control. Difference between nervous and hormonal control.
(i) Nervous co-ordination	The components, structure and functions of the central nervous system the brain and spinal cord. Peripheral nervous system – somatic Ns, Autonomic Ns, Mechanism of transmission of impulses. Structure, function and classification of neuron; the reflex arc, reflex and voluntary action compared; coordinated reflexes.
(ii) Hormonal co-ordination:	Animal hormones. Sites of secretion, functions and effect of ones and under secretion. The role of thyroxine in the metamorphosis of toad.
(iii) Sense Organs:	The skin; sensations such as touch, pressures, cold and left; organs of smell, tastes, sight and hearing Mechanism of smelling, tasting, seeing and hearing. Association between organs of taste and smell. Eye and ear defects and their corrections.
f. Homeostasis (Regulation of Internal Environment):	The skin and regulation of body temperature. Osmo-regulation and maintance of acid-base balance. The role of the kidney in regulating water and salt content or the blood. The conditions the affect the functioning of the kidney (water and salt content of the blood, environmental temperature etc.)

<b>PHYSIOLOGY OF PLANTS</b>	
a. Nutrition	Autotrophic: - photosynthetic and chemosynthetic autotrophs. Photosynthesis: Outline of the process; light and dark reaction; materials and conditions necessary for photosynthesis. Evidence of photosynthesis. Mineral requirement of plants: soil and atmosphere as sources of mineral elements. The macro-and micro-nutrients; effects of mineral deficiencies. The difference between food produced by plants and mineral elements.
b. Respiration:	Outline of the process and its significance. Cell (tissue) respiration: the role of oxygen in the liberation of energy for the activities of the living organisms. Aerobic respiration, anaerobic respiration, yeast fermentation and energy release. Outline of the chemical processes involved in glycolysis and Krebs's cycle. The role of ATP. Energy balance sheet fundamental similarities in the respiration of plants and animals. Special features of respiration (i.e. stomata and lenticels) and mechanisms of gas exchange in plants.
c. Irritability in Plants:	Stimuli and types of responses: tropism, taxis, nastic and sleep movements. Hormonal co-ordination in plants – Auxins and tropism Growth: General features, regions of fastest growth in (root and shoot tips), basis of growth – cell division (mitosis). Enlargement and differentiation: the influence of growth hormones: growth curvatures (i.e. tropisms): Types of tropism; seed germination.
d. Transport in plants:	Need for transportation – increase in size and complexity. Materials for transportation – excretory products (water, carbon (iv) oxide, oxygen, tannins, acids, resins, gum, mucilage,

	alkaloids and anthocyanin), gases, manufactured food, nutrients and hormones. Absorption and transportation of soil water. Mechanisms of water and food transport: transpiration pull, root pressure, and active transport in plants.
<b>ECOLOGY, GENETICS AND EVOLUTION.</b>	
a. Basic Ecological Concepts:	Components of the ecosystem: biotic and abiotic. The biotic component (plants, Animals, microbes). Introductory microbiology. Ecological Components: environment, biosphere, lithosphere, hydrosphere, atmosphere, habitat, niche, population, biotic community.
(i) Ecosystem	
(ii) Ecological factors:	Physical factors, edaptive factors, food chains, food webs and trophic levels. Energy flow and biogeochemical cycles (water, Nitrogen, carbon etc.); the role of microorganisms. Ecological succession and climax community.
(iii) Habitats	Aquatic, marine etc.
b. Ecological management:	Association within the community (symbiosis, predation, parasitism etc.) Adaptation to environmental factors and population regulation. Pollution of the environment and control: Effects on biotic and abiotic systems and the methods of control. The role of micro-organisms in pollution and pollution control. Sanitation and sewage disposal. Conservation of natural resources (water, soil, minerals, forests and wild life).
c. Introductory Genetics And Evolution	
(i) Biology of Heredity:	Variation (morphological, physiological) and its application (crime detection, blood transmission, determination of paternity etc.) Heritable and non-heritable variations; Mendel's experiments, mendelian traits and mendelian laws. Process of transmission of hereditary characters from parents to offspring's: chromosomes as the basis

	of heredity, probability in genetics. Application of the principles of heredity in Agriculture, medicine marriage counseling etc.
(ii) Evolution	Adaptation for survival; factors that bring about competition; intra and inter-specific competition; structural adaptations for obtaining food, protection / defence, securing mates for reproduction, regulating temperature and loss of water; behavioural adaptations in social animals. Adaptations and evolution. Theories of evolution- Lamarck's and Darwin's theories. Brief account of evidence for evolution.