Detailed Syllabi of Polytechnic in Agro Processing
(Course : Diploma in Agro Processing and Food Technology)

Semester-I

APFT 111 *Deeksharambh* (Introduction cum foundation course of 2 weeks) 0+2 (NC)

The activities to be taken under *Deeksharambh*, in addition to giving a broad view and application areas of the subject of study, also will aim at creating a platform for

- Helping students from different backgrounds for cultural integration
- Knowing about the operational framework of academic process in university
- Instilling life and social skills, leadership qualities, team working spirit
- Developing social awareness, ethics and values, creativity
- Helping students to identify the traditional values and indigenous cultures along with diverse potentialities both in indigenous and developed scenario.

The details of activities/ schedules will be decided by the parent universities. The structure shall include, but not restricted to:

I. Discussions on operational framework of academic process in university, as well as interactions with academic and research managers of the University
II. Creating awareness on the subject of study, and the traditional values and indigenous cultures along with diverse potentialities both in indigenous and developed scenario
III. Interaction with alumni, business leaders, perspective employers, outstanding achievers in related fields, and people with inspiring life experiences;
IV. Group activities to identify the strength and weakness of students (with expert advice for their improvement) as well as to create a platform for students to learn from each other's life experiences;
V. Field visits to related fields/ establishments; and
VI. Sessions on personality development (instilling life and social skills, social awareness, ethics and values, team work, leadership, etc.) and communication skills.

APFT 112 Introduction to Agricultural Engineering 3 (2+1)

Objective

To enable the students to have basic idea on different agricultural engineering applications and the machinery involved in different farm operations, post-harvest and allied activities

Theory

Introduction of Agricultural Engineering as a discipline; divisions, importance, scope of employment, research and higher studies of Agricultural Engineering; Importance of Agricultural Engineering for today's agriculture; Farm power, Farm machinery types and sections ;

Introduction to renewable energy systems; importance, Renewable energy status and potential in India and state ; Types and components of solar collectors, solar water heaters, crop dryers, solar photovoltaic pumps, Types of biogas plants, bio-mass briquetting machine, wind mills and its components.

Introduction of soil and water engineering, Different types of water harvesting structures, Types of wells and pumps, Types of irrigation methods and their components, Introduction to drainage systems, mulching and soil erosions.

Introduction to planning and layout of farmsteads, animal houses, poultry houses; Different types of grain storage structures; Greenhouse and its different parts; Low cost protected structures. Classification of different types of agricultural commodities; Moisture content and its importance in grain storage; Common reasons of food spoilage, food preservation methods; Different primary processing operations and their necessity; Different types of traditional and modern storage structures; Storage of perishable commodities; Different types of packaging materials and their suitability for various food products; Basic principles of value addition of food, refrigerated and frozen storage, chemical preservation and other novel methods.

Practical

Study of tillage, sowing, planting, weeding, fertilizer application implements ; Study of pesticide application, harvesting and threshing implements ; Study of various components of tractor and power tiller ; Study of various types of biogas plants ; Study of solar collectors, solar water heater and solar dryers ; Study on various components of sprinkler and drip irrigation; Study on various components centrifugal pump; Study of various post-harvest operations; Study of different food processing equipment; Visit to a greenhouse; Visit to implement manufacturing unit; Visit to a mechanized farm; Visit to a watershed; Visit to a food processing industry.

APFT 113 Fundamentals of Food Processing 3 (2+1)

Objectives

To gain an understanding of the perishability of food and causes for food spoilage, having an idea of the basic methods of preservation of food and knowledge about non thermal processing of food.

Theory

Food: Definition and Functions, Classification of foods, sources, types and perishability of foods; Causes and types of food spoilage; Scope and benefit of food preservation. Food processing: Introduction, levels and techniques; Methods of food preservation; Preservation by salt and sugar: Principle, method and effect on food quality. Preservation by heat treatment: Principle, process and equipment for blanching, canning, pasteurization, sterilization. Preservation by use of low temperature: Principle, methods, equipment. Preservation by drying, dehydration and concentration: Principle, methods, equipment; Non-thermal preservation processes of food preservation

Practical

Demonstration of various perishable food items and degree of spoilage; Blanching of selected food items; Preservation of food by heat treatment- pasteurization; Preservation of food by high concentration of sugar: Jam; Preservation of food by using salt: Pickle; Preservation of food by using acidulants i.e. pickling by acid, vinegar or acetic acid; Preservation of food by using chemical preservatives; Preservation of bread, cake using mold inhibitors; Drying of fruit slices pineapple slices, apple slices in cabinet drier; Drying of green leafy vegetables; Drying of mango/ other pulp by foam-mat drying; Drying of semisolid foods using roller dryers; Drying of foods using freeze drying process

APFT 114 Basic Civil Engineering and Surveying & Levelling 3 (2+1)

Objective

To aware the students about building construction and to conduct the survey work for any area and also to prepare layout of engineering structures.

Theory

Materials of construction; building components and their requirements; building systems; design loads. Building drawing conventions; plan, elevation and section. Elementary building bye-laws; building classification. Foundations – definition, purpose of foundation, causes of failure of foundation. Elements of Building Construction: Walls and types. Masonry types. Stairs, lintels and arches. Plastering and pointing. Roof and roof coverings. Damp proofing and water proofing.

Surveying: Introduction, classification and basic principles; Linear measurements, chain surveying, cross staff survey, compass survey, planimeter; Errors in measurements, their elimination and correction; Plane table surveying, methods, advantages and disadvantages. Levelling, levelling difficulties and error in levelling, contouring, computation of area and volume. Theodolite traversing, total station, electronic theodolite; Introduction to GPS and DGPS survey.

Practical

Linear measurements using different instruments; Reconnaissance survey in the field; Use of field book; Study on various types of chain used in chain survey and its components; Study of errors in chain surveying; Use of ranging rods and ranging in the field; Obstacles during chaining; Offsets in chain survey; Cross Staff; Survey of an area; Preparation of map; Study on various types of compass; Compass survey of an area; Plotting of compass survey; Plane table surveying and different methods; Study on various types of levels and its components; Setting up of dumpy level in the field; Computation of various methods for RL; Study on Levelling, Measurement of slope in the field; Contour survey of an area and preparation of contour map; Introduction of software in drawing contour; Theodolite surveying; Setting out curves by Theodolite; Use of minor instruments; Use of total station, EDM in the field; Use of modern computers for surveying.

APFT 115 Basic Mechanical Engineering 3 (2+1)

Objective

To aware the students of about different materials and their properties.

Introduction: Prime movers, Sources of energy, Types of prime movers, Force and mass, Pressure, Work, Power, Energy, Heat, Temperature, Units of heat, Specific heat capacity, Internal energy, Enthalpy, Entropy, Efficiency. Fuels and Combustion: Introduction, Classification, Solid fuels, Liquid Fuels, Gaseous fuels, LPG,CNG and biofuels ,Calorific values. Steam Boilers: Introduction, Classification, Simple vertical boiler, Cochran type, Lancashire boiler, Locomotive boiler, Babcock and Wilcox boiler. Important Engineering Materials: Properties of materials, Ferrous & Nonferrous materials and other important engineering materials such as Timber, Abrasive material, silica, ceramics, glass, Basic measuring instruments and gauges.

Practical

Demonstration of various prime movers, d Study of different types of boilers; boiler mounting and accessories; various types of burners and fuels; Determination of calorific values of different fuels. Identification of different materials of manufacture. Demonstration of different measuring instruments and measurement technique. Identification of various hand tools. Demonstration of various power tools and machine tools.

APFT 116 Workshop Technology & Practices 2 (0+2)

Objective

To expose the students to basic manufacturing processes involved for production of different machine elements and to facilitate hands-on experience of using these machines.

Practical

Introduction about different shops in the workshop; Safety and precautions to be taken in the workshop; Study of different tools used for fitting and different fitting operations; Preparation of a paper weight; Study of various carpentry tools, types of wood and their characteristics and working with carpentry tools; Demonstration of different carpentry joints: Preparation of dovetail joint in carpentry; Study of welding, types of welding, tools and equipments, types of flames, Working with electric arc welding; Equipment and tools, safety and precautions taken in ARC welding; Preparation of Butt joint and lap joint with welding; Working on a lathe machine and study of different tools used in lathe machine; lathe operations; demonstration of different machines in machine shop such as shaper, milling machine, etc. and with different tools used in machine shop; Exercise on bending, shaping etc.; Exercise on Drawing, Punching, Riveting; Making different types of sheet metal joints using G.I. sheets.

APFT 117 Agricultural Informatics and Artificial Intelligence 3 (2+1)

Objective

To acquaint students with the basics of computer applications in agriculture, multimedia, database management, application of mobile app and decision- making processes, etc. and to provide basic knowledge of computer with applications in Agriculture and to make the students familiar with Agricultural-Informatics, its components and applications in agriculture

Theory

Fundamentals of computers, Analogy of computers, memory concepts; Operating systems : definition and types ; Application of MS-Office in data handling like creating, editing, formatting document ; Data presentations ; Tabulation, Graph creation ; Introduction to DBMS and Internet, Web designing, DBMS in agriculture ; Application of information communication technology in agriculture, concepts and different applications ; Introduction to computer programming ; General concepts and different computer programming languages ; Introduction to artificial intelligence and its applications in agriculture : concepts, techniques and applications

Practical

Study of computer components, accessories, practice of important DoS Commands, Introduction of different operating systems such as Windows, Unix/ Linux, creating files and folders, File Management. Use of MS-WoRD and MS Power-point for creating, editing and presenting a scientific document, MS- EXCEL - Creating a spreadsheet, Use of statistical tools, Writing expressions, Creating graphs, Analysis of scientific data, Handling macros. MS-ACCESS: Creating Database, preparing queries and reports, Demonstration of Agri-information system, Introduction to World Wide Web (WWW) and its components, Study of ICT tools and computer models for various agricultural applications.

APFT 118 Communication Skill 2 (1+1)

Objective

To acquire competence in oral, written and non-verbal communication, develop strong personal and professional communication skill and demonstrate positive group communication.

Theory

Communication Process: The magic of effective communication; Building self-esteem and overcoming fears; Concept, nature and significance of communication process; Meaning, types and models of communication; Verbal and non-verbal communication; Linguistic and non-linguistic barriers to communication and reasons behind communication gap/ miscommunication.

Basic Communication Skills: Listening, Speaking, Reading and Writing Skills; Precis writing/ Abstracting/Summarizing; Style of technical communication Curriculum vitae/resume writing; Innovative methods to enhance vocabulary, analogy questions.

Structural and Functional Grammar: Sentence structure, modifiers, connecting words and verbals; phrases and clauses; Case: subjective case, possessive case; objective case; Correct usage of nouns, pronouns and antecedents, adjectives, adverbs and articles; Agreement of verb with the subject: tense, mood, voice; Writing effective sentences; Basic sentence faults.

Practical

Listening and note taking; Writing skills: precis writing, summarizing and abstracting; Reading and comprehension (written and oral) of general and technical articles; Micro-presentations and Impromptu Presentations: Feedback on presentations; Stage manners: grooming, body language, voice modulation, speed; Group discussions; Public speaking exercises; vocabulary building exercises; Interview Techniques; organization of events.

APFT 119 NCC-I/NSS-I (0+1)*

Semester-II

APFT 121 Engineering Mathematics-I 3 (3+0)

Objective

To make the students acquainted with the basic mathematics applied in engineering and their applications in solving engineering problems

Theory

Differential calculus: Functions of two or more variables, Taylor's and Maclaurin's expansions, Maxima and minima. Partial differential equations: Partial derivative and total derivative, homogeneous functions and Euler's theorem. Formation of PDE, Integral calculus: Double integrals, triple integrals, application of double and triple integrals to find area and volume. Differential Equations: First order differential equations, exact and, linear differential equation and equations of first order and higher degree, Clairaut's equation. Higher order differential equations: Methods of finding complementary functions and particular integrals. Matrices: Elementary transformations, Gauss elimination, Gauss-Jordan method to find the inverse of a matrix. rank of a matrix, solution of linear equations, Eigen values and Eigen vectors, Cayley-Hamilton Theorem- its use to find inverse of the matrix.

APFT 122 Engineering Drawing and Graphics 3 (1+2)

Objectives

To gain an understanding about drawing as per engineering requirement, getting an idea of the isometric, orthographic views and projection and knowledge about Computer Aided Design.

Theory

Definition of projection, Principle of projection, Methods of projections, Orthographic projection, plane of projection, First and third angle of projection. Different methods of dimensioning; Isometric scale, Isometric axes, Isometric projection, Preparation of working drawing from models and isometric views. Concept of sectioning; Revolved and oblique section; Sectional drawing of simple machine parts; Types of rivet heads and riveted joints, Symbols for different types of welded joints; Nomenclature, thread profiles, multi-start threads, left and right-hand thread; Square headed and hexagonal nuts and bolts; Conventional representation of threads; Different types of lock nuts, studs, machine screws, cap screws and wood screws; Foundation bolts; Drawing of missing views.

Practical

Use of drawing instruments, Planning and layout as per IS, Scaling technique, Drawing of set of lines with different conditions, Draw Orthographic projections of different objects, Draw isometric drawings from given orthographic views, Isometric projection of geometrical solids; Preparation of manual drawings with dimensions from models and isometric drawings of objects and machine components; Preparation of sectional drawings of simple machine parts; Drawing of riveted joints and thread fasteners, Practice in the use of basic and drawing commands on AutoCAD.

APFT 123 Engineering Chemistry 3 (2+1)

Objective

To make the students acquainted with applications of chemistry in engineering and different chemical processes in agricultural and food engineering

Theory

Colloids: Classification, properties like optical activity-Tyndall effect, Brownian movement, Water: Physical and chemical properties of water, Temporary and permanent hardness, disadvantages of hard water, scale and sludge formation of boilers, boiler corrosion, Fuels: Classifications, calorific value and its determination methodology. Corrosion and corrosion control : Types of corrosion and factors affecting corrosion, methods of preventing corrosion. Lubricants: Classifications, properties-viscosity, flash point and fire point mechanism, thick film, thin film and extreme pressure, neutralization point, saponification number and mechanical stability. Type of polymerization with examples (addition, free radical); Different properties of polymers chemical resistance, crystallinity. Polymers: Effect of heat on polymers, general use, Fertilizers and organic chemistry.

Practical

To determine of temporary and permanent hardness of water by EDTA method; To study the different types of fuels and compare their characteristics; To study different types of foods and their ingredients; To study the different types of food preservatives and their active principles; To estimate chloride in water sample; To study Bomb calorimeter and determination of

calorific value ; To estimate dissolved oxygen in water sample; To estimate chloride in water samples;

APFT 124 General Microbiology 3 (2+1)

Objective

To identify the micro-organisms, their structure and growth characteristics and techniques for cultivation and preservation and control

Theory

Scope and history of microbiology: (notable contributions of Leeuwenhoek, Pasteur, Koch, etc.), Place of Microorganisms in living world; Groups of microorganisms; Applied area of microbiology, Classification and identification of micro- organism; Major Characteristics of Microorganisms. Microscopy: Introduction to microscope; Component of microscope; Structures external to cell wall, Cell wall; Structures internal to cell wall. Cultivation and preservation of micro-organisms: Nutritional requirements; Types of media. Physical condition required for the growth; Enumeration methods for micro-organisms. Bacterial Metabolism and Growth: Reproduction of bacteria; Growth of bacteria: growth curve, Control of microorganisms: Physical and Chemical agents.

Practical

To study Microscopy; Micrometry; Sterilization of glassware and acquainting with equipment used in microbiology; To prepare of nutrient agar media and techniques of inoculation; To study Staining methods (gram staining, negative staining); To study Pure culture techniques (streak plate/pour plate/spread plate); Identification procedures (morphology and cultural characteristics); To study Growth characteristics of fungi: To determine microbial numbers, direct plate count, generation time.

APFT 125 Web Designing and Internet Applications 3 (1+2)

Objective

To learn by students about designing the web and web planning process.

Theory

Basic principles in developing a web designing, Planning process, Five Golden rules of web designing, Designing navigation bar, Page design, Home Page Layout, Design Concept. Basics in Web Design, Brief History of Internet, World Wide Web. Web Standards. Audience requirement. Introduction to JavaScript, variables & functions. Working with alert, confirm and prompt. Connectivity of Web pages with databases.

Practical

Introduction of DREAM WEAVER windows layouts & menu; DREAM WEAVER: Planning & Setting Web Site Structure. DREAM WEAVER: Text formatting, Listing & Table. DREAM

WEAVER: Image properties & Linking. DREAM WEAVER: Frame and partition tags. FTP Uploading & Downloading. JavaScript : Introduction, variable and operators. JavaScript: alert, confirm and prompt dialog boxes. JavaScript: Concept of Form Elements & events.

APFT 126 Crop Production and Protection Technology 3 (3+0)

Objective

To enable the students to have basic idea on crop production and protection practices to understand the domain of agricultural sciences and to have an idea of the different types of machineries/ equipment that can be adopted for these operations

Theory

Introduction and scope of agronomy; Crop seasons; Agronomic practises of major local field crops; Basic principles of natural farming, organic farming and sustainable agriculture. Water requirement of crops and critical stages for irrigation; Weeds and their management in crops; Crop rotation, cropping systems, cropping scheme, relay cropping, mixed cropping and intercropping. Quality of irrigation water. Essential plants nutrients- their functions and deficiency symptoms in plants; Important inorganic fertilizers and their reactions in soils; Gypsum requirement for reclamation of sodic soils and neutralizing RSC. Types of horticultural crops; Sowing and planting times and methods; Seed rate and seed treatment for vegetable crops; Macro and micro propagation methods; Types of plant growing structures; Pruning and training; Water requirements and critical stages; Management of orchard; Major pests and diseases of different crops and their management.

Practical

Identification of crops and their varieties, seeds and weeds; Study of different fertilizer application methods and weed control methods; Judging the maturity time for harvesting of crop; Study of seed viability and germination test; Examination of soil profile in the field; Determination of bulk density; particle density and porosity of soil; Determination of organic carbon of soil; Identification of nutrient deficiency symptoms of crops in the field; Determination of gypsum requirement of sodic soils; Identification and description of important fruits, flowers and vegetables crops; Study of different garden tools; Preparation of nursery bed; Practices of pruning and training in some important fruit crops; Study of cultural operations for vegetable crops; Seed extraction techniques; Visit to commercial greenhouse/ polyhouse.

APFT 127 Basic Electrical Engineering 3 (2+1)

Objective

To gain an idea of the basic measuring electrical current and its quality and knowledge about application of wiring and connections.

Theory

AC Fundamentals: Definitions of cycle, frequency, time period, amplitude, Peak value, RMS value, Average value, Electro motive force, Magnetic circuits, composite magnetic circuits, magnetic leakage, phase relations and vector representation, AC through resistance, inductance and capacitance, AC series and parallel circuits, Simple R-L, R-C and R-L-C circuits; Engineering Circuit Analysis: Current, Voltage, Power, Circuit elements, Ohm's law. 3-Phase Systems: Star and Delta connections, Relationship between line and phase voltages and currents in Star and Delta connections, various methods of single and three phase power measurement. Transformer: Principle of working, construction of single-phase transformer, core type, shell type transformer, emf equation, Transformer losses, efficiency. Single phase induction motor: Double field revolving theory. Poly phase induction motor: Construction, operation, starting and speed control methods. Alternators: Principle of operation, types of rotors, EMF equation. D.C. Machine (generator and motor): Types, Construction and Operation, EMF equation, their starting, speed controls and characteristics. Electric Power Economics: Measuring Equipment: Classification, Characteristics of different electrical measuring systems and equipment. Electrical Wiring: system of wiring, domestic wiring installation, industrial electrification. Protection devices: Earthing, Circuit protection devices, fuses, ELCB and relays.

Practical

Star connection study of voltage and current relation; Delta connection study of voltage and current relation. Measurement of Power in 3 phase circuit by wattmeter and energy meter: (a) for balanced loads, (b) for unbalanced loads. Starting of induction motors by; (a) D.O.L. (b) Manual star delta (c) Automatic star delta starts. Starting of slip ring induction motors by normal and automatic rotor resistance starters. Study the starter connection and starting reversing and adjusting speed of a D.C. motor. Problems on Industrial Electrification. Study of various circuit protection devices. Study of various measuring instruments.

APFT 128 NCC-I/NSS-I (0+1)*

Semester-III

APFT 211 Engineering Mathematics-II 3 (3+0)

Objective

To make the students acquainted with the application of various advanced mathematics such as vector calculus, Fourier series and Laplace transform and applications of numerical methods in engineering

Theory

Vector calculus: Scalar and vector point functions, vector differential operator Del, gradient of scalar point function, divergent and curl of vector point function, functions of a complex variable, limit, continuity and analytic function, Cauchy-Reimann equations, harmonic functions. Fourier series: Periodic functions, Eulers formulae. ; Laplace Transform: rules for

Laplace transform and inverse Laplace transform, applications to find solutions of ordinary. Numerical methods: Finite difference operators and their relationship, Newtons forward and backward interpolation formula, Newtons divide difference interpolation and Lagranges interpolation formula, numerical differentiation and integration rule, numerical solutions of ODE by Taylors series, Eulers and Runge-Kutta method of order four.

APFT 212 Food Chemistry 3 (2+1)

Objectives

To learn the chemical aspects of food and bio- materials and its importance in food processing, to gain an understanding of various water and macro- molecules and to have an idea of about the effect of processing on these biomolecules

Theory

Water; Moisture in foods, role and type of water in foods, functional properties of water, water activity and sorption isotherm, molecular mobility and foods stability; Carbohydrates; Monosaccharaides, disaccharides and polysaccharides, dietary fibres and carbohydrates digestibility; Proteins in foods: Proteins: Classification, structure and properties, Proteins and nutrition, Functional properties of proteins, Processing induced, physical, chemical and nutritional changes in protein, chemical and enzymatic modification of protein. Lipids in foods: Classification, structure and properties of lipids; Role and use of lipids/fat, use of oils and fats in food formulation. Enzymatic and chemical reactions of fats; Rancidity and its types, detection techniques, chemical aspects of lipids, antioxidants. Vitamins and their importance, Preservatives: Introduction to food preservatives, definition, types natural and artificial preservative and its use, colouring and flavoring reagents of foods.

Practical

To determine moisture content of foods using different methods; To determine crude proteins by micro-Kjeldhal method; To determine essential amino acids i.e. lysine, tryptophan, methionine, etc.; To prepare protein isolate and concentrate of proteins; To determine of acid value, saponification value and iodine number of fat/oil.

APFT 213 Food Microbiology 2 (1+1)

Objectives

To learn about use of microbiology of different foods, food borne toxins and understand spoilage of foods

Theory

Importance and significance of microbes in food science; Sources of microorganisms in foods and their effective control; Factors affecting growth and survival of microorganisms in foods; Intrinsic factors i.e., pH, water activity, nutrients, redox potential, oxygen etc., Extrinsic factors: Relative humidity, temperature, gaseous atmosphere etc. Normal Microbiological

quality of Foods and its significance: milk and milk products, fruits and vegetables, cereals and cereal products, meat and meat products, fish and other sea foods, poultry and eggs; sugar and sugar products, slats and spices and canned foods; Chemical changes caused by microorganisms: Changes in nitrogenous organic compounds, non-nitrogenous organic compounds, organic acids, other compounds, lipids, pectic substances; Shelf life: Calculation of shelf life, Shelf-life requirements, Microbial toxins; Bacterial toxins, fungal toxins, algal toxins and mushroom toxins.

Practical

Isolation of bacteria and molds from foods; Microbial examination of vegetable and fruits: Identification, isolation and confirmation; Microbial examination of milk and milk products: Identification, isolation and confirmation; Microbial examination of sugar, salts and spices: Microbial examination of canned products: Identification, isolation and confirmation; Determination and enumeration of pathogenic and indicator organisms in foods (Coliform/ Enterococcus); Thermal death time determination; Detection of Salmonella from food sample; Detection of coliforms from water by MPN method.

APFT 214 Farming based Livelihood System 3 (2+1)

Objectives

To make the students aware about farming based livelihood systems in agriculture and to disseminate the knowledge and skill how farming based systems can be a source of livelihood

Theory

Status of agriculture in India and different states, Income of farmers and rural people in India, Livelihood-Definition, concept and livelihood pattern in urban and rural areas, Different approaches and framework, Definition of farming systems and farming based livelihood systems Prevalent Farming systems in India contributing to livelihood. Types of traditional and modern farming systems. Components of farming system/ farming-based livelihood systems-Crops and cropping systems, Livestock production, Horticultural crops, Agro--forestry systems, Small-, medium- and large- enterprises including value chains and secondary enterprises as livelihood components for farmers, Commercial farming-based livelihood models by NABARD, ICAR; Case studies on different livelihood enterprises associated with the farming. Risk and success factors in farming-based livelihood systems, Schemes and programs by Central and State Government. Role of farming- based livelihood enterprises in 21st Century in view of circular economy, green economy, climate change, digitalization and changing life style.

Practical

Demostration of farming systems and agricultural based livelihood enterprises; Study of production and profitability of crop based model, Study of production and profitability of livestock based model, Study of production and profitability of food processing based livelihood models, Study of production and profitability of farming based livelihood models; Field visit of innovative farming system model; Visit of Agri-based enterprises and study of

their functional aspects; Study of agri-enterprises involved in industry and service sectors (Value Chain Models), Project concept formulation on farming-based livelihood systems along with cost and profit analysis, Case study of Start-Ups in agri-sectors.

APFT 215 Unit Operations in Food Processing 3 (2+1)

Objectives

To familiarize with Commonly involved unit operations in food processing and differentiate between blanching, pasteurization and sterilization along with application of these unit operations in food product development

Theory

Evaporation: Principles of evaporation, mass and energy balance, factors affecting rate of evaporation, thermodynamics of evaporation. Evaporation equipment: Natural circulation evaporators, horizontal/vertical short tube, natural circulation with external calandria, long tube, forced circulation; single effect, multiple effect evaporators; Fouling of evaporators and heat exchangers; Food freezing: Introduction, freezing point curve for food and water, freezing points of common food materials, Principles of food freezing; Freezing systems; Direct contact systems, air blast immersion; Changes in foods; Frozenfood properties; freezing time, factors influencing freezing time, freezing/thawing time; Freeze concentration: Principles, process, methods; Frozen food storage: Quality changes in foods during frozen storage; Freeze drying: process and equipment; Expression and Extraction: liquid-liquid extraction processes, types of equipment; Leaching: process, types of equipment, Crystallization and dissolution: Theory and principles, Distillation: Principles and methods, Baking: Principles and food baking equipment; Roasting: Principles of roasting, roasting equipment. Frying: theory and principles, method of frying Puffing: Puffing methods and equipment. Blanching: Principles and equipment; Pasteurization: Principles and equipment Methods of heating, Sterilization: Principles, different methods and equipment; Aseptic processing, Homogenization, Emulsification.

Practical

Study of working principle open pan and vacuum evaporator and estimation of heat/mass balance during concentration of liquid foods; Study of single effect evaporator and estimation of heat/mass balance during concentration of liquid foods; multiple effect evaporator, Study of solvent extraction process; Study on crystallization of sugar. To study freezing of foods by different methods IQF freezing; To study simple distillation process; To study the process of roasting; Determination of oil uptake by the food product during frying ; Study of sterilizer /blancher/ pasteurizers/ fryers/ homogenizers/ irradiators.

APFT 216 Processing Technology of Spices and Plantation Crops 2 (2+0)

Objectives

To learn processing technology of different spices and understand post-harvest technology of tea, coffee, cocoa etc.

Theory

Production and processing scenario of spice, flavour and plantation crops and its scope; Major spices: Post harvest technology, composition; Processed products of spices: Ginger, chilli, turmeric, onion and garlic, pepper, cardamom. Equipment for grinding; Minor spices: Herbs, leaves and spartan seasonings and their processing and utilization; All spice, Annie seed, sweet basil; Caraway seed, cassia, cinnamon Clove, coriander, cumin, dill seed; Fennel seed, nutmeg, mace, mint marjoram; Rosemary, saffron, sage; Savory, thyme, ajowan; Asafetida, curry leaves; Postharvest technology for Tea, coffee, cocoa, Vanilla and annatto processing; Post-harvest technology and processing of areca nut, cashew nut, oil palm, coconut. Flavours of minor spices; Flavour of major spices. Spice oil and oleoresins: Extraction techniques; Standard specification of spices; Standards like ESA, ASTA, FSSAI and maintenance of quality by fumigation, CAS and ETO sterilization. Functional packaging of spices and spice products; Byproducts of plantation crops and spices.

APFT 217 Basic Electrical and Electronics Gadgets and Instruments 2 (1+1)

Objective

To enable the students to take up repair and maintenance of different common electrical gadgets and instruments.

Theory

Introduction to different electrical appliances used in agricultural buildings, structures and farm operations. Diode and its applications: Rectifier, Clipper, Clamper, voltage multiplier and capacitive filter zener diode as voltage regulator. Transistor and its applications: Bipolar junction transistor, operating point. Various biasing methods, fixed, self-biasing and potential divider biasing method; OP-AMP, Ideal OP-AMP characteristics. Introduction to digital electronics and logic gates: Basic theorem of boolean algebra, combinational logic circuits (basic gates, SOP rule and K-map), binary adder. Principles of general instruments, measurement of displacement, temperature, velocity, force and pressure using different instruments like strain gauges, load cell, thermistors, thermocouples, pyrometer, linear variable differential transformer (LVDT), capacitive transducers, RTD, instruments for measurement of speed, wind velocity, solar radiation, anemometer, multimeter, etc.

Practical

Basic Electrical and Electronics Gadgets

To prepare an electrical switch board to control two light points, one plug point, one fan point and fuse (House wiring); To prepare an electrical switch board to control two light points using two two-way switch (staircase wiring); To connect and test a fluorescent lamp; To find faults and repair home appliances such as heater, electric iron, fans and mixer-grinder, etc.; To find faults and repair UPS; To measure the power requirement and power factor in a AC single phase series RLC circuit; To measure energy of a single phase AC circuit with the help of ammeter, voltmeter and power factor meter and energy meter; To measure the power consumption in a three-phase circuit using two-wattmeter method.

Instrumentation

To prepare a DC power supply unit using diode and filter circuit; To study the Zener diode as voltage regulator circuit; To study transistor characteristics in CE configurations; To verify different logic gates; To measure unknown resistance using Wheatstone bridge; To measure the displacement and to determine the characteristics of LVDT; To measure the displacement using LVDT and potentiometer; To measure the pressure using strain gauge and Bourdentube; To measure the temperature using RTD, thermistors and thermocouple and study their characteristics; To measure the speed, wind velocity, solar radiation etc, using different measuring tools like tachometer, anemometer, pyranometer, multimeter, etc.; To acquaint with different other types of instruments used in agriculture and food processing applications.

APFT 218 Computer Programming and Data Structures 2 (0+2)

Objective

To make the students conversant on computer programming languages, specifically C language as well as to make him familiar with programming for simple agricultural engineering applications

Practical

Introduction to high level languages; Structure programming, C programming, a simple C programming, execution of a C program, program and instruction; Familiarizing with Turbo C IDE; Building an executable version of C program; Study of different operators such as arithmetic, relational, logical, assignment, increment and decrement, conditional, bitwise and special operators, precedence of arithmetic operators; Debugging a C program; Developing and executing simple programs; Creating programs using decision making statements such as if, go to and switch; Developing program using loop statements while, do and for; Using nested control structures; Familiarizing with one and two dimensional arrays; Using string functions; Creating user defined functions; Introduction to structures, union, pointers, linked list and queues.

Semester-IV

APFT 221 Post-Harvest Engineering of Cereals, Pulses & Oilseeds 3 (2+1)

Objectives

To understand the basic post-harvest operations and use of material handling equipment

Theory

Overview of Post-Harvest Technology. Post-harvest losses, reasons for losses, importance of loss reduction, Post-Harvest Handling operations.

Cleaning; Cleaning of grains, types of cleaners, screens, types of screens, rotary screens, vibrating screens, machinery for cleaning of fruits and vegetables (air cleaners, washers),

cleaning efficiency, care and maintenance; Sorting, grading, methods of grading; Size grading, colour grading, specific gravity grading; screening, equipment for grading of fruits and vegetables, Magnetic separator, destoners, electrostatic separators, pneumatic separator. Decorticating and Shelling; Principles of working, decorticators/dehullers/shellers, Milling, polishing, grinding, milling equipment, de-huskers, polishers (abrasion, friction, water jet), oil expellers,

Materials Handling; Introduction to different conveying equipment used for handling of grains; Classification, principles of operation, conveyor system selection; Belt conveyor: Principle, characteristics, inclined belt conveyors, idler spacing; Chain conveyor: Principle of operation, advantages, disadvantages; Screw conveyor: Principle of operation, capacity, inclined and vertical screw conveyors; Bucket elevator: Principle, classification, operation, advantages, disadvantages, buckets types, power requirement; Pneumatic conveying system: types, air/product separators; Gravity conveyor, capacity and power requirement.

Practical

Study of cleaners for grains; Study of graders for grains; Study of decorticators; Study of a maize/ sunflower sheller; Study of vacuum dryer; Study of working principle of spray dryer and spray drying process; Study of drum dryer and liquid food dehydration using drum drying; Study of fluidized bed dryer and drying process; Study of freeze dryer and freeze drying process; Study of rice milling machines; Study of pulse milling machines; Study of different components of flour mill; Study of different materials handling equipment.

APFT 222 Post-Harvest Engineering of Horticultural Crops 3 (2+1)

Objectives

To understand the basic post-harvest operations and preservations of fruit and vegetables

Theory

Production and processing scenario of fruits and vegetables in India and world; Scope of fruit and vegetable processing industry in India; washing of fruits and vegetables. Overview of principles and preservation methods of fruits and vegetables; Supply chain of fresh fruits and vegetables; Primary processing and pack house handling of fruits and vegetables; equipment for grading of fruits and vegetables. Peeling, slicing, cubing, cutting and other size reduction operations for fruits and vegetables; Minimal processing of fruits and vegetables; Blanching, Canning; FSSAI specifications of fruits and vegetables based processed products; Processing and equipment for manufacture of jam, jelly and marmalades, candies, chutney, pickles, sauce, puree, paste, ketchup, toffee, cheese, leather, dehydrated, wafers and papads, powders; Production of pectin and vinegar, By-products of fruit and vegetable processing industry

Practical

Primary processing of selected fruits and vegetables; Study of washers for fruits and vegetables; Canning of Mango/Guava/ Papaya; Preparation of jam from selected fruits; Preparation of jelly from selected fruits; Preparation of fruit marmalade; Preparation of RTS;

Preparation of squash; Preparation of syrup; Preparation of raisins, dried fig and dried banana; Preparation of anardana; Preparation of pickles; Preparation of dried ginger; Preparation of dried onion and garlic; Preparation of banana and potato wafers; Preparation of dehydrated leafy vegetables; Visit to fruits and vegetables pack house, canning plant, vegetable dehydration plant.

APFT 223 Food Biochemistry and Nutrition 3 (2+1)

Objectives

To gain an understanding of nutrition and diets and understand metabolic pathways for different biomolecules in human body

Theory

Concepts of Food and Nutrition; Functions of food; Basic food groups; nutrients supplied by food; Water and energy balance, water intake and losses, basal metabolism; Formulation of diets, classification of balanced diet, preparation of balanced diet for various groups; Recommended dietary allowances for various age groups; Malnutrition; Assessment of nutritional status; Potentially toxic substance in human food; Mechanism of Enzyme action; Introduction to enzyme and characteristics, coenzymes, Nucleic acids, structures of various components of DNA and RNA.

Introduction to carbohydrates metabolism, glycolysis, TCA cycle; Metabolism of Lipids; Introduction to lipid metabolism, β-oxidation of long chain fatty acids; Biosynthesis of fatty acids, triglycerides and phospholipids; Introduction to protein metabolism, Fixation of Nitrogen. Deficiency of Vitamins A &D, Vitamins E and K and water-soluble vitamins.

Practical

Preparation of various solutions and buffers; Qualitative and quantitative determination of carbohydrates; Qualitative and quantitative determination of amino acids; Qualitative and quantitative determination of proteins; Qualitative and quantitative determination of lipids; Estimation of sugars by Anthrone method; Estimation of protein by Lowry method; Estimation of amino acid using Biuret reaction; Determination of calcium in food samples.

APFT 224 Food Thermodynamics 3 (2+1)

Objectives

To have an idea about basic concepts of energy and laws of thermodynamics and knowledge about thermodynamic cycles and their application

Theory

Basic concepts: definitions, approaches, thermodynamic systems, thermodynamic properties and equilibrium, state of a system, state diagram, path and process, different modes of work, Zeroth law of thermodynamics, concept of temperature, heat. First law of thermodynamics: Energy, enthalpy, specific heats, applications of first law, steady and unsteady flow analysis.

Second law of thermodynamics: Kelvin-Planck and Clausius statements, reversible and irreversible processes, entropy, availability and irreversibility. Properties of Pure Substances: Thermodynamic properties of pure substances in solid, liquid and vapor phases, P-V-T behaviour of simple compressible substances, phase rule. Thermodynamic cycles: Carnot vapor power cycle, ideal Rankine cycle, air standard Otto cycle, air standard Diesel cycle, vapor-compression refrigeration cycle. Psychometry: thermodynamic properties of moist air, Psychometric processes, Three stages of water, phase diagram for water, vapour pressure-temperature curve for water, heat requirement for vaporization, measurement of humidity.

Practical

Demonstration and application of zeroth law of thermodynamics; first law of thermodynamics; and second law of thermodynamics. Study of vapour compression refrigeration test rig; heat pump; properties of wet, dry, saturated and superheated steam; Use of steam tables and Moiler charts; dryness fraction of steam; use of psychometric chart for humidification, dehumidification, heating and drying; Determination of thermodynamic properties on psychometric charts; study of steam trap and steam line layouts; Visit to food plant with steam utilization.

APFT 225 Dairy and Food Engineering 2 (1+1)

Objective

To make the students acquainted with the different unit operations in processing and value addition of different dairy and food products

Theory

Unit operations in milk processing: Engineering, thermal and chemical properties of milk and milk products; Principles and equipment related to receiving of milk, pasteurization, sterilization, homogenization, cream separation, preparation of butter, cheese, paneer and ice cream. Filling and packaging of milk and milk products, Thermal processing: different types of retorts and continuous sterilizers, canning process, aseptic processing. Mixing: Theory of mixing of solids and pastes, mixing index, mixers for solids, liquid foods and pastes, viz. tumbling mixer, screw mixer, ribbon mixer, liquid mixers, sigma-blade mixer, anchor and gate agitator; Separation processes: principle and equipment for sedimentation of solids in liquid and solids in air; Principle and operation of tubular bowl centrifuge and disc bowl centrifuge; Filtration: principle, construction and working principles of different types of filters as plate and frame filter press, shell and leaf filter, centrifugal filter, rotary drum filter, continuous belt filter; Membrane separation: principle, characteristics and applications

Practical

Preparation of flow charts for different food processing industries; Study of different parts of retort and canning process; Study of different types of mixers for solids and liquids; Study of settling and sedimentation process in a tank; Study of different types of filters; Study of membrane modules and different types of membranes; Study of measurement of different properties of milk and milk products; Study of milk pasteurizer, sterilizer and homogenizer;

Study on preparation of cream and butter; Study of preparation of cheese, paneer and ice cream; Study of different types of packaging materials; Study of different types of filling machines for liquids and powder/ granules; Study of layout of a food processing plant; Visit to food processing industries and dairy plants to study the plant layout and unit operations.

APFT 226 Food Packaging Technology and Equipment 2 (2+0)

Objectives

To understand concept of packaging, its type and properties of packaging materials and to gain knowledge about intelligent, smart and active packaging

Theory

Need of packaging; Package requirements, package functions; Properties of different packaging materials; Package materials: Classification of packages, paper as package material, advantages and disadvantages; Glass as package material, advantages, disadvantages; Metal (Aluminum/ tin/SS) as package material, advantages, disadvantages, Plastic as package material, classification of polymers, properties of each plastics, uses of each plastics; Aseptic packaging: Need, advantages, process, comparison of conventional and aseptic packaging, system of aseptic packaging and materials used in aseptic packaging; Permeability: Theoretical considerations, permeability of gases and vapours; Permeability of multilayer materials; Permeability in relation to packaging requirement of foods; Intelligent/Smart/Active packaging systems and their food applications, CAP/MAP; Edible packaging- Types and sources; Microwavable packaging- Types and applications. Packaging practices followed for fruits and vegetables and their products, packaging machines, Filling machines, vacuum packaging machines. Bottle fillers, fillers for dry mixers, ice-cream fillers, Form fill and seal (FFS) machines, vacuum packaging machine, shrink wrap packaging machine, Aseptic tetra pack system; Labelling requirements, methods of coding and regulation and standards of labelling of food packages.

APFT 227 Environmental Studies and Disaster Management 3 (2+1)

Objective

To expose and acquire knowledge on the environment and to gain the state-of--art-skill and expertise on management of disasters

Theory

Environmental StudiesIntroduction to Environment - Environmental studies - Definition, scope and importance- Multidisciplinary nature of environmental studies ; Natural Resources: Classification of resources ; Ecosystems - Concept of an ecosystem - Structure and function of an ecosystem - Energy flow in the ecosystem ; Biodiversity and its conservation: Introduction, definition, types. Biogeographical classification of India ; Environmental Pollution: Definition, cause, effects and control measures; Solid Waste Management: Classification of solid wastes and management methods ; Social Issues and the Environment ; Water conservation, rain water harvesting, watershed management. ; Environmental ethics: Issues and possible solutions,

climate change, global warming, acid rain, ozone layer depletion, nuclear accidents ; Environment Protection Act , Human Rights, Value Education. Women and Child Welfare

Disaster management : Disaster definition - Types – Natural Disasters - Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions ; Man Made Disasters - Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, road accidents, rail accidents, air accidents, sea accidents ; Central, state, district and local administration in disaster control

Practical

Visit to a local area to document environmental assets river/forest/grassland/hill/mountain. Energy: Biogas production from organic wastes. Visit to wind mill / hydro power / solar power generation units. Biodiversity assessment in farming system. Floral and faunal diversity assessment in polluted and un polluted system. Visit to local polluted site - Urban/Rural/Industrial/Agricultural to study of common plants, insects and birds. Environmental sampling and preservation. Water quality analysis: pH, EC and TDS. Estimation of Acidity, Alkalinity. Estimation of water hardness. Estimation of DO and BOD in water samples. Estimation of COD in water samples. Enumeration of *E. coli* in water sample. Assessment of Suspended Particulate Matter (SPM). Study of simple ecosystem- Visit to pond/river/hills. Visit to areas affected by natural disaster.

APFT 228 Food Plant Utilities and Services 2 (1+1)

Objectives

To gain knowledge of various Utilities and services required in a food processing plant

Theory

Classification of Various Utilities and Services in food Plant/ industry. Commercial energy Pricing; Electrical System- Introduction to electric power supply systems, electrical billing, electrical load management and maximum demand control, power factor improvement and benefits, transformers, system distribution losses, harmonics, trouble shooting of electrical power system. Electrical motors- Types, losses in Introduction motor, motor efficiency, factors affecting motor performers, performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors. Compressed air system - Requirement, types, compressor efficiency, efficient compressor operation, compressed air system components, capacity assessment, leakage test, factors affecting the performance and efficiency. HVAC and Refrigeration system - Requirement, vapor compression refrigeration cycle, refrigerants, coefficient of performance, capacity, factors affecting refrigeration and air conditioning system performance and saving opportunities. Vapor absorption refrigeration system: Working principle, types and comparison with VCR system, saving potential; Fans and blowers - Requirement, types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities, Pumps and pumping systems- Requirement, types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities. DG set system- Requirement, introduction, factors

affecting selection; Fuels and combustion - Introduction to fuels; properties of fuel oil, coal and gas; storage; handling and preparation of fuels; principles of combustion, combustion of oil, coal and gas; draft system. Boilers- Boiler specification, Indian boiler regulation, system components, types, combustion in boilers, performance terms, analysis of losses, feed water treatment, blow down, energy conservation opportunities; Steam system - Properties of steam, assessment of steam distribution losses, steam leakage, steam trapping, condensate and flash steam recovery system, opportunities for energy savings; Waste heat recovery - Classification, advantages and application, commercially viable waste heat recovery devices, saving potential; Other utilities and services- Lighting, CIP system, waste water/drainage, water treatment, dust removal, fire protection and maintenance system.

Practical

Study on energy basic, types, forms, terms and measuring instruments used in food plant utilities.; electrical power supply system, billing and load estimation; Motors and variable speed drives specification, selection, performance terms and definitions; compressed air system components and performance terms and definitions; refrigeration and HVAC system components, performance terms and definitions and load estimation of a plant; fans and blowers, types, specification, performance terms and definitions. Pumps types, specification, selection, performance terms and definitions; plant lighting system and their components; DG system their specification and selection; combustion of oil, gas and coal; boiler performance terms and assessment. Study on cost of steam; waste heat recovery devices. Recuperates, Regenerators, Heat wheel, Heat pipes, Economizers, Heat exchanger (Shell and tube, PHE, run around coil exchanger, direct contact HX), Waste heat recovery boilers, Heat pumps and Thermo compressor. ClP system components; water treatment plant; effluent treatment plant; fire control operations and use of fire extinguishers.

Semester-V (Skill Enhancement Courses)

APFT 311 Operation and Maintenance of Agro/Food Processing Equipment 4 (2+2)

Objective

To develop Skill for Employment and Entrepreneurship in Agriculture and Food Industry and to gain complete hands on experience on these skill areas.

Theory

Acquaintance with different unit operations involved in agro-processing. Type and utility of different cleaning and grading equipment, rice and pulse milling machineries, flour mills, pulverisers, boilers, pasteurizer and sterilizer, canning machineries and packaging machineries; their principle of working, repair and maintenance; factors affecting the performance of the equipment.

Practical

Cleaning and grading of agricultural commodities: operation and maintenance of different cleaners, graders and destoners; operation and maintenance of dehusker, dehuller, degermer

and dryer. Operation and maintenance of rice mill, dal mills and oil mill machineries. Operation and maintenance of flour mills and pulverisers, pasteurizer and sterilizer, peeler, slicer, pulper and juicer. Operation and maintenance of canning and packaging machineries.

APFT 312 Processing and Value Addition including Cold Chain Management 4 (2+2)

Objective

To gain complete hands on experience on primary processing and value addition including cold chain logistics

Theory

Primary processing of major cereals including the millets. Preparation of value added products from cereals and millets. By-products processing of cereals and millets; Preparation of nutritious infant foods from cereals and millets; Breakfast cereal foods: Preparation of flaked, puffed, expanded, extruded and shredded products.

Refrigerated transport: Handling and distribution, cold chain, refrigerated product handling, order picking, refrigerated vans, refrigerated display. Low temperature Refrigeration: cryogenic fluid and fluid properties; liquefaction; application in food. Winter/summer/year round air-conditioning, unitary air-conditioning systems, central air-conditioning, physiological principles in air-conditioning, air distribution; humidifiers and dehumidifiers.

Practical

Morphological characteristics of cereals; Physical and chemical properties of cereals. Production of sorghum flakes; Production of popcorns, flaked rice, puffed rice, noodles; Preparation of sorghum mal. Processing of value added products from millets; Visit to Cereal processing unit.

Study of direct and indirect contact freezing equipment for foods; Study of spray freezing process for foods; Study of food cold storage; Study of refrigeration system of dairy plant; Study of cooling system for bakery; Study of refrigerated van; Study of deep freezing and thawing of foods; Study of refrigerated display of foods.

APFT 313 Introduction to Manufacturing of Bakery Products 2 (0+2)

Objective

To gain complete hands on experience on the preparation, packaging and storage of bakery and confectionary products and also to understand extrusion technology and its application in production of breakfast cereals and snacks

Theory

Bakery products- Types (leavened and unleavened), specifications, compositions and ingredients (flour, sugar, fat, shortening, leavening agent etc.); Processing technology of bread, biscuits and cakes. Classification of biscuits and manufacturing process of crackers

Confectionery and chocolate products: Types, specifications, compositions, ingredients, formulations; Extrusion technology and applications in food processing; Snack foods: Types, specifications, compositions, ingredients, Formulations, processing, equipment, packaging, storage and quality testing; Snack food seasonings. Breakfast cereals, macaroni products and malts: Specifications, compositions, ingredients; Formulations, processing, equipment for breakfast cereals, macaroni and malts; Packaging, storage and quality testing for breakfast cereals, macaroni and malts. Cooked corn products- tortilla chips; Oils and industrial frying. Preservatives used in Bakery, Confectionery and snack products preservation.

Practical

Identifications and composition of various ingredients for snacks, bakery and confectionery products; Flours, their classifications and characterization; preparation, packaging and quality evaluation of s Formulations, processing (mixing, fermentation, rounding, proofing, sheeting, moulding, baking, de-panning etc.), equipment, packaging, storage. Selected snack items; preparation, packaging; Processing of chocolate- types cocoa beans and processing, other ingredients, mixing refining, conching, storage and packaging. Processing, equipment, packaging, storage and quality testing of confectionery and chocolate products. Product quality characteristics. Visit to bakery, confectionary and snack units (industry).

APFT 314 Storage Technology of Food Grains 4 (2+2)

Objective

To gain complete hands on experience on the storage of cereal product, snacks and its management

Theory

Conversant with technical terms of grain storage; Study on optimal moisture content and temperature for storage of important food grains. Acquaintance with different factors for grain deterioration during storage and main insects of stored commodities; Cleaning, drying and aeration of stored products; Moisture content and its importance in grain storage; Different types of traditional and modern storage structures; Storage of perishable commodities; Constructional features, maintenance, sanitation and hygiene of warehouses.

Practical

Measurement of temperature, relative humidity, grain sampling and moisture content measurement, grain quality; Acquaintance with warehouse equipment and different storage structures; Determination of dimension of warehouse for bag storage; Study on integrated pest management, chemical and non-chemical pest and rodent control, measures in grain storage system, Detection methods of insect infestation in food grains and prevention and control of storage fungi; Acquaintance with inventory, logistics, and collateral management; Guideline for procurement and disposal of food grains; Quality control of food grains.

APFT 315 Basic Food Analysis Laboratory Techniques 2 (0+2)

Objective

To learn various instruments used for food analysis and gain knowledge about various equipment and their working for those analyses

Theory

Concepts of food analysis; Rules and regulations of food analysis Principles and methodology involved in analysis of foods: Rheological analysis, textural profile analysis of foods, Methods of analysis: Proximate constituents: Total fat, crude fiber, protein, moisture, minerals analysis; adulterations. Principles and methodology involved in analytical techniques: spectroscopy, ultraviolet visible, infrared spectroscopy, atomic absorption and emission, florescence mass spectroscopy. Food compositional analysis and applications in the food industry. Chromatography and Separation techniques. Solid-state sensors for pH, acidity, amperometric, potentiometric and; Acoustic sensors, Rapid microbiological methods: Overview, Conductance/impedance techniques for microbial assay; chemosensors, biosensors, immunosensors.

Practical

Sampling plan; Sample collection and preparation for analysis; Sensory evaluation of products; Quality evaluation of raw materials: Fruits, vegetables, cereals, dairy products, meat, poultry products; Quality evaluation of food products for color and taste of marketed products; Analysis of heavy metals using atomic absorption spectrophotometer; Estimation of physic acid using spectrophotometer; Separation of amino acids by two-dimensional paper chromatography; Identification of sugars in fruit juice using TLC; Separation of pralines by ion- exchange chromatography; Molecular weight determination using sephadox-gel; Identification of organic acids by paper electrophoresis; Gelelectrophoresis for analytic techniques; Quantitative determination of sugars and fatty acid profile by GLE, GCMS; Quantitative make-up of water and fat soluble vitamins using HPLC; Fatty acid profiling using gas chromatograph; Separation of sugars by paper chromatography; Analysis of wheat flour; Analysis of foods for pesticide and drug residues; Study of colorimetry and spectrophotometry; Spectrophotometric method of total chlorophyll (A and B).

APFT 316 Technical Report Writing 2(2+0)

Grammar : Language in use in terms of synonyms, antonyms, acronyms etc., Wordblending, Common-error and Correct English Usage's, Types of Writing, -stress on technical/ scientific Writing, Dissertation or Thesis Writing, Study of International Standard of Technical Report Writing, Review of literature models, reference-cards preparation etc.

Communication: Different Speech Acts, Public Speaking and Seminar Presentation.

Applied Topics: Guidance in particular Competitive Exams Such as GMAT, GRE, TOEFL, and BSRB Etc.

APFT 317 Seminar 1(0+1)

Students' seminar on Agricultural Processing and Food Technology.

Semester-VI

APFT 321 Industrial Training & Experience 20 (0+20)

Objective

To gain complete hands on experience on the procurement, production and analysis of various raw material and valued added food products

Practical

In a time of rapid population growth, shifting dietary trends, and mounting environmental challenges, the importance of agro-processing and food technology is paramount. This course is designed to tackle the diverse challenges facing the food and agro-based industries today. It emphasizes a comprehensive approach to food technology education, integrating theoretical knowledge, practical skills, and ethical considerations. A key component of the program is the sixth-semester industry placement, where students will be assigned to leading agro-based food industries. During this period, they will gain hands-on experience in various processing operations and analytical techniques, equipping them to contribute effectively to both the industry and the society.