



RAM KRISHNA DHARMARTH FOUNDATION UNIVERSITY, BHOPAL

Airport Bypass Road, Gandhi Nagar, Bhopal - 462033

Scheme for M.Sc. Food Science and Tech NEP 2020

For 2 Year PG programme

First Year



Scheme for M.Sc. Food Science and Tech NEP 2020

For 2 Year PG programme

Scheme sem-1: (For the course of science having major practicum components)

M.Sc. Food Science and Tech I Semester

S.No	Course Code	Course Name	Total Mark	Credit (s)	End Semester Exam Marks		Internal Marks	
					Max	Min.	Max	Min.
1.	MFST2-511	FOOD PROCESSING & PRESERVATION	100	6	60	24	40	16
2.	MFST2-512	FOOD MICROBIOLOGY & FOOD CHEMISTRY & NUTRITION	100	6	60	24	40	16
3.	MFST2-513	Practical - I	100	4	60	24	40	16
4.	MFST2-514	Practical – II	100	4	60	24	40	16
5.	MFST2-515	Internship/Seminar /Field Project	100	2	-	-	100	40
		Grand Total	500	22				



BRANCH	Subject	Subject Code
M.Sc. (Food Science and Tech)	FOOD PROCESSING & PRESERVATION	MFST2-511

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.

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

Unit-2

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

Unit-3

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

Unit-4

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

Unit-5

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

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



BRANCH	Subject	Subject Code
M.Sc. (Food Science and Tech)	Biology and Diversity of Pteridophyta and Gymnosperms	MFST2-512

Unit 1

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

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

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.

Unit-3

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

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

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.

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

Unit-4

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



Unit 5

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.

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

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

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.



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BRANCH	Subject	Subject Code
M.Sc. (Food Science and Tech)	Practical – I	MFST2-513

List of practical

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



BRANCH	Subject	Subject Code
M.Sc. (Food Science and Tech)	Practical – II	MFST2-514

List of Practical

1. Microscopy and micrometry.
2. Preparation of nutrient media, sterilization and inoculation techniques,
3. Isolation of pure culture, microbial examination of natural food products,
4. identification of food pathogen in water, milk, cereals, pulses, oilseeds, meat and poultry.
5. Microbial production of alcohol (cereal based), acetic acid and lactic acid.
6. Electrophoresis of proteins for their identification.
7. Determination of free fatty acids of GLC.
8. Estimation of antinutritional factors including gossypol, trypsin inhibitor, phytic and etc.
9. Chromatographic separation techniques for sugars and proteins.
10. Determination of physical, chemical and functional properties of various proteins.
11. Preparation of protein concentrates and isolates from different sources. Preparation of protein hydrolysate.



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BRANCH	Subject	Subject Code
M.Sc. (Food Science and Tech)	Internship/Seminar/Field Project	MFST2-515

Project /Dissertation work (Six weeks) in the form of small thesis based upon the topic related to the M.Sc. Food Science and Tech syllabus . The topics of the dissertation with synopsis will be decided by the

Departmental Research Advisory Committee (DRAC).



M.Sc. Food Science and Tech II Semester

S. No	Course Code	Course Name	Total Mark	Credit (s)	End Semester Exam Marks		Internal Marks	
					Max	Min.	Max	Min.
1.	MFST2-521	FOOD ENGINEERING & FERMENTATION TECHNOLOGY	100	6	60	24	40	16
2.	MFST2-522	CEREAL AND LEGUME TECHNOLOGY & FRUIT AND VEGETABLE TECHNOLOGY	100	6	60	24	40	16
3.	MFST2-523	Practical - I	100	4	60	24	40	16
4.	MFST2-524	Practical – II	100	4	60	24	40	16
5.	MFST2-525	Value-added course (VAC) from /MOOCS, SWAYAM, NPTEL	100	2	-	-	100	40
		Grand Total	500	22				



BRANCH	Subject	Subject Code
M.Sc. (Food Science and Tech)	FOOD ENGINEERING & FERMENTATION TECHNOLOGY	MFST2-521

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.

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

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

Unit 2

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

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

Unit-3

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

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-4

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

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



BRANCH	Subject	Subject Code
M.Sc. (Food Science and Tech)	CEREAL AND LEGUME TECHNOLOGY & FRUIT AND VEGETABLE TECHNOLOGY	MFST2-522

Unit - I

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

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 – II

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.

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 – III

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.

Unit – IV

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.

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.

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 – V

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

Introduction & definition of Food Science; Palatability of food and measurement of acceptance by

i) testing ii) appearance iii) smell iv) taste; 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.



BRANCH	Subject	Subject Code
M.Sc. (Food Science and Tech)	Practical – I	MFST2-523

List of Practicals

1. Determination of thermal process time, osmotic dehydration of food.
2. Preparation of intermediate moisture food, clarified juice, candy and microwaved (cooked) foods. Extrusion cooking, modified atmosphere packaging.
3. Application of psychrometric charts in food engineering, Generation of steam and its applications, Measurement of pressure, and flow of fluids.
4. Study of heat exchangers, dryers, elevating and conveying equipments, size reduction equipments, and sieve analysis.
5. Food plant design, Study of mechanical separators, Kinetics of fruit and vegetable dehydration, Visit to food processing plants.
6. Follow up of bacterial growth in batch culture, Different methods of microbial cultivation, Mass transfer across membrane, permeability coefficient,
7. Measurement of B.O.D., Measurement of C.O.D., Fermenter operation and measurement,
8. Production of starter, bakers yeast culture,
9. production of citric acid, alcohol, alcoholic beverages, enzymes, amino acids,
10. Visit to effluent treatment plant.



BRANCH	Subject	Subject Code
M.Sc. (Food Science and Tech)	Practical – II	MFST2-524

List of Practical

1. Experimental milling, physico-chemical tests for flour quality of wheat, rheological properties of dough, test baking,
2. Physicochemical test of rice and evaluation of cooking quality, milling and parboiling of paddy, dhal milling,
3. Visit to dhal mills.
4. Preparation of protein concentrates and isolates, antinutritional factors in pulses, and extruded products.
5. Malting flaking, puffing, corn syrup, germination, soaking and sprouting food grade cake, production of protein rich food.
6. Preparation of peanut butter.
7. Equipment for fruits and vegetable processing,
8. Canning of fruits and vegetables, precooling unit and cold storage.
9. Preparation of fruit juices, squashes, syrups, nectar and ready-to-serve beverages. Preparation of jams, jellies, marmalade, preserves, and candies.
10. Preparation of pickles, chutneys, and tomato products, Drying of fruits and vegetables, quality control of processed products.
11. Visit to fruit and vegetables processing factories, freezing and freeze drying of foods, processing of mushroom.
12. Manufacture of texturized vegetable proteins.
13. Preparation of protein gels and expanded products.
14. Development of simulated milk products from soy proteins.
15. Use of vegetable proteins as meal extenders.



M.Sc. Food Science and Tech III Semester

S. No	Course Code	Course Name	Total Mark	Credit (s)	End Semester Exam Marks		Internal Marks	
					Max	Min.	Max	Min.
1.	MFST2-531	TECHNOLOGY OF MEAT, FISH, POULTRY AND MILK PRODUCTS	100	6	60	24	40	16
2.	MFST2-532	FOOD QUALITY, SAFETY MANAGEMENT FOOD ADDITIVES, CONTAMINANTS AND TOXICOLOGY	100	6	60	24	40	16
3.	MFST2-533	Practical - I	100	4	60	24	40	16
4.	MFST2-534	Practical – II	100	4	60	24	40	16
5.	MFST2-535	Internship/Seminar/Field Project	100	2	-	-	100	40
		Grand Total	500	22				



BRANCH	Subject	Subject Code
M.Sc. (Food Science and Tech)	TECHNOLOGY OF MEAT, FISH, POULTRY AND MILK PRODUCTS	MFST2-531

Unit - I

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.

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.

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 - II

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.

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 – III

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

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

Unit – IV

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

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

Unit – V

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.



BRANCH	Subject	Subject Code
M.Sc. (Food Science and Tech)	FOOD QUALITY, SAFETY MANAGEMENT FOOD ADDITIVES,CONTAMINANTS AND TOXICOLOGY	MFST2-532

Unit – I

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.

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

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

Unit – II

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

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.

Unit – III

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.

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

Unit – IV

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

Unit – V

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

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)



BRANCH	Subject	Subject Code
M.Sc. (Food Science and Tech)	Practical – I	MFST2-533

List of Practicals

1. Determination of food additives in foods.
2. Detection of adulteration in foods.
3. Estimation of toxins and pesticide in foods.
4. Chemical residues and aflatoxins,
5. estimation of preservative and antioxidants.
6. Rheological properties of foods.
7. Detection of adulteration of fats and oil.
8. Estimation of sugars using HPLC.
9. Electrophoresis of proteins for their identification.
10. Determination of free fatty acids by GLC.
11. Mass spectroscopy, Nuclear magnetic resonance (NMR).Chromatography- different types, their principles and applications,GC-MS. Spectroscopy- UV-Visible, DSC, SEM.



BRANCH	Subject	Subject Code
M.Sc. (Food Science and Tech)	Practical – II	MFST2-534

List of Practical

1. Processing of meat and fish, freezing, canning, curing, smoking, drying and pickling.
2. Evaluation of quality and grading of eggs, preparation of egg-products.
3. Analysis of milk , milk pasteurization and sterilization.
4. Analysis of milk products.
5. Preparation of cream, butter, cheese, paneer, milk sweets and ice cream.
6. Visit to dairy plants.
7. Sensory analysis and hedonic rating of food.
8. Identification and ranking of food product attributes, sensory and instrumental methods for measuring food attributes.



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BRANCH	Subject	Subject Code
M.Sc. (Food Science and Tech)	Internship/Seminar/Field Project	MFST2-535

Project /Dissertation work (Six weeks) in the form of small thesis based upon the topic related to the M.Sc. Food Science and Tech syllabus . The topics of the dissertation with synopsis will be decided by the

Departmental Research Advisory Committee (DRAC).



M.Sc. Food Science and Tech IV Semester

S. No	Course Code	Course Name	Total Mark	Credit (s)	End Semester Exam Marks		Internal Marks	
					Max	Min.	Max	Min.
1.	MFST2-541	POST-HARVEST TECHNOLOGY OF PLANTATION CROPS	100	6	60	24	40	16
2.	MFST2-542	TECHNOLOGY OF OILSEEDS AND FATS	100	6	60	24	40	16
3.	MFST2-543	Practical - I	100	4	60	24	40	16
4.	MFST2-544	Practical – II	100	4	60	24	40	16
5.	MFST2-545	Value-added course (VAC) from /MOOCS, SWAYAM	100	2	-	-	100	40
		Grand Total	500	22				



BRANCH	Subject	Subject Code
M.Sc. (Food Science and Tech)	POST-HARVEST TECHNOLOGY OF PLANTATION CROPS	MFST2-541

Unit – I

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

Unit – II

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

Unit – III

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

Unit – IV

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

Unit – V

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.



BRANCH	Subject	Subject Code
M.Sc. (Food Science and Tech)	TECHNOLOGY OF OILSEEDS AND FATS	MFST2-542

Unit – I

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

Unit – II

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

Unit – III

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

Unit – IV

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 – V

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.



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BRANCH	Subject	Subject Code
M.Sc. (Food Science and Tech)	Practical-I	MFST2-543

List of Practicals

1. To visit Biotechnology Lab.
2. Principle working & uses of instruments. Laminar air flow, Autoclave, Incubator, Hot air oven, Gel Electrophoresis.
3. Preparation of culture media, Nutrient Agar, Nutrient Broth, Eosin Methylen Blue Agar, MacConkey Agar media.
4. Isolation of bacteria by streak plate method.
5. Isolation of bacteria by pour plate method.
6. Uses of Microorganisms in the Food Industry
7. Determination of moisture content and fat content of given oil sample.
8. Composition of oils and fats.



BRANCH	Subject	Subject Code
M.Sc. (Food Science and Tech)	Practical-II	MFST2-544

List of Practical

- 1) Determination of peroxidise value of given sample
- 2) Determination of acid value and melting point of oils and fats.
- 3) Determination of peroxidise value of given sample
- 4) Determination of HCl test and kries test of given oil sample.
- 5) Test for presence of olive oil and refined winterize salad oil cold test.
- 6) Determination of cloud point in palmalin oil
- 7) Determination of smoke point, flesh point, fire point of given oil sample.