BABA FARID GROUP OF INSTITUTIONS

DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

"Food technology course attract a large number of students because of its novelty as an educational course and also because of the growing demand for food technologists in today's world of packaged and fast foods. Food technologists are mainly required in hotels, food industries, rice mills, distilleries and packaging industries. The Ministry of Food Processing Industries which started functioning since 1988 has given a tremendous boost to this sector in India. The food technology courses give adequate training and knowledge to candidates regarding the quality analyzes of raw materials, packaging standards and methodology, health and hygiene parameters, processing techniques, storage and food value. They are also educated and trained to develop methodologies for extracting useful byproducts from industrial and domestic waste. The future of the food industries, on a global scale,is in the hand of food technologists. Food technology course cover the various aspects of food technology, microbiology, food preservation techniques, genetics and food packaging. "

--Dr. Sudhir Kumar
In-Charge
Department of Food Technology

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Syllabus of B.Sc. in Food Technology

SEMESTER I

BSFT 101 FOOD PRESERVATION AND PROCESSING PRINCIPLES

Unit-I

Basic considerations: Aims and objectives of preservation & processing of foods, Degree of perishability of unmodified foods, Causes of quality deterioration and spoilage of perishable foods, intermediate moisture foods, wastage of foods.

Unit-II

Preservation of foods by low temperatures:

Chilling temperatures: Consideration relating to storage of foods at chilling temperatures, Applications and procedures, Controlled and Modified atmosphere storage of foods, Post storage Handling of foods.

Freezing temperatures: Freezing process, Slow and fast freezing of foods and its consequence, other occurrences associated with freezing of foods. Technological aspects of pre-freezing, Actual freezing, Frozen storage and thawing of foods.

Unit-III

Preservation of foods by high temperatures: Basic concepts in thermal destruction of microorganisms D,Z,F values. Heat resistance and thermophic microorganisms. Cooking, Blanching, Pasteurization and Sterilization of foods. Assessing adequacy of thermal processing of foods, General process of canning of foods, Spoilage in canned foods.

Unit-IV

Preservation by water removal:

Principles, Technological aspects and application of evaporative concentration process; Freeze concentration and membrane process for food concentrations.Principles, Technological aspects and application of drying and dehydration of foods. Cabinet, tunnel, belt, bin, drum, spray, vacuum, foam mat, fluidized-bed and freeze drying of foods.

Unit-V

Principles, Technological aspects and application of sugar and salt, Antimicrobial agents, Biological agents, non ionizing and ionizing radiations in preservation of foods. Hurdle technology.

Book References Author

O.R.Fennema Principles of Food science
V.Kyzlink Principle of Food Preservation
James M.Jay Modern Food Microbiology

BSFT102 FRUITS, VEGETABLES AND PLANTATION PRODUCTS

Unit-I

Structural, Compositional and Nutritional aspects of fruits and vegetables. Physiological development: Growth, Maturation, Ripening and Senescence. Post harvest handling including controlled and modified storage. Techniques of processing and preservation of fruits and vegetables by refrigeration and freezing, canning and bottling, drying and dehydration.

Unit-II

Technology of fruits and vegetable products: Juices and pulps, Concentrates and powders, Squashes and cordials. Beverage: Still and carbonated. James, Jellies and Marmalades.

Preserves, candies and crystallized fruits. Tomato products: Puree, Paste, Ketchup, Sauce and soup. Chutneys, pickles and other products.

Unit-III

Spices: Composition, Structure and characteristics. Preservation and processing of major and minor spices of India; whole spice, Spice powder, Paste and extracts, Spice oils and oleoresins. Composition, Structure ,characteristics & processing of cashew nut and other dry fruits

Unit-IV

Composition, Production and processing of Tealeaves: Black tea, Green tea and Oolong tea. Instant tea. Production and processing of coffee cherries by wet and dry methods to obtain coffee beans, grinding, storage and preparation of brew, Soluble /Instant coffee, Use of chicory in coffee, decaffeinated coffee.

Unit-V

Production, processing and chemical composition of cocoa beans. Cocoa Processes: Cleaning, roasting, alkalization, cracking and fanning, Nib grinding for cocoa liquor, cocoa butter and cocoa powder. Manufacturing process for chocolate: Ingredients, Mixing, Refining, Conching, Tempering, Moulding etc. to obtain chocolate slabs, chocolate bars, enrobed and other confectionary products.

Book References:

Author Title

G. Lal, G.S. Siddappa and G.L. Tondan Preservation of fruits & vegetables.
& G.L. Tandon B.L. Amla Food Industry.
B. Shrilakshimi Food Science.
Bernard. W. Minifie Chocolate, Cocoa and Confectionary: Science and Technology.
R.H.H. Wills et.al. An introduction to the Post-harvest physiology and handling of fruits and vegetables.

BSFT 103 BASIC FOOD MICROBIOLOGY

Unit-I

General characteristics of microorganism: Classification, morphology, physiology, growth, nutrition and reproduction; Pure culture techniques and maintenance of cultures, control of microorganism.

Unit-II

Incidence of microorganism in foods, source of contamination. Principle underlying spoilage and preservation of foods.

Unit-III L

Contamination, spoilage and preservation of cereal products, sugar products, fruit and vegetable products, meat products, fish and sea foods egg and poultry products milk and milk products and other foods, Microbiological standard of foods.

Unit-IV

Food poisoning and food borne infections, food plant sanitation, inspection and control, personnel hygiene, HACCP in food industry. Beneficial microorganisms and their utilization in food fermentation.

Book references:

Author Title

M.J.Pelczar Microbiology
James M. Jay Modern Food Microbiology
Adams & M.O..Moss Food Microbiology
W.C.Frazier Food Microbiology

BSFT104 FOOD PACKAGING

Unit-I

Basic Concepts: Concept of packaging, Functions of a Food Package, Package development factors and Food package development. Aseptic Packaging. Newer trends.

Unit-II

Cellulosic and Polymeric packaging materials and forms: Food grade polymeric packaging materials, Rigid plastic packages. Films: Oriented, Co-extruded, Laminates and Metallised; Cellophane, Olefins, Polyamides, Polyesters, PVC, PVDC, PVA, Inomers, Copolymers,

Polycarbonates, Phenoxy, Acrylic and Polyurethane. Their mechanical sealing and barrier properties.

Unit-III

Glass and Metal containers: Glass: Composition, Properties, Bottle making and Closures for glass containers. Metal: Bulk containers, Tin-plate containers, Tin free steel containers, Aluminium containers, Latest development in metal cans and protective lacquers.

Unit-IV

Food product characteristics and package requirement, Selection of materials, Forms, Machinery and methods for fresh produce (Fruits, Vegetables, Egg, Meat and Fish), Edible oils and Fats, Spice and spice products, Processed products (Fruit & Vegetable, Cereal & Pulse, Dairy, Confectionary & Snacks, Meat & Marine products).

Unit-V

Package printing, Packaging Laws and Regulations, Evaluation of food packaging materials and package performance.

Book References:

Author Title

M. Mahadeviah and R.V. Gowramma Food Packaging Materials
S. Saclarow and R.C. Griffin Principles of Food Packaging
Trends in Food Science & Technology Proceedings of IFCON-1988

BSFT105 BASIC NUTRITION

Unit 1: Terms used in Nutrition and Health. Definitions-Health, Nutrition, Nutrients, Foods, Diet, R.D.A., Balanced diet, Malnutrition (Definition, causes, symptoms,), Under-nutrition, Over-nutrition, Optimum nutrition, PEM-Kwashiorkor, Marasmus

Unit 2: Five Food Groups and Food guide, relationship between food and nutrition, functions of food, classification of nutrients, factors affecting food consumption and food acceptance.

Unit 3: WATER- Functions, sources, requirements, water balance, dehydration (ORS) and toxicity, water as a cooking medium, effects of hard and soft water on cooking.

CARBOHYDRATE- Composition and classification, source, functions, requirements principles of cereal and sugar cookery (in brief)- effect of moist heat, effect of dry heat, identity of grains, gel formation, gluten formation, Pectic gels, crystallization, caramelization.

LIPIDS- composition, sources, functions, requirements, deficiency and excess; fatty acids- essential and non-essential, SFA, USFA, MUFA, PUFA, significance of fatty acids, Rancidity, Emulsion, changes on heating, smoking point, frying point, melting point,

processes- hydrogenation and rendering; factors affecting fat absorption (in brief)

Unit 4:

PROTEIN composition, classification (complete, incomplete), sources, functions, requirements, deficiency, nutritional classification of amino acids (essential, Non-essential, semi-essential), mutual supplementation, Biological value, effect of heat on protein- denaturation, coagulation and Maillard reaction, foam formation, fermentation, Germination, Protein in Foods – Pulse, milk, egg, fish, meat.

Unit 5:

MINERALS- distribution in body, functions and sources, bioavailability and requirement, deficiency and excess of the following. Factors affecting (enhancing/inhibiting) absorption Calcium, Phosphorus, Iron, Iodine

VITAMINS- classification, sources, functions, requirements, deficiency and excess of the following, Factors affecting availability of vitamins from the diet.

References-

Guthrie Helen (1986) Introductory Nutrition. Times Mirror/ Mosby College Publishing.
Age International Pvt. Ltd.

Bhatia Arti: Nutrition & Dietetics- Anmol Publication Pvt. Ltd.- New Delhi.
Blank F.C. (1999): Handbook of Food & Nutrition, Ago Botanical Publishers, Bikaner.
C.Gopalan, B.V. Ramasastri and S.C. Balasubramanian (1989)- Nutritive Value of Company, Minneapolis.
Elenaor N., Whitney S., Rady R. (1993): Understanding Nutrition, West Publishing Indian Foods. NINICMR Hyderabad 500 007
Kukude, S *et al*. Food Science, Sheth Publications.
Marion Benion & Hughes: Introductory Foods, Macmillan New York
Mudambi and Sheela Rao: Food science
Mudambi, S.R., Rajgopal, M.V.(1990) Fundamentals of Foods and Nutrition, New
Nutrient Requirements and Recommended Dietary Allowances for Indians- I.C.M.R.
Potter: Food Science,CBS publishers Pub.Co.Publication 1999.
Robinsson, and Lawler. (1986) Normal and Therapeutic Nutrition. Mac Millan
Shakuntala Manay: Foods Facts and Principles, Wiley Eastern
Srilaxmi: Food Science, New Age International
Subbulaksmi G., and Udipi S.:Food Processing and Preservation
Wardlaw (1993): Perspectives in Nutrition, Paul Insel Mosby.

SEMESTER II

BSFT 201 FOOD BIOCHEMISTRY AND BIOTECHNOLOGY

UNIT-I

Nutrition: Function's and energy of foods, basal energy metabolism, dietary allowances and standards for different age groups. Assessment of nutritional quality of foods, mineral and vitamins as functional constituents in human metabolism and deficiency diseases associated. Effect of processing on nutritive value of food.

UNIT-II

Enzyme: Classification, nomenclature, activation energy, Michaelis-Menten equation, Lineweaver Burk Plot, factors affecting enzymes action, mechanism of enzyme action.

UNIT-III

Proteins: Utilization of protein in body proteins products of protein metabolism. Disorders in metabolism, clinical proteins associated with excess and deficiency of proteins.

UNIT-IV

Carbohydrates: Utilization of carbohydrates in body metabolism of carbohydrates and disorder in metabolism.

UNIT-V

Lipids: Utilization of fats, biosynthesis of fatty acids and fats, clinical disorders associated with fats.

Books Recommended :

1. Food :Facts and Principles-N. Shakuntala Manay, N.Shadksharawamis.
2. Food Science-B.Srilakshmi
3. Fundamentals of Nutrition-L Loyd McDonald
4. Principles of Biochemistry-Lehninger

BSFT 202:FRUIT AND VEGETABLE PROCESSING TECHNOLOGY

UNIT-I

Current status of production and processing of fruits and vegetables. Structural, compositional and nutritional aspects. Post-harvest physiology, handling, losses and conservation of fruits and vegetables.

UNIT-II

Techniques of extension of shelf life of unmodified produce: use of adjuncts, novel packaging,controlled and modified atmosphere storages. Processing for conversion into products and preservation by use of chemical preservatives, chilling & freezing, sterilization & canning, concentration and dehydration and other special techniques.

UNIT-III

Technology of Products: juices & pulps, concentrates & powders, squashes & cordials, nectars, fruit drinks & beverages carbonated and its quality control. Fermented products (Cider, wine, brandy).

UNIT-IV

Jam, Jelly and Marmalades; candied fruits, dried fruits and fruit products (eg. Aam papads, bars); soup mixes; sauces & ketchups; puree & pastes; chutneys & pickles.

UNIT-V

Spices & condiments, spice oils oleoresins, Processing of cashew nuts, coffee & cocoa beans, and tealeaves, Specialty fruit and vegetable products.

Books Recommended

1. Food science by B.Srilakshami;New Age International.
2. Fundamentals of Foods and Nutrition by R. Madambi & M.V. Rajgopal.
3. Foods :Facts and Principles by N Shakuntala manay;New Age International (P) Ltd.
4. Preservation of Fruits and Vegetable by Girdhari lal and Sidappa; CBS Publications

5. Food Science and Processing Technology,Vol., 2 by Mridula and Sreelata
6. Food Preservation by Sandeep Sareen
7. Fruit and Vegetable Preservation by Shrivastava and Kunal.
8. Post-Harvest Physiology & Handling of Fruits & Vegetables by Wills, Lee, Graham, McGlasson & Hall (AVI)
9. Literature from Spice Board of India,etc.

Additional references

Bose, T.K. Ed. 1985. Fruits of India: Tropical and Sub-tropical. Naya Prokash, Calcutta.
Dauthy, M.E. 1997. Fruit and Vegetable Processing. International Book Distributing Co. Lucknow, India.
Hamson, L.P. 1975. Commercial Processing of Vegetables. Noyes Data Corporation, New Jersey.
Jagtiani J., Chan, H.T. and Sakal, W.S. Ed. 1988. Tropical Fruit Processing Academic Press, London.
Kadar, A. A. 1992. Postharvest Technology of Horticultural Crops. 2nd Ed. University of California.
Lai, G., Siddappa, G. and Tondon G.L. 1986. Preservation of Fruits and Vegetables, indian Council of Agril. Research, New Delhi.
Salunkhe, D.K. and Kadam, S.S. Ed. 1995. Handbook of Fruit Science and Technology: Production, Composition and Processing. Marcel Dekker, New York.
Salunkhe, D.K. and Kadam, S.S. Ed. 1995. Handbook of Vegetable Science and Technology. Production, Composition, Storage and processing Marcel Dekker, New York.
Seymour, G.B., Taylor, J.E. and Tucker, G.A. Ed. 1993. Biochemistry of Fruit Ripening. Chapman and Hall, London.
Srivastava, R.P. and Kumar, S. 1998. Fruit and Vegetable Preservation: Principles and Practices. 2nd Ed. International Book Distributing Co. Lucknow.
Ting, S.V. and Rousett, R.L. 1986. Citrus Fruits and Their Products. Marcel Dekker, New York.
Thurme S. Ed. 1991. Food Irradiation. Elsevier Applied Science, London.
Wills, R.B.H., McGlasson, W.B., Graham, W.B., Lee, T.H. and Hall, E.G. 1981. Postharvest: An Introduction tothe Physiology and Handling of Fruits and Vegetables. Granada, U.K.

BSFT 203 Fermentation technology

Unit-1

Introduction to fermentation: Rate of microbial growth and death. Fermentation kinetics, Types of fermentation sub-merged/solid state, Batch /continuous fermentation.

Unit-2

Fermenter design, operation, measurement and control in fermentation, Aeration and agitation in fermentation: Oxygen requirement, measurement of adsorption coefficients, sterilization of air and media; scale up in fermentation.

Unit - 3

Production of beer, wine and vinegar, Traditional fermented foods like idli and dosa. Principles of downstream processing and Product recovery.

Unit -4

Production of alcohols, organic acids, single cell proteins, enzymes and immobilization of enzymes. Biological waste treatment.

Suggested Readings

Stanburry P.P. and Whitaker, A. 1984. Principles of Fermentation Technology. Pergamon Press, Oxford UK.
Steinkraus, K.H. 1983. Handbook of Indigenous Fermented Foods. Marcel Dekker, New York.

BSFT204: MILK AND MILK PRODUCTS TECHNOLOGY

UNIT-I

Introduction: Status of Dairy Industry in India. Cooperative Dairying. Operation Floods. Chemical composition, microbiological quality, and nutritional importance of milk and milk product in PFA Act, Rules, 1955 as amended to date.

UNIT-II

Fluid Milks: Physicochemical characteristics and factors affecting them. Production, collection, testing quality, cooling, storage, and transportation of liquid milks. Receiving and quality assessing of liquid milk in dairy industry for detection of adulteration, decision for acceptance/rejection, and determination of price of the milk.

UNIT-III

Standardization and/or processing (pasteurization, sterilization and UHT processing), storage, packaging and distribution of liquid milks: whole, standardized, toned, double-toned, and skim milk. Recombined, reconstitued, and flavored milks. Cleaning and santitization of dairy equipments and plant as a whole.

UNIT-IV:

Milk Products: Definition, composition, methods of preparation/production, quality and/or grading parameters, packaging, storage characteristics, uses and shelf-life of cream, butter and ghee; evaporated and condensed milks, skimmed, whole and instants milk powders.

UNIT-V

Ice-Creams, fermented milks (Curd, yogurt etc.) and milk-products (cheeses, butter milk, lassi etc.); other milk products (khoa, casein, whey proteins, lactose etc.); milk and milk productbased sweetmeats (burfi, rasogolla, milk-cake, kalakand, ruberii etc.)

Books Recommended:

1. Outlines of Dairy Technology by Sukumar De,Oxford University Press.
2. Principles of Dairy Processing by James N.Warner, Wiley Eastern Ltd.
3. Milk and Milk Products by Eckles,Combs; and Macy,Tata McGraw Hill.
4. Technology of Indian Milk Products by Aneja et al. A Dairy India Publication.
5. PFA Act 1954 & Rules 1955 as amended to date.

BSFT 205: Food quality and safety management

Unit-1

Objectives, importance and functions of quality control. Methods of quality, assessment of food materials-fruits, vegetables, cereals, dairy products, meat, poultry, egg and processed food products.

Unit-2

Sanitation and hygiene, GMP, GLP, Statistical quality control. Food laws and standard, PFA, AGMARK.

Unit-3

Sampling and specification of raw materials and finished products, Concept of Codex Almentarious/ /USFDA/ISO 9000 series , rules and regulations for waste disposals.

Unit-4

Food adulteration and food safety. HACCP, Sensory evaluation-introduction, panel screening, Sensory and instrumental analysis in quality control, IPR and patents. Suggested Readings

Amerine, M.A. Pangborn, R.M., and Rosseler, E.B. 1965. Principles of Sensory
Evaluation of Food. Academic Press, New York.
Birk, G.G., Herman, J.G. and Parker, K.J. Ed. -1977. Sensory Properties of Foods.
Applied Science, London.
Charalambous, G. and Inglett, G. 1981. The Quality of Foods and Beverages. (2 vol.set). Academic Press, New York.

Furia, T.E. Ed. 1980. Regulatory Status of Direct Food Additives. CRC Press, Florida.
Krammer, A. and Twigg, B.A. 1970. Quality Control for the Food Industry. 3rd Edn. AVI, Westport.
Pattee, H.E. Ed. 1985. Evaluation of Quality of Fruits and Vegetables. AVI, Westport.
Ranganna, S. 1986. Handbook of Analysis and Quality Control for Fruits and Vegetable Products. Tata McGraw Hill, New Delhi.
Tannenbaum, S.R. Ed. 1979. Nutritional and Safety Aspects of Food Processing, Marcel Dekker, New York.

SEMESTER III

BSFT 301: Food additives, contaminants and toxicology

Unit-1

Additives in food processing and preservation. Their functions and safety. Safety and quality evaluation of additives. Acute and chronic studies. LD50. Analytical methods: chemical and instrumental.

Unit-2

Various additives such as preservatives, antioxidants, emulsifiers, sequesterants, humectants, stabilizers with respect to chemistry, food uses and functions in formulations.

Unit-3

Colours, flavours, sweeteners, acidulants with respect to chemistry, food uses and functions in formulations, indirect food additives

Unit-4

Food contaminants, physical, chemical, microbial and other contaminants; food toxicants.

Suggested Readings

Fennema, O.R. Ed. 1976. Principles of Food Science: Part-I Food Chemistry. Marcel Dekker, New York.

Potter, N.N. 1978. Food Science. 3rd Ed. AVI, Westport.

Branen A.L. and Davidson, P.M. 1983. Antimicrobials in Foods. Marcel Dekker, New York.

Furia, T.E. 1980, Handbook of food additives, Vol I and Vol II.

BSFT302: Food Beverages

Unit 1 Fruit Juices Squashes & Cordials:

Equipment for fruit juices, double operations prosses. Pulping equipment, dearator & flashpasteurization, fruit beverage-preparation & preservation. Straining, filtration & clarification. Preservation of fruit juices preservation by addition of sugar, freezing ,by carbonation & by filtration.

Unit 2. Fruit Beverages:

Squases & Cordials,juices syrups, carbonated beverages. Fruit juice concentrate. Fruit juice powder

Unit 3.Fermented Beverages:

Beer –Brewing , raw material & manufacture,storage finishing & packaging Grape wine-composition of grapes, wine type & their composition mold & yeast of grape & wine. Chemistry of Fermentation; composition of wine .Production of red and white table wine, production of sherry sparkling wine ,desert wine vermouth wine,flavoured wine , fruit wine etc . spoilage of wine –Non-bacterial & bacterial.

Unit 4:Brandy & whisky production-Definition ,compounds and methods of manufacture; winery by-products.

Unit 5: Coffee-Production practice, processing of coffee beans into powder, instant coffee, decaffeination. Tea-Leaf processing, various classes of tea, changes during processing of tea leaves, instant tea.

References Books:

1. Preservation of fruits & vegetable. Girdharilal & Siddappa
2. Commercial fruits & Vegetable Product. W.V.Cruees
3. Technology of wine making food science. W.V.Cruees.S
4. Technology, chemistry and microbiology of food beverages: Varman & Sakesland

BSFT 303:Technology of Spices.

UNIT 1- Spices, Spice oils & Oleoresin

Definition, Classification, Chemical composition , Use of Spices. Spice oil and Oleoresins—Definition, Technology of Manufacturing

UNIT II—Major Spices

Pepper Refining and processing of pepper Pepper products:- White pepper, dehydrated green pepper, Pepper oil, Oleoresin.

UNIT III

Chillies:- Drying of chillies, quality attributes of chillies and paprika **Cardamom:-** Composition, Drying of fruits, Bleaching, Grading, Cardamom products, Essential oil and oleoresins

UNIT IV

Ginger:-Curing, Bleaching, Grading Ginger Products, Ginger oils, Ginger oleoresin, Dehydrated Ginger, Bleached Ginger

Turmeric:-Curing, Grading, Turmeric powder, Essential oil, oleoresin.

Packaging of spices

REFERENCES

Major spices of India J S Pruthi

Quality assurance in spices and spice products J S Pruthi

BSFT304: Food Engineering

UNIT I Unit operations & Heat transfer

Unit operations and Heat transfer: Mode of heat transfer – Conduction, Convection, Radiation. Heat exchanger:Classification, contact type heat exchange - Immersion, Non-contact type heat-exchanger, Plate Heat exchanger, Scraped surface Heat exchanger, Tubular Heat exchanger, Double & Triple tube Heat exchanger, Shell and Tube Heat exchanger. Pasteurization: HTST, UHT, Pasteurizing equipments

UNIT II Refrigeration & Freezing

Refrigeration Principle of refrigeration, Vapour compression refrigeration cycle

Freezing Principle of freezing & freezing rate

UNIT III Evaporation

Principle, single effect evaporation, multiple effect evaporation, Types of evaporators - Horizontal tube, Vertical tube, Falling film evaporator, Raising film evaporator.

UNIT IV Driers & Boilers

Driers Principle , constant rate & falling rate of period of drying, Types of driers - Drum drier, Cabinet drier, Tunnel drier, Spray drier, Fluidized bed drier

Boiler Principle, working of water tube & fire tube boiler

UNIT V Rheology

Definition, Rheological characteristics of foods, viscosity, apparent viscosity-Newtonian and Non Newtonian

References

Unit operations of Agricultural processing K.M Sahay & K.K Singh

Refrigeration & Air conditioning P Kurmy & Gupta

Introduction to Food Engineering R. Paul singh, Dennis R Heldman

Introduction to Food Process Engineering Ramco.T. Toledero

Unit Operations of Chemical Engineering Warren L Macabe, Julian C Smith, Peter Hariot

BSFT 305: CEREALS AND LEGUMES PROCESSING TECHNOLOGY

UNIT-I

Importance of cereals and legumes, Post-harvest quality and quantity losses. Recommended pre-processing practices for handling of cereals and pulses for their safe storage, including control of infestation, National and International quality and grading standards.

UNIT-II

Structure, types, composition, quality characteristics and physicochemical properties of wheat. Cleaning, tempering and conditioning, and milling processes for different wheat's. Turbogriding & Air Classification. Blending of flours. Milling equipments and milling products (Dalia, Atta, Semolina and flour). Flour grades and their suitability for baked goods. Quality characteristics and rheological properties of wheat milling products and its assessment. Byproduct utilization.

UNIT-III

Structure, types, composition, quality characteristics and physicochemical properties of rice. Milling and parboiling of paddy, Curing and ageing of paddy and rice. Criteria in and assessment of milling, cooking, nutritional and storage qualities of raw & parboiled rice. Processed rice products (flaked, expanded and puffed rice). By-product (husk and rice bran) utilization.

UNIT-IV

Structure, types and composition of corn. Dry and wet milling of corn. Starch and its conversion products. Processed corn products (popped corn, corn flakes etc.) Structure and composition of barley, bajra, jowar and other cereal grains and millets. Malting of barley. Pearling of millets. Parched and snack products.

UNIT-V

Structure, composition and properties of legumes. Cleaning, grading, pretreatments for difficult-to-mill (urad, arhar, moong, moth) and easy-to-mill (chana, masoor and pea) legumes, milling practices and actual milling of different legumes. Sweet and savory products from legumes in India.

Books Recommended

1. Cereals Technology by Samuel A.Matz. CBS Publications.
2. Technology of Cereals by N.L.Kent.
3. Food Facts and Principles by Mannay;New age International (P) Ltd.
4. Food Science by Norman N.Potter;CBS Publications.
5. Chemistry and Technology of Food and Food Products by M.B. Jacobs
6. Manuals on Rice and its Processing by CFDRI.
7. Cereals & Cereals Products-Chemistry & Technology by DAV Dendy & B.J.Dobraszezk, Aspen Publication.
8. Development in Milling & Baking Technology by AFST (I), CFDRI, Mysore, India.
9. Food Industries of CEEDC, IIT, Madras.
10. Articles on Pulse Milling in India Food Industry & JFST,both Publications of AFST (I).

Semester IV

BSFT 401: EGG, POULTRY, MEAT & FISH PROCESSING TECHNOLOGY

UNIT-I

Current levels of production, consumption and export of category products. Nutritional, safety/health and hygienic considerations.

UNIT-II

Egg: Structure, composition, nutritional and functional characteristics of eggs. Grading, spoilage, storage and transportation of whole eggs. Processing of eggs for liquid products (white, yolk and whole egg) and solid products (albumen, whole egg powder) for preservation through freezing & drying.

UNIT-III

Poultry: Pre-slaughter care and consideration; Operations in preparation of dressed poultry, its storage and marketing; Quality and safety considerations; utilization of by-products. Poultry cuts.

UNIT-IV

Meat: Ante-mortem examination of meat animals, scientific techniques of slaughtering, dressing, post-portem inspection, storage, tenderization, cuts, packaging; beef, mutton, pork as human foods, cured meat products, sausages, by-products, frozen and canned meat products.

UNIT-V

Fish: Types, catch, examination; care in handling & transportation; processing of shell-fish, crabs, oysters, lobsters, frog legs etc. for domestic and export markets. Filleting and freezing, canning salting & drying of fish. Fish sauce and protein concentrates.

Books Recommended:

1. Meat Science by R.A. Lawrie,Pergamon Press.
2. Poultry Products Technology by G.J. Mountney.
3. Meat, Poultry & Sea Food Technology by R.L.Henricksons.
4. Poultry Meat and Egg Production by Parkhurst & Mountney.

BSFT 402: FOOD ADDITIVES AND LEGISLATION

UNIT-I

Definitions, uses and functions of Acid, Base, Buffer systems, Salts and chelating/sequestering agents, Masticatory substances. Low calorie and non nutritive sweeteners, Polyols.

UNIT-II

Antioxidants, Emulsifying and stabilizing agents, Anti-caking agents, thickeners, Firming agents. Flour bleaching agents and Bread improvers.

UNIT-III

Anti microbial agents / Class I and Class II preservatives as per PFA Act.

UNIT-IV

Colorants, Flavoring agents and related substances, Clarifying agents. Gases and Propellants. Tracers and other additives.

UNIT-V

Food standards and Specifications: Compulsory and voluntary trade and Company standards. Consumer Protection Act (1986) and relevant Food Legislation (Act, orders, standards):
PFA(1954), FPI(1955), SWMA, MPO(1977), VCO(1978), AgMark, BIS, US, Canadian, EU, ISO and Codex Food Standards, Export Quality Control and Inspection act (1963), Environment Protection Act (1986), WTO & GATT.

Books Recommended:

1. Food Chemistry O.R.Fennema
2. Food Chemistry Belitz, Grosch
3. Various acts, orders, standards & specification

BSFT 403: FOOD HYGIENE AND PLANT SANITATION

UNIT-I

General principle of food hygiene, Hygiene in rural and urban areas in relation to food preparation, personal hygiene and food handling habits. Place of sanitation in food plants. Sanitary aspects of building and equipment: Plant layout and design, Comparative studies on sanitary fabrication of different types of processing equipments.

UNIT-II

Safe and effective insect and pest control: Extraneous materials in foods, Principles of Insects and pets control. Physical and chemical control. Effective control of micro-organisms: microorganisms important in food sanitation, micro-organisms as indicator of sanitary quality. Physical and chemical methods.

UNIT-III

Sanitary aspects of water supply: Source of water, quality of water, water supply and its uses in food industries. Purification and disinfection of water preventing contamination of potable water supply.

UNIT-IV

Effective detergency and cleaning practices: Importance of cleaning technology, physical and chemical factors in cleaning, classification and formulation of detergents and sanitizers, cleaning practices.

UNIT-V

Sanitary aspects of waste disposal. Establishing and maintaining sanitary practices in food plants, role of sanitation, general sanitary consideration and sanitary evaluation of food plants.

Books Recommended:

1. Guide to Improve Food Hygiene - Gaston and Tiffney
2. Practical Food Microbiology & Technology - Harry H. Weiser, Mountney, J. and Gord, W.W.
3. Food Poisoning and Food Hygiene - Betty C. Hobbs
4. Principles of Food Sanitation - Marriott and Norman, G.
5. Hygiene and Sanitation in Food Industry - S. Roday

BSFT 404: ENTERPRENERSHIP AND AGRIBUSINESS MANAGEMENT

UNIT-I

Element in Enterprise Management: Basic management concepts, personnel, production, materials, financing and marketing managements, problem solving and innovation, industrial and business law. Entrepreneurial motivation.

UNIT-II

Environmental analysis, project selection, project appraisal, modification/ finalization of project, collaborations, preparations for launching, trial run and test marketing.

UNIT-III

Management of agribusiness projects and enterprise. Management of agribusiness trade in WTO environment. Agricultural and food policy. Rural environment and institution.

UNIT-IV

Marketing of Agricultural input and Marketing of Agricultural product. Market research for agribusiness.

UNIT-V

Commodity trading and forecasting for agribusiness. Retail and supply chain management. Management of cooperation.

Books Recommended:

1. Marketing Management - Philip Kotler
2. Marketing Management - Dr. P. K. Srivastava
3. Marketing Management - Dr. S. C. Jain

BSFT 405: INDUSTRIAL MICROBIOLOGY & ENZYME TECHNOLOGY

UNIT-I

Introduction, Classification of Microbial products. Microbial Processes for Production of organic acids, solvents, antibiotics, enzymes, polysaccharides, lipids, pigments and aroma.

UNIT-II

Equipments and Accessories for industrial processes.

UNIT-III

Stability of Enzymes. Enzymes stabilization by selection and genetic Engineering, protein engineering.

UNIT-IV

Reaction Environment rebuilding, Chemical modification, intra-molecular cross linking, immobilization.

UNIT-V

Application of enzymes in industry, analytical purpose and medical therapy

Books Recommended:

1. Industrial microbiology:-Casida Newage Publication 2001
1. Industrial microbiology:-Prescott and Dunn CBS Publications 4th Ed. 1999
2. Enzymes:-Trevor. Horwood 2001
3. Journals and Reviews

SEMESTER V
BSFT 501: OILS AND FATS PROCESSING TECHNOLOGY

UNIT-I
Sources; chemical composition; physical and chemical characteristics; functional and nutritional importance of dietary oils and fats. Post-harvest handling storage and processing of oilseeds for directs use and consumption.
UNIT-II
Extraction of oil by mechanical expelling and solvent extraction and obtaining deoiled cakes suitable for edible purposes. Processing of other plant sources of edible oils and fats like coconut, cottonseed, rice bran, maze germ, etc.
UNIT-III
Refining: Clarification, degumming, neutralization (alkali refining), bleaching, deodorization techniques / processes. Blending of oils.
UNIT-IV
Processing of refined oils: Hydrogenation, fractionation, winterzation, inter-esterification etc. for obtaining tailor-made fats and oils.
UNIT-V
Production of butter oil, lard, tallow, Margarine, Cocoa butter equivalents, shortenings, low fat spreads, peanut butter etc. Speciality fats and designer lipids for nutrition and dietetics, especially by biotechnology.
Books Recommended
1. Bailey's Industrial Oil & Fat Products, 4th ed.John Wiley & Sons.
2. The Industrial Chemistry of Facts & Waxes 3rd. by Balliere,Tindall & Cox.
3. Handling & Storage of Oiseeds,Oils,Fats & Meal by Paterson, HBW.
4. Modern Technology in the Oils & Fats industry by S.C. Singhal,OTA (I).

BSFT 502: Food flavourings
Unit 1
Food flavor and its importance to consumers and food processors. Flavor and nutrition. Sources, extraction, delivery systems, and analyses (chemical, instrumental, and sensory) of flavours and flavorings in foods. Sensory perception of flavor: Senses of taste and smell, tasting versus sniffing, astringency, pungency, interaction of senses in flavor perception; taste, odour,and acceptance of flavor stimuli.
UNIT-II
Chemistry of substances responsible for taste and flavor-taste sensations, flavour enhancers, flavour potentiators or modifiers. Methodology of sensory evaluation and determination of threshold levels as specified by BIS.
UNIT-III
Flavoring constituents of various foods like meat, fish, milk, vegetables, fruits, fats & oils, spices & herbs, cereals and pulses. Flavor changes during processing, preservation, packaging, and storage of foods. Roles as sulfur compounds, fatty acids, amino acids, terpenoids, lactic acid-ethanol in food flavours. Process and reaction flavours/volatiles in foods.
UNIT-IV
Spices and herbs as food flavorings: Processing of basil, mint, saffron, cloves, tamarind, ginger, cardamom, chilies, pepper etc. for essential oils, extracts and oleoresins as the case may be.
UNIT-V
Determination of hygroscopic nature and shelf life/acceptance of foods. Natural, Nature identical and Synthetic flavors: Definitions, chemical composition/constituents, extraction and preparation of flavors, Stability and utility of flavor preparations. Methods used in flavor evaluation. BIS Specifications/PFA restrictions for use of certain constituents in flavoring materials.

Books Recommended:
1. Food Chemistry by Fennema
2. Spices & Flavor Technology by Pruthi, J.S.

BSFT 503: DESIGN OF FOOD PROCESSING EQUIPMENTS

UNIT-I

Introduction to design of post harvest equipments. Design considerations and their interaction with material selection, equipment size and structural design. Code and material selection.

UNIT-II

Design of material handling equipment: Belt conveyor, bucket elevator, screw conveyor, cyclone conveyor, chain conveyor, pneumatic conveyor.

UNIT-III

Design of heat exchangers: Shell and tube, plate and scraped surface heat exchanger (Design will include functional & structural design).

UNIT-IV

Design of seed processing equipments: Air screen cleaner, rotary cleaner, graders based on size shape and surface produce handled, seed treater.

UNIT-V

Storage and pressure vessels: Design of shell conveyor and other components including nozzles, flanges, reinforcement.

Books Recommended:
1. Process Plant Design - Beckhurst, J. K. and Harber, J. H.
2. Process Equipment Design - Brownell, L. E. and Young, E. H.
3. Process Equipment Design - Joshi, M. V.
4. Chemical Engineering Handbook - Perry, R. H. and Chitton, C. H.

BSFT 504: FOOD QUALITY AND SAFETY

UNIT-I

Ways of describing food quality: Composition, appearance, kinesthetic and flavour attributes. Nutritional quality of foods and its assessment (content and quality of nutrients). Microbiological quality of foods.

UNIT-II

Sensory quality and its evaluation, instrumental measurement of sensory attributes such as color, viscosity, texture etc.

UNIT-III

Quality control, quality assurance and total quality management in food industry.

UNIT-IV

Defects in food quality, its sources, classification, prevention and control. Statistical quality control. Quality costs.

UNIT-V

Antinutritional factors in food. Undesirable constituents developing in Process and storage of food. Microbial contamination, pesticide residues, concept of HACCP, physical, chemical and microbiological safety of food.

Books Recommended:
1. Quality control in the food industry -S. M. Herschfoerfer
2. Quality control for the food industry -A. Kramer and B.A.Twigg
3. Principles of sensory evaluation of Foods -M. A. Amerine
4. Rheology and Texture in Food Quality -J. M. deMan, P. W. Vowsy
5. Food Chemistry - Fenemma
6. Analysis of Fruits and vegetables -Ranganna

BSFT 505:FOOD INDUSTRY WASTE MANAGEMENT

UNIT-I

Characterization and utilization of by-products from cereals, pulses, oilseeds, fruits, vegetables, plantation, dairy, eggs, meat, fish and poultry processing industries. Elements of importance in efficient management of wastes from aforesaid food industries.

UNIT-II

Standards for emission or discharge of environmental pollutants from food processing industries covered under PFA Act., 1986. Characterization of food industries effluents, in terms of parameters of importance

UNIT-III

Unit concept of treatment of food industry effluents: Screening, sedimentation, floatation as per and primary treatments, biological oxidations:– objectives, organisms, reactions, oxygen requirements, aeration devices.

UNIT-IV

Effect on characteristic parameters of effluents in treatments using lagoons, trickling filters, activated sludge process, oxidation ditches, rotating biological contracters and theirs variations and advanced modifications.

UNIT-V

Advanced wastewater treatment systems: physical, physicochemical and chemical treatments. Coagulation and flocculation, disinfection, handling and disposal of sludge and treated effluents conforming to EPA provisions.

Books Recommended:

1. Water technology by N.F.Gray.
2. Environmental pollution by K.C.Agrawal.
3. Industrial microbiology by L.E.Casida Jr
4. Environmental pollution control engireering by C.S. Rao.
5. Food processing waste management by green and Kramer (AVI)
6. By- products from food industries: utilization and disposal by AFSI(I)
7. Environment (protection) act, 1986.
8. Handbook of advanced wastewater treatment by Culp and Wisner.

SEMESTER VI

BSFT 601 Industrial training

To acquaint the students with practical aspects related to the operations of food processing equipments and processing of food products.