Bilaspur University, Bilaspur (C.G.)

Department of Food Processing and Technology

Scheme and Syllabus of B.Sc. (FPT)

Presented for approval in Board of Studies (Food Processing and Technology) and Academic Council (For implementation in session 2016-2017 and onwards)

B.Sc. (Food Processing & Technology)

(Six Semester Course)

SCHEME OF B.SC (FPT) SEMESTER-I

Course code	Course Name	Credit	Internal assessment	External assessment	Total Marks
CHE-111	General Chemistry	5	25	75	100
MIC-112	General Microbiology	5	25	75	100
FPT-113	Basic Food Science	5	25	75	100
COM-114	Communication Skills	5	25	75	100
FPT-115	Basic Food Science Lab.	2.5	13	37	50
MIC-116	General Microbiology Lab.	2.5	13	37	50
	Total	25			500

SCHEME OF B.SC (FPT) SEMESTER-II

Course code	Course Name	Credit	Internal assessment	External assessment	Total Marks
PHY-121	General Physics	5	25	75	100
CHE-122	Basic Biochemistry	5	25	75	100
FPT-123	Engineering Properties of Food Materials	5	25	75	100
EVS-124	Environmental Studies	5	25	75	100
FPT-125	Laboratory Course-I	5	25	75	100
	Total	25			500

SCHEME OF B.SC (FPT) SEMESTER-III

Course code	Course Name	Credit	Internal assessment	External assessment	Total Marks
FPT-211	Unit Operations in Food Processing	5	25	75	100
CHE-212	Food Chemistry	5	25	75	100
FPT-213	Food Processing and Preservation	5	25	75	100
STAT-214	Element of Statistics	5	25	75	100
FPT-215	Laboratory Course-II	5	25	75	100
	Total	25			500

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SCHEME OF B.Sc. (FPT) SEMESTER-IV

Course Code	Course Name	Credit	Internal assessment	External assessment	Total Marks
FPT-221	Technology of Fruits and Vegetables Processing	5	25	75	100
MIC-222	Food Microbiology	5	25	75	100
FPT-223	Milk and Milk products	5	25	75	100
CS-224	Fundamental of Computers	5	25	75	100
FPT-225	Laboratory Course-III	5	25	75	100
	Total	**25**			**500**

SCHEME OF B.Sc. (FPT) SEMESTER-V

Course code	Course Name	Credit	Internal assessment	External assessment	Total Marks
FPT-311	Food Packaging	5	25	75	100
FPT-312	Agricultural Waste and By-Products Utilization	5	25	75	100
FPT-313	Food Safety & Quality Systems	5	25	75	100
FPT-314	Skill Development and Seminar	5	25	75	100
FPT-315	Laboratory Course-IV	5	25	75	100
	Total				**500**

SCHEME OF B.Sc (FPT) SEMESTER-VI

Course code	Course Name	Credit	Internal assessment	External assessment (Report & Viva)	Total Marks
FPT-321	Rural Linkage to Food System	10	50	150	200
FPT- 322	In-Plant Training	15	75	225	300
	Total				**500**

CHOICE BASED CREDIT SYSTEM						
S. No.	Subjects	Semester	Credits/ Marks	Subject offering for	Number of Seats	Scope of Subjects
1	General Physics	II	5/100	Students studying in UG/PG	5	To study about various physical quantities and their conversions.
2	Unit Operation in Food Processing	III	5/100	Students studying in UG/PG	5	To study about all unit operation during food processing
3	Food Packaging	V	5/100	Students studying in UG/PG	5	To Study about various food packaging systems.

B.Sc. (Food Processing and Technology)

DETAILED SYLLABUS OF B.Sc (FPT) 1ST SEMESTER

CHE-111 GENERAL CHEMISTRY

UNIT 1

Atomic Structure: Introduction, dual nature of the electron, Heisenberg's Uncertainty Principle, Quantum-mechanical model of atom, Wave mechanical model of hydrogen atom, concept of atomic orbitals, electron spin, Pauli Exclusion Principle, Aufbau Principle.

UNIT 2

Chemical bonding: Electronic theory of valency, Ionic or Electrovalent bond, Covalent bond, coordinate bond, van der waals or intermolecular forces, hydrogen bond, metallic bond, resonance, valence bond theory for covalence, hybridization, VSEPR model and molecular shapes, molecular orbital theory, shapes of molecular orbitals, energy level diagrams for some diatomic molecules/ions.

UNIT 3

Solutions: Introduction, Modes of expressing concentration of solutions, vapour pressure of a liquid, Raoult's law, Liquid-liquid equilibria, Ideal and non-ideal solutions, Azeotrope, Distillation of miscible liquids—theory of fractional distillation, Colligative properties, thermodynamics of the mixture, Henry's law,

UNIT 4

Organic Chemistry I: Structures and nomenclature of organic compounds, Types of reactions of organic compounds: substitution, addition, elimination, redox, and rearrangements, Electron delocalization, alkanes, cycloalkanes and aromatic hydrocarbons: structure of benzene, reactions of benzene, The Grignard reagent, Stereoisomerism.

UNIT 5

Organic Chemistry II: Chemistry of functional groups: alkenes, hydrogenation, alkynes, alkyl halides, alcohols and ethers, phenols, aldehydes and ketones: Cannizzaro reaction, Diels-Alder reaction, Carboxylic Acids, Amines, Hofmann degradation of amides.

TEXT BOOKS/ REFERENCES:

1. Organic Chemistry (7th Ed) Morrison, Boyd & Bhattacharjee, Pearson.
2. Engineering Chemistry (15th Ed) Jain & Jain. Dhanpat Rai Publishing Company.
3. A Textbook of Engineering Chemistry M M Uppal Khanna Publications.

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MIC-112 GENERAL MICROBIOLOGY

UNIT-1
History and scope of Microbiology, discovery, importance and relevance of microorganisms. Microscopy: basic techniques of Microscopy optical and electron techniques of microscopy staining and its types.

UNIT-2
Microbial Control: sterilization and disinfection techniques. Physical and chemical methods of sterilization.

UNIT-3
Important cultural characteristics of Bactaria, Virus, Fungus and algae. Culture of micro-organisms culture media natural complex, semi defined, synthetic media, minimal media. General and selective media, Anaerobic cultures.

UNIT-4
Isolation and preservation of pure cultures. Pour plate method, streak plate spread plate and single cell isolation, micromani pulator and capillary pipette method.

UNIT-5
Applications – Food microbiology, Agriculture microbiology, Medical microbiology, Industrial microbiology Environmental and Biotechnology microbiology.

TEXT BOOKS/ REFERENCES:

1. Microbiology (5th Ed) by M. J. Pelczar, E. C. S. Chan and Noel R. Krieg. Tata McGraw-Hill.
2. Microbiology by R. P. Singh Kalyani Publishers.
3. General Microbiology Vol I & II by Pawar & Dhaliwal Himalaya Publication.

FPT-113 BASIC FOOD SCIENCE

Unit 1

Introduction to Food Science, Different kinds of Food Industries, Components of Food industries. Scope of food processing and technology.

UNIT 2

Food constituents: Carbohydrates, lipids, proteins, vitamins and minerals, water. Nutritional and chemical properties of food constituents and its function.

UNIT 3

Introduction to Food preservation techniques. Define: Pasteurization, Sterilization, Ultra High temperature, Blanching, etc. Low temperature preservation techniques: Cooling, Evaporation, refrigeration and freezing.

UNIT 4

Definition of chemical preservatives and types. Introduction to new techniques in preservation of food like High Pressure Processing, Ohmic heating, Pulse electric field processing, Irradiation etc. Drying and their importance in the food processing.

UNIT 5

Basic introduction to unit operation in Food Processing and define the term Cleaning, dry cleaning methods, wet cleaning methods, peeling, grading, sorting.

Text books/ References:

1. Food Science by Norman N Potter and Joseph H. Hotchkiss, CBS Publishers and Distributors.
2. Advanced Textbook on Food and Nutrition by Dr. M. Swaminathan Vol: I & II, The Bangalore Printing and Publishing Co. Ltd.
3. Food Facts and Principles Many N. S. & Shadakshasawamy M. New Age International Publishers.

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COM-114 COMMUNICATION SKILLS

UNIT-1

FUNDAMENTAL OF COMMUNICATION: Definition, Importance, Process, Forms of communication, Dimension of communication, Channels of communication, Barriers of communication, Qualities of good communicator.

UNIT-2

Verbal and Non-Verbal Communication:Audio/Visual Communication, Effective Speaking, Interpersonal Communication, Non-Verbal Communication: Kinesics, Proximics, Paralanguage, Activity: Short Classroom presentation.

UNIT-3

Listening Skill and Self-Assessment: Definition and Importance, Intelligent Listening, Barriers of Listening and qualities of overcoming barriers, SWOT analysis,

UNIT-4

Writing Skills: Use of Grammars, brief description & detailed Illustrations, Business correspondence, Presentations, Report Writing, Projects, notice and Circulars.

UNIT-5

Effective Uses of Communication Skills (Practical Approach) Basics of Phonetics, Presentation Skill-Do's and Dont's, Extempore, Debate, Role Plays, Interview, Group Discussion. Information Communication Technology.

Text books/ References:

1. P K Agrawal and A K Mishra, Business Communication, Sahitya Bahwan Publication.
2. Vinod Mishra and Narendra Sukla, Business Communication, SBPD Publishing House.
3. N Gupta and P Mahajan, Business Communication, Sahitya Bahwan Publication.

FPT-115 BASIC FOOD SCIENCE LAB

1. Determination of moisture content of wheat flour.
2. Determination of ash content of wheat flour sample.
3. Determination of lipid content of soybean seeds.
4. Determination of protein content of wheat flour/ground nut.
5. Determine the total soluble solids of different food samples (e.g. jam, jelly & marmalade).

MIC-116 GENERAL MICROBIOLOGY LAB

1. To isolate microorganism form air by expose plate method.
2. To prepare agar slant and agar for culturing bacteria.
3. To enumerate bacterial colonies by plate count method.
4. To study method of obtaining pure culture of micro-organism.
5. (a) To perform simple staining to identify bacteria on the basis of their cell shape.
   (b) To perform differential staining to identify bacteria on the basis of their cell wall.

PHY-121 GENERAL PHYSICS

UNIT 1

Units and measurement: Measurement in science, fundamental quantities and units, derived units, systems of units (CGS, FPS, MKS and SI: Base units, SI prefixes), concept of dimension, dimensional formulae's (velocity, acceleration, area, volume, force, density, momentum, work, pressure and co-efficient of viscosity), conversion of units from one unit to another.

UNIT 2

Basic laws in physics: Newton's law of motion- first law, second law and third law; friction- coefficient of static and kinetic friction; calorimeter, latent heat, specific heat, entropy, enthalpy; the law of thermodynamics- first law, second law and third law; laws of gases (Boyle's law, Charles's law and Gay-lusaac law).

UNIT 3

Laser: definition, spontaneous and stimulated emission, characteristics of the laser radiation (coherence, mono-chromaticity, high directionality, and extreme brightness); population inversion (inverted population), pumping and active system; ruby laser: construction, working and energy levels; gas laser: construction, working and their energy levels; CO_2 laser: vibrational mode of CO_2, design and mechanism of CO_2 laser and energy level in CO_2 laser; Application of laser (in bar code reading, environmental study, welding industry, military activities, sensor devices, printing, medical and surgery).

UNIT 4

Crystal structure: Space lattice, the basis of crystal structure, unit cell, seven crystal systems, bravais space lattices crystal structure (SC, FCC and BCC), classification of crystal based on nature of forces, number of atoms per unit cell, lattice plane and miller and their indices, coordination number, atomic radius, packing factor.

UNIT 5

Radioactivity and nuclear detector: radioactivity, nature of nuclear radiations, characteristics properties of radioactive- radiations, properties of α, β, and γ rays, difference between natural and artificial radioactivity, law of radioactive disintegration, half life period, measurement of rate of decay and half life with examples, isotopes and isobars, artificial radioactivity, artificial transmutation- Rutherford's experiment, Nuclear detectors- proportional counter (working and ionization characteristics), Geiger-Muller counter (construction, counts per minute, quenching and count rate).

TEXT BOOKS/ REFERENCES:

1. Engineering Physics by R K Gaur and S L Gupta, Dhanpat Rai Publications, New Delhi.
2. Physics by Rresnick, Halliday and Krane (5th Edition) Volume-I & II.
3. Engineering physics: Theory and experiments by S K Srivastava and R A Yadav.
4. Electricity and Magnetism by A S Mahajan & A A Rangwala Tata McGraw Hill Publishing Co. Ltd.

CHE-122 BASIC BIOCHEMISTRY

UNIT 1

Chemical constituents of life: Cell, eukaryotic and prokaryotic cell; Biomolecules: Carbohydrates- structure of monosaccharide, disaccharides, polysaccharides, homo-polysaccharides (starch, dextrin & glucose), hetero poly-saccharides; Proteins- Amino acids, structure of amino acids, properties of protein, denaturation, classification of protein; Lipids-fatty acids, essential fatty acid and triglycerides.

UNIT 2

Enzymes: Introduction, classification, structures and functions; Co-enzymes and co-factors; Active site; Mechanisms of enzyme action; Factors affecting enzyme activity; Specificity of enzymes; Enzyme inhibition; Isozymes.

UNIT 3

Metabolism: Introduction to metabolism, metabolism of carbohydrates, metabolism of lipids, metabolism of amino acids, integration of metabolism, metabolism of nucleotides, mineral metabolism. Insulin, glucose homeostasis and diabetes mellitus.

UNIT 4

Metabolism of lipids: fatty acid oxidation, ketone bodies, biosynthesis of fatty acids, metabolism of phospholipids, glycolipids, cholesterol, lipoproteins, metabolism of HDL, obesity.

UNIT 5

Metabolism of amino acids, transamination, metabolism of ammonia, urea cycle, integration of metabolism, [illegible] disorders of purine metabolism, mineral metabolism.

TEXT BOOKS/ REFERENCES:

1. Biochemistry by U. Satyanarayana and U. Chakrapani Books and Allied (P) Ltd.
2. Principles of biochemistry by A. L. Lehninger, D. L Nelson and M. M. Cox. MacMillan Publishers
3. Lab manual of biochemistry by Arti Nigam Tata McGraw Hill Publishing Co. Ltd.

FPT-123 ENGINEERING PROPERTIES OF FOODS MATERIALS

Unit I :
Physical Properties of food and measuring methods- Shape, size, volume, density, porosity and surface area. Structure of seeds & grains. Basic concepts of friction in food materials, solid friction, rolling resistance, internal friction and angle of repose.

Unit II :
Rheological characteristics of Foods like stress, strain time effects, Rheological Classification and Ideal rheological behaviour; Rheological models and their equations.

Unit III :
Thermal Properties of Foods Definitions & significance- specific heat, enthalpy, conductivity and diffusivity, surface heat transfer coefficient.

Unit IV :
Aerodynamic and hydrodynamic properties of Foods Drag coefficient, terminal velocity and their application in the handling and separation of food materials.

Unit V:
Mechanical properties related terms and their definition, Types of mechanical damage, causes of damage, Mechanical damage in grains, fruits & vegetables, Coefficient of restitution, Damage of food materials under static, impact and vibration.

Text Books:
1. Nuri N. Mohsenin: Physical Properties of Plant and Animal Materials Gordon and Reach Science Publishers (1970)
2. Nuri N. Mohsenin: Thermal Properties of Food & Agricultural materials Gordon and Reach Science Publishers (1970)

TEXT BOOKS/ REFERENCES:

1. M.A.Rao and S.S.H.Rizvi: Engineering Properties of Foods Mercel Dekker inc. New York (1998)
2. M.J.Lewis: Physical Properties of Foods and Food Processing Systems Woodhead Publishing Cambridge, UK (1990)
3. Reynold Jewitt and Others: Physical Properties of Foods Allied Science. Publishers (1983)
4. Shafiur Rehman: Food Properties Hand Book CRC Press Inc. New York (1995)
5. J.H.Prentice: Measurements in the Rheology of Food Stuffs Elsevier Applied Science Publishers (1984)
6. Micha Peleg and Edward B.Bagley: Physical Properties of Foods AVI Publishing company Inc, Westport USA (1983)

27/6/16 27.06.16 Rewa 27/6/16.

EVS-124 **ENVIRONMENTAL STUDIES**

UNIT-I

Natural Resources

Renewable and non Renewable Resources. Forest Resources, Water Resources. Mineral resources, Food Resources Energy Resources and Land resources. Natural resources of Chhattisgarh.

UNIT II

Ecosystems:

Concepts of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers , Energy flow in the ecosystem, Ecological succession, Food chains food webs and ecological pyramids, Introduction , types, characteristics features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert Ecosystem and Aquatic Ecosystem.

UNIT-III

Environmental pollution:

Definition, Causes, Effects and Control measures of Air pollution, Water Pollution Soil pollution, Nuclear Pollution and Noise Pollution. Major environmental problems in Chhattisgarh. Study of climatic changes like Global warming and acid rain, ozone layer. Solid waste management: Causes, effects and control of urban and Industrial wastes. Role of individual in control of Pollution.

UNIT-IV

Biodiversity and its conservation

Biodiversity-Definition and Types, Values of Biodiversity. Hot Spots of Biodiversity. Endangered and Endemic Species. Threats to biodiversity. Biodiversity of Chhattisgarh state. Conservation of biodiversity.

UNIT V

Human rights and its role in society:

Definition of Human rights: Indian constitution, Need for Human rights, Awareness towards Rights of an Individual , Violation of human rights-certain common social issues as examples. Measures to improve human rights awareness, Role of individuals in society for creating awareness.

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FPT-125 **LABORATORY COURSE-I**

1) Determination of acids (citric and acetic acids) in fruits and vegetables.
2) Determination of chlorophyll in leafy vegetables.
3) To study about measuring methods of Shape & Size.
4) To study about measuring methods of Volume.
5) To study about measuring methods of Density and Porosity.
6) To study about measuring methods of Surface area.
7) Determination of total sugar using Fehling's solution.
8) Determination of ash, water soluble ash and acid insoluble ash.
9) Determination of gluten content.

DETAILED SYLLABUS OF B.Sc (FPT) 3RD SEMESTER

FPT-211 UNIT OPERATIONS IN FOOD PROCESSING

Unit-1

Screening; types of screens ; Grizzly; Revolving screen; Shaking screen; Rotory screen; Vibratory screen; Horizontal screen; Perforated metal screens; wire mesh screen; Ideal and Actual screen; Effectiveness of screen; Air screen cleaners;

Unit -2

Definition and Introduction to Separation; Types of Separator- Disk, Indented cylinder, Spiral, Specific Gravity, Destoner, Inclined Draper, Velvet roll, Pneumatic & aspirator, separation based fluidisation technique, Magnetic and Cyclone Separator.

Unit -3

Size reduction procedures- Crushing, Impact, Shearing, Cutting; Cereal grinding, Degree of grinding; Size reduction machinery- crusher, grinder, attrition mills, hammer mill, ball mills, rietz mill & oil expression and extractions- hydraulic press, screw press

Unit-4

Utilities of Drying; thermal properties; Equilibrium moisture content (EMC); Drying theories; methods of drying;- Contact drying, Convective drying, freeze drying, radiation drying, Superheated steam, Drying rate period; types of dryers-Deep bed, Flat bed, Continuous, Recirculating, LSU, Fludised bed, Rotary, Tray, Tunnel and solar, Etc.

Unit-5

Material handling & transportation- Belt conveyor, bucket elevator, screw conveyor, pneumatic conveyor; transportation. Applications of Unit operations to the food industry.

Text books/ References:

1. Sahay KM & Singh KK 1994. Unit Operation of Agricultural Processing. Vikash Publication House.
2. Fellos PJ 2005 Food Processing Technology: Principle &Practice 2nd Ed. CRC.
3. Potter NN & Hochkiss 1997 Food Science 5th Ed. CBS.
4. Potty VH & Mulky MJ 1993 Food Processing. Oxford & IBH.
5. Ramaswamy H & Marcotte M. 2006 Food Processing: Principles & Applications. Taylor & Francis

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CHE-212 **FOOD CHEMISTRY**

UNIT 1

Water; Definition of water in foods, physical properties of water and ice; structure of water and ice; interaction of water with solutes; sorption phenomenon; types of water; water activity, Solutions, Colloids, Gels and Sols.

UNIT 2

Carbohydrates: Definition, classification, structure of monosaccharides, disaccharides and polysaccharides (starch, glycogen, cellulose, hemi-cellulose, lignins, pectins, gums and mucilages); chemical reactions of carbohydrates; effect of processing and storage on carbohydrates, Modified starches.

UNIT 3

Proteins: Amino-acids –structures & classification, essential and non-essential amino-acids, peptides-peptide bonds and some important peptides; Denaturation of proteins, Protein interaction and degradation, protein-lipid complexes and protein-carbohydrate complex. Properties of proteins; important food proteins; changes of proteins on processing and storage

UNIT 4

Lipids: Definition, fats and oil difference, different classifications, structures, physical and chemical properties of lipids and fatty acids, effect of processing and storage on fats and oils, Chemical reactions of fats: oxidative and hydrolytic rancidity.

UNIT 5

Enzymes - general characteristics, enzymes in food processing, Nomenclature of enzymes, Enzymatic and non-enzymatic browning such as Maillard reactions. Vitamins: structures and functions in brief. Minerals: Occurrence and functions in brief.

TEXT BOOKS/ REFERENCES:

1. Food Chemistry by O. R. Fennema McGraw Hill.
2. Principles of Food Chemistry by J M DeMan AVI.
3. Food Chemistry by L H Meyer AVI, New York.

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FPT-213 FOOD PROCESSING AND PRESERVATION

UNIT 1

Food processing and preservation principles, method of preservation: pasteurization (definition, time-temperature combination and equipments) sterilization (definition, time-temperature combination and equipments), blanching (definition, time-temperature combination and equipments, adequacy in blanching), canning (definition, time-temperature combination and equipments), packaging (Introduction, Metal Containers, Glass Containers, Rigid Plastic Containers, Retortable Pouches).

UNIT 2

Food Freezing and thawing process: Introduction, freezing point and freezing rate, comparison of Freezing and thawing process; freezing methods: Air freezing, plate freezing, liquid immersion freezing and cryogenic freezing. Freezer selection. Advantages and disadvantages of freezing. Freezing curve. Freezer selection, advantages and disadvantages of freezing and changes in food during freezing storage.

UNIT 3

Food Drying/Dehydration: Definition, free and bound moisture, concept of water activity, factors affecting drying, Drying curve (constant rate period and falling rate period), moisture content (wet basis and dry basis), equilibrium moisture content, Drying methods and equipments: sun/solar drying, Cabinet drying, tunnel dryer, spray dryer, freeze dryer, fluidized bed dryer, Nutritional, physico-chemical changes during drying.

UNIT 4

Food Concentration: Evaporation- Definition, types of evaporator (single effect, double effect and multiple effect evaporator); Freeze concentration- General principles and applications, basic elements, ice crystal nucleation, growth and crystallization, separation techniques (filtration and wash column).

UNIT 5

Membrane Processing: General principles and advantages, dead end and cross flow, Classification of membrane system: Reverse Osmosis, Nano Filtration, Ultra Filtration, Micro Filtration, Electodialysis and Pervaporation; Membrane technology comparison chart, Membrane application in the food industries; Membrane performance, and Limitation of membrane processes.

TEXT BOOKS/ REFERENCES:

1. Food Processing: Principles and Applications by Ramaswamy H. & Marcotte M. Taylor & Francis.
2. Food Science by Norman N Potter and Joseph H. Hotchkiss, CBS Publishers and Distributors.
3. Novel Food Processing Technologies by Barbosa-Canovas, Tapia & Cano CRC Press, 2004.

STAT - 214 **ELEMENTS OF STATISTICS**

UNIT-1

Introduction: Meaning, Importance advantages and Limitation of Statistics; Collection, Classification, Tabulation, Graphic and Diagrammatic presentation of Data (one dimensional and two dimensional).

UNIT-2

Measures of Central Tendency: Mean, Median, Mode, Geometric Mean, Harmonic Mean, Partition Values.

UNIT-3

Measures of Dispersion: Range Method, Quartile Deviation, Mean Deviation, Standard Deviation, Coefficient of Variation.

UNIT-4

Correlation: Karl Pearson's Coefficient of Correlation, Spearman's rank Correlation Coefficient.

UNIT-5

Measures of Skewness: Karl Pearson's Coefficient of Skewness, Bowley's Coefficient of Skewness.

TEXT BOOKS/ REFERENCES:

1. Gupta, S.P., Statistical Methods; S. Chand & Sons, New Delhi
2. Gupta, K. L., Business Statistics; Navyug Shahitya Sadan, Agra
3. Elhance, D. N.: Fundamentals of Statistics; Kitab Mahal, Allahabad
4. Shukla, S.M.: Business Statistics, Sahitya Bhawan, Agra
5. Gupta, B.N.: Business Statistics, SPBD, Agra

FPT-215 LABORATORY COURSE-II

1. Preparation of pickle
2. Sun drying of potatoes
3. To study about effectiveness of the screen.
4. To study about measuring methods of Shape & Size.
5. To study about measuring methods of Volume.
6. To study about measuring methods of Density and Porosity.
7. To study and determine total reducing sugars, sucrose and fructose-glucose ratio.

DETAILED SYLLABUS OF B.Sc (FPT) 4TH SEMESTER

FPT-221 TECHNOLOGY OF FRUITS AND VEGETABLES PROCESSING

Unit 1

Current status of production and processing of fruits and vegetables. Scope of fruits and vegetables preservation in India: Product mix, availability of raw material, manpower, capital, lack of awareness, marketing facility, transport facility, availability of containers, publicity and role of government.

Unit 2

Juice extraction: juice, history of juicing, types of juices, process flow diagram for fruit juice production, juice extraction process- fruit selection, sorting, washing, juice extraction, deaeration, straining/filtration, clarification, adding of sugars, fortification, bottling, sealing and storage; methods of juice preservation, causes of juice spoilage.

Unit 3

Canning: Introduction, can manufacture, canning process - selection of fruits and vegetables, grading, washing, peeling, cutting, blanching, cooling, filling, exhausting, sealing, processing, cooling and storage; types of canning- pressure canning and water bath canning, common causes of spoilage in canning of foods.

Unit 4

Minimally processed fruits and vegetables: Modified atmosphere packaging (MAP): Introduction, gases used in MAP, role of N_2, O_2 & Co_2, Principles of MAP, Types of MAP- active packaging & passive packaging, factors affecting MAP, graphical representation, application of MAP, effect of MAP on shelf-life, future research needed, advantages and disadvantages; and controlled atmosphere packaging (CAP): Introduction, gases used in CAP, factors affecting CAP- Temperature control, humidity control and gas control, advantages and disadvantages.

Unit 5

Statutory Provisions for Quality Control in India: Prevention of Food Adulteration act, Fruit Product Order act, AGMARK act, Vegetable Oil Product order; Food Standardization and regulatory agencies in India: Central Committee for Food Standards, Central and state food departments, State Food Laboratories / Food and Drug Administration, Bureau of Indian Standards, Food Corporation of India, Army Supply Corps and Central Insecticide Board.

Reference books/ Text books

1. R. P. Srivastava & Sanjeev Kumar Fruit and Vegetable Preservation: Principles & Practices International book distributing Co. Lucknow.
2. Giridhari Lal, G.S. Siddappa & G.L. Tondon Preservation of Fruits and Vegetables CFTRI, ICAR, New Delhi -12.
3. Y. H. Hui, S. Ghazala, D.M. Graham, K.D. Murrell & W.K. Nip Handbook of Vegetable Preservation and Processing Marcel Dekker (2003).

27/6/16 Rewa 27/6/16. 29.06.16

MIC-222 FOOD MICROBIOLOGY

UNIT 1

Food as a substrate for microorganisms: Hydrogen-ion concentration (pH), Moisture requirement: concept of water activity (a_w), oxidation-reduction potential, nutrient content, accessory food substances or vitamins, inhibitory substances and biological structure, combined effects of factors affecting growth.

UNIT 2

Microorganisms important in food microbiology: Molds: General characteristics of molds, classification and identification of molds, Yeasts and yeast like fungi, General characteristics of yeasts, Bacteria, morphological characteristics important in food bacteriology. Mold, yeast and bacteria of industrial importance.

UNIT 3

General principles underlying food spoilage: fitness or unfitness of food for consumption, causes of spoilage, classification of foods by ease of spoilage, factors affecting kinds and numbers of microorganisms in food, factors affecting the growth of microorganisms in food, chemical changes caused by microorganisms.

UNIT 4

Food Fermentations: Bread, Traditional Indian fermented foods, Malt beverages, wines, wine defects and microbial spoilage, Distilled liquors, vinegar, fermented vegetables, fermented dairy products, Oriental fermented foods.

UNIT 5

Contamination of foods, from green plants and fruits, from animals, from sewage, from soil, from water, from air, during handling and processing, Food-borne illness: Bacterial: Food borne poisonings, infections and intoxicants: non bacterial: Mycotoxins, Viruses, Rickettsias, Food borne parasites, Seafood Toxicants, Poisoning by chemicals

TEXT BOOKS/ REFERENCES:

1. Food Microbiology by Frazier J. & Westhoff D. C. McGraw Hill.
2. Fundamentals of Food Microbiology Ray B. CRC Press
3. Dairy Microbiology by Robinson R. K. Applied Science

FPT-223 **MILK AND MILK PRODUCTS**

Unit 1

Milk- Definition, Status, Indian Standards Composition. Factor affecting composition of milk, food and nutritive value, physico chemical properties of milk and milk constituents. Microbiology of milk and public health, Clean milk production, packaging, Cleaning and sanitization of dairy equipment judging and grading of milk.

Unit 2

Introduction- sterilized milk, homogenized milk, soft curd milk flavoured milks, Vitamin/Irradiation milk, Acidophilus milk fermented milk, standardized milk, Reconstituted/ rehydrated milk, recombined milk, toned & double toned milk

Unit 3

Cream-Introduction, definition, classification, composition, nutritive value and production. Butter- Introduction, definition, classification, composition, nutritive value and methods of manufacturing. Butter oil- Introduction, definition, classification, composition, nutritive value and methods of manufacturing.

Unit 4

Ice Cream- Introduction, definition, classification, composition, nutritive value, role of constituents, properties of mixture and methods of manufacturing. packaging, hardening and storage and distribution, Defects in ice cream, their causes and prevention, use of ice cream.

Unit 5

Introduction, definition and composition of Cheese, Paneer, Channa, Ghee, Khoa Importance of cleaning and sanitization and In-plant cleaning system methods.

TEXT BOOKS/ REFERENCES:

1. Outlines of Dairy Chemistry, De S; Oxford.
2. Milk Processing and Technology by A Q Khan, Allahabad Publication.
3. Milk & Milk Processing; Herrington BL; 1948, McGraw-Hill Book Company.
4. Modern Dairy Products, Lampert LH; 1970, Chemical Publishing Company.

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CS-224 **FUNDAMENTALS OF COMPUTER**

Unit-I:

Definition and development of computer, Characteristics, Capabilities and Limitations of Computer; Types and Generation of Computer, Basic Input-Output Devices, Different types of memory, Software Concepts- System Software, Application Software, Utility Software

Unit-II:

Definition and Objective of Operating System, Types of Operating System Introduction to MS Office- Creating, Opening, saving documents, Working with fonts, Bullets, Numbers, Alignment, paragraph, page layout etc.

MS Excel- Creating, Opening, saving workbook, Working with Excel workbook and worksheets, Formulas and functions, charts & Graphs.

Unit-III:

Making presentation with MS Power Point- Working with power point, designing presentation.

Management Information System (MIS)-Definition, Role and Importance Of Management, Process of Management, Organization Structure and Theory, Strategic Management of Business

Exercises Unit-IV:

Network basics, Concept of Internet, uses of Internet, DNS, Client Server, Establishing connectivity on the Internet, types of Internet providers, Working with Email, World Wide Web, Search engines and Web Browsers, Security threats

Unit V

Definition, Functions of E-Commerce, and Traditional Commerce practices v/s E-Commerce practices, Limitations of E-Commerce, types of E-Commerce: Business to Business (B), Business to Consumer (B2C) and Consumer to Consumer (C2C).Consumer to Business (C2B) Business - to - Government (B2G) , Government - to - Business (G2B) , Government - to - Citizen (G2C) , Payment System - Credit Card , Credit card payment process , Debit Card , Smart Card , E-Money , Electronic Fund Transfer

TEXT BOOKS/ REFERENCES:

1. "Fundamental of computer ", V. Rajaraman, PHI Publication
2. "Fundamental of IT", Leon and Leon , Leon Tec world
3. "Introduction to Information Technology", Aksoy and Denardis, Cengage learning

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FPT-225

LABORATORY COURSE-III

1. Estimation of saponification value of fats and oils
2. Refractive index of different fats and oils
3. Estimation of iodine value of fats and oils
4. Determine the fat by garbar method and SNF content in the milk
5. Perform Alkaly Test of milk.
6. Determine pH content of milk.
7. To study about TPA test.
8. Determination of beta-carotene in fruits and vegetables.

DETAILED SYLLABUS OF B.Sc (FPT) 5TH SEMESTER

FPT-311 FOOD PACKAGING

Unit 1: Definition and functions of Food Packaging: Containment, Protection, Convenience, Communication, Requirements for effective food packaging, Packaging Innovation, Types of containers: primary, secondary and tertiary.

Unit 2: Structure and properties of plastic polymers – polyolefins: Low density polyethylene, linear low density polyethylene, High density Polyethylene, Polypropylene, Co-polymers of ethylene: Ethylene-Vinyl Acetate, Ethylene-Vinyl alcohol. Ionomers.Substituted Olefins: Polystyrene, Poly vinyl chloride, Poly vinylidene chloride. Polyesters: Polyethylene Terephthalate,

Unit 3: Paper and Paper based packaging materials – Pulp, Introduction to pulping, Kraft process, Digestion, bleaching. Papermaking: Fourdrinier Machine. Paperboard products, Corrugated Fibre board, Edible Films

Unit 4: Metal and Glass packaging materials: Metal, Metal cans, Can construction, Double seaming, Can corrosion. Glass: Composition, Properties and Manufacturing, Form Fill Seal packaging, Hermetic Closure, Retortable pouches and trays, Microwave oven Packaging

Unit 5: Package testing: Gloss, Tensile strength, Bursting strength and Tear strength, Barrier properties: Oxygen transmission rate, Water vapor permeability, Safety of Food packaging.

Text books/ References:

1. Ahvenainen R. 2001. *Novel Food Packaging Techniques*. CRC.
2. Mahadeviah M & Gowramma RV. 1996. *Food Packaging Materials*. Tata McGraw Hill.
3. Stanley S & Roger CG. 1998. *Food Packaging*. AVI Publ.
4. AACC. 2004. *Storage of Cereal Grains and their Products*.
5. Mahajan & Goswami. 2005. *Food and Process Engineering*.
6. Ojha TP & Michael AM. 2006. *Principles of Agricultural Engineering*. Jain Brothers.

FPT-312 AGRICULTURAL WASTE AND BY-PRODUCTS UTILIZATION

UNIT 1

Introduction and Background Agricultural Waste, Crop Waste, Agricultural Residues (annual crops), Technical terms, rice by-products utilization-rice bran and germ, rice bran oil, economic products from agriculture waste/by-products.

UNIT 2

Biomass Gasifier, Technology used for the utilization of agricultural wastes: Biomass Gasifier, Nimbkar Agricultural Research Institute (NARI) Gasifier, Rice-Husk Based Gasifier, Heat and Steam from Sugarcane Leaf and Bagasse.

UNIT 3

Biogas: Definition, composition, history of biogas, Production of biogas; types of biogas plant (floating drum type and fixed dome type) and their components (inlet, outlet, stirrer, slanting pipe, digester, gas holder and gas outer pipe), Selection and Design of biogas plant.

UNIT 4

Production of Alcohol from waste materials: Introduction, Production methods, Cellulolysis (biological approach): Pretreatment, Cellulolytic processes (Chemical and Enzymatic hydrolysis), Microbial fermentation, Gasification process (thermochemical approach).

UNIT 5

Production and testing of Paperboards and Particleboards from Agricultural Waste: Introduction, History, Terminology and classification, Raw materials, Production steps- Pulping, Classifications of pulp, Bleaching, Plies, Coating, Grades.

TEXT BOOKS/ REFERENCES:

1. K M Sahay and K K Singh. 2013.Unit Operations of Agricultural Processing. Vikas Publishing House Pvt Ltd, Noida, Uttar Pradesh.
2. Beggs C. *Energy Management and Conservation.* Elsevier Publ. Chaturvedi P. 2000. *Energy Management: Challenges for the Next Millennium.*
3. *Energy Conservation through Waste Utilization.* American Society of Mechanical Engineers, New York.
4. *Energy Conservation Guidebook.* The Fairmont Press.
5. Wulfinghoff DR. *Energy Efficiency Manual.* Energy Institute Press.

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FPT-313 FOOD SAFETY & QUALITY SYSTEMS

UNIT 1

Objectives, importance and functions of quality control. Quality systems and tools used for quality assurance including control charts, acceptance and auditing inspections, critical control points, reliability, safety, recall and liability.

UNIT 2

Concept of food safety and standards, food safety strategies. Preventive food safety systems - monitoring of safety, wholesomeness and nutritional quality of food. Prevention and control of microbiological and chemical hazards.

UNIT 3

Introduction to food laws, need for enforcing the laws and various types of laws. Mandatory food laws and FSSAI 2006.

UNIT 4

Labeling - Nutritional labeling - Specification - rules and regulation- ISI certification- Principles - Role of AGMARK, FPO, BIS and PFA.

UNIT 5

Food hygiene auditing- Monitoring environmental quality in food industries- Rules and regulation for setting a food processing unit.

TEXT BOOKS/ REFERENCES:

1. Early R.1995.*Guide to Quality Management Systems for Food Industries*. Blackie Academic.
2. Furia TE.1980. *Regulatory status of Direct Food Additives*. CRC Press.
3. Krammer A & Twigg BA.1973. *Quality Control in Food Industry*. Vol. I, II. AVI Publ.

Export/Import policy by Govt. of India.

FPT-314 **SKILL DEVELOPMENT AND SEMINAR**

Skill: Introduction, Labour skills, Life skills, People skills, Social skills, Soft skills, Hard skills and Mastering skills.

National Skill Development Agency (NSDA), Introduction, Functions; Skills Innovation Initiative: Introduction, Format for the executive summary of the proposal submitted Under the Skills Innovation Initiative.

National policy for skill development and entrepreneurship- vision, mission and objectives; Skills Development Act, 1998 (SDA): Vision, Purposes of the Skills Development Act, Institutions Created by the Act - The National Skills Authority ("NSA") & Sector Education and Training Authorities (SETAs).

FPT-315 LABORATORY COURSE-IV

1. Determination of Grammage of A4 size paper.
2. Determination of non-enzymatic browning in various types of foods.
3. To study about the act and regulations adopted in food industry.
4. To study about the milk chilling center.
5. Determination of water vapour transmission rate.
6. Determination of oxygen transmission rate.

B.Sc (FPT) SEMESTER-VI

FPT-321 Rural linkage to food system

For these students collect the data for the village. Also include the food pattern

FPT- 322 In-Plant Training

In that students required to take training for the Institute/ University/Industry etc.