

Food Science and Technology Department

Course Outline

MTH 101: ELEMENTARY MATHEMATICS 1 (3,1,0)

Number systems. Indices, surds and logarithms. Polynomials. Remainder and factor theorems. Polynomial equations. Partial fractions. Fields. Ordered fields. Inequalities. Mathematical induction. Permutations and combinations. Binomial theorem. Sequences and series. The quadratic equation and function. The relation between the roots and the coefficients' Complex numbers, Addition, subtraction. Multiplication and division, Argand diagram. De-movre's theorem. n-th roots of complex numbers. Elementary set theory. Venn diagrams and application of De-morgan's law Trigonometry properties of basic trigonometry functions. Addition formulae and basic identities. Sine and cosine formulae. Half angle formulae. Area of a triangle. The solution of trigonometric equations Inverse trigonometric functions. Functions. Concept and notation. Examples composition Exponential and logarithmic functions, Graphs and properties. Limits and continuity Techniques for finding limits. The derivative. Calculations from first principles. Techniques of differentiation. Chain rule Higher order derivatives. Extremum problems Mean value theorem Applications Indeterminate forms and L' hospital's rule. Taylors and Meclaurin's series. Curve sketching. Integration as the reverse of differentiation, as area, as limit of finite sum. Definite integration as the reverse of differentiation, as area, as limit of finite sums. Applications.

Pre-requisite; Credit O/L Maths.

PHY 101: GENERAL PHYSICS 1 (2,1,1)

Mechanics; Space and time, units and dimensions; Vectors kinematics, Newton's laws; Galilean invariance; statistics and dynamics of particles; universal gravitation; work and potential energy; conservation of energy and momentum; rigid bodies fluid mechanics. Thermal physics; thermal properties, including elementary thermodynamics and kinetic theory.

Pre-requisite; Credit in O/L physics.

CHM 101: GENERAL CHEMISTRY 1 (2,1,1)

Chemical reaction, equations and stoichiometry, Atomic structure and the periodic classification of element. Electronic theory of atoms Radioactivity. Ionic and covalent bonds. Solids and their structure. Dipole interactions and its effect on physical properties. Redox reaction Equilibrium. Elementary electrochemistry. Introduction to kinetic properties of gases, Basic chemical kinetics and chemical thermodynamics, principles of metal extraction.

Pre-requisite: Credits at WASC/GCE O/L Chemistry

BIO 101: BIOLOGY FOR PHYSICAL SCIENCE (2,0,1)

Cell structures and organization; plant and animal cells. Functions of cellular organelles; diversity, characteristics of living things, General reproduction; mitosis and meiosis, abnormalities associated with gene crossing, heredity and evolution. Concept of ecology and types of habitats diversity of plants and animals, food chains and food chain and food webs; interrelationship of organisms, Elementary biochemistry of carbohydrates; Proteins and lipids structure and chemical characteristics.

ENG 101: WORKSHOP PRACTICE 1 (0, 0, 1 UNIT)

General: Use of engineering measuring instruments Calipers e.g. Vernier Calipers; Gauges e.g. Micrometer; Screw gauge and other devices. Introduction to hand tools, proficiency in the use of wood planer, Hand Saw, Sanders and Pattern Making. Sheet Metal Work: Production of sheet metal products – layouts, cutting, shaping, simple bend theory. Introduction to joining techniques: Soldering, brazing, fusion welding, fastening and assembly. Basic woodworking principles and tools finishing and evaluation of finished products.

ENG 102: WORKSHOP PRACTICE II (0, 0, 1 UNIT)

Industrial Safety: Safety code of conduct and safety consciousness. Survey of common sources of accidents in the work place. Accident prevention and control. Machine Shop Work: Working components in a lathe machine, instructions in simple metal working processes e.g. shaping, milling, grinding, drilling, reaming, metal spinning, design of jigs and fixtures. Introduction of automation in manufacturing: Visualization fixtures and CAD automobile work, simple automotive diagnosis and repairs. Electrical Workshop Practice: Convention and application of colour, codes for cables, resistors etc. and signs. Use of simple electrical tools, machines etc.

ENG 103: ENGINEERING DRAWING I (0, 0, 1 UNIT)

Introduction to the engineering tools. Planning and layout of engineering drawing. Engineering drawing concept. Introduction to Dimensioning – types; Dimensioning of circles, holes, radii, tolerancing. Descriptive Geometry. Freehand sketching. Introduction to Drawing/Drafting Software and CAD Basic tools: Orthographic multi view projection. Construction of plane shapes using CAD construction techniques. Presentation of data results: Using charts, graphs etc. by appropriate computer Software. Further dimensioning – addition of dimensions to drawings using CAD.

ENG 104: ENGINEERING DRAWING II (1, 0, 1 UNIT)

Connections in Engineering Drawing. Introduction to IS Code of Drawing. Conics and Engineering Curves – ellipse, parabola, hyperbola, cycloid, trochoid,

involutes. Projection of planes and solids (cube, prism, pyramid, cylinder, cone and sphere). Projection on auxiliary planes. Isometric projection. Introduction to section drawing and use of CAD Construction techniques. Development and intersection of surfaces. Detail drawing with the addition of machine and surface texture symbols. Simple assembly drawing with suitable fits and a part list and introduction to limits and tolerance. Screw threads, fasteners and springs including keys and key ways.

GST 101: USE OF ENGLISH I (1, 1, 0)

Library orientation, study aids through dictionary practice, vocabulary development techniques, reading and comprehension techniques, listening and note-taking techniques – outlining and summarizing, dealing with examination questions.

GST 103: HUMANITIES I (1, 0, 0)

Introduction to humanities, definition and rationale. Role literature in the humanities aspects of the contemporary African novel; significant examples of African/Western poetry; dramatic art – role and relevance in modern Nigeria with practical demonstrations/performances. Roles of philosophy in the humanities, man and his quest for certainty; materialism, idealism; the meaning and significance of selected concepts – freedom, responsibility, obligation, the “good life”, art beauty; values – relative and non-relative; inductive arguments and scientific reasoning. Exposure to African History – its role and relevance, African art and music – its history and development, Religion and the meaning of life-post, present, and future.

MTH 102: ELEMENTARY IN MATHEMATICS II (3, 1, 0)

Transcendental functions. Hyperbolic functions. Inverse functions. Logarithmic differentiation. Integration by substitution. Integration by parts. Improper integrals. Applications. Areas and volumes. Center of mass. Ordinary differential equation. First-order equation with variables separable. First order linear equations. Second order homogeneous equations with constant co-efficient. Applications. Plane analytic geometry. Rectangular Cartesian co-ordinates. Distance between two points. Straight line. Loci. The circle, parabola, ellipse and hyperbola. Second degree curves. Plane polar co-ordinates. Vector addition and multiplications. Products of three or more vectors. Vector functions and their derivatives. Velocity and acceleration. Inverse of non-singular matrices. Cramer’s rule and application to the solution of linear equations. (Examples should be limited to $m \times n$ matrices where $m = 3$.) Transformations of the plane. Translation, reflection, rotation, enlargement, shear, composition of transformations. Invariant points and lines.

Pre-requisites: Credit O/L mathematics.

PHY 102: GENERAL PHYSICS II (2, 1, 1)

Electricity: Electrostatics; charge and matter, the electric field, Gauss's law, electric potential, capacitors and dielectrics. Current electricity; current and resistance, Ohm's law, electromotive force and circuits, RC circuits. Magnetism: magnetostatics; the magnetic field, Ampere's law, Faraday's law of induction, inductance, LR circuits. Magnetic properties of matter. Sound and optical properties.

Pre-requisites: Previous registration in PHY 101 and MTH 101.

CHM 102: GENERAL CHEMISTRY II (2, 1, 1)

Organic formulae and structure. Homology and Isomerism. Concept of hybridization. Survey of reactions of functional groups in Aliphatic and Aromatic compounds. Introduction to the chemistry of Alkanes, Alkenes, Alkynes, Haloalkanes, Alkanols, Ethers, Amines, Aldehydes, Ketones, Carboxylic acids and their derivatives.

Pre-requisites: Credits at WASC/GCE/O/L Chemistry.

GST 102: USE OF ENGLISH II (1, 1, 0)

Second stage library work with emphasis on effective search techniques, paragraph development, essay writing principles and practice, term paper writing, technical report writing, business letter writing, referencing and documentation, grammar and mechanics.

GST 108: SOCIAL SCIENCE I (1, 1, 0)

This covers the nature and scope of politics and economics. From the basic concepts in economics and political science to the political set-up in Nigeria, the civil service structure, public investment and economic infrastructures to fiscal federalism and revenue allocation. A global perspective of economics; economic systems and development nations' economics. International trade and economic development; Balance of payments, commercial policies of Nigeria and other developing countries. Economic integration; state and structure of economics of ECOWAS countries, the ECA and countries, the ECA and economic co-operation in Africa. Foreign aid and investments: the multinational corporations, technological dependence. Global interdependence and the New International Economic order. World economic crises energy and OPEC, food storages and armament.

GST 110: SCIENCE TECHNOLOGY AND SOCIETY I (1, 1, 0)

The scientific evolution of man – science, need, history, classifications, and modern scientific methods; science and man's environment – Terrestrial and Cosmic Life; harnessing science – climate and vegetation. Production, processing, conservation,

distribution; energy resources – solar, thermal, nuclear energy – fossil fuels, estimates of energy reserves in Nigeria.

STA 211: INTRODUCTION TO STATISTICS AND PROBABILITY (2,1,0)

Frequency distribution, measures of location and dispersion in simple and grouped data. Laws of probability. The binomial, poisson and normal distributions. Estimation and test of hypothesis. Analysis of variance and covariance, simple regression and correlation, contingency tables and χ^2 – applications.

Pre-requisites: MTH 101 & 102

CHM 201: PHYSICAL CHEMISTRY I (2, 0, 1)

Types of chemical bonds and factors influencing the formation of ionic bonds. Ionic radii, effect of co-ordination number on ionic radii and types of ionic crystal structures. The Born-haber cycle. Magnetic moments of ions. Physical and chemical equilibrium: gas/solid, liquid/liquid: Distribution law, distillation of liquid mixture. Colligative properties of dilute solutions. Gaseous state and the kinetic theory of gases. Introduction to electrochemistry and chemical kinetics.

Pre-requisite: CHM 101

CSC 201: COMPUTER AND APPLICATION I (2, 1, 1)

Briefly history of computers and computers generation. Classification of computers. Structure of a general-purpose computer. Number systems. The stored programme. Techniques of problem-solving. Flowcharting. Stepwise refinement. Algorithm for searching, sorting and merging of ordered lists. Data preparation. I/O Devices. Data types. Data representation. Data problem-oriented languages. BASIC and FORTRAN programme; arithmetic expression, assignment statement I/O commands; Logical Expression, arrays; sequencing, alternation and iteration; sub-programmes and parameters. Elementary Numerical Algorithms.

Pre-requisite: MTH 101 and MTH 102

MTH 203: ELEMENTARY DIFFERENTIAL EQUATION I (2, 1, 0)

Derivation of equations from physics, chemistry, biology, geometry and etc. First order equations. Applications of first order equations. Second order linear equations. Fundamental solutions. Linear dependence and independence. Wronskian. Properties of solutions of linear equations. Method of undetermined coefficients and variation of parameters. Applications of second order linear equations. General theory of n-th order linear equations. Laplace transform. Convolution. Solution of initial-value problems by Laplace transform method. Difference Equations.

Pre-requisites: MTH 101 & MTH 102

GST 201: NIGERIAN AND AFRICAN CULTURAL DEVELOPMENT SOCIAL SCIENCE II (1, 0, 0)

Concept and meaning of development; traditional Africa's geographical and ethnographical review, family structure, kinship system, socio-economic pre-occupations, political systems, art and music, modes of communication etc.; African and processes of modernization – education, writing and the press, urbanization and social change, modern trends in art and aesthetics, nationalism and cultural revival, mass media and national development.

PHY 201: APPLIED ELECTRICITY I (2, 1, 0)

Electrical circuit theory: DC and AC circuit analysis. Magnetic circuit: Magnetomotive force, magnetic flux and reluctance, relative magnetic permeability and susceptibility. Introduction to electrical machines: DC generator; DC motor; polyphase systems; transformers, electric power distribution. Electric lamps and illumination. Galvanometers, ammeter and voltmeters.

Pre-requisite: PHY 102 and MTH 102

MTH 222: INTRODUCTORY NUMERICAL ANALYSIS (2, 1, 0)

Solution of algebraic and transcendental equations. Curve fitting, Lagrange and Aitken's interpolating polynomials. Errors. Difference calculus. Newton forward and backward difference formulae. Approximation of functions. Numerical differentiation and integration. Numerical solution of systems of linear equations. Numerical methods for differential equations.

Pre-requisite: MTH 102

CHM 202: INORGANIC CHEMISTRY I (2, 0, 1)

Theory and principles of qualitative and quantitative inorganic analysis. The detailed chemistry of hydrogen, the noble gases, the representative elements of groups 1 to 5 elements. Classification of crystalline solids and structures.

Pre-requisite: CHM 101

CHM 204: ORGANIC CHEMISTRY I (2, 0, 1)

Stereochemistry and Stereoisomerisms

Functional group chemistry in alicycle and aromatic compounds: Preparations, properties and applications. Comparative study of functional groups and introductory reaction mechanisms should be discussed functional Group analysis.

Pre-requisite: CHM 102

PHY 204: MODERN PHYSICS I (2, 1, 0)

Special relativity: Defects in Newtonian Mechanics; the speed of light; the Lorentz transformation; transformation of velocities. Experimental basis of quantum theorem: black body radiation, electrons and quanta; Bohr's theory of atomic structure. Waves and particles: De Broglie hypothesis, the uncertainty principle of Heisenberg. Schrödinger's wave equation and simple applications.

Pre-requisites: PHY 101 and 102 and previous registration in MTH 201 and/or MTH 203.

ENG 209 ENGINEERING THERMODYNAMICS (1,2,1) 4 UNITS

Fundamental concept: History of thermodynamics, dimensions, units, system, state property, process, heat, work, pressure, temperature. Zeroth Law.

The first law of thermodynamics: conservation of energy (Joule's experiment) First law, energy-Non flow process, entropy, steady flow processes. Properties of pure substances, PVT relations and Diagrams, CP, CV, ideal gas, thermodynamics chart, and tables.

The second Law of thermodynamics and heat engine cycles cannot heat engine and cycles. The second law and its corollaries. Entropy: Reversible and irreversible processes. Clausius inequality, entropy and irreversibility. Heat engine and heat calculations. Heat engine and heat pump calculations, Application of 2nd law of non-flow and steady flow processes. Available and unavailable energy, availability criteria equations.

FST 202: INTRODUCTION TO FOOD SCIENCE AND TECHNOLOGY (2, 1, 1)

Food supply, composition and nutrition. Aims, principles and methods of food processing and preservations. Food storage, including the role of pest and microorganisms. Food industries in Nigeria and their role in war against hunger. Indigenous food processing methods. Mathematical methods of process data analysis; use of linear, semi-log graph papers in data analysis; representation of concentrations of multi-component systems on triangular graphs etc. Gas Laws – Concept of the ideal

gas, standard conditions, Daltons Law Amagat's law, volume, mole and pressure fractions and percentage in gas mixtures.

FST 204: INTRODUCTION TO PROCESS CALCULATIONS (2, 1, 0)

Gas Laws – Concept of the ideal gas, standard conditions, Daltons Law Amagat's law, volume, mole and pressure fractions and percentage in gas mixtures. Processes and reaction (steady and unsteady states) types and industrial equipment used. Use of flow charts, chemical equations, stoichiometry limiting reactants, excess reactants, conversion, selectivity, yield, once through and recycle systems, and tie substances, material balance – conservation law, component balances. Fuels and combustion – types of fuel, combustion reaction and fuel gas analysis, calculation on-air requirements for combustion, excess air. Energy balance – types of energy, specific heats, (C_p and C_v) calculation of enthalpy changes, of formation, latent heats of vaporization fusion, solution mixing etc. Introduction to enthalpy – concentration diagrams and applications, general energy balances for simple processes; uses of steam table and charts. Humidity – wet and dry – bulb thermometry try, the humidity chart and its applications in solving dry and humidification problems.

Pre-requisites: MTH 101 & 102; PHY 101 & 102

FST 206: INTRODUCTION TO MICROBIOLOGY (1,0,1)

History and scope of microbiology. General characteristics of micro-organisms. Classification of bacteria, scientific basis of classification. International code of bacterial nomenclature and classification. Microorganisms – Growth and reproduction, sterilization and disinfection Economic importance of microbes. Effect of the environment on microbial growth. Techniques for culturing, isolation and identification, of microorganisms important in food.

Pre-requisite: BIO 101

FST 208: FOOD CHEMISTRY I (2, 1, 0)

Introduction to food biochemistry: This will include the study of Carbohydrates; definition, occurrence, classification, structure and characteristic reactions. Introduction to aerobic, anaerobic metabolism. **Lipids**; definitions, the fatty acids, saturated fatty acids, unsaturated, saponifiable and non-saponifiable lipids. Simple lipids; fats, oils and waxes, composition, physical properties, hydrolysis and oxidation. Compound lipids; sources, physical and chemical properties. Role of lipids in foods. **Proteins**; occurrence, the peptide bond, amino acids and classification of proteins. Properties of proteins, amphoterism, zwitterion and iso-electric pH, **Enzyme kinetics**; Introduction to Michaelis-Menten equation, factors affecting enzyme activity, activation and inhibition of enzymes.

Pre-requisite: CHM 101, 102

FST 301:UNIT OPERATIONS (FLUID FLOW) IN FOOD TECHNOLOGY I (2, 1, 0)

Units and dimensions – different systems of units and conversions; fundamental and derived dimensions dimensional consistency. Newtonian and Non-Newtonian fluids – flow properties, including Pseudo-plastic flow, dilatancy etc. Measurement of flow properties – Viscometer, (capillary, rotational etc) and other mechanisms. Heat Transfer: Stationary and non-stationary heat conduction. Heat transfer through composite bodies. Forced and natural convection, relation. Mass Transfer: Stationary mass transfer by molecular diffusion, mass transfer by forced convection (analogy with heat transfer) simultaneous heat and mass transfer (with examples in the food industry).Pumps and compressors used in the food industries: Types, characteristic and applications.

Pre-requisite: MTH 101 & 102; PHY 101 & 102 (FST 204 for ICH students only)

FST 302: UNIT OPERATIONS IN FOOD TECHNOLOGY II (2, 1, 0)

Power requirements in fluid transport. Fuel utilization in practical steam generation (solid, oil, gas fire boilers). Type and utilization of boiler steam distribution system and waste-heat management boiler feed-water treatment. Equipment and uses of the following unit operation in food industries: Distillation, evaporation extraction (Liquid-Liquid, Leaching, Absorption, Membrane, Separation Processes). Concepts and definitions. Importance of properties in the formulation, processes and storage, including thermal, optical, textural and rheological evaluation of food products. Selected local food products will be used in examples.

Pre-requisite: MTH 101 & 102; PHY 101 & 102

FST 303: FOOD PROCESSING FUNDAMENTALS (2, 1, 1)

Thermodynamic properties of food materials. Fluids – perfect and real fluids, compressible and incompressible fluids. The basic method of food processes and preservation. Principles and practice in thermal and low-temperature preservation dehydration/drying concentration and irradiation fermentation. The discussion should include equipment and systems. A preliminary and preparative operation for the industrials e.g. selection, sorting, cleaning, grading and storage; including discussion for the industrial equipment. Effects of various unit operations on nutrients of different food products such as fruits and vegetables, milk and milk products, cereals and oilseeds, etc.

Pre-requisite: FST 202

FST 304: FOOD LAWS AND STANDARDS (2, 0, 0)

Definition and importance of food laws and standards (national and international). The development of food standards and regulations. The Codex Alimentarius. The food regulatory agencies in Nigeria. Food and drugs Laws of Nigeria. Existing food regulations in Nigeria (at least 50% of the existing regulations must be covered, with particular reference to the food produced in Nigeria). Comparison with foreign standards.

FST 305: FOOD MACHINERY (2, 0, 1)

Features and operations of cleaning; sorting and grading equipment for agricultural products – grains, fruits, vegetables and livestock products. Grading Tables; Size reduction – cutting, milling, shredding etc; agglomeration; filtration; sedimentation and clarification equipment (Types and Uses). Mechanical separations (expressions and centrifugation). Agitation; mixing, and homogenization equipment. (Types and Applications). Electric motors (types and Applications).

FST 306: POST-HARVEST PHYSIOLOGY AND STORAGE (2, 0, 1)

Plant – The physiology or biochemistry of maturation, ripening and senescence of plant produce. Harvest indices. Quality attributes of edible plant tissues. Regulation of ripening and senescence (respiration and ethylene phenomena). Fresh plant products, handling, physiological disorders and diseases of plant tissues, (control of post-harvest losses). Response of plant tissues to stress conditions and to injury animal-quality criteria of edible animal tissues. Biochemistry of conversion of muscle to meat. The response of animal tissue to stress condition and injury post-mortem. Fresh animal produce, storage, temperature, relative humidity and moisture content of the stored foods. Short term and long term storage. Traditional methods of handling and storage of both plant and animal procedure should be considered.

Pre-requisite: FST 202

FST 307: FOOD CHEMISTRY II (2, 0, 1)

Chemical and biochemical reactions of carbohydrates, lipids, proteins, and other constituents in fresh and processed foods. Carbohydrate: Oligosaccharides; sugars in food technology and Polysaccharides. Starch; occurrence and composition, structure and properties of the starch, amylose and amylopectin, starch enzymes, starch manufacture. Glycogen, cellulose, hemicellulose. Other polysaccharides will include Pectic substances; occurrence and structure, pectin as a jellying agent, use of pectin in foods, clarification of cloudy juice, use of pectin in foods. The plant gums, sources and roles in food. Non-enzymic and enzymic browning; Maillard, browning of ascorbic acid, caramelization of sugars. Protein systems in foods: Proteins of meat and fish; Structure and function of the muscle, rigour Mortis, collagen and gelatin, myoglobin, the red pigment of meat. Proteins of egg milk and seed proteins. Lipids: lipid oxidation, rancidity,

formation of peroxide and hydro-peroxide, degradation of the peroxides, the effect of environmental factors. Vitamins: Fat-soluble vitamins, water-soluble vitamins. Carotenoids; functions, break down of carotenoids, carotenoids in food systems. Food additives: Coloring agents; flavouring agents; sources, natural flavour substances, synthetic flavouring substances, natural flavouring complexes, thermal process flavouring and smoke flavourings. Preservatives and stabilizers: effect on food, usage and limits. Water: Structure, liquid water and ice, water activity, phase transition of foods containing water. Minerals; classification.

Laboratory analysis will cover analysis of nutrients in food; the determination of fat, protein, moisture ash and crude fibre. Carbohydrate determination by difference. Method for determination of protein and nitrogenous compounds will include Kjeldahl, Dye-binding, and Biuret. Methods for fat extraction and rancidity measurement: Soxhlet, iodine value, peroxide value, free fatty acid measurement. Moisture content determination by oven drying. Dry ashing using the muffle furnace and wet ashing, followed by the determination of the mineral composition.

Pre-requisite: FST 206 and CHM 204

FST 308: FOOD MICROBIOLOGY I (2, 0, 1)

Study of micro-organisms associated with spoilage of fruits, vegetables, meat and meal products (including poultry), seafoods, milk and milk products, cereal products, oilseeds (nuts) frozen foods canned and fermented foods. The enzymes and micro-organisms in food processing. Public health aspects of food microbiology, including food poisoning (from bacteria and fungi), and infection (bacterial, protozoan, viral of microbial origin). Microbial indicators. Food preservation processes including high-pressure processing for microbial inactivation.

Pre-requisites: FST 201 and 206

FST 310: HUMAN NUTRITION (2, 0, 1)

Structure and functions of human gut: nutrient digestion and absorption. Metabolism of carbohydrate, protein and fat. Glycolysis and the role of ATP-energy metabolism-(Basal metabolic rate- BMR). Pathways and control of metabolism: citric acid cycle, pentose phosphate pathways, and Krebs' cycle. Gluconeogenesis – the role of the liver in metabolism. Bioavailability of vitamins and minerals. The nucleic acids (DNA, RNA); biosynthesis of protein. Electrolytes and the regulation of body fluid's (blood and urine) pH and sugar. Lipid transport and cholesterol metabolism. The practical section will be on the laboratory components of the course using rats' e.g. isolation of glycogen from rat liver, enzyme and acid hydrolysis of glycogen.

Pre-requisite: FCA 206

AEC 201: INTRODUCTION TO MICROECONOMICS (2,0,0)

AGR 307: CROP AND ANIMAL PRODUCTION (2,1,0)

MGT 304 MARKETING MANAGEMENT (3,0,0)

MGT 310 FINANCIAL AND INDUSTRIAL MANAGEMENT (2,1,0)

FST 312: PROCESSING AND STORAGE OF AGRICULTURAL FOOD PRODUCTS (2, 0, 1) (FOR NON-FST STUDENTS ONLY)

Scope, theory, practice of food science and technology. An overview of food spoilage, preservation and poisoning. Principles, practices and machinery involved in processing major agricultural food products of plant and animal origin including food packaging storage.

ENT : ENTREPRENEURIAL STUDIES (300L)

FST 401: TECHNICAL REPORT WRITING (1,0,0)

Methods and formation involved in writing and presentation of scientific research and technical reports. Current techniques in scientific paper presentation. Referencing in food and technology research journals. Use of audiovisual presentation aids.

Fourth-year standing, i.e SIWES 400 Students.

Prerequisite: Not more than 6 credit units outstanding.

FST 403: FUNDAMENTAL CONCEPTS IN FOOD PROCESSING PLANT DESIGN AND SANITATION (2, 0, 1)

Food plant construction material-strength and corrosion resistance (with particular reference to specific metals, alloys, polymer, wood, ceramic etc). under different environments, corrosion, prevention, techniques material selection in the food industry. Diagrammatic representation: instruments, activators, valves, line diagrams etc. Block and flow charging. Instrumentation (flow, level, pressure, temperature, composition). Controller types and modes of operation (on/off, promotional/integral, manual and automatic). control valves (types, characteristic etc). pipeline design and plant-lay out in the food industry. Introduction to process design economics. Optimization techniques. Machines utilized in sanitation and disinfection in food plant

Hygienic practices for preparation, packaging of food products including food plant and its premises. Sanitizing and cleaning agents and their properties. Methods of plant cleaning and disinfection. Factors influencing the choice of cleaning and sanitizing method. Types of gaseous effluent and solid waste of food plant. Principles and limitations of methods of treatments utilization and disposal. Effect of industrial food

waste on the environment. conversion of waste for fuel, fertilizer, animal feed, etc. Biochemical oxygen demand (BOD) and chemical oxygen demand (COD) for waste effluent. Coagulation, emulsion breaking, neutralization precipitation and chemical oxidation processes as methods of wastewater treatment. Biological treatment of wastes. .

Pre-requisite: FST 307

FST 405: FRUITS AND VEGETABLES PROCESSING (2, 0, 1)

Types, and quality criteria of fruits and vegetables. Pre-processing handling, preservation and storage conditions of fresh fruits and vegetable including their processed products. Use of chemicals in the preservation of fruits and vegetable products. Processing of some fruits to single strength juices, pastes, puree, concentrates, jam, jelly and marmalade. Utilization of products and by-products of fruits and vegetable origin. Traditional and modern techniques involve in processing.

Pre-requisite: FST 303

FST 407: PRINCIPLES OF FOOD QUALITY MANAGEMENT AND EXPERIMENTAL DESIGN (2, 1, 0)

Definition, scope significance of food quality and quality control. Quality parameters and a specification. Instrumental and sensory of quality parameters evaluation. Sampling plans and statistical methods employed in data analysis: Microbial and production quality control (Raw material through the production line to finished product). Construction of quality control charts. ISO and HACCP quality parameters and standards. Develop applied quantitative computer skills for the transparent design, analysis and interpretation of data arising from elementary univariate experimental designs. Basic concepts of experimentation, treatments, spatial layout of experimental units, response variables and hypothesis testing. Review of the two-sample t-tests, the fundamental equation of analysis of variance (ANOVA) and the underlying assumptions. Analysis of Variance (ANOVA) regression and correlation coefficients. Analysis, interpretation and reporting of data from univariate experimental design including the completely randomized, the randomized block, the Latin square and factorial design with and without replication. Hypothesis testing of main and interaction effects. Concepts of repeated measures designs and autocorrelation. Concepts of simultaneous inference using Scheffe, Turkey and Student-Newman-Keuls multiple range tests. Transparent analysis, interpretation and reporting of data arising from elementary experimental designs.

Pre-requisites: MTH 211, FST 304, 308 and 309

FST 409: MEAT AND MEAT PRODUCTS PROCESSING (2, 0, 1)

Structure of muscles and composition of meat. Principles and processes employed in the conversion of acceptable animal tissues to food. Formulation and processing of meat, fish, poultry, eggs, sea, foods products, including sausages, meat, loaves and ball, corned beef, canned fish. Curing, drying, refrigeration, freezing and chemical treatment as a means of preserving animal tissues. Meat packaging, practical should include animal slaughter, carcass dressing, fabrication and identification of meat and poultry cuts. Meat tenderization. Meat, fish and poultry industry in Nigeria. Micro-organisms of interest in meat fish, and poultry industries.

Pre-requisites: FST 309, FST308

FST 411: FOOD INSTRUMENTAL ANALYSIS (2, 0, 1)

Sampling techniques, homogenous sample and random sampling. Qualitative and quantitative analysis. Spectroscopic techniques, this will include the basic principles radiation, energy, atomic structure and the Beer-Lamberts law. Principles of instrumentation and applications of UV/Visible spectrophotometry, spectrofluorimetry and flame spectrophotometry. The basic principles of the IR spectrophotometry, electron spin resonance, nuclear magnetic resonance, and mass spectrometry; their application in food analysis. Chromatographic techniques: general principles of chromatography, adsorption and partition chromatography. Principles and instrumentation of gas-liquid chromatography, ion-exchange, permeation, and affinity chromatography. High-pressure liquid chromatography. The basic applications of each technique in food analysis. The use of polarimeter, refractometer and hydrometer in food analysis. Radio-isotope techniques, detection and measurement of radioactivity. Use of radio-isotopes in sterilization of food and equipment.

Pre-requisite: FST 309

FST 413: BEVERAGE TECHNOLOGY (2, 0, 1)

Types: definition and differentiation of alcoholic and non-alcoholic beverages. Principles and practices applied in the production of alcoholic beverages. Material selection including yeast strains. Function of selected ingredients. Common defects in beer, wine, malt and soft drinks. Beneficial and unwanted yeast in these beverage industries local materials in the production of beer and wine and malt beverages. Relationship of raw material selection to quality of product.

Pre-requisites: FST 308 and 309

FST 421: BREWING MALT AND WORT PRODUCTION (2,0,1)

Origin of brewing, grain morphology, malting – concept and practice. Handling and storage of malted and unmalted cereals. Brewhouse processes and wort production including cereal and adjunct conversion, malt extract production, wort cooling and aeration. Production of African beers. Lab to include malting and wort extraction.

SIW 400/401: STUDENTS INDUSTRIAL WORK EXPERIENCE SCHEME (0,0,4/0,0,2)

Pre-requisite: Outstanding courses must not exceed 6 credit unit loads.

FST 501: FOOD PRODUCT DEVELOPMENT (2, 0, 1)

New food product development objective(s) motivations in concept creation. Screening of initial concepts (idea). Material selection and testing. Laboratory development and assessment of new products (prototypes). Use of production guidance and consumer taste.

Pre-requisite: SIW 400/401

FST 503: MILK AND DAIRY TECHNOLOGY (2, 0, 1)

Physical and chemical properties of raw milk and milk components. Handling of raw milk. Definition and differential of different milk products. Technology and manufacture of different milk products, including butter, ice cream, cheese, powdered milk and culture milk products. Simulated milk products (e.g. soyamilk) including margarine. Micro-organism of importance in milk industries. Defects and quality parameters of products. Preservation and storage of milk product and homogenization operations.

Pre-requisites: FST 308.

FST 505: CEREALS AND MILLING TECHNOLOGY (2, 0, 1)

The structural and compositional features of the principal cereals to relate to the efficiency of milling operations. The theory and practice of pre-milling processes- conditioning/tempering and aeration. Types of mills. Wet and dry milling. Milling processes applied to maize, rice, sorghum, wheat, millet, oat, barley, roots and tubers. Detailed studies of the comprehensive mechanism of milling as employed in various food products. Particle size analysis. Product and by-product utilization.

Pre-requisite: SIW 400/401

FST 506: BAKERY TECHNOLOGY (2, 0, 1)

Advance study of the baking processes, basic properties, chemical and biological reactions of ingredients used in the production of bakery products. Emphasis on fundamental principles of biological and chemical leavening and rheological properties of dough, butter and ingredients. Biscuit technology: cake and paste products. The use of composite flour and non-wheat flour in bakery equipment and machines (types, functions, selection and requirement and equipment to be studied will include header, shifting, farinographs extension meter etc. Panels. Market assessment of new product pilot plant scale-up. Industrial scale-up and optimization, including material, and energy balances.

Pre-requisite: SIW 400/401

FST 507: A FOOD SCIENCE AND TECHNOLOGY SEMINAR (0, 1, 0)

Student's participation in a weekly written and oral presentation of a topic in the area of Food Science and Technology (not project topic) by a final year student to members of FST department. A seminar topic is selected by the individual student and his/her academic adviser and approved by the seminar coordinator or the Head of Department.

Pre-requisite: SIW 400/401

FST 509: RESEARCH PROJECT I (0, 0, 2)

A research project in a food-related topic approved by the department and supervised by staff in the department. The result will be presented in form of a Thesis, followed by an oral defence. Required of every graduating student.

Pre-requisite: SIW 400/401 Total credit load outstanding must not exceed 6 units

FST 510: RESEARCH PROJECT II (0, 0, 3)

A research project in a food-related topic approved by the department and supervised by staff in the department. The result will be presented in the form of a Thesis, followed by an oral defence. Required of every graduating student.

Pre-requisite: SIW 400/401 Total credit load outstanding must not exceed 6 units

FST 511: FOOD PACKAGING (2, 0, 1)

The history and principles of food packaging, nature and properties of conventional materials – glass, metal, plastic wood and paper. Synthetic packaging material, composite packaging, laminated coated packaging material. Moisture and gas movement across packages. Migration of compounds from packages into food and their health implication. Package testing, (mechanical strength and permeability). Implication

of local packaging materials on product quality and losses. Types of packaging equipments and processes.

Pre-requisites: Total credit load outstanding must not exceed 6 units.

FST 513: OILSEEDS PROCESSING AND UTILIZATION (2, 0, 1)

Composition and quality criteria of oilseeds. Detailed study of the processing techniques, types of equipment, products and products of soybeans, local pear, locust bean, melon seed (egusi), groundnuts, African oil bean, sunflower seeds castor seed, palm fruit, coconut etc. Application of oils, and some by-products in margarine, butter and protein food condiments, and other product from oilseed residues. Waste management in the processing of oilseeds. Comparative assessment of the efficiency of the modern and traditional methods.

FST 514: WATER TREATMENT, PROCESSING AND QUALITY (2, 0, 1)

Quality of potable water and water used as ingredients in food products. Processes and equipment for water treatment e.g, aeration, filtration, disinfection and other methods applied in converting a water supply to good quality water. World health organizations' specification for potable water. Considerations for packaged water production, pipe networks for water distribution-materials, operations and safety.

FST 553: BIOTECHNOLOGY IN FOOD SYSTEMS (2, 0, 1)

Definition and scope of biotechnology. Basic principles of genetic engineering as a tool of biotechnology. Industrial fermentation processes; batch and continuous fermentation systems for generation of single-cell proteins, microbial enzymes and amino acids. Product recovery and purification. Production control and instrumentation. Fermentation scale-up. Genetically modified foods . Biotechnology in food analysis.

FST 540: FOOD DEHYDRATION TECHNOLOGY (1,0,1)

Theory and elements of drying: detailed emphasis on psychrometric charts, enthalpy diagrams and sorption isotherms. Principles, design and construction of drying equipment such as solar dryer, spray dryer and fluidized bed dryer. Miscellaneous drying technologies: puff drying. Drying of local grains.

FST 542: ENGINEERING PROPERTIES OF FOOD (1,0,1)

Flow properties of particulate foods with reference to sedimentation, centrifugation, fluidization, pneumatics and hydraulic transport. Importance of properties of food in formulation processes and storage: including thermal, optical, textural and rheological evaluation of food products.

FPT 508: FOOD REACTOR DESIGN (2, 1, 0)

The design and analysis of food (biological) reactors with isothermal, non-isothermal and adiabatic operations and applications. Batch and seem-batch reactors, continuous stirred tank reaction, plug flow reactor and laminar flow reactors.

FST 544: ADVANCES IN FOOD PROCESSING TECHNOLOGY (1,1,0)

Novel heating systems such as ohmic, dielectric, microwave etc. Use of cryogenic freezing systems. High-pressure sterilization. Advances in separation processes: membrane separation, ultrafiltration, supercritical CO₂ etc. Application of irradiation and safety. Advances in extraction technology.

FST 546: INTERNATIONAL FOOD POLICY RESEARCH (2,0,0)

Status of food and nutrition in the world. Production levels of different food items: pulses, tubers cereals, meat, oil. Population growth and food demand. Structural changes and the demand for food in Africa and Asia. Regionalism. Food security and strategic grain reserves. Agriculture, technological change and the environment linkage.

FST 531: FOOD QUALITY ASSURANCE AND SAFETY (2,0,1)

Functions of quality control departments in monitoring safety and quality of food as well as compliance with government regulations. Description of federal regulatory agencies. Development of specifications, food standards and critical control points. Selection of analytical methods. Acceptance sampling and control charts. History and Principles of Hazard analysis and critical control points (HACCP): Identification of Hazard analysis and critical control points. Food quality assurance and regulation/legislation.

Food Hygiene: Food poisoning and microbiological safety, Hygiene system/standards, personal hygiene, pest control, cleaning and disinfection. Definition and scope of food safety. Food safety Act. Risk Analysis: Chemical risk, Microbiological risk, Genetically modified foods; Food borne diseases. Risk assessment, management and communication

Pre: FST 403

FST 530: FOOD TOXICOLOGY (1,0,1)

Antinutritional factors in food- identification (qualitative and quantitative assay) and implications. Specific toxins such as mycotoxins and their implications. Detection of harmful chemicals in food such as lead, mercury etc. Food allergy: causes and control.

FST 532:SENSORY EVALUATION OF FOOD PRODUCTS (2, 0, 1)

Principles of sensory evaluation including experimental methods. Preparation of sensory evaluation on first prototype. Design of sensory score sheets. The techniques for sensory evaluation of food including hedonic, ranking, and others. Evaluation of sensory data and products modification. Advances in sensory evaluations of food including use of electronic tongue and face smile. Qualitative descriptive analysis of food using specific food products.

FST 533: ORGANOLEPTIC FACTORS IN FOOD (2,0,0,)

Food components, which have a major influence on the sensory properties of foods. Food pigments and flavours form an important part of the course. Natural food pigments (e.g. chlorophyll, carotenoids, anthocyanins) and flavours, as well as the nature-identical and artificial ones, will be discussed. The role of water in foods and water activity. Sorption isotherm as it influences the textural/rheological properties of food.

Pre-requisite: FST 305, 309

FST 536: FOOD AND NUTRITION BIOCHEMISTRY (1, 0, 1)

Malnutrition: Biochemistry and consequences; causes of malnutrition. Diseases of nutritional effects such as kwashiorkor, scurvy, and diabetes. RDA and food balance sheet. Nutrient requirement of different classes of individuals (babies, the young, adults, elderly, pregnant and lactating mothers). Nutritional assessment of human subjects: use of dietary, anthropometric, clinical, vital statistics and biochemical measurements. Determination and application of nutritional indices such as weight-for-age (WA), weight-for-height (WH), and others. Calculation of Z-score, BMI, PEM and nutritional status interpretation. Assessment of nutritional quality of food product: Steps in formulating experimental and control food samples; determination of biological values (BV), protein efficiency ration (PER) etc. Haematological evaluation: Hb, packed cell volume (PVC), Red blood cells and white blood cells, and their interpretations. Practical section is on nutritional survey using anthropometric, biochemical (haematological), and vital statistics parameters; determination of energy value of food with bomb calorimeter.

FST 521: PRINCIPLES AND PRACTICES IN ENOLOGY (2,0,1)

History and composition of wines, classification of wines. Fermentation, clarification, fining and stabilization of wines, additives of wine and wine diseases/defects. Lab is based on wine must production, fermentation, wine racking, ageing, packaging and pasteurization and common equipment used in wine making.

FST 520: BEER PRODUCTION (2,0,1)

Processing of wort into different kinds of beers, non-alcoholic beverages and miscellaneous products. Fermentation/maturation, celler/post-fermentation processes, pure yeast propagation and pitching. Fermenters (especially cylindroconical vessels CCVs), beer filtration and filter aid use. Beer container filling, beer stabilization and carbonation. Beer infection, diseases and defects. Lab to include evaluation of fermentation parameters, pasteurization and carbonation.

FST 522: NON ALCOHOLIC BEVERAGE TECHNOLOGY (2,0,1)

Treatment of water for soft drinks, the composition of soft drinks, edible acids and properties. Concentrate composition and manufacture. Beverage carbonation process. Cocoa, coffee and tea processing. Dry mixes and fruit concentrate.

FST 524: DISTILLERY TECHNOLOGY (2,0,1)

Production of spirit beverages – whiskey, rum, gin, vodka, brandy and indigenous gin. Description of processing, raw materials, blending/formulation of spirits. Lab to include evaluation of alcoholic content, distillation and maturation studies.

FST 526: UTILITIES FOR BEVERAGE PROCESSING (1,01)

Carbondioxide generation, processing and storage. Refrigeration uses and calculators. Compressed air (generation, application, sterile air etc), steam/hot water (generation, application, energy saving concepts), heat exchangers and water treatment.

FST 528: AUTOMATION IN FOOD PROCESSES (1,0,0)

Essential conditions for food plant automation. Materials for automation plant construction, automatic CIP and suitable equipment including mix proof pipe networks. Artificial intelligence: programmable logic controller technology, the role of the food technologist in process automation, Standard drawing symbols and design procedures in plant automation.

FST 551: FOOD MICROBIOLOGY II (2,0,1)

Techniques for culturing, isolation, enumeration and identification of microorganisms important in food. pure cultures. Types of media used in food microbiology. Classification of fungi important in food. food bacteriology. Survival, inhibition and death of microorganisms food-borne disease out-breaks. Food hygiene, sanitation and inspection.

FST 550: MICROBIAL PHYSIOLOGY AND BIOCHEMISTRY (2, 0, 1)

Microbial growth – changes in cell population and macromolecular composition during the growth process. Growth under nutrient-limiting and non-limiting conditions. Microbial metabolism – carbohydrate, protein and lipid metabolism, metabolic enzymes, sources of reducing power, energy yields, biosynthetic intermediates and products. Regulatory mechanisms in microbial metabolism. Transport systems in the microbial cell.

FST 552: FOOD FERMENTATION TECHNOLOGY (2, 0, 1)

Some microorganisms are important in the manufacture of industrial (food) products and their exploitation (SCP production, industrial enzyme production, production of flavour enhancers, acidulants, vitamins and amino acids). Product recovery and purification. Isolation, propagation and maintenance of starter cultures. Principles of batch and continuous fermentations. General principles of industrial fermentations.

FST 554: MICROBIAL GENETICS (2, 1, 0)

Mechanism and nature of mutations and recombination (transformation, conjugation and transduction). Chromosomal replication and genetic transfer. Plasmids their importance in genetics. Mutagenic agents and their mode of action. Enzymes important in microbial genetics.