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ANANTAPUR

Course Structure and Syllabi for Pre Ph.D

FOOD TECHNOLOGY (2017-18)

PART-I

Choose any **one** subject of the following

S.NO	PAPER	PAPER CODE
1	Chemistry of Foods.	**17PH53101**
2	Food Analysis	**17PH53102**
3	Food Preservation Technology	**17PH53103**
4	Technology of Fruits and Vegetables	**17PH53104**

PART-II

Choose any **one** subject of the following

S.NO	PAPER	PAPER CODE
1	Technology of Milk and Milk Products.	**17PH53201**
2	Technology of oils and fats.	**17PH53202**
3	Bakery and Confectionary technology	**17PH53203**
4	Technology of Meat, Poultry and Fishery Products	**17PH53204**
5	Food Biochemistry and Nutrition	**17PH53205**
6	Food Microbiology	**17PH53206**
7	Plantation Products and Flavor Technology.	**17PH53207**
8	Food Processing Engineering	**17PH53208**
9	Packaging Technology and Food Laws	**17PH53209**
10	Management of Food Processing Industries.	**17PH53210**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17PH53101) CHEMISTRY OF FOODS

UNIT I

CARBOHYDRATES

Introduction – Classification of Carbohydrates - Determination of the configuration of the monosaccharide. Ring structure of the monosaccharide. Glucose and fructose. Methods for determining the size of sugar rings. Conformational analysis. isopropylidene derivatives of the monosaccharide.Disaccharides. Structure and synthesis of Sucrose, Maltose and Cellobiose.

Trisaccharides. Polysaccharides. Photosynthesis. Glycosides.

UNIT II

AMINO-ACIDS

Classification of amino-acids. Isolation of amino-acids. General properties of amino-acids. General nature of proteins. Structure of proteins. Polypeptides. Peptide bonds, Primary, Secondary, Tertiary, Quaternary. Biosynthesis of amino-acids and proteins.

UNIT III

OILS, FATS, WAXES

Introduction – Occurrence – Glycerides – Chemical composition of fats and lipids – General Physical and Chemical properties – Hydrolysis – Hydrogenation – Hydrogenolysis – Transesterification – Auto oxidation – Rancidification – Acid Value – Saponification value – Iodine value –Reichert. Meissl value – Uses of Oils/fats – Fixed and volatile oils – Mineral Oils – Drying Oils Waxes.

UNIT IV

VITAMINS

Introduction. Vitamin B complex. Vitamin E group. Vitamin K group. general study- detailed study – Chemistry of thiamine (Vitamin B1) - Ascorbic acid (Vitamin C) –Vitamin D-Pentothenic acid, biotin (Vitamin H) and tocopherol (Vitamin E) Biological importance of Vitamins. Carotenes. Vitamin A,Xanthophylls -Carotenoid acids.

UNIT V

Nucleic Acids - Introduction-definitions -RNA, DNA, three components of phosphoric acid ,pentose sugar and nitrogen, modified bases . Purines -Introduction. Uric acid. Purine derivatives. Xanthine bases. Biosynthesis of purines.

References:

1. Chemistry of organic natural products Vol.1&Vol.2 byO.P..Agarwal (Goel Publishing Ltd).
2. Organic natural productsVol 2 by I.L.FINAR (Pearson Publishers).
3. Text Book of Biochemistry byRama Rao, A.V.S.S. (1986) 5^{th} edition (L.K. and S. Publishers).
4. Biochemistry by L. Strayer and W. H Freeman, USA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17PH53102) FOOD ANALYSIS

UNIT-I

Proximate constituents: preparation of samples, detection of moisture content in food samples, ash and mineral matter, acid insoluble ash, alkali insoluble ash, titratable acidity. Estimation of crude fiber,dietary fiber. Estimation of total sugars, reducing sugars, estimation of organic and inorganic proteins. Estimation of starch.

UNIT-II

Edible oils: physical characteristics - specific gravity, refractive index, melting point of fat, measurement of odour, chemical characteristics – Saponification value, iodine value, thio nitrogen value, impurities – volatile, insoluble and mineral matter.Flavoring materials: sampling, extraneous matter, volatile and nonvolatile extracts, nitrogen in nonvolatile ether extracts, alcoholic extract, detection of added starch, estimation of starch. Determination of volatile oils, tannins estimation, pungency rating, test for adulterants. Extraction of oleo resins, estimation of oleo resins, peroxide value.

UNIT-III

Preservation in food: estimation of sulphur dioxide, sodium benzoate, sorbic acid, antioxidants, estimation of B.H.A, BHT, TBHQ (Tertiary Butyl Hydro Quinone), stabilizing agents. Additives used in food analysis.

Sensory analysis: laboratory set of equipment, selection of panel member, training of panel member. Judging of quality, difference test, ranking test, sensitivity test, descriptive flavor profile test, threshold value, dilution number, paired comparison test, ANOVA test, dunnet test, hedonic rating test.

UNIT-IV

Food microbiology: determination of microbial load, microbial content, microbial count, isolation of microorganism from spoiled fruits and vegetables. Isolation of bacteria from idly, butter and stored foods. Enumeration and identification of E-coli from food samples. Preparation of media for culturing of autotrophic and heterotrophic micro organisms.

UNIT-V

UV-visible and infrared spectroscopy

Absorptivity – Apparent deviations from Beer's law – Double beam spectrophotometer operation – Sources of radiation – Detectors – Photo metric accuracy – Instrumentation, - Chemical applications – Qualitative analysis – determination of ligand/metal ratio in a complex Quantitative analysis – photo metric titration. Introduction-origin of IR spectra-instrumentation, group frequencies, applications of IR spectra analysis spectral data of alcohols-aldehydes and ketones –carboxylic acids –amines –amino acids –proteins.

References:

1. Hand book of Analysis & Q.C. for Fruits & Vegetables products – Ranganna.(Tata Megrahill
2. Publisers).
3. Food microbiology by Frazier.
4. Instrumental methods of analysis by B.K Sharma (Goel Publisher Ltd).
5. Spectroscopic analysis by Y.R. Sharma (S. Chand Publisher Ltd).
6. Instrumental methods of analysis by chatwal (Himalaya Publishing Ltd).
7. Nielsen, S., editor. 2010. Food Analysis, 4th edition. Springer, New York.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17PH53103) FOOD PRESERVATION TECHNOLOGY

UNIT-I

Food and its preservation –source of problems, nature of food – plant and animal origin, cereals, pulses dry fruit seeds , legumes , nuts , and tubers, vegetables, fruits milk and dairy products, meat and poultry egg and egg products, fish and shell fish, animal by-products benefits of industrial food preservation .Principles of fresh food storage-nature of hazardous, decaying of foods – metabolism , determine the refrigerated load needed , animal products storage , quality control, effect of cold storage on quality , preservation of food in micro nutrients, storage of grains bulk storage control of insects and mites chemical aspects. Nature of food hazardous- cases of food spoilage, food poising, food toxications, mycotoxins, chemicals in food preservation.

UNIT-II

Principles of refrigerated gas storage of fruits and vegetables, sub -atomsphere storage, gas atmospheric storage of meat , quality parameters, gas storage of grains, flours, , principles of freezing – triple point of water, freezing point of foods , volume changes during freezing, methods of freezing –direct, indirect, immersion type of freezing , freezer burnt, packing requirements in frozen foods, effect of freezing on microorganism, thawing damages to frozen foods and freezing of dairy products.

UNIT-III

Principles of food preservation by canning and drying- spoilage cased microorganisms, heat resistant microbes, processing of canning, heat resistant of enzymes in food, inoculated pack studies ,spoilage of canned foods ,storage of canned foods, corrosion of cans, misconceptions relating to canned foods, improvement in canning technology, retard pouches – optimizing thermal processing. HACCP in canning.Dehydration and drying, types of dryers used in food preservation, influencing of dehydration on nutritional value of foods, influencing of drying on microorganism, enzymes, pigments dehydration of fruits and vegetables, animal products, grains .

UNIT –IV

Preservation of low-moisture foods: manufacturing peanut butter and it's important principles of low- moisture foods – canned white bread, fungicidal and bactericidal agents, low-moist pet foods processing, water activity, problems in low- moist foods, storage stability of low-moist foods .

UNIT-V

Principals food preservation by fermentation – ferments of carbohydrates, types of fermentation, fermentation action order, fermentation control, wine preservation, beer preservation, vinegar fermentation, cheese fermentation, HACCP in analysis of cheese, mycotoxin principles of pickling –salt pickling of fruits and vegetable, sweet pickling, dill pickles Sauer kart, olives fermented pickles products, control of fermentation in commercial braining tanks, brine recovering principles, fish salting, smoking, curing, meat curing and smoking, pickling of meat, preparation of dry sausages .Principles chemical preservation of foods – additives and their uses , importation of chemical additives, safety of food additives, functional chemical additives application, chemical preservatives microbial antagonistic, antibiotics, antioxidants, other chemical additives.

References:

1. **Preservation and canning of fruits and vegetables** by EIRI board of consultants and engineers India research institutes, Delhi.
2. **Hand book of food dehydration and drying**, by EIRI board of consultants and engineers India research institutes, Delhi.
3. **Technology of food preservation**, 4th edition, by N.W. Desrosier and Desrosier, AVI publishing company, New york.
4. Heldman, D. R. and Singh, R. P. 1981. Food Process Engineering, Avi Pub. Co., Westport, Connecticut.
5. Fellows, P. J. 2009. Food processing technology: principles and practice. Elsevier.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17PH53104) TECHNOLOGY OF FRUITS AND VEGETABLES

UNIT – I

Introduction to Fruits and vegetables,definition, structure, origin, classificationoffruits based on pH. Desirable characteristics of Fruits & vegetables for processing ,chemical composition, Nutritive value, its importance and stability in processing.Introduction to Fruit ripening , ripening agents & their effects, repining changes, enzymatic action, deterioration factors & their control..Preservation of fruits and vegetables – Introduction to preservation, Principles of Preservation, Factors effect in preservation.Types of preservation, by products from fruits &vegetable waste & their utilization.

UNIT – II

Fruits & Vegetable juices, syrups, squashes, cordials & nectars, fruit concentrates, jams & jellies, marmalaledes, preserves, butter & candied fruit preparation & manufacturing. Pickles and chutneys – introduction, types, pickling process of fruit &vegetables and its methods, quality control and its related problems.

UNIT –III

Pectin – chemistry, its related compounds, manufacturing process and various uses in food industry.

Vinegar – General properties, types, preparation, industrial method of manufacturing, various uses of Vinegar.

UNIT-IV

Tomato products – types, preparation of various tomato products namely sauce, ketchup, pasteand soup.

UNIT-V

FSSAI standards for fruits and vegetable products.

References:

1) Fruits & Vegetables processing – FAO Agricultural service bulletin – 119
2) Fruit & Vegetables preservation principles & practices 3rd revised Edition – R.P.Sruvasta
3) Processing, dehydration, canning preservation of Fruit & Vegetables. By international book distribution co.lukno
4) http://old.fssai.gov.in/Portals/0/Final_Regulations_2010.pdf

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17PH53201) TECNHOLOGY OF MILK AND MILK PRODUCTS

UNIT-I

Milk procurement- chilling methods- storage of milk – standardization- homogenization- types of pasteurization- packaging of milk- UHT milk- aseptic packing of milk- distribution of milk.

Unit II

Cream- cream preparation- preservation of cream- defects in cream-consumer cream products.Butter- Types of Butter- Preparation of Table butter- Continuous butter making- Butter oil Preparation, Preservation and Defects- - Butter substitutes- Margarine and other spreadable butters.

Unit-III

Cheese- advances in cheese making- cheese additives- cheese flavor technology- immobilized enzymes- accelerated cheese ripening- Mozzarella cheese, blue veined cheeses. Indian cottage cheese, whey-utilization of whey based products.

Unit -IV Sweetened Condensed milk –Preparation- Vacuum Pan- Defects- Evaporated milk- method of manufacture- Dried Milks- methods of Dehydration-preparation of Whole milk powder by spray drier- Properties of Milk powders- Defects in milk powders- preparation of Infant milk foods- Malted milk.Advances in manufacture of Ice-Cream- substitution of sweeteners- utilization of artificial sweeteners – Fancy ice-creams- Sherbets- Milk Lollies- Kulfies- Milk by-products- edible casein- Sodium casemate.

Unit- V

Advances in Traditional Dairy Products Technology - Khoa- Varieties of khoa- Khoa based sweets-Kalakhand- Gulabjamun- Milk cake- Chhana and Chhana based sweets- Rasogolla- Rasmalai- Advances in Paneer- Shrikhand-Sandesh-Methods of preparation- Preservation- Fermented Milk Products-Dahi- Yoghurt- Lassi- Mistidhoi- their composition -Changes in constituents during formulation and flavor development – Ghee- industrial production of

ghee- ghee adulterants- identification- renovation of ghee-FSSAI standards , ghee residues and defects.

References:

1. Outlines of Dairy Technology by Sukumar De(Oxford Publishers).
2. Indian Milk and Milk products by R.P.Aneja(Tata Megrahill Publishing Ltd).
3. Milk and Dairy Technology by Edgar spreer
4. Technological Advances in market Milk By j. David
5. Advances in Milk processing Vol I by R.K.Robinson
6. Advances in Milk products Technology vol-II by R.K.Robinson

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17PH53202) TECHNOLOGY OF OILS AND FATS

UNIT - I

Sources and classification of Oils and Fats

Glyceride - Structure and composition of oils and fats.

Definition, distinction between oils and fats – Simple and mixed triglycerides,mono-and di-glycerides.

Non-glyceride components of oils and fats:- Phosphatides ,sterols, carotenoid pigments – Tocopherols and other antioxidants – Vitamin A, D and E.

UNIT - II

Chemical reactions of fats and fatty acids:- Hydrolysis, esterification and inter-esterification, saponification with alkalies, hydrogenation of the carboxyl group, formation of nitrogen derivatives, formation of acid chlorides, dehydration, pyrolysis. Hydrogenation and halogenation reactions in the fatty acid chain, sulfation and sulfonation, atmospheric oxidation (rancidity). Polymerization, isomerization and reactions of hydroxyl groups.

UNIT -III

Classification of oils and fats.

Glycerides composition and important characteristics of the oils of the following oils:- Coconut, Cottonseed, peanut, palm, sunflower, sesame, safflower, rice bran, rapeseed and mustard. Linseed;, soybean, tung, castor oils, lard and tallows

UNIT-IV

Production statistics of oilseeds and oils in India.

Post harvesttechnology , storage and pretreatment of oil seedsPackaging of edible oils

UNIT- V

Oil seed milling, Mechanical expression of oil and Solvent extraction

Refining and Bleaching:- Degumming, alkali refining, (Batch process), Miscella refining, Refining losses – Bleaching by Absorption – Continuous bleaching.

References:

1) Bailey's Industrial Oils and Fats products, Volume 1- 5 by Ed. D. Sworn, Wiley-Inter Science Publications, N.Y., John Wiley & Sons (1982)
2) Bailey's Industrial Oils and Fats products, by Ed. D. Sworn, Wiley-Inter Science Publications, N.Y., John Wiley & Sons (1982).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17PH53203) BAKERY AND CONFECTIONARY TECHNOLOGY

UNIT- I

Introduction to sugar confectionery, Types of sugar and their manufacturing process.

Ingredients of confectionery- sugars, starch, Glucose syrups and starch hydrolysates –fats – modification of oils and fats.

Colour and flavour- colours for the sugar confectionery, Flavorings flavor strength, functions of carrier solvents and powders, factors affecting stability of flavoring compounds,refined glucose syrups, high fructose corn syrup, Gums , gelling agents and thickenings – properties and its applications.

UNIT- II

Manufacture of high-boiled sweets, ingredients, prevention of recrystallization and stickiness, product types.Caramel, toffee and fudge, ingredients, structure of toffee, formulation, processing, toffee stability, fudge.

Cocoa, chocolate and related products: Cocoa beans, cocoa fruit, pulp, fermentation, drying Sequence of processes chocolate receipts, cocoa powder, mixing, refining, conching and tempering of chocolate. Gums and jellies, technology and chemistry of hydrocolloids, hydrocolloid pretreatment processes, liquor preparation, shaping drying finishing treatments, re-work, common faults, causes and cures.

UNIT –III

Liquorices paste and liquorice allsorts, cream paste and aerated confectionery: ingredients and manufacturing of liquorices paste, cream pastes and aerated confectionery- methods of aeration, marshmallow, Nougat.

Tablets, Lozenges and sugar panning, Tablettting, granulation, ingredients, compression, Lozenges, sugar panning, Hard panning, Soft panning, polishing, Additional panning techniques.

Chewing gum technology: Gum base, sugars, flavors, humectants, fruit acids, sugar-free chewing gum ingredients, formulation and chewing gum mixing.Count line components, manufacturing of count lines and cereal bars.

UNIT – IV

Bakery Raw materials-General ingredients-Wheat flour-Manufacturing and Characteristics of wheat flour for Bakery industry,ISI standards for Wheat atta, Maida and sujji,Sugar and its uses, Shortenings, Milk, yeast-Uses and specifications-Salt and its uses-Egg and Egg Products-Chemical Leavening Agents, Cocoa Chocolate, Flavors, Emulsifiers, lecithin, Bread improvers, Enriching agents, Water and miscellaneous Ingredients,

Bread making process –straight doughs -quantity of yeast, quantity of water, quantity of salt. Leaven process, Dough rheology. Chemistry and related technology (double baking, chapatti making etc.)- baking.

UNIT – V

Biscuits- Classification, dough consistency, baking techniques and Packaging.

Cookies and Crackers -ingredients, formulation aspects, baking, decoration, sugar, cookies and sugar wafers.

Cereal and Legume based foods –raw materials, preparation of wheat products-dalia –Karah-parathas-and- maize fried products -golgappas-popcorn-bhelpuri-expanded and extruded snacks-papads, vadia, besanladdoos, chikki, sevian

References:

1) Text Book of Food Science and Technology byVijayaKhade, ICAA, New Delhi.2001
2) Manufacturing of snacks food bynamkeen, pappad and potato products-EIRI Publications, Delhi
3) Cereal Technology by Kent Jones. (Oxford Publishers Ltd).
4) Technology of Cereals by Kent. (Oxford Publishers Ltd).
5) Sugar Confectionery Manufacture by (Ed) E.B. Jackson, 2nd Ed., Blackie Academic and Professional , Glasgow (1996).
6) Sugar Confectionery and Chocolate Manufacture – by R.Loes , Leonard Hill Books, International Text Book Company Limited (1973).
7) Drying of Cereal Grains by Brookers.(EIRI Publisers)
8) Snack food by R.Gordan Booth- CBS publications
9) Hand book of bakery industries-EIRI Publications.
10) Food preparation-A scientific approach by Meera Rao Patankar, Anmol Publications New Delhi.
11) Biscuit, cracker and cookies recipes for the food industryby Duncan Manley, Wood head Publishes- Cambridge, England.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17PH53204) TECHNOLOGY OF MEAT, POULTRY AND FISHERY PRODUCTS

UNIT – I

Introduction on meat and poultry industry. Development of meat and poultry industry in India. Itsneeds in national economy. Glossary of market terms for meat animals and birds. Effect of feed, breed and environment on production of meat and its quality and desi- birds. Methods of analysis of meat products- chemical, physical, panel, microscopic, bacteriological

UNIT – II

Selection of meat animal and its transportation, pre –slaughtering transportation and its care, slaughter house and its design.

Slaughtering, inception, grading- Ant mortem examination of Meat Animals. Slaughter of meat animalcattle, buffalo, sheep, goat and pigs.Dressing carcasses. Modern abattoir practices.

Post-mortem examination of meat,retail and whole sale cuts, grading, factors influencing quality of fresh and cured meat.mechanical deboning, ageing of meat, meat tenderization, meat emulsions restructured meat products, meat plant sanitation and safety.

UNIT - III

Meat preservation by refrigeration and freezing, thermal processing, dehydration, irradiation, chemicals and antibiotics. meat by products. Cold storage and freezing, canning, smoking, curing-bacon, ham, sausage products. and pickling of marine products – fish pastes, sauces, oils, protein concentrates, meal and other products. Preservation and processing of shrimp, lobsters.

UNIT – IV

Egg and Egg products: the egg factory, its techniques of working, structure, composion, nutritional value Preservation and measures of Egg quality. Dehydrated egg powder, frozen egg, poultry processing's.

Preservation of eggs by different methods-refrigeration, freezing, dehydration, coating and industrial use if egg products, postmortem change of meat and its quality grading and marketing of shell eggs.

Preparing poultry for consumption-ready to cook chicken.

By-products-meat fat, feeds, hides, skins natural casings and feathers, miscellaneous by-products.

Meat hygiene, quality control of meat production, processing, specification of meat products

UNIT- V

Introduction of fisheries resources in world, preservation of fish-cold storage, freezing canning, drying and dehydration, smoking curing and pickling. Fish products-fish past ,sauces, fish oil fish protein concentrates ,fish meal by-products of fish processing quality control of fish and fish products, food standards, fish processing sanitation.

Bio chemical composition of fish, prawn marine products. Postmortem changes and quality assessment, processing of marine products and spoilage of fish, preservation methods without retention of freshness. Modern preservation methods such as vacuum packaging gas packaging, ethanol vapour generation, hurdle barrier concept, value added fish products.

References:

1) Meat and meat products technology (including poultry products technology) BYB.D. sharmajaypeeBrothesmedicialpiblisherspvltd, New Delhi.
2) Modern abattoir practices and animal byproduct technology by R.D.Sharma
3) Fish technology Ronald by J.Robert
4) Meat science (latest edition) by R.A.Lowrie, paragoan press, oxford and new York
5) Fish processing and preservationby Charles.L.Cutting, agro bio's Publishers.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17PH53205) FOOD BIOCHEMISTRY AND NUTRITION

UNIT - I

Introductory to cell Bio-Chemistry:- Separation of Sub-cellular components and their bio-chemical functions.

Enzymes - General Properties, Classification, Co-enzymes,co-factors and factors responsible for catalytic efficiency of enzymes, examples of inhibitors and activators.

UNIT - II

Carbohydrate metabolism: Digestion, absorption and biochemical functions of carbohydrates, glycolysis, TCA cycleoxidation, oxidative phosphorylation and elements of bioenergetics. Biosynthesis of starch and glycogen. Elements of Photosynthesis.

Lipid Metabolism: Digestion, absorption and functions of lipids, Oxidation of fatty acids, Biosynthesis of fatty acids.

UNIT -III

Protein metabolism: - Digestion, Absorption and functions. End products of protein metabolism. Intermediary metabolism of amino acids and the urea cycle.

Nucleic acids: - Bio-chemical functions. Elementary notions of Protein biosynthesis.

Biochemistry of Hormones.

Mineral Metabolism:- Biochemical functions of minerals. Active transport and ionabsorption. Calcium, Phosphorous and Iron metabolism.

UNIT -IV

Functions of Food, energy value of Food. Nutritive value of Foods nutritional significance of Carbohydrate, Proteins, Fats, vitamins and minerals. Deficiency diseases. Fortification of foods.

UNIT – V

Nutritional requirements – Balanced diets – Food tables. Nutrition of weaned infants, preschool children and infant foods. Nutrition, feeding of adults, expectant and nursing, mothers and industrial workers.

Supplementary and special dietetic foods. Effect of cooking and processing on the nutritive value of Foods. Causes and prevention of malnutrition. Theoretical aspects of techniques in nutrition research. Activities of international Organizations in the field of nutrition. Blood composition and functions.

References:

1) Biochemistry by L. Strayer and W. H Freeman, USA
2) Principles of Biochemistry byVioet&Vioet
3) Essentials of Food and Nutrition No.1 by Swaminathan M.(1991) The Bangalore Printing and Publishing Company
4) Principles of Biochemistry (CBS Publishers) by Martin estal (1990)
5) Text Book of BiochemistrybyRama Rao, A.V.S.S. (1986) 5th edition (L.K. and S. Publishers).
6) A biologists Guide to principles and Techniques of Practical Biochemistry by Ed. Wilson, K. and Goulding, K.H. (1986)3rd Edition (Edward Arnold).
7) Biochemistry by3M. Zubay, G. (1989) 2nd edition (Maxwell MacMillan
8) Davidson's Human Nutrition and Dietetics, Passmore, R and East Wood, M.A., (1986) 8th Edition (Longman).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17PH53206) FOOD MICROBIOLOGY

UNIT - I

Classification systemfor living organisms (Two kingdoms, three kingdoms, five kingdoms) Origin of microbiology-definition, History, Scope of microbiology-Branches of microbiology. Microscopic Study of bacteria yeast molds, viruses, with respect to morphology, reproduction growth, and nutritional requirements. Growth curve and reproduction.

UNIT -II

Culturing of microorganisms –methods of sterilization, disinfection and sanitation (Maintaince of aseptic conditions) Isolation, preservation and maintenance of pure culture. General and selective media for different types of microorganisms.

UNIT -III

Food microbiology - Microbes in manufacturing of important food ingredients. Factors affecting spoilage of foods; Micro flora associated with various food groups their spoilage potential & control. Microbiological spoilage problems associated with typical food products. Microorganisms in food fermentation.

UNIT -IV

Harmful /deleterious effects –food borne infections, food poisoning, Microbial toxins, Newer pathogens. Detection methods for E. Coli, Staphylococci, yersinia, campylobacter, B.cereus, Cl.botulinum& Salmonella from food samples.Microbiological quality assurance systems in food industry,food standards, rapid methods of microbial analysis.

UNIT - V

Industrial productions – fermentations, machines, fermentation types, chemostat. Industrial production of alcoholic, distilled beverages, citric acid, lactic acid bread enzymes (amylase), acetic acid.Microbial food products, mushrooms, single cell proteins, dairy products-yogurt, cheese, flavoured milk.

References:

1) Basic Food Microbiology by Banwant(CBS Publishers)
2) Modern Food Microbiology by Jay (CBS Publishers)
3) Microbiology by Frazier
4) Atlas R.M1934: Basic and practical Microbiology by MacMillan Publication Company, New York.
5) Microbiology principles and applications byCruger J.G. Black J.G. and Davison V.E. 1990: Prentice Hall of India Pvt. Ltd.,
6) Microbes in action – a laboratory manual of MicrobiologybyHary W.S. Paul J and Van Denmark 1972: Tarporwalsd.B. & sons, & Co., Ltd., Bombay.
7) Brock & Brock Basic Microbiologyby Prentice – Hall (India) Ltd., New Delhi.
8) CBS Publishers & Distributors, 485, BholaNath Nagar, Shahdara, Delhi 110 032
9) Prescott's Microbiology by Joanne Willey (Author), Linda Sherwood (Author), Chris Woolverton (Author). 2010. McGraw Hill, New york.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17PH53207) PLANTATION PRODUCTS AND FLAVOR TECHNOLOGY

UNIT - I

Flavours and flavoring materials: Flavorings in foods, added flavorings, compound flavorings, flavoring materials, and selection of flavoring materials.

Flavoring materials of natural origin: Natural flavors, sources of natural flavoring materials – Herbs and spices, standards of purity and sensory assessment of herbs and spices, classification of herbs and spices, Spice processing-milling, Microbiology of spices, gas sterilization of spices, gamma irradiation, Heat treatment, Distillation or Extraction. Distillation of volatile oils, Spice essential oils, Application of spice essential oils, Essential oil content of spices. Oleoresins-Extraction, quality and, application of oleoresins.

UNIT - II

Plants as source of essential oils Citrus fruits-Citrus essential oils, Composition of Citrus oils, processed citrus oils, methods of de-terpenization, Citrus leaf and Flower oils. The Mints: Peppermint - Cultivation and Distillation, Rectification. Corn mint- Cultivation and Distillation, Dementholisation. Spearmint-Blended Peppermint, Composition of Mint oils. Other Commercially Important Sources-Fruit, Fruit Juices and Concentrates,

Vanilla –Introduction, Curing Process, Classification, Flavor, The Chemistry of Vanilla flavor, Precursors and the Development of Flavor, Beverage flavors – Cacao, Chocolate, Coffee, Tea, and Aromatic vegetables.

UNIT -III

Flavoring materials made by processing: Natural products made by roasting (cocoa/chocolate) Reaction flavors – Enzymatically derived flavorings (Butter and cheese) – Flavors made by fermentation – Biotechnological production of aroma chemicals – Flavors made by pyrolysis.

UNIT -IV

Flavor potentiators: Chemical properties, sensory properties, flavour potentiation in foods – toxicity. Flavor Production: Liquid flavorings, emulsions, dry flavorings. Application of flavorings in food processing:, Achieving flavor balance, and criteria for application of flavorings, Available flavorings, processing parameters, specific flavoring applications.

UNIT - V

Tea, Coffee, Cocoa and Cashew nuts: Production, processing and chemistry of tea manufacture. Tea products such as soluble tea, tea concentrate, decaffeinated tea and flavoured tea.

Production, processing, roasting and brewing of coffee. Soluble coffee manufacture. Chemistry, standards and specifications of coffee. Other coffee products and coffee substitutes monsoonal coffee, decaffeinated coffee, coffee brew concentrate and chicory.

Production, processing and chemical composition of cocoa products and quality standards. Chemistry and technology of cashew nut.

References

1) Text Book of Food Science and Technology by VijayaKhadeICAA, New Delhi.2001
2) Source Book of Flavours - Eiri Publications
3) Flavour Chemistry and Technology byH.B.Heath and G.Reineccius,AVT PublishingCompany Connecticut (1986)
4) Food AdditivesbyA.L. Branen, P.M. Davidson and S.Salminen,Marcel Dekker Inc., W.Y (1990).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17PH53208) FOOD PROCESSING ENGINEERING

UNIT– IFLUID FLOW

Types of flow, Reynolds number, Viscosity, Concept of boundary layer, basic equations of fluid flow, valves, flow meters, manometers and measurement of flow and pressure. Material handling systems Liquid handling – Different types of pumps, Gas handling – Various types of fans, blowers and compressors, Solid handling – Bins, Bunkers, Conveyors, Air transport.

UNIT - II

HEAT TRANSFER , DRYING, EVAPORATION, AND CRYSTALIZATION

Sources of heat, Heat transfer by conduction, convection and radiation, with examples, steady state and unsteady state heat conduction individual and overall heat transfer co-efficient. Heat exchange equipments, types, relative merits and demerits.

Moisture content and mechanism of drying, rate of drying and time of drying calculations. Classification and types of dryers, dryers used in food industries and special drying methods.

Types of evaporators, single effect and multiple effect evaporators. Freezing and thawing Principles, applications and equipment.

UNIT III

SIZE REDUCTION &MIXING

Definition, objectives of size reduction, factors affecting size reduction, laws governing energy and power requirements of mill, types of mills including ball mill, hammer mill, fluid energy mill etc.

Properties of particulate solids, screening and industrial screening equipment-sieves and screens, magnetic separators, electrostatic separators, froth flotation

Theory of mixing, mixing time, power used in agitated vessels, powers consumption of mixing, rate of mixing viscous materials and pastes. Solid-solid, solid-liquid and liquid-liquid mixing equipment.

UNIT-IV

DISTILLATION, FILTRATION, AND CENTRIFUGATION

Simple, steam and flash distillations, principles of rectification, azeotropic and extractive distillation.

Extraction and Leaching Principles, equipment, types and applications.

Theory of filtration, filter aids, filter media, industrial filters including filter press, rotary filter, edge filter, etc. Factors affecting filtration.

Introduction, Principles of centrifugation, equations for centrifugal force, equations for rate of settling in centrifuge, industrial centrifugal filters- tubular, disc bowl filters, gas-solid cyclone separators and centrifugal sedimentary.

UNIT - V

ADVANCES IN FOOD TECHNOLOGY

Extrusion technology, Membrane processesing, Supercritical fluid extraction, Cryogenic grinding, high pressure processing, radiofrequency and microwave processing and Ohmic heating.

References

1) Unit Operations of Chemical Engineering by W.L.McCabe, J.C. Smith and P. Harriot, 5th Edition, McGraw Hill Book Co., 1993.
2) Chemical Engineering Handbook by Ed. Robert H. Perry, Cecil H.Citon.
3) Chemical engineering by J.M. Coulson and J.F. Richardson
4) Essentials of Food Processing Engineering by C.Gopala Rao,
5) Unit Operations in Food Processing by R.L.Eave, (MCG-Bostence)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17PH53209) PACKAGING TECHNOLOGY AND FOOD LAWS

UNIT - I

Introduction to packaging – Definition – Factors involved in the creation of food package, designing successful packaging – Packaging materials and forms – Testing of packaging materials, paper, paper board, plastics, glass containers, metal packaging.

Basic types of food processing for packaging – Heat processing (including irradiation), high barrier plastics packaging, Aseptic packaging, packaging for microwavable foods, Irradiation, UV – Light, Ultrasonic, High pressure techniques – Dehydration - Reduction of available water, Active packaging systems – Freezing, commercial freezing methods, protection needed by frozen foods.

UNIT - II

Packaging of fresh and chilled foods: Meat, Shell fish and dairy products and the package requirements – vacuum and modified atmosphere packaging. Packaging of frozen foods – package requirements for frozen fish, and dairy products.Packaging of fresh fruits and vegetables. Details of packaging of fruits &vegetables products packaging materials, packaging methods, problems related in packaging & Quality control, testing of packaging materials and importance of packaging in Food & Vegetables.Packaging of whole grain products: milled grain produced prepared mixes, paste, biscuits, bread and backed foods. packaging styles, wrapping materials and methods.

UNIT -III

Packaging Machinery Production and packaging line requirements – Bottling, layout of bottling line and details of individual steps on the automatic line – canning, details of individual steps in canning process – wrapping operations – form, fill and seal machines and labeling machines.

UNIT -IV

Biopackaging : Use of biopolymers in packaging, properties and applications of biopackaging, Recycling, reuse and disposal of food packaging materials, edible packaging materials.

UNIT - V

Food laws development and enforcement. FSSAI standards for food packaging. .

References:

1) Principles of Food packaging by Stanley Sacharow and Roger C. Griffin 2nd Edition, AVI Publishing Company, Estport, Connect
2) Food packaging and preservation by Ed. M.Mathlouthi, Blackte Academic Professional – Chapman & Hall (1994) (Daya Publishing Ltd)
3) A Hand Book of Food packaging by EIRI

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17PH53210) MANAGEMENT OF FOOD PROCESSING INDUSTRIES

UNIT - I

Entrepreneurship – Definition – Concept – Qualities of an Entrepreneur – Selection of project – Selection of Location – Economics of Site Location – Urban vs Suburban Locations – Plant layout – Types of Lay out – Flow lines – Material handling Equipment – Selection of Handling Equipment for Food Processing Industries – Introduction to production systems. Types of business ownership such as Proprietorship, Partnership, Limited Company and Joint stock companies.

UNIT - II

Management – Definition – Functions – Principles – Planning – Organizing – Coordinating – Directing – Controlling. Objectives–Polices of Corporate Management – Organization Structures – types-advantages and disadvantages of each type.

Brief description of Functional Management systems such as Financial Management, Personnel Management, Production Management and Marketing Management

Labor welfare and safety measures – Forecasting the demand for the product and demand analysis – Supply and demand relationships.

UNIT -III

Principles of Accountancy - Ledger and journal postings – Brief discussion of Balance sheet – trial balance – Profit and Loss accounts – Introduction to different types of accounts – Cost accounting – types – Methods of preparing cost sheet for the product manufactured.

UNIT -IV

Quality Control – Quality aspects of food – Quality control theory – Control of variables and attributes – Control charts – Sampling Theory – Problems related to quality control of food products – ISO 9000.

UNIT - V

Introduction to Operations Research – Model building – Brief description with simple examples of Linear Programming – Resource allocation model – Transportation model – Assignment model – Brief treatment of Sequencing model, waiting line model.

Inventory Management – EOQ model – ABC, JIT, FIFO, FILO, VED and FSN analysis .

References:

1) Industrial Engineering and Management by O.P. Khanna (Dhanpath ray Publishers)
2) Operations Research by V .K .Kapoor (Dhanpath ray Publishers)