

DEPARTMENT OF PURE AND APPLIED CHEMISTRY

VISION

To create a class of scientists, par excellence, who devote their studies to the investigation of the nature of matter and its applicability in solving man's problems in a non – toxic environment

MISSION

To seek knowledge truthfully from Christian principles and using scientific methods to understand the nature of matter and its uses

THE PHILOSOPHY OF THE DEPARTMENT

The philosophy of the Department is in line with that of the University: to search for the TRUTH scientifically by studying matter (science of chemistry), in order to provide knowledge for the understanding of the nature of matter and its applicability for the integral and holistic formation of man in order to advance knowledge in the service of God and humanity.

Chemistry is the science that deals with the nature of matter. Chemistry is fundamental to all other sciences; it is the centre science which leads to the understanding of matter, hence chemistry is studied as pure science as well as an applied science; in the first case ,it observes and explains the nature: structure, composition, the properties and the laws that govern the characteristics of matter; in the second case, it modifies natural products and creates (synthesizes) new substances and utilizes both for the development of man in a friendly environment.

The degree offered in this department is B. Sc (Industrial Chemistry)

The Industrial Chemistry programme is designed to inculcate disciplined investigative character in the students to understand the science of chemistry in relation to other sciences and technology and its applicability in solving human problems in a non toxic environment. The graduates of industrial chemistry should be well balanced citizens who contribute meaningfully to the industrial, economic and political developments globally, and of their country in particular.

THE OBJECTIVES

The objectives of the programme are:

- to create awareness in students of the vast natural resources endowed to man in our environment for exploitation chemically for man's development
- to make the students know the nature : structure, composition, properties and uses of these resources and the laws governing their general characteristics.
- to produce skill graduates in industrial chemistry, who can manipulate natural products or create (synthesize) substances in the laboratory as well as in the industrial system.
- to produce skill workers in chemical industries.
- to produce teachers in Chemistry at the secondary school level and prepare them for higher degree courses in chemical sciences.

BRIEF HISTORY OF THE DEPARTMENT

The Department of Pure and Applied Chemistry is one of the foundation Departments in the College of Natural and Applied Sciences (NAS) of Veritas University, Abuja at Obehie Campus. It started functioning in 2008/2009 session, when Veritas University started its academic activities, with two foundation students: Aduaka, Stephen C. (VUG|CHM|08|038) and Ezeigbo, Charles C. (VUG|CHM|08|089) and an academic staff: Dr. U. D. Akpabio (an Associate Professor of Chemistry) who was also the Acting Head of the Department while Mr. Ito E. Udo was the Laboratory Technologist. The Department has a well equipped laboratory and a lecture hall.

LIST OF CURRENT STAFF

MBONU, Idongesit Justina B.Sc. (Calabar), M.Sc. (Port-Harcourt), Ph.D. (Calabar)	Designation : Research Interest: Tel: E-mail	Lecturer 11 & Ag. Head of Department Metal Organic Frameworks 08037047734 mbonui@veritas.edu.ng
OJINNAKA, Chukwunonye M. B.Sc., Ph.D. (Ibadan)	Designation : Research Interest: Tel: E-mail:	Visiting Professor Organic Chemistry +2348063680679 cmojinnaka@yahoo.co.uk
AKPABIO, Ukana Davies B.Sc. (Nsukka), M.Sc. (Zaria), Ph.D (Manchester)	Designation : Research Interest: Tel: E-mail	Visiting Associate Professor Polymer/Tech/ Wood & Paper Chemistry 08032606222 ukanadakpabio@yahoo.com
NNOROM, Innocent Chidi B.Sc (Uturu), M.Sc. Ph.D (Ibadan)	Designation : Research Interest: Tel: E-mail	Visiting Senior Lecturer Analytical/Environmental 08138060935 chidiabsu@yahoo.co.uk
AYI, Ayama Ayi B.Sc. (Calabar), Ph.D (Calabar)	Designation : Research Interest: Tel: E-mail	Visiting Senior Lecturer Metal Organic Frameworks & Nanoparticles in ionic liquids 08035961521 Ay_72000@yahoo.com
BAYIM, Peter-Robins Bayim B.Sc., M.Sc,	Designation : Research Interest: Tel: E-mail	Visiting Lecturer 11 Antiretroviral Properties of traditional Medicinal Plants 08063293135 Bayim22@yahoo.com
UDO, Ito E. Esiet HND (Calabar), B.Sc., M.Sc (Uyo),	Designation : Research Interest: Tel: E-mail	Assistant Lecturer Environmental/ Analytical 08027577081 Ityboy2001@yahoo.com
EBIEKPE, Victor Edet. B.Sc (Uyo), M.Sc.	Designation : Research Interest: Tel: E-mail	Assistant Lecturer Corrosion of Materials, Modern Corrosion Theory-Principles and Applications 08038229443 ebivik@yahoo.com

ADMINISTRATIVE AND TECHNICAL STAFF

NAME OF STAFF		RANK
AZOWENUNEBI, MARY O. B.Sc (Delsu-Abraka)	Designation: Tel: E-mail	Secretary 11 07035319083 azowenunebim@veritas.edu.ng
ONYEAJAGWA, Calista N. NCE, TC 11	Designation : Tel: E-mail	Clerical Officer 080650818873 onyejagwac@veritas.edu.ng
NTINSO, Emmanuel Sunday OND (Nekede)	Designation : Tel: E-mail	Laboratory Assistant 08081744411 ntinsoe@veritas.edu.ng
NNOLIM, Lucia Chidinma OND (Nekede)	Designation : Tel: E-mail	Student on Industrial Training 07067294870 Dove-4mum@yahoo.com

ADMISSION REQUIREMENTS

The admission requirements for both B. Sc (Chemistry) and the B. Sc (Industrial Chemistry) are as stipulated by the Joint Admission Matriculation Board (JAMB) for Unified Tertiary Matriculation Examinations (UTME).

- University Matriculation Board (UTMB) Candidates:

Passes at credit level in *Five Subjects* which include English Language, Mathematics, Chemistry, Biology and Physics at the Ordinary Level (SSCE, WASCE, or GCE)

- Direct Entry Candidates:

Possession of one of the following qualifications

Higher School Certificate*

Interim Joint Matriculation Board (IJMB) Examination*

Nigeria Certificate in Education (NCE)*

Ordinary National Diploma (OND, ND) Upper Credit in Chemistry or Related field*

Higher National Diploma (HND) Lower Credit in Chemistry or Related field*

First degree in Chemistry or related area from a recognized University

* *With two "A" Level Passes in Chemistry and anyone of Physics or Maths*

plus UTME requirements.

B. Sc (HONS) INDUSTRIAL CHEMISTRY CURRICULUM**100 LEVEL FIRST SEMESTER**

Course Code	Course Title	Units
GES 1011	English and Communication Skills	2
GES 1021	Science, Technology and Society	2
GES 1031	Nigerian Peoples and Culture	2
BIO 1111	General Biology I	3
PHY 1111	General Physics I	3
PHY 1121	Experimental Physics I	1
PHY 1131	Heat and Geometrical Optics	2
MTH 1111	Elementary Mathematics I	3
CHM 1111	General Chemistry I	3
CHM 1121	General Chemistry Practical I	1
	Total	22

100 LEVEL SECOND SEMESTER

Course Code	Course Title	Units
GES 1012	English and Communication Skills II	2
GES 1012	Logic and Philosophy	2
GES 1022	Political Economy	2
GES 1032	Computer Appreciation	2
GES 1042	Community Service	1
BIO 1112	General Biology II	3
MTH 1112	Elementary Mathematics II	3
MTH 1212	Basic Statistics for Sciences	2
PHY 1112	General Physics II	3
PHY 1122	Experimental Physics II	1
CHM 1112	General Chemistry II	2
CHM 1122	General Chemistry Practical II	1
	Total	24

200 LEVEL FIRST SEMESTER

Course Code	Course Title	Units
GES 2011	Application of the Computer	2
GES 2021	Entrepreneurship I	2
THG 2711	Introduction to Ancient Church History	2
MTH 2131	Mathematical Methods I	2
PHY 2211	Introduction to Electronics	2
BCH 2111	General Biochemistry I	3
CHM 2211	Organic Chemistry I	2
CHM 2311	Inorganic Chemistry I	3
CHM 2321	Inorganic Chemistry Practical I	1
CHM 2511	Analytical Chemistry I	2
CHM 2521	Analytical Chemistry Practical I	1
	Total	23

200 LEVEL SECOND SEMESTER

Course Code	Course Title	Units
GES 2012	Entrepreneurship II	2
MTH 2142	Mathematical Methods II	3
PHY 2722	Energy Physics	2
BCH 2112	General Biochemistry II	3
CHM 2212	Organic Chemistry II	3
CHM 2412	Physical Chemistry I	2
CHM 2422	Physical Chemistry Practical	2
CHM 2612	Process Calculations in Chemistry	3
THG 2722	Introduction to Medieval and Contemporary Church History	2
	Total	22

300 LEVEL FIRST SEMESTER

Course Code	Course Title	Units
CHM 3221	Heterocyclics and Carbocyclics	3
CHM 3231	Organic Chemistry Practical	1
CHM 3311	Inorganic Chemistry II	2
CHM 3321	Inorganic Chemistry Practical II	1
CHM 3411	Physical Chemistry II	3
CHM 3511	Analytical Chemistry II	3
CHM 3521	Applied Spectroscopy	3
CHM 3611	Polymer Chemistry	3
CHM 3621	Process Chemistry I	3
THG 3341	Social Teaching of the Church	2
	Total	24

300 LEVEL SECOND SEMESTER

Course Code		Units
CHM 3002	STUDENTS' INDUSTRIAL WORK EXPERIENCE SCHEME (SIWES) (6 months)	6
	Total	6

400 LEVEL FIRST SEMESTER

Course	Course Title	Units
CHM 4511	Research Methodology	2
CHM 4521	Separation Methods	2
CHM 4221	Natural Products	3
CHM 4411	Advanced Chemical Kinetics	2
CHM 4421	Radiochemistry and Nuclear Chemistry	2
CHM 4611	Industrial Methodology and Quality Control	3
CHM 4711	Environmental Chemistry	3
*CHM	Technical Elective I	4
	Total	21

400 Level SECOND SEMESTER

Course Code	Course Title	Units
CHM 4112	Seminar	1
CHM 4122	Project	6
CHM 4612	Process Chemistry II	2
CHM 4672	Petroleum Processing	2
CHM 4682	Applied Surface and Colloid Chemistry	2
**CHM	Technical Elective II	4
THG 3532	Spiritual Theology	2
	Total	19

TECHNICAL ELECTIVES

Course Code	Course Title	Units
*CHM 4621	Food Processing Technology	2
*CHM 4631	Chemistry of Paints and Adhesives	2
*CHM 4641	Industrial Management	2
*CHM 4651	Fibre Science and Technology	2
**CHM 4322	Organo-metallic Chemistry	2
**CHM 4632	Rubber Technology	2
**CHM 4642	Pharmaceutical Chemistry	2
**CHM 4652	Mineral Processing/Metallurgy	2
*CHM 4662	Corrosion Chemistry	2

* First Semester Technical Electives

** Second Semester Technical Electives

Total Credits for B. Sc (Hons.) Industrial Chemistry: 160 Units

COURSE DESCRIPTION

GES 1011: English and Communication Skills I (2 credit units)

The course is designed to impart the communication skills in the medium of English. Emphasis is on introducing students to English for Academic purposes and specifically focuses on: Study skills and Study plans; Listening and Note taking; Speaking (sounds of English, stress, intonation and rhythm); Reading Skills and strategies such as skimming and scanning, SQ3R, KWL, CATAPULT, THIEVES, etc); Book review and Library skills. The concentration of this course is equipping students to develop appropriate listening, reading and study skills using the library as a major store house of acquiring knowledge. Thus, the following are emphasised: listening comprehension, determining main idea, note taking; reading comprehension – reading skills, determining main idea from reading, skimming and scanning; and use of library, including cataloguing systems, locating books and journals, lending/borrowing, reference materials, indexing and examination taking techniques as well as book review.

GES 1012: English and Communication Skills II (2 credit units)

This is a continuation of GES 1011 (English and Communication Skills 1) that introduced students to the rudiments of English for academic purposes. The focus of this course is academic writing and information literacy skills. Broadly, the course covers the use of English for academic discourse, use of library skills with particular reference to information literacy skills for academic success. The use of English component seeks to equip students with the linguistic conventions and skills suitable for academic writing such as fundamentals of English language grammar related to the sentence; writing – planning, assembling and organizing outlines, unity, coherence, context, originality, mechanical accuracy, paragraph development, forms of writing including but not limited to narration, description, argumentation, exposition, summary, correspondences, speech writing, etc. The use of library segment seeks to expose students to skills and strategies for locating, retrieving, organizing, synthesizing, and publishing information within the ICT domain. Such exposure is to provide students with appropriate skills for constructive, creative and critical academic tasks in order to train independent learners who should take responsibility for their own learning. The information literacy component also focuses on various citation and documentation processes for academic writing.

GES 1021: Science, Technology and Society (2 credits) (20:10:0) LTP

Scientific evolution of man: the history of science, classification; scientific methods. Science and the environment: terrestrial and cosmic life; ecology and types of habitat: climate and vegetation; Energy resources: fossil fuels, nuclear energy and renewable energy resources; the Nigerian energy reserves. Characteristics of living things; cell and tissue biology; biochemistry and cellular metabolism; taxonomy of living things; Engineering technology and socio-economic development of Nigeria; the effect of adequate and stable electric power supply and satellite communication technology on the technological development of Nigeria; political and other constraints. The interaction between science and technology; Social implications of advances in Science and Technology: automated industrial plants; satellite technology; space technology; genetic engineering technology; weapons of mass destruction (WMD); and environmental pollution; health education.

GES 1031: Nigerian Peoples and Cultures (2 Credits) (20:10:0) LTP

The concept of culture, Pre-colonial cultures and languages of Nigeria; Principles of kinship, descent and marriage in Nigerian cultures; Nigerian economic institutions; Nigerian political institutions; Education and development in Nigeria; Religion in Nigerian culture; Culture, environment and health practices in Nigeria;

GES 1042: Community Service (1 Credit) (0:0:45) LTP

Civil works beneficial to the University community and its environs including but not limited to farming, road building and maintenance, landscaping, planting of flowers and hedges, grass-cutting and general cleaning of campus and its environs, concreting and laying of seating and footpath slabs.

GES 1022: Philosophy and Logic (2 credits) (20:10:0) LTP

The nature, definition and branches of philosophy; Philosophy and other disciplines; Nature of philosophical problems, Periods in the history of Philosophy; Philosophy and national development; national ideology and patriotism; Types of argument and reasoning. Symbolic logic, Inferences and biconditionals; Qualification theory

GES 1032: Political Economy (2 credits) (20:10:0) LTP

Basic definitions and concepts; The primitive society; the slave-owning, feudal and colonial systems; The Capitalist, socialist and mixed systems; modes of commodity production, labour relations and distribution of wealth; The political and economic structure of Nigeria; the public and private sectors; the agricultural, industrial and Oil sectors. National Development Planning in Nigeria; the economic role of Nigerian government: expenditures and revenues; fiscal policies; revenue generation and allocation; Human resources development and utilization in Nigeria. Techno-economic infrastructure and unemployment in Nigeria and in developed and developing economies; International trade; balance of payments; the World Bank, IMF and Nigeria; ECOWAS and economic integration; Multinational economic organizations; OPEC. Imperialist and neo-colonial systems; Nigerian political economy of development

GES 1052: Computer Appreciation (2 Credits) (20:10:0) LTP

Evolution of computers and computer technology: generations and classification of computers; hardware and software techniques and applications; Components of a computer system; Basic concepts of computer algorithms, programming languages and programming; Introduction to computer networks; Use of keyboard and mouse as input devices; Windows, word processing, spreadsheets and presentation slides; Application of computer in medicine, social, environmental and natural sciences, engineering, humanities, education and management science; Hands on practice using Microsoft Word, Excel and Power Point.

GES 2011: Application of the Computer (2 credits) (20:10:0) LTP Prerequisite: GES 1052

Introduction to problem solving using a standard methodology; Practice with steps of program development life cycle; techniques of good programming style; Introduction to structured programming concepts; Code reuse; Programming in Pascal and C including procedures and units, file i/o, language libraries, access to operating system services; practical exercises in software product development and use of compiler, debugging in an IDE and from the command-line, documentation.

GES 2021: Entrepreneurship Studies I (2 credit units) (20:10:0) LTP

The focus of the two-semester course on entrepreneurship—Entrepreneurship Studies I and II—is on examining entrepreneurship theories and fostering the practice of entrepreneurship among student participants leading to self-employment and job creation after graduation. In this first segment of the course, the students learn conceptually about being an entrepreneur in Nigeria. The first half of the semester will be devoted to studying the following topics: basic concepts of entrepreneurship, business risks and profits, historical role of entrepreneurship in industrial and socio-economic development of the society, entrepreneurship theories, and types of entrepreneurs. Others are the personal and interpersonal characteristics and behavioural traits of entrepreneurs, personal traits required for successful performance as an entrepreneur, entrepreneurship role demands, and the problem of succession in entrepreneurial enterprises. The second half of the semester will focus on learning how to conduct a market survey and consumer research for identifying and evaluating new business opportunities, setting up a business organization, and keeping of basic business/accounting records, developing a business plan, and identifying sources of financing. The problems of financing and managing growth in entrepreneurial firms will be discussed.

GES 2012: Entrepreneurship Studies II (2 credit units) (20:10:0) LTP Prerequisite GES 2021

The focus of the Entrepreneurship Studies II is on fostering the practice of entrepreneurship among student participants. The students will learn how to identify and evaluate new business opportunities in the manufacturing and service industries in Nigeria, and how to start and manage a small or medium-sized business venture. Topics to be covered include: Identifying and evaluating new business opportunities; Conducting a feasibility study; Starting a new business venture from the scratch; Acquiring an existing business; Successful business planning: (1)

Formulating a business plan, (2) Developing business strategies in the manufacturing industry; (3) Developing business strategies in the service industries; (4) Implementing business strategies; and (5) Evaluating business strategies. Every student enrolled in this course will be expected to participate in a group to do a feasibility study and then develop a detailed business plan for starting, owning, and managing a small or medium-sized business enterprise.

LTP:** L represents the number of Lectures, T, number of Tutorials and P, number of Practical lessons.

VUNA THEOLOGICAL PROGRAMME FOR ALL STUDENTS

THG 2711 Introduction to Ancient Church History (2 Credits)

Ancient Church history comprises the patristic period often taken to be the period from the closing of the NT writings circa 100 to the Council of Chalcedon, in 451. The course is designed to highlight the importance of this period to theological scholarship, doctrinal development and ecumenical studies.

THG 2722 Introduction to Medieval and Contemporary Church History (2 Credits)

Medieval Church History covers the Middle age period which gave birth to scholasticism and humanism. These two are important to any attempt to understand the development of history of theology in this period and the religious and intellectual factors that led to the Reformation. This is a period between the Dark Ages and the 16th Century; however, the Reformation and Counter Reformation period is purposely included in order to bring the period of its logical conclusion to the contemporary era and the Second Vatican Council.

THG 3341 Social Teaching of the Church (2 Credits)

Since theology does not restrict itself to spiritual matters alone but concerns itself with the entire human well being, the course therefore, with reference to the social teaching of the Church as also pastor of the material well being of the human persons, with special emphasis on human dignity and rights.

THG 3532 Spiritual Theology (2 Credits)

The course aim to lead the students into the nature of the spiritual life in a way that gives meaning and purpose to the spiritual exercises they perform. It studies the nature of theology as a systematic reflection on the meaning and content of Christian revelation and faith; various theological disciplines and their interconnectedness; meaning of spirituality; different aspect of spirituality- Biblical, Liturgical, Pastoral and African; rise and development of monasticism and modern Spirituality; Overview of the history of Christian spirituality; Christian virtues and universal application of charity, chastity, poverty and obedience, spiritual retreats.

CHM 1111 General Chemistry I (3 Credits; L35 P0 T10)

Basic principles of matter and energy from the chemist's point of view; a broadly based course suitable for students from various disciplines including the College of Natural and Applied Sciences; Topics to be covered will include matter and units of measurement, atomic theory and molecular structure, stoichiometry, the periodic classification of the elements, atomic structure, chemical bonding, thermo chemistry, properties of gases and gas laws, liquids, solids and solutions.

CHM 1121 General Chemistry Practical I (1 Credit; L0 P15 T0)

Determination of the densities of solids and liquids, empirical and molecular formulae; Separation of binary mixtures; Gravimetric determination of the number of molecules of water of hydration in a hydrated salt; Single and double replacement reactions; Writing Lewis structures for atoms, ions, molecules and products of chemical reactions; Calculation of energies of excitation and determination of the excited states of atoms by the application of Bohr's theory of the hydrogen atom and quantum chemistry

MTH 1111 Elementary Mathematics I (Algebra and Trigonometry) (3 Credits);
Prerequisite: SSS Mathematics/Further Mathematics

Elementary set theory: Sets, subsets, union, intersection, complements; Venn diagrams. Real numbers: integers, rational and irrational numbers, mathematical induction; real sequences and series; theory of quadratic functions, binomial theorem; Geometric representation of complex numbers: algebra of complex numbers, the Argand diagram, De Moivre's theorem, nth roots of unity. Circular measure, Trigonometric functions of angles of any magnitude, addition and factor formulae

PHY 1111 General Physics I (3 Credits)

Fundamental principles of Mechanics and properties of matter: Topics to be covered include the following:- Motion in one dimension, motion in a plane, work and energy, conservation laws, collisions, solid friction, rotational dynamics and kinematics, equilibrium of rigid bodies, oscillations, gravitation, fluid statics and fluid dynamics. Surface tension, Viscosity and Hydrodynamics

PHY 1121 Experimental Physics I (1 Credit)

The course emphasizes experimental verification and quantitative measurements of physical laws, treatment of measurement of errors and graphical analysis of results. Experiments will be drawn from mechanical systems, static and rotational dynamics of rigid bodies, viscosity, elasticity, surface tension and hydrodynamics

BIO 1111: General Biology I (3 Credit Units)

Characteristics and classification of living things; the cell theory; animal and plant cell structures and organisation: functional anatomy and diversity of cellular organelles. Interrelationship of organisms, niches, food chains, trophic levels, productivity and energy cycling elements of population ecology and ecological methods, and types of habitats. Heredity and evolution

CHM 1112 General Chemistry II (2 Credits; L25 P0 T5)

Application of the principles of chemical and physical change to the study of the behaviour of matter and the interaction between matter. Course content includes chemical equilibrium, ionic equilibria, chemical thermodynamics, electrochemistry, chemical kinetics. Acids and bases. The chemistry of the representative elements and their common compounds with emphasis on gradation of their properties. Brief chemistry of the first series of transition elements, general principles of extraction of metals; introductory nuclear chemistry.

A survey of carbon compounds including overview of the common functional groups in aliphatic and benzenoid compounds. Introduction to reactions and reactions in Organic Chemistry.

CHM 1122 General Chemistry Practical II (1 Credit, L0 P15 T0)

Examination of the physical properties (physical state, appearance, odour, ignition test) of organic compounds. Purification of organic compounds by recrystallisation and distillation. The use of melting point and boiling point as criteria of purify. Solubility tests (in hot and cold water and in ether). Detection of elements present in organic compounds. Detection of functional groups present in organic compounds. A sequence of chemical reactions involving copper.

MTH 1112 Elementary Mathematics II (Calculus) (3 Credits); Prerequisite: MTH 1111

This is an introductory course on calculus. The topics include Functions of real variables, graphs, limits and continuity; the derivative as a limit of rate of change; Techniques of differentiation. The straight line, parallel and perpendicular lines, angle between two straight lines, the distance between points from a line, parametric equations, tangents and normal. Curve sketching; Rules of differentiation, maxima and minima, integration as an inverse of differentiation, Integration as a limit of a sum, areas under a curve, volumes

BIO 1112: General Biology II (3 Credit Units)

A generalized survey of plant and animal kingdoms based mainly on the study of similarities and differences in the external and internal features and ecological adaptations of the different forms. Groups to study include viruses, bacteria, fungi, algae, bryophytes, pteridophytes and spermatophytes (gymnosperms and angiosperms) protozoa, porifera, Cnidarians, platyhelminthes, nematode, annelid, arthropods, mollusc, echinodermata, protochordata and vertebrata

MTH 1212 Basic Statistics for Sciences (2 Credits); Prerequisite: MTH 1111

Nature and scope of statistics; populations and samples; Tabulation of data: frequency table, discrete and grouped data frequency polygon. Curve and ogive, measures of location: Mean median, mode, deviation, standard deviation, quartiles, deciles scatter diagrams, fitting of straight lines, linear regression, correlation coefficient, rank correlation coefficient, measures of skewness, simple concept of probability. Introduction to random variable (discrete and continuous)

PHY 1112: General Physics 11 (3 credits) (30:15:0) LTP Pre-requisite: PHY 1111 and MTH 1111

This is an introductory course on electricity and magnetism. Topics covered will include the following Electrostatics, the electric field, Gauss' Law, electric potential, capacitors and Dielectric, current electricity-current and resistance Kirchoff's law, Source of electromotive force and Circuit. The magnetic field, Ampere's Law and Faraday's law of induction.

PHY 1122 Experimental Physics II (1 Credit) Prerequisite: PHY 1121

The experiments covered in this course will mainly be drawn from topics covered in General Physics II. They include verification of laws of current electricity, measurement of electrical properties of conductors, d. c. and a. c. circuit properties, series and parallel connections, resonant circuits, transformer characteristics and other electrical circuit problems.

BCH 2111 General Biochemistry I (3 Credits; L45 P0 T10)

Buffers, acidity and alkalinity; pH and pKa values and their effects on cellular activities. Chemistry of amino acids, proteins and their derivatives: methods of isolation and identification. Chemistry and structures of carbohydrates, lipids and nucleic acids.

BCH 2112 General Biochemistry II (3 Credits; L35 P0 T10)

Aspects of human genetics, pedigree analysis. Further consideration of various deviations from basic principles. Gene interaction.

CHM 2211 Organic Chemistry I (3 Credits; L35 P0 T10) Prerequisite: CHM 1111, 1112

Isomerism and conformation, Enantiomorphs, Diastereoisomers, mesoforms, racemic forms. Optical activity, inductive and resonance effects. Activation energy, free radical substitution reactions in alkanes. Aromaticity, basic organic reactions, e.g addition, free radical, elimination and condensation reactions, etc. Fats and oils, soaps and detergents, Amino acids and proteins, carbohydrates. Test for functional groups. Use of simple techniques for purification, e.g recrystallisation, preparation of simple esters, aldehydes, ketones and amines, hydrolysis of esters.

CHM 2311 Inorganic Chemistry I (3 Credits; L35 P0 T10) Prerequisite: CHM 1111, 1112

Simple consideration of molecular orbital and valence bond theories, Ionic lattices and molecular shapes. Chemistry of hydrogen, noble gases, boron and aluminum, carbon and silicon; nitrogen and phosphorus; oxygen and sulphur, the halogens. Introduction to organometallic chemistry.

CHM 2321 Inorganic Chemistry Practical I (1 Credits; L0 P15 T0)

Action of acids on metals, effects of ions of similar charge on the dissolution of weak electrolytes. Identification of anions in solution. Synthesis of Mohr's salt, potash alum from aluminum scrap, exaamincobalt (III) chloride, dicyanoamminenickel (II) etc.

CHM 2511 Analytical Chemistry I (2 Credits; L25 P0 T5) Prerequisite: CHM 1111, 1112

Introduction of basic analytical chemistry. Concepts of qualitative and quantitative analysis. Sampling methods: representative, homogeneous/heterogeneous. The theory of errors: types of errors, instrumental and personal errors, sources and prevention, determinate and indeterminate errors. Statistical treatment of data: significant figure, mean, mode, accuracy, precision, standard deviation, relative errors, student t-tests, Q-test, confidence level, correlation and regression analysis, calibration curves. Gravimetric analysis, concepts of ligands and chelation. Volumetric analysis, acidimetry and alkalimetry, acid-base indicators, primary standards, precipitation and redox titrations; applications of volumetric analysis; balancing of equations. Introduction to electroanalytical methods: electrogravimetry and coulometry.

CHM 2521 Analytical Chemistry Practical I (1 Credit; L0 P15 T0)

Theory and practice of quantitative chemical analysis, acid-base, oxidation-reduction, precipitation and complexometric titrations, Gravimetric analysis. Quantitative analysis for anions and cations.

MTH 2131 Mathematical Methods I (2 Credits); Prerequisite: MTH 1112

Real-value functions of a real variable. Review of differentiation, integration, and their applications; Mean-value theorem; Taylor series; Real-valued functions of two and three variables, implicit functions; Partial derivatives, Chain rule, extrema, Lagrange multipliers, increments, differentials and linear approximations. Coordinate transformations; Evaluation of line and multiple integrals

CHM 2212 Organic Chemistry II (3 Credits; L35 P0 T10) Prerequisite: CHM 1111, 1112

Fundamental theories and principles of chemical reactivity. Chemical reactions and synthesis of monofunctional compounds. Reaction and mechanism of common reactions, stereochemistry, chemistry of difunctional compounds, chemistry of aromatic compounds. Aromaticity and routes to polymer aromatic compounds.

CHM 2412 Physical Chemistry I (2 Credits; L25 P0 T5) Prerequisite: CHM 1111, 1112

Introduction to basic physical chemistry. Emphasis is on the properties of gases, the three laws of thermodynamics and the principles of chemical kinetics and electrochemical cells.

CHM 2422 Physical Chemistry Practical (2 Credits; L0 P30 T0)

Experiments in kinetics, surface chemistry and thermochemistry. Use of simple techniques for purification e.g recrystallisation, precipitation, steam distillation; fractional distillation.

CHM 2612 Process Calculations in Chemistry (3 Credits; L30 P0 T15) Prerequisite: CHM 1111, 1112

Data reduction and special functions in chemistry. Units and dimensions, stoichiometric and composition relations. Material and energy balance calculations in chemical reactions and processes.

CHM 2712 Introduction to Environmental Chemistry (3 Credits; L30, P0, T15) Prerequisite: CHM 1111, 1112

Components of the total environment; air, water, land; their natural forms. Causes of environment impairment. Environmental pollution: sources and types of pollution. Effects of Pollution. Water and waste water characteristics and their measurements. WHO standards. Industrial water supply, introduction to waste water treatment. Solid waste; effects and solid waste management

MTH 2142 Mathematical Methods II (2 Credits); Prerequisite: MTH 2131

Elementary vector calculus: The operators - grad, div and curl - in Cartesian coordinates; Ordinary first order differential equations (ODE): variables separable, homogeneous, exact, linear equations; use of integrating factor; orthogonal and oblique trajectories; complementary functions; general solution of an ODE, particular integral; Second order linear ODE with constant coefficients, General theory of 2nd order linear equations. Solution of initial value problems; Application of differential equations to life, physical and social science problems

PHY 2712: Energy Physics (2 credits) (30:15:0) LTP

Conventional and non-conventional energy resources. Renewable and non-renewable energy resources. The principles, demands and outlook for power and energy. Transformation of energy, its costs and productions. Principles and problems of electrical energy from fossil and hydroelectric generation; their costs, capacity, storage, reserves, efficiency, and consequent social and environmental effects. Electrical energy from nuclear reactors, energy from future breeder reactors, fusion power, water power, geothermal power, tidal power, solar power, wind power etc. promise and problems of such unconventional energy sources. Excursions to plant locations.

CHM 3211 Structure and Reactivity in Organic Chemistry (3 Credits;L35 P0 T10)

Prerequisite: CHM 2211, 2212

Stereochemistry, kinetics and mechanism of organic reactions; reactive intermediates. Theory of organic chemistry.

CHM 3221 Heterocyclics and Carbocyclics (3 Credits; L35 P0 T10); Prerequisite: CHM 2211, 2212

Preparation and properties of heterocyclic compounds; compounds with linked aromatic rings; 3, 4, 5 and 6 membered ring carbocyclic compounds.

CHM 3231 Organic Chemistry Practical (2 Credits; L0 P30 T0)

Characterization and estimation of functional groups in organic compounds. Preparation of derivatives of organic compounds. Application of spectroscope for structural elucidation. Preparation of simple organic compounds including Grignard reaction, Diel-Alder reaction.

CHM 3311 Inorganic Chemistry II (3 Credits; L35 P0 T10) Prerequisite: CHM 2311

Detailed study of the chemistry of the transition (d-block) elements to highlight their industrial uses. Introduction to alloy chemistry and the chemistry of co-ordination compounds.

CHM 3321 Inorganic Chemistry Practical II (1 Credit; L0 P15 T0).

Preparation of complex inorganic compounds

CHM 3411 Physical Chemistry II (3 Credits; L35 P0 T10) Prerequisite: CHM 2422

Chemical thermodynamics including treatment of partial molar quantities and chemical potentials. Brief introduction to quantum mechanics: limitation mechanics and deviation/application, physical significance. Atomic structure.

CHM 3511 Analytical Chemistry II (3 Credits; L35 P0 T10) Prerequisite: CHM 2511

Introduction to electroanalytical methods: coulometry, conductometry, voltametry, polarography, amperometry and potentiometry; concepts and analytical applications in titrations; methods in electrophoresis. Complexometric titrations: concepts of ligands, EDTA titration, direct and indirect titrations, metal ion indicators. Introduction to spectroanalytical methods: uv-visible colorometry, infra-red, atomic absorption and flame emission spectrometry. Beer-Lambert's law, methods of quantitative analysis involving this law.

CHM 3511 Analytical Chemistry Practical II (3 Credits; L0 P30 T0) Prerequisite: CHM 2521

Chromatographic techniques, Gravimetric analysis and precipitation titration, Potentiometric titration, Application of flame photometry, polarimetry and refractometry in chemical analysis.

CHM 3521 Applied Spectroscopy (3 Credits; L25 P0 T5) Prerequisite: CHM 3211

Principles and application of IR, UV, NMR and mass spectroscopy in the determination and elucidation of structures of organic compounds.

CHM 3611 Polymer Chemistry (3 Credits; L35 P T10) Prerequisite: CHM 2211, 2212

Definition of basic terms. Outline sources of raw materials for polymers. Classification of polymers. Step-growth polymerization, free radical addition polymerization. Solubility and solution properties of polymers. Fibre forming polymers.

CHM 3621 Process Chemistry I (2 Credits; L20 P0 T10) Prerequisite: CHM 2611

Heat generation and transfer in industrial chemical operations; Energy balance, material balance. Flow diagrams laboratory techniques contrasted with methods used in a large industrial scale.

CHM 3631 Fibre Science and Technology (3 Credits; L35 P0 T10) Prerequisite: CHM 2211, 2212, 2422

Basic chemistry of natural and synthetic fibres. Methods of fibre processing for paper making and textiles, Methods of application of dyes to fibre materials.

CHM 3002 Students' Industrial work Experience Scheme (SIWES) (L0 P90 T0):

6 months Industrial Attachment in Chemical Industries) (6 Credits)

CHM 4111 Research Methodology (2 Credits; L25 P0 T5)

This course is designed to expose students to research methodology in chemistry. Topics covered include: basic concepts of research, curiosity, creativity and commitment; assumptions; observation and inference; conceptual models; inductive and deductive reasoning; identification and formulation of research topics; control of extraneous variables; research ethics; sources of information; data gathering and measurement techniques; data manipulation techniques; physical and mathematical modelling.

CHM 4211 Organic Reaction Mechanisms (3 Credits; L35 P0 T10) Prerequisite: CHM 3211

Studies of types and mechanisms involved in substitution, elimination, addition and rearrangement reactions of aliphatic and aromatic compounds and natural products. Oxidation and reduction mechanisms, reactions of the intermolecular and intramolecular cyclisation types and stereochemistry considerations.

CHM 4221 Natural Products (3 Credits; L35 P0 T10) Prerequisite: CHM 2212

Chemistry of natural products of pharmaceutical importance: terpenoids, steroids, alkaloids, lipids and carbohydrates, antibiotics, flavonoids, prostaglandins and chlorophylls. General and specific methods of isolation, separation, purification and structure determination by chemical and spectroscopic methods. Biosynthesis of selected examples.

CHM 4421 Radiochemistry and Nuclear Chemistry (2 Credits; L25 P0 T5) Prerequisite: CHM 3312

Natural radioactivity, fusion, fission, decay processes, nature of radiation, nuclear models, energetic of nuclear reaction. Principles and measurement of radioactivity. Applications of radioactivity. Radiation hazards.

CHM 4521 Separation Methods (3 Credits; L35 P0 T10) Prerequisite: CHM 2511

Separation techniques: Filtration; batchwise, co-current and counter-current techniques, sublimation chromatography-column, paper and gas, ion-exchange techniques, electrophoresis, dialysis, etc.

CHM 4611 Industrial Methodology and Quality Control (2 Credits; L25 P0 T5) Prerequisite: CHM 3131

Measurement and evaluation of work. Time motion and methods of studies. Reliability theory and quality control. Production and inventory control, resource allocation, GPA principles, economic and accounting, Ergonomics design of machine systems. Chemical and technology quality of textiles, plastics, dyes, detergents, food and cosmetics.

CHM 4621 Food Processing Technology (2 Credits; L25 P0 T5) Prerequisite: CHM 2612, 3621

Analysis of food samples for trace elements, vitamins, proteins contents etc. Methods of food preservation, studies of food poisoning and problems of nutrient deficiencies

CHM 4631 Chemistry of Paints and Adhesives (2 Credits; L25 P0 T5) Prerequisite: CHM 3611

Surface coating terminologies, definitions/nomenclature. Constituents of paints, vanishes and lacquers. Binders (film formers) convertible and non-convertible binders, pigments and extenders, solvents for surface coatings. Paint additives. Paint formulations and manufacture. Film properties and measurements. Classification of adhesives, choice of adhesives, theories of adhesion. Adhesive formulations and bonding techniques. Test methods and their significance.

CHM 4641 Industrial Management (2 Credits; L25, P0 T5)

Industrial law, legislations in wages, trade marks and patents. An introduction to concepts of procedure of decision making in the management of business operations.

CHM 4711 Environmental Chemistry (3 Credits; L35 P0 T10) Prerequisite: CHM 2412, 2712

The crucial link between chemical principles and natural environment will be stressed. Air and water pollution, their characteristics and methods of control. Water treatment methods.

CHM 4112 Seminar (1 Credit)

Undergraduates will be required to present a seminar on assigned topics of current interest in all areas of Chemistry and Industrial/Applied Chemistry.

CHM 4122 Project (6 Credits)

This is a two semester course that provides the opportunity for undergraduates to work closely with members of staff in a supervised reading, library work and experimental or theoretical project. Topics will be assigned near the end of the third year and the student is required to present an original report on assigned project and defend the write up before an external assessor. It is also envisaged that the student be made to present at least one seminar on the topic before the rest of the department. The grade is awarded at the end of the two semesters.

CHM 4312 Inorganic Reaction Kinematics and Mechanisms (2 Credits; L20 P0 T10) Prerequisite: CHM 2412, 3411
Redox reactions; mechanisms of electron transfer reactions: outer-and-inner sphere mechanisms, substitution reactions; General mechanism of square planar complexes of Pt (II) and other d8 metal ions, substitution reactions in octahedral complexes.

CHM 4322 Organometallic Chemistry (2 Credits; L25 P0 T5) Prerequisite: CHM 2212, 3312, 3532 Introduction to organometallic compounds of transition elements, classification of ligands, electron rule, bonding, preparation of organometallic compounds of transition elements. Reaction and structures of organometallic compounds of transition elements. The organic chemistry of ferrocene and related compounds. The role of organometallic compounds in some catalytic reactions.

CHM 4612 Process Chemistry II (2 Credits; L25 P0 T5) Prerequisite: CHM 3621
Conservation of mass, energy and momentum in ideal reactors. Materials in isothermal reactors. Conversion on single isothermal reactors and multi-isothermal reactor system. Automated reactions.
Review of individual organic and inorganic raw materials; technical and economic principles of processes and product routes flow diagrams.

CHM 4622 Petroleum Chemistry (2 Credit Units; L25 P0 T5); Prerequisite: CHM 2211, CHM 2212
Composition, classification and properties of crude oil and petroleum gases. Processing of petroleum and hydrocarbons, preparation and chemical transformation of primary petrochemicals. Chemistry of petroleum refining, catalytic cracking, alkylation, polymerization, etc. Current petroleum uses, future of petroleum.

CHM 4632 Rubber Technology (2 Credits; L25 P0 T5) Prerequisite: CHM 2211, 3611
Methods of processing rubber, extruder and extrusion methods. Injection moulding, calendaring, etc.

CHM 4642 Pharmaceutical Chemistry (2Credits; L25 P0 T5); Prerequisite: CHM 2212, 3211, 3511
Physicochemical properties of drugs in relation to their biological activity. General drug metabolism. Medicinal chemistry of some selected classes of compounds, including their synthesis: steroids (including steroidal hormones) and vitamins. Analgesic (antipyretic and narcotic). Local anaesthetics. Chemotherapeutic agents, e.g. sulphonamides, penicillins, antimalarial and anthelmintics. Pharmaceutical analysis and quality control procedures.

CHM 4652 Mineral Processing/Metallurgy (2 Credits; L25 P0 T5); Prerequisite: CHM 2612, CHM 3621, 3312
Minerals ores, occurrence, methods of concentration and beneficiation, calcinations, froth flotation leaching method or refining, smelting, direct reduction, pyrometallurgy and hydrometallurgy. Differential thermal analysis. Methods of reforming and applications of the ores of iron, aluminum, tin, lead, zinc and uranium.

CHM 4662 Corrosion Chemistry (2 Credits; L25 P0 T5); Prerequisite: CHM 2412, CHM 3312
Principles and theory of corrosion, kinetics and thermodynamics, aqueous, dry and bacterial corrosion, Their prevention.

CHM 4672 Petroleum Processing (2 Credits; L25 P0 T5); Prerequisite: CHM 4221, 3611, 3621
Physical and Chemical properties of crude oil. Refinery processes-separation by distillation processes and oil treatments-absorption, adsorption and solvent extraction. Vapour phase equilibrium in single-stage distillation method, multistage fractional distillation and solvent extraction. Conversion of processes of hydrocarbon: catalytic cracking, alkylation, isomerization, polymerization etc. Technology of lubricating oils and gasoline blending.

CHM 4682 Applied Surface and Colloid Chemistry (3 Credits; L35 P0 T10) Prerequisite: CHM 2412, 3411
The physical chemistry of surface and interfaces with emphasis on industrial applications. The properties of colloid and micelles. Distillation processes. Industrial catalysis, phase diagram.

GRADUATION REQUIREMENT

- i. Minimum number of Earned Credit hours for graduation: 160
- ii. Minimum number of years for graduation: Four (4)
- iii. Residency requirement: minimum of 4 years/maximum of 6 years
- iv. Minimum CGPA for graduation: 1.00/(Maximum: 5.00)