FEDERAL UNIVERSITY OF TECHNOLOGY
AKURE, ONDO STATE
NIGERIA

DEPARTMENT OF CHEMISTRY

COURSE DESCRIPTIONS

CHE 101 - GENERAL CHEMISTRY I (1 UNIT)
Atoms, molecules and chemical reaction, chemical equation and stoichiometry, atomic Structure and; Modern electronic theory of atoms; Radioactivity; Chemical kinetics Electro chemistry.

CHE 102 - GENERAL CHEMISTRY II (4 UNITS)
Historical survey of the development and importance of organic chemistry, nomenclature and classes of organic and purification of organics compounds; qualitative and quantitative organic chemistry; stereo chemistry; determination of structure of organic compounds; Electronic theory in organic chemistry; saturated hydrocarbons. Unsaturated hydrocarbons. Periodic table and periodic properties; Valence Forces; structure of Solids; The Chemistry of selected metals and non- metals Quantitative analysis.

CHE 101 - INORGANIC CHEMISTRY 1 (2 UNITS)
Pre. requisite - CHE 102
Chemistry of First row transition metals introduction to co ordination chemistry including elementary treatment of crystal field theory. Comparative Chemistry of the followings elements. (a) Ga, In, TI, (b) Oe, Sn, Pb, (Sc)As, Sb, BI, (d) Se, To, Po, Elementary introduction to Organometallic Chemistry. Role of metals in biochemical systems.

CHE 20I-ANALYTICAL CHEMISTRY 1 (2 UNITS)
Pre- requisite - CHE 101 and 102
Theory of Errors; Statistil; treatment of data: theory of Sampling. Chemical methods of analysis including volumetric, gravimetric and physiochemical methods. Optical methods of analysis; separation methods.

CHE 103 - ORGANIC CHEMISTRY I (2 UNITS)
Pre.requisite - CHE 101 AND 102
Factors affecting structure and physical properties of organic a compounds; Factors availability of electronic Ilereochemistry. Methane, energy of activation and free radical substitution reaction in alkanes. Aromatically various organic reaction e.g. addition free radical, elimination free radical, elimination reactions, etc.

CHE 204-STRUCTURE AND BONDING (2 UNITS)
Pre - requisite - CHE 205
Ideal of quantum states orbitals, shape and energy. Sample valence theory electron repulsion theory atomic spectra. Methods of determination molecular shape, bond lengths and angels. The structure and chemistry of some repreSeQtative main group element compounds.

CHE 205 - PHYTSICAL CHEMISTRY 1 (2 UNITS)
Pre- requisite - CHE 101.
Kinetic theory of gases; Behavior of real gases; The law of thermodynamics; Entropy and free energy, Reaction and phase equilibria, Reaction rates; Rate Laws; mechanism and theories of elementary processes; Photochemical reactions; basic electrochemistry.

CHE 301: INORGANIC CHEMISTRY II (4 UNITS)
Pre - requisite - CHE 201
the noble gases. hydrogen. Electronic structure and general properties and comparative study of group IIA elements. Chemistry of Boron; Carbon and Silicon; Nitrogen and phosphorus; Oxygen and Sulphur. The halogens. Transition elements. Separation of metals. Co-ordination Chemistry. Ligand and Crystal field theories. Introduction to Radiochemistry and the periodic table.

CHE 302 ATOMIC AND MOLECULAR STRUCTURE AND SYMMETRY (2 UNITS)
Pre- requisite - CHE 204
Schrodinger equation. Helium atom ground and excited state, Spin and Pauli Principle Hydrogen Molecule. configuration interaction. Coulson-Fischer function. Molecular orbitals and valence bond theory, concept of resonance and configuration interaction. Coulson-Fischer function. Molecular orbitals for diatomic molecules simple pi - electron theory, Huckel theory, Huckel theory. Walsh rules brief mention of other methods. Atomic Russel Saunders Coupling, mention of other methods. Atomic Russel Saunders Coupling, mention of other methods. Atomic Russel Saunders Coupling Orbital and spin angular momentum. Use of symmetry in chemistry.

CHE 303 - ORGANIC CHEMISTRY II (4 UNITS)
Pre- requisite - CHE 203
Alcohols and their reactions. Ethers and Epoxides. Carboxylic acids and their derivatives Aldehydes and Ketones. Carbanions I and II - unsaturated compounds. Carbanion II. Amines; Aromatic and Alicyclic chemistry. Polyfunctional compounds. Heterocyclic chemistry.

CHE 304 - PETROCHEMISTRY I (2 UNITS)
Petroleum in the contemporary energy scene. Nature. classification and composition of crude petroleum and natural gases. Distribution of petroleum and natural gas resources (the global and Nigerian situations). Petroleum technology Survey of refinery products and processes. Petrochemistry in industrial raw materials. Prospects for the petrochemical industry in Nigeria.

CHE 305 - PHYSICAL CHEMISTRY II (3 UNITS)
Pre - requisite - CHE 205
A review of Gibbs function. Chemical thermodynamics. Introduction to statistical thermodynamics. Ideal solutions. Non - ideal solutions. Properties of electrolytes.

CHE 306 - NATURAL PRODUCTS CHEMISTRY (1 UNIT)
Terpenoids, carotenoids, steroids, alkaloids and lipids.

CHE 307 - ORGANOMETALLIC CHEMISTRY (1 UNIT)
Pre - requisite - CHE 203
Classification of Organometallic compounds. Preparation structure and reaction including abnormal behaviour of organometallics. Generation and detection of free radicals; free Organometallic compounds.

CHE 308 - POL YMMER CHEMISTRY I (2 UNITS)
The nature polymer; Types of polymer and'polymerization processes; Addition condensation Polymerisation and their mechanisms. Physical properties of polymers. Solubility and solution properties. Structure and properties and fibre forming polymers.

CHE 309 - INDUSTRIAL RAW MATERIALS RESOURCES INVENTORY (1 UNIT)
Survey of Nigeria's industries and their raw material requirements. Mineral chemistry. Fossils and their uses. Plant and animal products. Nuclear, solar and hydronamic sources of energy. Potentials and application of locally available raw material as industrial feed stocks.

CHE 310 - COLOUR CHEMISTRY AND TECHNOLOGY (2 UNITS)
Colour and constitution. Chemistry, properties of dyes and pigments. Classification of dyes and fibres. Dyeing mechanisms. Preparation and dyeing of natural and synthetic fibres. Colour fastness properties. Quality control fastness properties. Quality control procedures and colouration industry.

CHE 311-ENVIRONMENTAL CHEMISTRY (2 UNITS)
Concepts of elementary Cycles. Characteristics of the atmosphere. Sources, types and effects of environmental pollution. Wastes water treatment. Composition of domestic waste. Water chemistry and analysis. Chemical and physical instrumentation in environmental sciences.

CHE 312 - APPLIED SPECTROSCOPY (2 UNITS)
Principles and application of UV, IR MMR and Mass spectroscopy the determination and elucidation ofstructures of organic compounds.

CHE 313 - INTRODUCTORY INDUSTRIAL CHEMISTRY (2 UNITS)
Review of application of chemistry in the chemistry in the chemical allied industries. Sources of chemical raw, materials and energy Renewable and non-renewable resources. Resources depleting and recycling. Raw materials from coal. Petroleum, wood, etc. material and energy balances. Pilot plants, model scales - up principle. Process optimization.

CHE 314- INDUSTRIAL CHEMICAL PROCESS 1(2 UNITS)
Production of primary intermediates and synthesis of industrial organic chemical polymers adhesives, dyes, explosives, insecticides, herbicide, flavouring agents and pharmaceuticals. Fermentation process.

CHE 315 - INSTRUMENTAL METHODS OF ANALYSIS (2 UNITS)
Spectroscopic techniques. Quantitative analysis. X-ray methods. Flourescence methods. Nuclear Magnetic resonance Electron spin resonance. Refractometry and ion interferometry. Polarimetry, Polarograph. Calorimetry.

CHE 316-INDUSTRIAL CHEMICAL TECHNOLOGY 1 (2 UNITS)
Heat transfer and Mass transfer process. Unit operations. Chemical technology equipment.

CHE 318 QUALITY CONTROL AND INDUSTRIAL SAFETY (1 UNIT)
Quality control as applied to selected products; preservation and control of industrial and laboratory hazards.

CHE 401 THEORY OF MOLECULAR SPECTROSCOPY (2 UNITS)
Pre- requisite CHE 302, 305, 312
Quantum theory of rotation and vibration. Theory of microwave, IR, Raman, UV, Visible and NMR spectroscopy. General introduction of electron spin resonance, Mossbauer effects, nuclear quadruple resonance and other modern techniques.

CHE 403- REACTION KINETICS (2 UNITS)
Pre -requisite - CHE 305
Review of first, second and third order rate equation, Rate constant and equilibrium constant. Collision theory, Transition state theory, reaction co-ordinates. Unimolecular reaction theory, bimolecular reaction mechanisms, chain reaction mechanism; Catalysis and heterogeneous. Reaction. Photochemical reaction mechanisms.

CHE 405 - RADIOCHEMISTRY AND NUCLEAR CHEMISTRY (2 UNITS)
Pre-requisite CHE 305
Natural radioactivity fission decay processes, nature of radiation, Nuclear model energetics of nuclear reaction. Principles and measurement of radioactivity. Application of radioactivity.

CHE 407 ANALYTICAL CHEMISTRY II (2 UNITS)
Pre- requisite CHE 305
Theory of error. Potentiomeric and pH methods. Conductometric methods. Electrolytic methods. Radiochemical methods. Chromatography.

CHE 409 - HETEROCYCLIC CHEMISTRY (2 UNITS)
Pre-requisite - CHE 303
The synthetic and mechanistic aspects of fused heterocyclic system particularly Quinolines, Isoquinolines, Benzofurans;Benzothiophenes, Indoles, Benzopyryllium salts CoumarinsChromonnes. Application of heterocyclic syste!ll in drug synthesis.

CHE 411- CO-ORDINATION CHEMISTRY (2 UNITS)
Pre-requisite - CHE 301
Definition, Recognition and Application Co-ordination, Nomenclature, Co-ordination formula and Isomerism in complexes stereochemistry of complex molecules. Theories structure and bonding. Physical methods of structural investigation. Magnetic properties. Absorption and vibrational spectra. The spectrochemical series. The Nephelauxetic series and the John - Teller distortion. Stabilization of unusual oxidation state by complex formation. Thermodynamic stability of complex compounds, the stability constant, the chelate effect. Preparation and reactions of complexes. Kinetic and Mechanisms,

CHE 413- NON-AQUEOUS SOLVENTS (1 UNIT)
Pre-requisite - CHE 301
Classification and general Characteristics, solute solvent interaction. Protonic solvent Oxyhalide solvents. Liquid halides. Dinitrogen tetroxide, sulphur dioxide

CHE 415- CHEMISTRY OF LANTHANIDES AND ACTINIDES (1 UNIT)
Pre requisite- CHE 301
The element and the position of the two series in the periodic table. Comparison of the two series.

CHE 417 - NATURAL PRODUCTS CHEMISTRY II (2 UNITS)
Pre-requisite - CHE 203 and 306
Chemistry of terpenoids, steroids, and alkaloids, antibiotics, flavonoids. Prostaglandins and chlorophylls. Other natural products of pharmaceutical importance. General methods of isolation, separation, purification and structure determination of the natural products Classifications. Discussion of chemistry of important member; Biogenesis.

CHE 419 - FOOD CHEMISTRY (2 UNITS)
Occurrence, structures, and functions of carbohydrates, Protein, fats and oil, physical and chemical properties. Starch behavior during baking and staling of bread. Glucose syrup chemistry of enzymatic and non-enzymatic products. Ripening and natural of fruits - Pectic substances and their uses. The chemistry of fermentation process in the food industry. Effect of enzymes in food. Enzymatic and non-enzymatic browning.

Students Industrial Work Experience
CHE 402: Site Supervisor's Assessment
CHE 404: FUTA Supervisor's Assessment
CHE 406: Student's Seminar and Report Presentation.

CHE 501 - PROJECT
CHE 501 is a six - unit project carried out over 2 semesters constituting the final year thesis of the undergraduate program. It is aimed at exposing the graduating student into the technique of designing and execut- . ing a research topic of relevance to the current national needs and those of the various industries that carried out under the supervisor of members of the academic staff of the departments. Areas of Chemistry where such topic are drawn continually are in the Chemistry Departmental Handbook.

CHE 502 - SEMINAR (2 UNITS)
This is a 2 - unit course of critical review of current topics of chemical interest. Students are required to write a treatise on selected studies and to present class seminars on them.

CHE 503 - INDULSTRIAL CHEMICAL PROCESSES II (2 UNITS)
Pre-requisite - CHE 314
Chemical processing of minerals, Metallurgy and hydrometallurgical processes. Industrial electrochemistry. Manufacture of some heavy inorganic chemicals. Cement and binding materials. Inorganic fertilizers.

CHE 504 - INDUSTRIAL CHEMICAL TECHNOLOGY II (2 UNITS)
Pre-requisite - CHE 316
Hydrogen and carbon monoxide synthesis, gas, exoprocess, water gas, source of hydrogen and its application. Industrial organic materials, Raw materials, Technical and economic principles of processes and product routes. Flow diagrams. Selected oils and fats, soap and detergents, sugar, paint, varnish, plastics, wood, pulp and paper. Environmental pollution.

CHE 505-COLOUR CHEMISTRY AND TECHNOLOGY II (2 UNITS)
Pre-requisite - CHE 311
The chemistry and theory of dyeing. Chemistry an application of reactive dyes. Preparation and dyeing of man - made fibres. Dyeing machineries printing. Colouring matters for food, drugs and

cosmetics. Dyes used in paper industry and colour photography.

CHE 506 - FOOD ANALYSIS (2 UNITS)
Sampling and treatment for analysis - proximate analysis of food. Analysis of:
(a) Sugar and fruit product
(b) Milk and diary product;
(c) Flesh food;
(d) Fermented product (beer, wine, vinegar);
(f) Oil vale rancidity

CHE 507 - POLYMER CHEMISTRY II (2 UNITS)
Chemistry transformation of polymer. Methods of investigation of polymer structures phase state and phase transitions of polymers. Rheological and electrical properties polymer. Polymer solutions. Plasticization.

CHE 508 - ELECTROCHEMISTRY (2 UNITS)
Pre-requisite - CHE 301
Electrical double layer, potential at zero charge, polarizable and non-polarizable interface, mass transport, concentration polarization, Fick's Laws, Levic equation Electronics. Polagraphy.

CHE 509- WATER AND WASTE WATER TREATMENT (2 UNITS)
. Background, sample water analysis, flow, dispersion, degradation amounts and composition of wastes, biological aspects, particles. transport in soil and ground water sinks for water sinks for water treatment, conventional processes, in handling swage water treatment, plant waste, advanced waste treatment. Effects of water pollution.

CHE 510 ANALYSIS OF SELECTED MATERIAL INCLUDING DRUGS (2 UNITS)
Various techniques in use for the analysis of crude material. Analysis of environmental samples, e.g. pesticide residue, hydrocarbons and air. Analysis for heavy metal contaminants. Organic functional groups and drug analysis. Soil and geochemical analysis.

CHE 511 - APPLIED SURFACE AND COLLOID CHEMISTRY (2 UNITS)
Some general principles relating to surfaces. Electrical potentials. Attractive forces, solid gas interface and solid liquid interface. Definition of colloid and history of colloid development. Types of colloids. Polymers, proteins, Gels, Association colloids Detergency.

CHE 512 - SPECIAL TOPIC IN INDUSTRY CHEMISTRY (2 UNITS)
An in-depth study of special relevant topics of industrial importance e.g. process central Quality control enhanced oil recovery, polymer Rheology. Etc.

CHE 513 : PETROCHEMISTRY
Chemical feed stocks for the petrochemical industries. Unit operations involved in the processing of petrochemical feed stocks. Chemical conversion - alkylation amination, halogenatiopn, etc. manufacture and uses of petrochemicals.

CHE 514 - DYE AND TEXTILE CHEMISTRY II (2 UNITS)
Principle of yarn manufacture both natural and manmade. Basic machine processes involved. Textile

processing, bleaching, dyeing theory printing. Surface activity Colour fastness and factors affecting it. Co louring matters. Management problems in textile industries.

CHE 515 - WOOD PULP AND PAPER CHEMISTRY I (2 UNITS)
Forests - conservation, exploitation and afforestation. Species, anatomy, physical properties and classification of wood. Preparation of wood for pulping. Physical and chemical methods of pulping. Bleaching reagents and pulp bleaching. Pulp- properties and uses.

CHE 516 - POLYMER TECHNOLOGY (2 UNITS)
Large scale industries polymerization processes. Polymer Tech. Polymer processing injection, extrusion, compression and transfer moulding of thermoplastics. Polymer additives. Polymer surface coating and adhesive.

CHE 517 - QUANTUM CHEMISTRY (2 UNITS)
Pre-requisite - CHE 304
Postulates of Quantum mechanics; operation angular momentum solution of the hydrogen atom problem. Theory of atomic spectra. Self-consistent Field theory computation aspects. Pertubation and variation methods

CHE 518 - WOOD PULP AND PAPER CHEMISTRY II (2 UNITS)
Detailed studies of the technology of pulp and paper manufacture. Special papers and structural boards. Pulp industries.