



RKDF UNIVERSITY, BHOPAL

M.Sc. (Food Science & Technology)

SCHEME

Semester – I

No	Subject Code	Subject Title	Marks Allotted						
			Assignment Marks		Theory Marks		Practical Marks		Total Marks
			Max	Min	Max	Min	Max	Min	
1	MFST 511	PRINCIPLES OF FOOD PROCESSING & PRESERVATION	20	8	80	32	-	-	100
2	MFST 512	FOOD MICROBIOLOGY	20	8	80	32	-	-	100
3	MFST 513	FOOD CHEMISTRY	20	8	80	32	-	-	100
4	MFST 514	BIOCHEMISTRY AND NUTRITION	20	8	80	32	-	-	100
5	MFST-515	PRACTICAL I (BASED ON MFST 511 & MFST 512)	-	-	-	-	50	20	50
6	MFST-516	PRACTICAL II (BASED ON MFST 513 & MFST 514)	-	-	-	-	50	20	50
Total			80	32	320	128	100	40	500



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M.Sc. (Food Science & Technology)

Syllabus Semester – I

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Food Science & Technology)	PRINCIPLES OF FOOD PROCESSING AND PRESERVATION	MFST- 511

Unit-1

Scope and importance of food processing: national and international perspectives, Principles of Preservation methods, fermentation methods for preservation, and chemical preservations of foods.

Unit-2

Food preservation by low-temp: Refrigeration, freezing and freeze-drying

Unit-3

Food preservation by heating: drying, osmotic dehydration, blanching, canning, pasteurization, sterilization, extrusion cooking.

Unit-4

Non-thermal preservation: Hydrostatic pressure, dielectric heating, microwave processing, hurdle technology, membrane technology, irradiation.

Unit -5

Preservation by food additives & Radiation: The ideal antimicrobial preservation/Added preservatives/Developed preservatives, Ultraviolet irradiation, Ionizing radiation, Gamma rays and cathode rays, microwave processing.

Suggested Readings:-

Arsdel W.B., Copley, M.J. and Morgen, A.I. 1973. Food Dehydration, 2nd Edn. (2 vol. Set). AVI, Westport.

Bender, A.E. 1978. Food Processing and Nutrition. Academic Press, London.

Fellows, P. and Ellis H. 1990. Food Processing Technology: Principles and Practice, New York.

Jelen, P. 1985. Introduction to Food Processing. Prentice Hall, Reston Virginia, USA. Lewis, M.J. 1990. Physical Properties of Food and Food Processing Systems. Woodhead, UK.

Wildey, R.C. Ed. 1994. Minimally Processed Refrigerated Fruits and Vegetables. Chapman and Hall, Lond



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M.Sc. (Food Science & Technology)

Semester – I

Syllabus

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Food Science & Technology)	FOOD MICROBIOLOGY	MFST- 512

Unit-1

History of microbiology of food. Types of micro-organism normally associated with food- mold, yeast, and bacteria, Microbial growth pattern, physical and chemical factors influencing destruction of micro-organisms.

Unit-2

Micro-organisms in natural food products and their control. Biochemical changes caused by micro-organisms, deterioration and spoilage of various types of food products, microbial food fermentation

Unit-3

Contaminants of foods-stuffs, vegetables, cereals, pulses, oilseeds, milk and meat during handling and processing.

Unit-4

Food poisoning and microbial toxins, standards for different foods. Food borne intoxicants and mycotoxins.

Unit-5

Beneficial microorganisms: SCP- Microorganisms used, raw materials used as substrate, condition for growth and production, nutritive value and use of SCP; Fat from microorganisms- Microorganisms used, raw materials, production of fat; Production of amino acids; Production of other substances added to foods. Production of enzymes- amylases, invertase, pectolytic enzymes, proteolytic enzymes, other enzymes. Fermentation- tempeh kedele, soya sauce production, vinegar, lactic acid bacteria fermented food, Dairy based fermented foods- Kefir, yoghurt, cheese and butter; Yeast based fermented foods- bread, wine and beer.

Suggested Readings:-

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

Jay J.M. 1986. Modern Food Microbiology. 3rd Edn. VNR, New York. Robinson, R.K. Ed. 1983. Dairy Microbiology. Applied Science, London.



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Semester – I

Syllabus

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Food Science & Technology)	FOOD CHEMISTRY	MFST- 513

Unit-1

Food chemistry-definition and importance, Carbohydrates-chemical reactions, functional properties of sugars and polysaccharides in foods. Applications and preparations of sugars and polysaccharides.

Unit-2

Protein and amino acids: structure, classifications, sources, denaturation and functional properties of proteins. Maillard browning. Lipids: classification, and use of lipids in foods, physical and chemical properties, effects of processing on functional properties.

Unit-3

Vitamins and Minerals, Effect of vitamins and minerals Enzymatic processing on browning in foods and industrial applications of enzymes. Water in food, water activity and shelf life of food.

Unit-4

Natural food flavours, extraction methods and characterization. Pigments in food and their industrial applications.

Unit-5

Enzymes: Nomenclature and classification , kinetics of enzymic reactions, types of enzymes, enzyme inhibition, reversible inhibition, irreversible inhibition, conditions affecting enzymatic reactions, co-enzymes,

Vitamins: classification, functions, requirement and deficiency conditions, vitamin A, D, E, K, Ascorbic acid, Thiamine, Riboflavin, Niacin, Pyridoxine, Folic acid, Pantothenic acid

Suggested Readings:-

Aurand, L.W. and Woods, A.E. 1973. Food Chemistry. AVI, Westport.

Birch, G.G., Cameron, A.G. and Spencer, M. 1986. Food Science, 3rd Ed. Pergamon Press, New York.

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

Meyer, L.H. 1973. Food Chemistry. East-West Press Pvt. Ltd., New Delhi. Potter, N.N. 1978. Food Science. 3rd Ed. AVI, Westport.



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M.Sc. (Food Science & Technology)

Semester – I

Syllabus

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Food Science & Technology)	Biochemistry and Nutrition	MFST- 514

Unit-1

Protein structure, commercial sources of proteins, principles for separation methods. Protein concentrates and isolates - various methods of manufacturing, factors affecting quality of isolates and concentrates. Protein hydrolysates - protein hydrolysates, factors affecting quality of hydrolysates.

Unit-2

Enzymes as biocatalysts – chemistry, classification, mode of action, specificity, assay techniques, isolation and purification, stabilization, enzyme kinetics. Applications of enzymes.

Unit-3

Pathways of metabolism of carbohydrates, proteins, lipids. Enzyme biosynthesis and regulation. Metabolic regulation, hormones, Release of energy and its trapping.

Unit-4

Metabolic rate and caloric needs. Requirements and role of nutrients in human health, RDAs. Nutrition of dietary fibres. Biological value of proteins. Energy value of foods. Techniques of diet and health surveys. Formulation of diets and food products for specific needs.

Unit-5

Amino acids and peptides-classification, chemical reactions and physical Properties. Sugars - classification and reactions. Heterocyclic compounds-and secondary metabolites in living systems - nucleotides, pigments, isoprenoids Separation techniques for different biomolecules

Suggested Readings:-

Altschul, A.M. and Wilcke, H.L. Ed. 1978. New Protein Foods. Vol. III. Academic Press, New York.
Bodwell, C.E. Ed. 1977. Evaluation of Proteins for Humans. AVI, Westport. Milner, M., Scrimshaw, N.S. and Wang, D.I.C. Ed. 1978. Protein Resources and Technology. AVI, Westport.
Salunkhe, O.K. and Kadam, S.S. Eds. 1999. Handbook of World Legumes: Nutritional Chemistry, Processing Technology and Utilization. Volume I to III. CRC Press, Florida.
Salunkhe, D.K. Chavan, J.K., Adsule, R.N. Kadam, S.S. 1992. World Oilseeds: Chemistry, Technology and Utilization, Van Nostrand Reinhold, New York.



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Semester – I

Syllabus

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Food Science & Technology)	LABORATORY COURSE-I	MFST- 515

LABORATORY COURSE-I

Importance of sampling and techniques of sampling. Estimation of moisture, proteins, fats, minerals and vitamins, starches, sugars, amino acids, crude fiber in foods. Determination of minerals-calcium, phosphorus, iron, Estimation of vitamins-ascorbic acid, carotene, thiamine. Analysis of lipids-saponification value, acid value and iodine value. Determination of starch and pectic substances using different methods. Isolation of starch, casein. Estimation of lactose in milk. Testing storage stability of fats and oils.

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Food Science & Technology)	LABORATORY COURSE-II	MFST- 516

LABORATORY COURSE II

Microscopy and micrometry. Preparation of nutrient media, sterilization and inoculation techniques, Isolation of pure culture, microbial examination of natural food products, identification of food pathogen in water, milk, cereals, pulses, oilseeds, meat and poultry. Microbial production of alcohol (cereal based), acetic acid and lactic acid.

Electrophoresis of proteins for their identification. Determination of free fatty acids of GLC. Estimation of antinutritional factors including gossypol, trypsin inhibitor, phytic and etc. Chromatographic separation techniques for sugars and proteins.

Determination of physical, chemical and functional properties of various proteins. Preparation of protein concentrates and isolates from different sources. Preparation of protein hydrolysate.



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SCHEME

Semester – II

No	Subject Code	Subject Title	Marks Allotted						
			Assignment Marks		Theory Marks		Practical Marks		Total Marks
			Max	Min	Max	Min	Max	Min	
1	MFST-521	PRINCIPLES OF FOOD ENGINEERING	20	8	80	32	-	-	100
2	MFST-522	CEREAL AND LEGUME TECHNOLOGY	20	8	80	32	-	-	100
3	MFST-523	FRUIT AND VEGETABLE TECHNOLOGY	20	8	80	32	-	-	100
4	MFST-524	FERMENTATION TECHNOLOGY	20	8	80	32	-	-	100
5	MFST- 525	PRACTICAL III (BASED ON MFST 521 & MFST 522)	-	-	-	-	50	20	50
6	MFST- 526	PRACTICAL IV (BASED ON MFST 523 & MFST 524)	-	-	-	-	50	20	50
Total			80	32	320	128	100	40	500



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M.Sc. (Food Science & Technology)

Semester – II

Syllabus

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Food Science & Technology)	PRINCIPLES OF FOOD ENGINEERING	MFST- 521

Unit-1

Unit operation in food engineering, Mass and energy balance, Fluid flow, fluid statics, fluid dynamics, fluid flow applications, Heat transfer-modes of heat transfer, conduction, convection, and radiation, heat exchangers and their designs.

Unit-2

Thermal processing-evaporation and concentration, dehydration, drying, blanching, pasteurization, sterilization, distillation and crystallization.

Unit-3

Mechanical separation-filtration, membrane concentration, sieving, centrifugation, sedimentation, Mechanical handling-conveying and elevation. Size reduction and classification-mixing, kneading, blending.

Unit-4

Applied mathematics, numerical analysis, computational mathematics; statistics, mean, mode, variance, standard deviation and statistical tools for data analysis.

Unit-5

Industrial production of chemicals: alcohols, acids (citric, acetic and gluconic), solvents (glycerols, acetone, butanol), antibiotics (penicillin, streptomycine, tetracycline) amino acids (lysine, glutamic acid), single cell proteins.

Suggested Readings

Batty, J.C. and Folkman, S.L. 1983. Food Engineering Fundamentals. John Wiley and Sons, New York.

Fennema O.R. Ed. 1985, Principles of Food Science: Part-II Physical Principles of food Preservation. Marcel Dekker, New York.

Harper, J.C. 1975. Elements of Food Engineering. AVI, Westport.

Heldman, D.R. and Lund, D.B. Ed. 1992. Handbook of Food Engineering Marcel Dekker, New York.



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Semester – II

Syllabus

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Food Science & Technology)	CEREAL AND LEGUME TECHNOLOGY	MFST- 522

Unit-1

General introduction to cereals trends of cereals, Structure and production nutrient distribution in cereals, wheat types, milling of wheat, quality of flour and flour treatment,

Unit-2

Technology of bread, biscuits, cakes, durum wheat, extruded products (pasta and noodles).Corn-wet milling and dry milling, corn flakes, corn starch and its hydrolyzed syrups.

Unit-3

Rice milling, milling machines, effect of different factors on milling yield and rice quality, parboiling of rice, and rice products. Production and utilization of minor cereals.

Unit-4

Structure and composition of legumes, their importance in Indian diet. Dhal milling and processing of pulses, antinutritional factors in legumes and methods of removal. Technology of baby foods.

Unit-5

Storage of cereals, Infestation control; Drying of grains, Processing of rice and rice products.Milling of wheat and production of wheat products, including flour and semolina.Milling of corn, barley, oat, coarse grains including sorghum, ragi and millets; Processing of tea, coffee and cocoa.

Suggested Readings

Blanshard J.M.V., Frazier, P.J. and Galliard, T. Ed. 1986. Chemistry and Physics of Baking. Royal Society of Chemistry, London.

Chakraverty, A. 1988. Postharvest Technology of Cereals, Pulses and oilseeds. Oxford and IBH, New Delhi.

Durbey, S.C. 1979. Basic Baking: Science and Craft. Gujarat Agricultural University, Anand (Gujrat).

Kent, N.L. 1983. Technology of Cereals. 3rd Edn. Pergamon Press, Oxford, UK. Mathews, R.H. Ed. 1989. Legumes: Chemistry, Technology and Human Nutrition. Marcel Dekker, New York.

Pomeranz, Y. Ed. 1978. Wheat: Chemistry and Technology. Am. Assoc. of Cereal Chemist. St.



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Paul, minnesota.

Pomeranz, Y. 1987. Modern Cereal Science and Technology. VCH Pub., New York. Salunkhe, D.K., Kadam, S.S. and Austin A. Ed. 1986. Quality of Wheat and Wheat Products. Metropolitan Book Co., New Delhi.

Salunkhe, D.K., Kadam, S.S. Ed. 1989. Handbook of World Food Legumes: Chemistry, Processing and Utilization, (3 vol. set). CRC Press, Florida.



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Semester – II

Syllabus

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Food Science & Technology)	FRUIT AND VEGETABLE TECHNOLOGY	MFST- 523

Unit-1

Principles and methods of fruit and vegetable preservation. Principles of storage of fruits and vegetables. Types of storage: natural, ventilated low temperature storage. Freezing and freeze-drying of fruits and vegetables.

Unit-2

Drying and dehydration of fruits and vegetables, problems related to storage of dehydrated products., Canning of fruits and vegetables, tin cans, glass containers, aseptic canning technology.

Unit-3

Fruit and vegetable juices, preparation of syrups, cordials and nectars, juice concentrates, pectin and related compounds, jams, jellies, marmalades, preserves. pickles, chutneys, tomato products.

Unit– 4

Fruit product order and quality control, Carbonated beverages. Processing of mineral water and water standards for food processing plants.

Unit-5

Introduction & definition of Food Science; Palatability of food and measurement of acceptance by :i)testing ii)appearance iii)smell iv)test; General structure and composition of cereals like wheat & rice, nutritive value & various products like whole wheat flour, maida,puffed rice etc; Food additives; classification, composition and nutritive value of fruits &vegetables; Milk & milk products; Classification & properties of sugar; fats, oil & nuts; Spice &beverages & their roles.

Suggested Readings:-

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.



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- 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 to the Physiology and Handling of Fruits and Vegetables. Granada, U.K.



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M.Sc. (Food Science & Technology)

Semester – II

Syllabus

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Food Science & Technology)	FERMENTATION TECHNOLOGY	MFST- 524

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 down stream processing and Product recovery.

Unit -4

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

Unit-5

Downstream processing: introduction, removal of microbial cells and solid matters, foam separation, precipitation, filtration, centrifugation, cell disruption, liquid-liquid extraction, chromatography, membrane process, drying and crystallization, effluent 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.



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Semester – II

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Food Science & Technology)	LABORATORY COURSE III	MFST- 525

LABORATORY COURSE III

Determination of thermal process time, osmotic dehydration of food. Preparation of intermediate moisture food, clarified juice, candy and microwaved (cooked) foods. Extrusion cooking, modified atmosphere packaging. Application of psychrometric charts in food engineering, Generation of steam and its applications, Measurement of pressure, and flow of fluids. Study of heat exchangers, dryers, elevating and conveying equipments, size reduction equipments, and sieve analysis. Food plant design, Study of mechanical separators, Kinetics of fruit and vegetable dehydration, Visit to food processing plants.

Follow up of bacterial growth in batch culture, Different methods of microbial cultivation, Mass transfer across membrane, permeability coefficient, Measurement of B.O.D., Measurement of C.O.D., Fermenter operation and measurement, Production of

starter, bakers yeast culture, production of citric acid, alcohol, alcoholic beverages, enzymes, amino acids, Visit to effluent treatment plant.



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Semester – II

Syllabus

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Food Science & Technology)	LABORATORY COURSE IV	MFST- 526

LABORATORY COURSE IV

Experimental milling, physico-chemical tests for flour quality of wheat, rheological properties of dough, test baking, physicochemical test of rice and evaluation of cooking quality, milling and parboiling of paddy, dhal milling, visit to dhal mills. Preparation of protein concentrates and isolates, antinutritional factors in pulses, and extruded products. Malting flaking, puffing, corn syrup, germination, soaking and sprouting food grade cake, production of protein rich food. Preparation of peanut butter.

Equipment for fruits and vegetable processing, Canning of fruits and vegetables, precooling unit and cold storage. Preparation of fruit juices, squashes, syrups, nectar and ready-to-serve beverages. Preparation of jams, jellies, marmalade, preserves, and candies. Preparation of pickles, chutneys, and tomato products, Drying of fruits and vegetables, quality control of processed products. Visit to fruit and vegetables processing factories, freezing and freeze drying of foods, processing of mushroom. Manufacture of texturized vegetable proteins. Preparation of protein gels and expanded products. Development of simulated milk products from soy proteins. Use of vegetable proteins as meal extenders.



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SCHEME

Semester – III

No	Subject Code	Subject Title	Marks Allotted						
			Assignment Marks		Theory Marks		Practical Marks		Total Marks
			Max	Min	Max	Min	Max	Min	
1	MFST 531	TECHNOLOGY OF MEAT, FISH AND POULTRY PRODUCTS	20	8	80	32	-	-	100
2	MFST 532	TECHNOLOGY OF MILK AND MILK PRODUCTS	20	8	80	32	-	-	100
3	MFST 533	FOOD QUALITY AND SAFETY MANAGEMENT	20	8	80	32	-	-	100
4	MFST 534	FOOD ADDITIVES, CONTAMINANTS AND TOXICOLOGY	20	8	80	32	-	-	100
5	MFST-535	PRACTICAL I (BASED ON MFST 531 & MFST 532)	-	-	-	-	50	20	50
6	MFST-536	PRACTICAL II (BASED ON MFST 533 & MFST 534)	-	-	-	-	50	20	50
Total			80	32	320	128	100	40	500



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Semester – III

Syllabus

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Food Science & Technology)	TECHNOLOGY OF MEAT, FISH AND POULTRY PRODUCTS	MFST- 531

Unit-1

Sources of meat and meat products in India, its importance in national economy. Chemical composition and microscopic structure of meat. Effect of feed, breed and management on meat production and quality. Slaughtering of animals and poultry, inspection and grading of meat.

Unit-2

Factors affecting post-mortem changes, properties and shelf-life of meat. Meat quality evaluation. Mechanical deboning, meat tenderization. Aging, pickling and smoking of meat. Meat plant sanitation and safety, Byproduct utilization. Poultry: classification, composition, preservation methods and processing.

Unit - 3

Structure, composition, nutritive value and functional properties of eggs and its preservation by different methods. Processing of egg products. Factor affecting egg quality and measures of egg quality.

Unit-4

Types of fish, composition, structure, post-mortem changes in fish. Handling of fresh water fish. Canning, smoking, freezing and dehydration of fish. Preparation of fish products, fish sausage and home makings.

Unit-5

Classification of fresh water fish and marine fish; Commercial handling, storage and transport of raw fish; Average composition of fish; Freshness criteria and quality assessment of fish; Spoilage of Fish; Methods of Preservation of fish: Canning, Freezing, Drying, Salting, Smoking and Curing.

Suggested Readings

Lawrie, R.A. 1975. Meat Science, 2nd Edn. Pergamon Press, Oxford UK. Lavie A.

1980. Meat Handbook. 4th Edn. AVI, Westport.

Portsmouth, J.I. 1979, Commercial Rabbit Meat Production. 2nd Edn. Saiga Survey, England.

Stadelmen, W.J. and Cotterill, O.J., 1977. Egg. Science and Technology. 2nd Edn. AVI, Westport.



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Semester – III

Syllabus

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Food Science & Technology)	TECHNOLOGY OF MILK AND MILK PRODUCTS	MFST- 532

Unit-1

Sources, and composition of milk, processing of market milk, standardization, toning of milk, homogenization, pasteurization, sterilization, storage, transportation and distribution of milk.

Unit-2

Milk product processing-cream, butter, , condensed milk, evaporated milk, whole and skimmed milk powder.

Unit-3

Instantization of milk and milk products, ice cream, khoa, channa, paneer, milk sweets. Judging and grading of milk and its products.

Unit-4

Fermented milk products. cheese, cheese spread, Youghurt, dahi shrikhand and similar products. Dairy equipments and sanitization.

Unit-5

Manufacture of milk products like evaporated milk, powder milk, condensed milk, cream butter, cheese, yogurt, ice cream, ghee, baby food and sweet meat.
Quality control of milk and milk products; Milk plant hygiene and sanitation.

Suggested Readings

Considine, D.M. Ed. 1982. Foods and Food Production Encyclopaedia, VNR, NewYork. Dey, S. 1994. Outlines of Dairy Technology. Oxford Univ. Press, New Delhi.
Macrae, R., Robinson, R.K. and Sadler, M.J. Ed. 1993. Encyclopaedia of Food Science, Food Technology and Nutrition Academic Press, London.
Robinson, R.K. (2 vol. set). 1986. Modern Dairy Technology Elsevier Applied Science, UK.
Rosenthal, I. 1991. Milk and Milk Products. VCH, New York.
Warner, J.M. 1976. Principles of Dairy Processing. Wiley Eastern Ltd. New Delhi. Yarpar, WJ. and Hall, C.W. 1975. Dairy Technology and Engineering AVI, Westport.



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Semester – III

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Food Science & Technology)	FOOD QUALITY AND SAFETY MANAGEMENT	MFST- 533

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 Alimentarius/ /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.

Unit-5

Indian Factories Act on safety; HACCP; Desirable safety features of some food processing equipment; Personal protective equipment; Safety from adulteration of food. Hygiene and sanitation requirement in food processing and fermentation industries; Cleaning, sanitizing & pest control in food processing; storage and service areas.

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.



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Semester – III

Syllabus

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Food Science & Technology)	Food additives, contaminants and toxicology	MFST- 534

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.

Unit-5

Low calorie sweeteners; pH control agents ; Preservatives; Stabilizers and other additives; Nutrient supplements & thickeners. Coating or enrobing; Coating materials; Enrobers; Dusting or breading; Pan coating(hard, soft, chocolate coating)

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.



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M.Sc. (Food Science & Technology)

Semester – III

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Food Science & Technology)	LABORATORY COURSE V	MFST- 535

LABORATORY COURSE V

Determination of food additives in foods. Detection of adulteration in foods. Estimation of toxins and pesticide in foods. Chemical residues and aflatoxins, estimation of preservative and antioxidants. Rheological properties of foods. Detection of adulteration of fats and oil.

Estimation of sugars using HPLC. Electrophoresis of proteins for their identification. Determination of free fatty acids by GLC. Mass spectroscopy, Nuclear magnetic resonance (NMR). Chromatography- different types, their principles and applications, GC-MS. Spectroscopy- UV-Visible, DSC, SEM.

Suggested Readings

Joslyn, M.A. Ed. 1970. Methods in Food Analysis. Academic Press, New York. King, R.D. Ed. 1978. Developments in Food Analysis Techniques-1. Applied Science Publishers Ltd., London. Morris, C.J. and Morris, P. 1976. Separation Methods in Biochemistry 2nd Ed. Pitman Pub., London. Plummer, D.T. 1971. An Introduction to Practical Biochemistry. Mc-Graw Hill Pub. Co., New York. Raghuramulu, N., Madhavan Nair, K., and Kalyanasundaram, S. Ed. 1983. A Manual of Laboratory Techniques. National Institute of Nutrition, ICMR, Hyderabad.

Semester – III

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Food Science & Technology)	LABORATORY COURSE VI	MFST- 536

Laboratory Course VI

Processing of meat and fish, freezing, canning, curing, smoking, drying and pickling. Evaluation of quality and grading of eggs, preparation of egg-products.

Analysis of milk, milk pasteurization and sterilization. Analysis of milk products. Preparation of cream, butter, cheese, paneer, milk sweets and ice cream. Visit to dairy plants.

Sensory analysis and hedonic rating of food. Identification and ranking of food product attributes, sensory and instrumental methods for measuring food attributes.



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SCHEME

Semester – IV

No	Subject Code	Subject Title	Marks Allotted						
			Assignment Marks		Theory Marks		Practical Marks		Total Marks
			Max	Min	Max	Min	Max	Min	
1	MFST 541	POST-HARVEST TECHNOLOGY OF PLANTATION CROPS	20	8	80	32	-	-	100
2	MFST 542	TECHNOLOGY OF OILSEEDS AND FATS	20	8	80	32	-	-	100
3	MFST 543	DISSERTATION	-	-	-	-	250	125	250
4	MFST-544	PRACTICAL VII(BASED ON MFST 541 & MFST 542)	-	-	-	-	50	20	50
Total			40	16	160	64	300	145	500



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Semester – IV

Syllabus

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Food Science & Technology)	Postharvest technology of plantation Crops & Food Packaging	MFST- 541

Unit-1

Importance of plantation crops, chemical composition and processing of tea, coffee, cocoa and their quality assessment. Instant coffee and tea.

Unit-2

Cocoa processing and chocolate. Processing of raw and refined sugar.

Unit-3

Spices - black pepper, green pepper, white pepper, oleoresin and volatile. Cardamom, ginger, chillies, turmeric; powder, oleoresin and volatiles.

Unit-4

Minor spices - Ajwan, coriander, cumin, cinnamon, fenugreek, garlic, mustard, mace and nutmeg, onion, saffron, tamarind, cloves, mint, vanilla, asafoetida and spice production, processing of spices.

Unit-5

Introduction to packaging. Packaging operation, package-functions and design. Principle in the development of protective packaging. Deteriorative changes in foodstuff and packaging methods for prevention, shelf life of packaged foodstuff, methods to extend shelf-life. Food containers-rigid containers, corrosion of containers (tin plate). Flexible packaging materials and their properties. Food packaging materials and their properties.

Suggested Readings

Haard, N.F. and Salunkhe, D.K. 1975. Postharvest Biology and Handling of Fruits and Vegetables. AVI, Westport.

Kader, A. A. 1992. Postharvest Technology of Horticultural Crops, 2nd Ed. University of California, Division of Agriculture and Natural Resources, California.

Salunkhe, D.K. and Kadam, S.S. Ed. 1998. Handbook of Vegetable Science and Technology. Marcel Dekker, New York, USA.

Wills, R.B.H., McGlasson, W.B., Graham, D., Lee, T.H. and Hall, E.G. 1989. Postharvest: An Introduction to the Physiology and Handling of Fruits and Vegetables. BSP Professional Books, Oxford.



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M.Sc. (Food Science & Technology)

Semester – IV

Syllabus

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Food Science & Technology)	Technology of oilseeds and fats & Food biotechnology	MFST- 542

Unit-1

Importance of oil seeds processing in India, Commercial edible oil sources. Processing of crude oils - oil extraction/pression and solvent extraction.

Unit-2

Refining of crude oil- degumming, bleaching, deodourization. Preparation of protein concentrates and isolates and their use in high protein foods.

Unit-3

Hydrogenation and interesterification, Shortening-introduction, manufacturing and uses of shortening, types of shortening. Margarine-manufacturing and uses of Margarine. Confectionery coatings.

Unit-4

Imitation dairy products - peanut butter and vegetable ghee. Chemical adjuncts-lecithins, GMS. Packing and storage of fats and oils, Cocoa butter, fat substitutes and low-calorie foods.

Unit-5

Plant tissue culture, Regulatory and social aspects of biotechnology of foods. Genetically modified foods (GMF) Production of food flavour, colour. polysaccharides, amino acids, vitamins, baker's yeast, brewer's yeast and single cell protein.

Suggested Readings

Hamilton, R.J. and Bharti, A. Ed. 1980. Fats and Oils: Chemistry and Technology. Applied Science, London.

Salunkhe, O.K. Chavan, J.K, Adsule, R.N. and Kadam, S.S. 1992. World Oilseeds: chemistry, Technology and Utilization. VNR, New York.

Wolf, I.A. Ed. 1983. Handbook of Processing and Utilization in Agriculture. (2 vol. set). CRC Press, Florida.

Painy, F.A. and Painy, H.Y. 1983. A Handbook of Food Packaging. Leonard Hill, Glasgow, UK.

Scicharow, S. and Griffin, R.C. 1970. Food Packaging. AVI, Westport.

Bains W. 1993, Biotechnology from A to Z, Oxford Univ. Press, Oxford.

Crueger, W. and Crueger A. 1984. Biotechnology: A Textbook of Industrial Microbiology. Science Tech. Madison, USA.

Joshi, V.K. and Pandey, A. Ed. 1999. Biotechnology. Food Fermentation, (2 Vol. set). Education Publ. New Delhi.

Knorr, D. 1982. Food Biotechnology. Marcel Dekker, New York.



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M.Sc. (Food Science & Technology)

Semester – IV

BRANCH	SUBJECT TITLE	SUBJECT CODE
M.Sc. (Food Science & Technology)	Project and Seminar n Dissertation	MFST 543

Student has to submit a typed and bound copy of seminar and project dissertation.

Suggested Journals :

Food Technology.

Journal of science of food and agriculture.

Journal of agricultural food chemistry.

International journal of food science and nutrition.

International journal of food science and technology.

Journal of food science and technology (India)

Indian food industry.

Beverage and food world.

Indian food packer.

Journal of human nutrition and plant foods.