

**MRSPTU B.Sc. (FOOD SCIENCE & TECHNOLOGY)/B.F.S.T(Hons.)
SYLLABUS 2019 BATCH ONWARDS**

SEMESTER V

Total Credits=22

| SEMESTER V | | CONTACT HOURS | | | MARKS | | | CREDITS |
|------------------------------|---|---------------|---|---|------------|------------|------------|-----------|
| SUBJECT CODE | SUBJECT NAME | L | T | P | Int. | Ext. | TOTAL | |
| BFOTS1-501 | Unit Operations in Food Engineering | 3 | 1 | - | 40 | 60 | 100 | 4 |
| BFOTS1-502 | Food Packaging | 3 | 1 | - | 40 | 60 | 100 | 4 |
| BFOTS1-503 | Sugar & Confectionary Technology | 4 | - | - | 40 | 60 | 100 | 4 |
| BFOTS1-504 | Food Packaging Lab XII | - | - | 4 | 60 | 40 | 100 | 2 |
| BFOTS1-505 | Sugar & Confectionary Technology Lab XIII | - | - | 4 | 60 | 40 | 100 | 2 |
| DEPARTMENTAL ELECTIVE | | | | | | | | |
| BFOTD1-511 | Spices and Flavour Technology | 4 | - | - | 40 | 60 | 100 | 4 |
| BFOTD1-512 | Spices and Flavour Technology Lab XIV | - | - | 4 | 60 | 40 | 100 | 2 |
| OR | | | | | | | | |
| BFOTD1-513 | Technology of Oils and Fats | 4 | - | - | 40 | 60 | 100 | 4 |
| BFOTD1-514 | Technology of Oils and Fats Lab XV | - | - | 4 | 60 | 40 | 100 | 2 |
| | | | | | | | | |
| TOTAL | | - | - | - | 340 | 360 | 700 | 22 |

Note: In Semester Vth, students have to choose either between BFOTD1-511, BFOTD1-512 or BFOTD1-513, BFOTD1-514

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SEMESTER VI

Total credits=20

| SEMESTER VI | | CONTACT HOURS | | | MARKS | | | CREDITS |
|--------------|------------------------------------|---------------|---|---|-------|------|-------|---------|
| SUBJECT CODE | SUBJECT NAME | L | T | P | Int. | Ext. | TOTAL | |
| BFOTS1-601 | Food Engineering | 3 | 1 | - | 40 | 60 | 100 | 4 |
| BFOTS1-602 | Food and Nutrition | 3 | 1 | - | 40 | 60 | 100 | 4 |
| | DEPARTMENTAL ELECTIVE | | | | | | | |
| BFOTD1-611 | Sensory Evaluation of food | 4 | - | - | 40 | 60 | 100 | 4 |
| BFOTD1-612 | Sensory Evaluation of food Lab XVI | - | - | 4 | 60 | 40 | 100 | 2 |
| OR | | | | | | | | |
| BFOTD1-613 | Food Plant Layout | 4 | - | - | 40 | 60 | 100 | 4 |
| BFOTD1-614 | Food Plant Layout Lab XVII | - | - | 4 | 60 | 40 | 100 | 2 |
| | DEPARTMENTAL ELECTIVE | | | | | | | |
| BFOTD1-621 | Food Safety | 4 | - | - | 40 | 60 | 100 | 4 |
| BFOTD1-622 | Food Safety Lab XVIII | - | - | 4 | 60 | 40 | 100 | 2 |
| OR | | | | | | | | |
| BFOTD1-623 | Food Quality Management | 4 | - | - | 40 | 60 | 100 | 4 |
| | | | | | | | | |
| BFOTD1-624 | Food Quality Management Lab XIX | - | - | 4 | 60 | 40 | 100 | 2 |
| | | | | | | | | |
| | TOTAL | - | - | - | 280 | 320 | 600 | 20 |

Note: In Semester VIth, students have to choose either between

BFOTD1-611, BFOTD1-612 or BFOTD1-613, BFOTD1-614

BFOTD1-621, BFOTD1-622 or BFOTD1-623, BFOTD1-624

Overall

| Semester | Marks | Credits |
|------------------|-------------|-----------|
| V th | 700 | 22 |
| VI th | 600 | 20 |
| Total | 1300 | 42 |

SEMESTER FIFTH

MRSPTU B.Sc. (FOOD SCIENCE & TECHNOLOGY)/B.F.S.T(Hons.) SYLLABUS 2019 BATCH ONWARDS

UNIT OPERATIONS IN FOOD ENGINEERING

Subject Code: BFOTS1-501

L T P C
3 1 0 4

Duration: 60 (Hrs.)

Course Objectives:

1. To aware students about basic concepts of food engineering.
2. To introduce them with various unit operations.
3. To familiarize them with the properties of fluid and its flow.
4. To enhance their knowledge about psychrometry and its effect on food processing.

Course Outcomes:

1. Students become aware about basics of food engineering.
2. Students come to know about various unit operations in food processing.
3. Students become familiar with the properties of fluid and its flow.
4. Students learn about psychrometry and its effect on food processing

UNIT I (12 Hrs.)

Introduction: Concept of unit operations

Preliminary Unit Operations: Material handling; Conveyors and elevators, types of conveyors and elevators.

UNIT II (17 Hrs.)

Cleaning: Dry-cleaning; screening, aspiration and magnetic cleaning, wet cleaning; soaking, spray washing, ultrasonic washing, sorting and grading; methods, advantages of sorting and grading

Size reduction: Benefits, criteria for size reduction, size reduction of solid, fibrous and liquid foods.

UNIT III (16 Hrs.)

Refrigeration and Freezing: Refrigeration, components of refrigeration system, compressors, condensers and expansion valve, selection of refrigerant, cooling load, coefficient of performance, refrigerant flow rate.

Direct contact and indirect freezing systems.

UNIT IV (15 Hrs.)

High temperature operations: Pasteurization, pasteurizer and its functioning.

Evaporation: Single effect evaporators and multiple effect evaporators, natural and forced circulations, falling and rising film evaporators.

Recommended Readings

1. Rao D. G., 'Fundamentals of Food Engineering', PHI learning private ltd., 2010.
2. Singh R. P. and Heldman D. R., 'Introduction to Food Engineering', Academic press 2nd, 3rd and 4th Edition, 1993, 2003, 2009.
3. Rao C.G., 'Essentials of Food Process Engineering', B.S. publications, 2006.
4. Fellow P., Food Processing Technology, 1988.

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FOOD PACKAGING

Subject Code: BFOTS1-502

L T P C
3 1 0 4

Duration: 60 (Hrs.)

Course Objectives:

1. To make students familiar about the importance of packaging in food.
2. To make them aware about various packaging materials.
3. To provide them knowledge about machines used for packaging of foods.
4. To introduce them with various packaging systems.

Course Outcomes:

1. Students become familiar about the importance of packaging.
2. Students become aware about various packaging materials used in food.
3. Students learn about different machines used for food packaging.
4. Students get knowledge about various packaging systems.

UNIT I (15 Hrs.)

Introduction to Food Packaging

Packaging Functions and Requirements, Printing of packages, Barcodes & other marking, Labelling Laws

UNIT II (16 Hrs.)

Food Packaging Materials: Paper and paper-based materials, corrugated fiber board (CFB). Plastics, formation- Injection molding, Blow molding, Types of plastics, Lamination, Biodegradable plastics, Edible packaging and Bio-composites. Environmental Concerns recycling and disposal of plastic waste.

UNIT III (14 Hrs.)

Metal packaging- Metals: Tinplate, tinning process, components of tinplate, tin free can (TFC) types of can, metallic films, lacquers

Glass: Composition, Properties, Methods of bottle making, Types of closures.

UNIT IV (15 Hrs.)

Packaging Machinery and Systems: Bottling machines, Cartoning systems, Seal and Shrink packaging machine; Form, Fill and Sealing machine (FFS).

Vacuum, Controlled and Modified atmosphere packaging systems; Aseptic packaging systems; Retort packaging, Active and Intelligent packaging systems

Recommended Readings:

1. Robertson G. L., 'Food Packaging – Principles and Practice', CRC Press Taylor and Francis Group, 2012.
2. Paine F.A. and Paine H.Y., 'A Handbook of Food Packaging', Blackie Academic and Professional, 1992.
3. Coles R., McDowell D. and Kirwan M. J., 'Food Packaging Technology', Blackwell, 2003.

MRSPTU B.Sc. (FOOD SCIENCE & TECHNOLOGY)/B.F.S.T(Hons.) SYLLABUS 2019 BATCH ONWARDS

SUGAR AND CONFECTIONARY TECHNOLOGY

Subject Code: BFOTS1-503

L T P C
4 0 0 4

Duration: 60 (Hrs.)

Course Objectives:

1. To familiarize students with manufacturing of sugar and utilization of its byproducts.
2. To provide them knowledge about various types of icings and toppings.
3. To aware them about chocolate manufacturing and its defects.
4. To teach them about different types of candies and their process of manufacturing.

Course Outcomes:

1. Students become familiar with the manufacturing of sugar and utilization of its byproducts.
2. Students gain knowledge about icings and toppings.
3. Students acquire knowledge about chocolate manufacturing.
4. Students learn about the process of candy manufacturing.

UNIT-I (15 Hrs.)

Composition and characteristics of cane juice, Cane juice extraction. Manufacturing of sugar. Deterioration of sugars during storage & transportation and its prevention, By-products of sugar industry and their utilization.

UNIT-II (15 Hrs.)

Icings and Toppings: Fondant, American frosting, Butter cream icing, royal icing, gum paste, glaze icing, marshmallow, almond paste and fudge.

UNIT III (15 Hrs.)

Chocolates: Cocoa processing, Cocoa liquor, Cocoa butter. Cocoa powder and chocolate manufacturing

Chocolate tempering and lipid crystallization, Chocolate enrobing and chocolate defects.

UNIT-IV (15 Hrs.)

Classification of confectionary: Hard and soft boiled sugar confectionary; fondant, fudge, caramel, toffee butterscotch, Sugar panning, hard boiled candy.

Recommended Books:

1. Minife B.W, 'Chocolate, Cocoa and Confectionary: Science & Technology', AVI Publishing Co., New York, 1997.
2. Mathur R.B.L., 'Handbook of Cane Sugar Technology', Oxford & IBH Publishing Co., New Delhi, 1986.
3. Faridi H., 'The Science of Cookie & Cracker Production', Chapman & Hall, UK, 1994.

**MRSPTU B.Sc. (FOOD SCIENCE & TECHNOLOGY)/B.F.S.T(Hons.)
SYLLABUS 2019 BATCH ONWARDS**

FOOD PACKAGING LAB XII

Subject Code: BFOTS1-504

**L T P C
0 0 4 2**

Duration: 30 (Hrs.)

Course Objectives:

1. To teach students about methods used to test packaging materials.
2. To aware students about edible packaging.
3. To make them familiar with packaging machines.
4. To provide them knowledge about the effect of food package designs on storage and processing.

Course Outcomes:

1. Students learn about the testing of packaging materials.
2. Students become aware about edible packaging.
3. Students become familiar with packaging materials.
4. Students acquire knowledge about the effects of food package designs on storage and processing.

PRACTICAL

1. Testing of physical/mechanical properties of food packaging materials.
2. Testing of thermal shock resistance of glass.
3. Gas/Vacuum packaging of foods
4. To Study the effect of packaging on shelf life of food products.
5. Determination of Water Vapor Transmission Rate of Packaging Material.
6. Edible packaging of Food Samples.
7. Study of Sorption Isotherm for Food Package Design.
8. Packaged food cut-out analysis.
9. To study the operation of FFS machine.

Recommended Readings:

1. Robertson G.L., 'Food Packaging – Principles and Practice', CRC Press Taylor and Francis Group, 2012.
2. Paine F.A. and Paine H.Y., A Handbook of Food Packaging, Blackie Academic and Professional, 1992.
3. Coles R., McDowell D. and Kirwan M. J., 'Food Packaging Technology', Blackwell, 2003.

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SUGAR AND CONFECTIONARY TECHNOLOGY LAB XIII

Subject Code: BFOTS1-505

**L T P C
0 0 4 2**

Duration: 30 (Hrs.)

Course Objective:

1. To provide knowledge about various types of sugars and its use in cookery.
2. To aware students about manufacturing of confectionary products.
3. To familiarize them with various quality parameters of confectionary products.
4. To provide practical knowledge of baking, icing and cake decoration.

Course Outcomes:

1. Students gain knowledge about various types of sugars and its use.
2. Students become aware about manufacturing of confectionary products.
3. Students become familiar with various quality parameters of confectionary products.
4. Students gain practical knowledge of baking, icing and cake decoration.

PRACTICAL

1. Determine the effect of heat on sugar solution and perform the thread and cold water test.
2. To study the process of inversion, melting and caramelization in sucrose.
3. Preparation of fondant, fudge and brittles.
4. Preparation of *Shakarpara* and *Chhana murki*.
5. Preparation of candy and toffee and to perform quality assessment tests.
6. Preparation of cake decorations.
7. Collection of various types of confectionary packages.
8. Determination of sugar in confectionary product by saccharometer.
9. Determination of refractive index of sugar – solutions of different consistencies.
10. Organoleptic testing of different confectionary products.
11. Visit to sugar and confectionary industry.

Recommended Readings:

1. Raina et.al., 'Basic Food Preparation-A complete Manual', 3rd Edition, Orient Longman Pvt. Ltd., 2003.
2. Manay, S. and Shadaksharaswami, M., 'Foods: Facts and Principles', New Age Publishers, 2004.
3. Beckett S.T., 'Industrial Chocolate Manufacture', Blackwell Publishing Ltd., 2009.
4. Minifie B.W., 'Chocolate, Cocoa and Confectionary', Aspen Publications, 1999.
5. Mohini S. and Eram R., 'Food science- Experiments and applications', 2nd Edition., CBS publishers & Distributors Pvt. Ltd. 2011.

**MRSPTU B.Sc. (FOOD SCIENCE & TECHNOLOGY)/B.F.S.T(Hons.)
SYLLABUS 2019 BATCH ONWARDS**

SPICES AND FLAVOUR TECHNOLOGY

Subject Code: BFOTD1-511

**L T P C
4 0 0 4**

Duration: 60 (Hrs.)

Course Objectives:

1. To provide knowledge about the chemical composition of spices.
2. To aware students about the flavor and food pigments.
3. To familiarize them with various enzymatic and non-enzymatic reactions in food.
4. To enhance their knowledge about various physical, chemical and nutritional changes in food.

Course Outcomes:

1. Students get knowledge about the chemical composition of food.
2. Students become aware about the flavor and food pigments.
3. Students become familiar with various enzymatic and non-enzymatic reactions in food.
4. Students acquire knowledge about various physical, chemical and nutritional changes in food.

UNIT I (15 Hrs.)

Classification & use of spices, Chemical constituents of spices, Processing of white pepper. Dehydration products of onion, garlic.

UNIT-II (15 Hrs.)

Cryomilling of spices. Spice oleoresins and spice emulsion. Packaging of spices and spice products.

Microbial contamination and insect infestation in spices and its control.

UNIT-III (16 Hrs.)

Classification of flavouring compounds. Stability of flavourings. Flavor encapsulation Processing of Cocoa and Coffee.

UNIT IV (14 Hrs.)

Processing of white pepper, cardamom, cinnamon, cloves, turmeric, ginger, fenugreek and fennel.

Recommended Books:

1. Peter K.V., 'Handbook of Spices', Woodhead Publishers, UK, 2001.
2. Pruthi, J. S., 'Spices and Condiments', NBT India, 1976.
3. Spice Statistics by Spices Board, GOI, Cochin, 2007.

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SPICES AND FLAVOUR TECHNOLOGY LAB XIV

Subject Code: BFOTD1-512

**L T P C
0 0 4 2**

Duration: 30 (Hrs.)

Course Objective:

1. To improve their practical knowledge about organoleptic evaluation of flavors.
2. To make them familiar with proximate analysis of spices.
3. To provide knowledge about adulterant detection in spices.
4. To detect the microbiological quality of spices.

Course Outcomes:

1. Students learn about organoleptic evaluation of flavors.
2. Students become familiar with proximate analysis of spices.
3. Students determine adulterants in spices.
4. Students check the microbiological quality of spices.

PRACTICAL

1. Determination of moisture in ground spices.
2. Determination of total ash in spices.
3. Determination of extraneous matter in spices.
4. Determination of pungency rating (Scoville method) in Red Pepper.
5. Adulteration tests for different spices.
6. Organoleptic evaluation of flavours.
7. Identification of Saffron by sulphuric – diphenylamine test.
8. To evaluate microbiological quality of spices.

Recommended Books:

1. Peter K.V., 'Handbook of Spices', Woodhead Publishers, UK, 2001.
2. Pruthi, J. S., 'Spices and Condiments', NBT India, 1976.
3. Spice Statistics by Spices Board, GOI, Cochin, 2007.

**MRSPTU B.Sc. (FOOD SCIENCE & TECHNOLOGY)/B.F.S.T(Hons.)
SYLLABUS 2019 BATCH ONWARDS**

TECHNOLOGY OF OILS AND FATS

Subject Code: BFOTD1-513

**L T P C
4 0 0 4**

Duration: 60 (Hrs.)

Course Objectives:

1. To introduce students with physical and chemical properties of fats and oils.
2. To aware students about different sources of animal and plant fat.
3. To provide them knowledge about rancidity, refining, bleaching and deodorization of fats.
4. To familiarize them with process of hydrogenation and winterization of oils.

Course Outcomes:

1. Students become familiar with physical and chemical properties of fats and oils.
2. Students become aware about sources of animal and plant fats.
3. Students acquire knowledge about various processes such as refining, bleaching and deodorization.
4. Students learn about the process of hydrogenation and winterization of oils.

UNIT-I (14 Hrs.)

Introduction to oils and fats, Physical and chemical properties of fats and oils, Nutritional importance of oils and fats.

UNIT-II (16 Hrs.)

Source and physico-chemical properties of following oils:

- a) Animal – Butter oil, lard and tallow.
- b) Plant – Groundnut, Sunflower, Soybean and Coconut oil.

Extraction of oils/fats.

Problems during storage – rancidity, reversion.

UNIT-III (15 Hrs.)

Refining: degumming, choice of alkali, batch and continuous refining.

Bleaching: choice of adsorbent, batch and continuous bleaching.

Deodorization: process parameters: batch and continuous processing

UNIT-IV (15 Hrs.)

Hydrogenation of oils: mechanism, process parameters and batch processing. Fractionation and winterization of oils.

Alternative processing methods: PCT (physical cleaning techniques)

Recommended Books:

1. Meyer L.H., 'Food Chemistry', CBS Publisher, New Delhi, 2006.
Potter N. N. 'Food Science', 5th Edition, CBS Publisher, New Delhi, 2006
2. Lawson H., 'Food Oils & Fats: Technology, Utilization and Nutrition', CBS Publisher, New Delhi, 1995.

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SYLLABUS 2019 BATCH ONWARDS**

TECHNOLOGY OF OILS AND FATS XV

Subject Code: BFOTD1-514

**L T P C
0 0 4 2**

Duration: 30 (Hrs.)

Course Objectives:

1. To make them familiar with proximate analysis of oils and fats.
2. To aware them about adulteration of oils and detection of adulterants.
3. To perform refining and bleaching of oils.
4. To provide them platform to experience actual working environment of an industry.

Course Outcomes:

1. Students carry out the proximate analysis of fats and oils.
2. Students learn to detect adulterants in milk.
3. Students perform refining and bleaching of oils.
4. Students visit a vegetable oils industry and become familiar with the industrial environment.

PRACTICAL

1. To determine moisture content of oilseed.
2. To determine FFA of oil.
3. Determination of Iodine Value, R.M. Value and Polenske Value.
4. To determine Saponification value, anisidine value and peroxide value of oil.
5. Determination of melting point of fats.
6. Detection of sesame oil in vanaspati by furfural test.
7. Detection of adulteration with mineral oil, Cotton seed oil or Ground nut oil.
8. Organoleptic evaluation of fats and oils.
9. To carry out refining and bleaching of oil in lab.
10. To estimate colour of oil.
11. Visit to vegetable oils industry.

SEMESTER SIXTH

MRSPTU B.Sc. (FOOD SCIENCE & TECHNOLOGY)/B.F.S.T (Hons.) SYLLABUS 2019 BATCH ONWARDS

FOOD ENGINEERING

Subject Code: BFOTS1-601

L T P C
3 1 0 4

Duration: 60 (Hrs.)

Course Objectives:

1. To familiarize students with the basic concepts of food engineering including units and dimensions
2. To introduce students with the basic principles of material and energy balances.
3. To aware students about principles of fluid flow and its effect in food processing.
4. To provide them knowledge about psychometric charts and its use in food industries.

Course Outcomes:

1. Students become familiar with the basic concepts of food engineering.
2. Students acquire knowledge about basic principles of material and energy balances.
3. Students become aware about principles of fluid flow and its effect in food processing.
4. Students learn to study psychometric charts and using them in food industries.

UNIT I (15 Hrs.)

Fundamental Concepts and Definitions: Dimensions and units, thermodynamic systems (closed, open and isolated), intensive and extensive properties, equilibrium state, density, specific volume, specific weight, specific heat, enthalpy, entropy, pressure, temperature scales.

UNIT II (15 Hrs.)

Material Balances: Basic principles, process flow diagrams, total mass balance, component mass balance.

Energy Balances: Basic principles, energy terms, specific heat of solids and liquids, properties of saturated and superheated steam, heat balances.

UNIT III (15 Hrs.)

Fluid Flow Principles: Fluid statics and dynamics, mass balance and energy balance, Bernoulli's equation, concept of viscosity, Newtonian and non-Newtonian fluids, streamline and turbulent flow, Reynold's number, Selection of pumps

UNIT IV (15 Hrs.)

Psychrometrics: Properties of dry air: composition of air, specific heat of dry air, enthalpy of dry air, dry bulb temperature, Wet bulb temperature, Relative humidity, Dew point temperature.

Recommended Readings:

1. Rao C.G., 'Essentials of Food Process Engineering'. B S publications, 2006
2. Rao D.G., 'Fundamentals of Food Engineering', PHI learning private Ltd., 2010.
3. Singh R.P. and Heldman D.R., Introduction to Food Engineering, 2nd, 3rd and 4th Edition, Academic press, 1993, 2003, 2009.
4. Fellow P., Food Processing Technology, 1988.

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FOOD AND NUTRITION

Subject Code: BFOTS1-602

L T P C
3 1 0 4

Duration: 60 (Hrs.)

Course Objectives:

1. To understand the concepts of food and nutrition.
2. To aware students about balanced diet and food groups.
3. To familiarize students with RDA and its importance.
4. To teach them the importance of meal planning in diet.

Course Outcomes:

1. Students understand the concepts of food and nutrition.
2. Students become aware about balanced diet and various food groups.
3. Students become familiar with RDA and its importance.
4. Students get knowledge about the importance of meal planning.

UNIT I (15 Hrs.)

Introduction to food and nutrition: Basic terms used in study of food and nutrition, BMI and nutritional status, understanding relationship between food, nutrition and health. Balanced diet Functions of food-physiological, psychological and social, concept of balanced diet, Food Groups, Food Pyramid.

UNIT II (16 Hrs.)

Nutrients: Classification, digestion, functions, dietary sources, RDA, clinical manifestations of deficiency and excess and factors affecting absorption of the following in brief: Energy, Carbohydrates, lipids and proteins, Fat soluble vitamins-A, D, E and K, Water soluble vitamins – thiamin, riboflavin, niacin, pyridoxine, folate, vitamin B12 and vitamin C
Minerals – calcium, iron, iodine, fluorine, copper and zinc

UNIT III (14 Hrs.)

Concepts of Meal planning: Factors affecting meal planning, understanding specific considerations for planning meal for different groups of people (Infants, Toddler, Adolescents, Adults, Old age and pregnant women)

UNIT IV (15 Hrs.)

Methods of cooking: Dry, moist, frying and microwave cooking, Advantages, disadvantages and the effect of various methods of cooking on foods.

Nutritional labeling.

Importance, global trends, codex guidelines, nutritional labelling in India, FSSAI guidelines.

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Recommended Readings

1. Bamji M.S., Krishnaswamy K. and Brahmam G.N.V., 'Textbook of Human Nutrition', 3rd Edition, Oxford and IBH Publishing Co. Pvt. Ltd., 2009.
2. Srilakshmi 'Food Science', 4th Edition, New Age International Ltd., 2007.
3. Srilakshmi, 'Dietetics', Revised 5th Edition. New Age International Ltd., 2005.
4. Wardlaw M.G. and Paul M Insel Mosby, 'Perspectives in Nutrition', 3rd Edition, 1996.
5. Codex Guidelines on Nutrition Labelling (CAC/GL 2_1985) (Rev.1_1993). Rome, Food and Agriculture Organisation of the United Nations / World Health Organisation, 1993.
6. Food Safety and Standards Authority of India portal, Government of India
7. Gopalan C., 'Nutritive Value of Indian Foods', NIN, ICMR, 1990.
8. Seth V. and Singh K., 'Diet planning through the Life Cycle: Part 1. Normal Nutrition. A
9. Practical Manual., 4th Edition, Elite Publishing House Pvt. Ltd., 2005.

SENSORY EVALUATION OF FOOD

Subject Code: BFOTD1-611

L T P C
4 0 0 4

Duration: 60 (Hrs.)

Course Objectives:

1. To aware students about structure and functions of taste organs.
2. To provide knowledge about taste measurements and taste abnormalities.
3. To make them familiar with the importance of odour, flavor and colour in sensory evaluation of food.
4. To understand the importance of texture and texture perception.

Course Outcomes:

1. Students become aware about structure and functions of taste organs.
2. Students acquire knowledge about taste measurements and taste abnormalities.
3. Students become familiar with the importance of odour, flavor and colour in sensory evaluation of food.
4. Students understands the concept of texture and texture perception.

UNIT I (16 Hrs.)

Taste: Introduction and importance of taste, Structure and physiology of taste organs- tongue, papillae, taste buds, salivary glands, Mechanism of taste perception

Chemical dimensions of basic tastes: sweet, salt, sour, bitter and umami

Factors affecting taste quality, reaction time, taste modification, absolute and recognition of threshold taste abnormalities.

Taste measurement

UNIT II (15 Hrs.)

Odour: Introduction, definition and importance of odour and flavor, Anatomy of nose, physiology of odour perception, Mechanism of odour perception

Odour classification, chemical specificity of odour.

Odour measurement using different techniques – primitive to recent techniques. Merits and demerits of each method. Olfactory abnormalities.

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UNIT III (16 Hrs.)

Colour: Introduction and importance of colour.

Dimensions of colour and attributes of colour, appearance factors, gloss etc.

Perception of colour, Colour abnormalities

Measurement of colour; Munsell colour system, CIE colour system, Hunter colour system, spectrophotometry and colorimetry etc.

UNIT IV (13 Hrs.)

Texture: Introduction, definition and importance of texture

Phases of oral processing

Texture perception, receptors involved in texture perception

Texture classification

Texture measurement – basic rheological models, forces involved in texture measurement.

Recommended Readings

1. Rao E. S., 'Food Quality Evaluation', Variety Books, 2013.
2. Amerine P. and Roessler, 'Principles of Sensory Evaluation of Food', Academic Press, London, 1965.
3. Meilgard D., 'Sensory Evaluation Techniques', 3rd Edition. CRC Press LLC, 1999.
4. Man J., 'Principles of Food Chemistry', 3rd Edition., Springer, 2007.
5. Brannen and et al., 'Food Additives', Marcel Dekker, New York, 1990.

SENSORY EVALUATION OF FOOD LAB XVI

Subject Code: BFOTD1-612

L T P C

Duration: 30 (Hrs.)

0 0 4 2

Course Outcomes:

1. To aware students about the importance of sensory panel.
2. To provide them practical knowledge of various sensory tests.
3. To provide them a platform for the sensory evaluation of various food products.
4. To familiarize them with various quality tests for milk products, cereals and confectionary products.

Course Outcomes:

1. Students become aware about the importance of sensory panel.
2. Students acquire knowledge about various sensory tests.
3. Students perform sensory evaluation of various food products.
4. Students become familiar with various quality tests of different food products.

PRACTICAL

1. Training of sensory panel.
2. To perform recognition and sensitivity tests for four basic tastes.
3. To perform analytical tests of sensory evaluation.

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4. Recognition tests for various food flavors, flavor defects in milk.
5. Sensory evaluation of milk and milk products.
6. Texture evaluation of various food samples- crispier/ cookies/ biscuits/ snack foods
7. Measurement of colour by using Tintometer/ Hunter Color Lab etc.
8. Qualitative tests for hydrogenated fats, butter, ghee
9. Platform tests for milk
10. Quality evaluation of various food stuffs- cereals, pulses, honey, jaggery, sugar, tea, coffee etc.

Recommended Readings

1. Rao E. S., 'Food Quality Evaluation', Variety Books, 2013.
2. Amerine P. and Roessler, 'Principles of Sensory Evaluation of Food', Academic Press, London, 1965.
3. Meilgard 'Sensory Evaluation Techniques', 3rd Edition. CRC Press LLC, 1999.
4. deMan J., 'Principles of Food Chemistry', 3rd Edition., Springer, 2007.
5. Brannen and et al., 'Food Additives', Marcel Dekker, New York, 1990.

FOOD PLANT LAYOUT

Subject Code: BFOTD1-613

L T P C
4 0 0 4

Duration: 60 (Hrs.)

Course Objectives:

1. To provide them knowledge about concepts of designing and importance of a good layout.
2. To teach them about the importance of plant site and location factors.
3. To make them familiar about the selection of plant building material and equipments.
4. To aware them about layout symbols.

Course Outcomes

1. Students get knowledge about concepts of designing and importance of a good layout.
2. Students learn about the importance of site selection.
3. Students become familiar about the selection of plant building material and equipments.
4. Students become aware about layout symbols.

UNIT-I (15 Hrs.)

Plant design concepts and general design considerations

Plant Layout problems, Importance and Objectives

Advantages of a good layout

UNIT-II (15 Hrs.)

Plant location: location factors and their interaction with plant location, Importance of a plant layout selection of site and layouts of different food industries.

UNIT-III (15 Hrs.)

Selection of building material, selection and planning of manufacturing process and service facilities. Process selection; process flow charts, selection of equipment and machinery; maintenance and replacement, depreciation of machinery

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UNIT IV (15 Hrs.)

Management set up in a plant. Plant layout, layout symbols.

Recommended Books:

1. Marriott, 'Principle of Food Sanitation', 5th Edition, CBS Publishers, New Delhi, 2006.
2. Green J.H. and Kramer A., 'Food Processing Waste Management', AVI Publishers, USA., 1979.
3. Potter N. N., 'Food Science', 5th Edition., CBS Publishers, New Delhi, 2006.
4. Sharma S.C., 'Plant Layout and Material Handling', 3rd Edition Khanna Publishers, 2000.
5. James M. M., 'Plant layout & design', Collier Macmillan Ltd., 1962

FOOD PLANT LAYOUT LAB XVII

Subject Code: BFOTD1-614

L T P C
0 0 4 2

Duration: 30 (Hrs.)

Course Objectives:

1. To prepare layouts for different processing plants.
2. To prepare process diagrams of various manufacturing units.
3. To teach them about the calculations related to processing cost.
4. To aware them about the processes to calculate the life of various machines and equipments in the plant.

Course Outcomes:

1. Students prepare layouts for different processing plants.
2. Students learn to prepare to process diagrams for various manufacturing units.
3. Students become aware about the calculations related to processing cost.
4. Students become familiar about the shelf life estimation of various machines.

PRACTICAL

1. Preparation of layout and process diagram of potato crisp manufacturing plant.
2. Preparation of layout and process diagram of Jam/Marmalade manufacturing plant.
3. Preparation of layout and process diagram of Bread making plant.
4. Preparation of layout and process diagram of a dairy industry.
5. Preparation of layout and process diagram of wine making unit.
6. Preparation of layout and process diagram of a modern slaughter house.
7. Preparation of layout and process of diagram of a confectionary unit.
8. Calculation of depreciation of machinery and processing costs.

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FOOD SAFETY

Subject Code: BFOTD1-621

L T P C
4 0 0 4

Duration: 60 (Hrs.)

Course Objectives:

1. To aware students about food safety and importance of food safety.
2. To make them familiar about various food hazards and its impact on health.
3. To provide them knowledge about food safety tools and their need for food quality.
4. To enrich their knowledge about different food safety laws.

Course Outcomes:

1. Students become aware about food safety and its importance.
2. Students become familiar with various food hazards and its impact on health.
3. Students get knowledge about food safety tools and their need for food quality.
4. Students acquire knowledge about different food safety laws.

UNIT I (15 Hrs.)

Introduction to Food Safety

Definition, Types of hazards, biological, chemical, physical hazards, Factors affecting Food Safety, Importance of Safe Foods

Food Hazards of Physical and Chemical and Microbiological origin, Management of hazards, Need, Control of parameters, Temperature control and Food storage

UNIT II (14 Hrs.)

Hygiene and Sanitation in Food Service Establishments

Introduction, Sources of contamination, Control methods using physical and chemical agents, Waste Disposal, Pest and Rodent Control and Personnel Hygiene

UNIT III (16 Hrs.)

Food laws and Standards

Indian Food Regulatory Regime, Global Scenario and Other laws and standards related to food safety (FSSAI, AGMARK, FPO, MFPO, MPO, BIS AND ISO)

UNIT IV (15 Hrs.)

Recent concerns

New and Emerging Pathogens, Genetically modified foods\Transgenics, Organic foods and newer approaches to food safety

Recommended Readings

1. Lawley R., Curtis L. and Davis J., 'The Food Safety Hazard Guidebook', RSC publishing, 2004.
2. De Vries, 'Food Safety and Toxicity', CRC, New York, 1997'
3. Marriott, N. G., 'Principles of Food Sanitation', AVI, New York, 1985.
4. Forsythe, S. J., 'Microbiology of Safe Food', Blackwell Science, Oxford, 2000.

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5. Forsythe S. J., 'The Microbiology of Safe Food', 2nd Edition, Willey- Blackwell, U.K., 2010.
6. Mortimore S. and Wallace C. 'HACCP, A practical approach', Chapman and Hill, London, 1995.
7. Clive de Blackburn and Peter McClure., Foodborne Pathogens Woodhead Publishing, 2009.

FOOD SAFETY LAB XVIII

Subject Code: BFOTD1-622

**L T P C
0 0 4 2**

Duration: 30 (Hrs.)

Course Objectives:

1. To teach them about preparation of selective and complex media.
2. To improve their practical handling of microbiological tools.
3. To provide knowledge about different methods of staining and its use in food safety.
4. To aware them about the importance of personal hygiene and its assessment.

Course Outcomes:

1. Students learn about media preparation.
2. Students acquire knowledge about handling of microbiological tools.
3. Students get knowledge about different methods of staining and its use in food safety.
4. Students become aware about the importance of personal hygiene and assessment of personal hygiene.

PRACTICAL

1. Preparation of different types of media (complex, differential and selective)
2. Enumeration of aerial microflora using PDA
3. Identification of Molds by lactophenol blue staining
4. Negative Staining
5. Microbiological Examination of food
6. Bacteriological Analysis of Water by MPN method
7. Assessment of surface sanitation by swab and rinse method
8. Assessment of personal hygiene
9. Detection of Physical and chemical hazards in food.
10. Determination of coliforms in water.

Recommended Readings

1. Lawley R., Curtis L. and Davis J., 'The Food Safety Hazard Guidebook', RSC publishing, 2004.
2. De Vries, 'Food Safety and Toxicity', CRC, New York, 1997.
3. Marriott, N. G., 'Principles of Food Sanitation', AVI, New York, 1985.
4. Forsythe, S. J., 'Microbiology of Safe Food', Blackwell Science, Oxford, 2000.

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5. Forsythe S. J., 'The Microbiology of Safe Food', 2nd Edition, Willey- Blackwell, U.K., 2010.
6. Mortimore S. and Wallace C. 'HACCP, A practical approach', Chapman and Hill, London, 1995.
7. Clive de Blackburn and Peter McClure., Foodborne Pathogens Woodhead Publishing, 2009.

FOOD QUALITY MANAGEMENT

Subject Code: BFOTD1-623

**L T P C
4 0 0 4**

Duration: 60 (Hrs.)

Course Objectives:

1. To aware students about quality concepts, quality perception, quality attributes of foods.
2. To familiarize students to concepts of quality management
3. To aware students about food contamination, heavy metals, pesticide residues, antibiotics, agrochemicals, veterinary drug residues, environmental pollutants.
4. To aware students about need of food additives in food processing and preservation.

Course Outcomes:

1. Students become aware about different physical, chemical and biological contaminants.
2. Students become aware to quality control and quality assurance in food.
3. Students get knowledge about different food additive and food preservatives.
4. Students acquire knowledge about cryogenic freezing, supercritical fluid extraction, fat mimetics, flavour encapsulation.

UNIT I (15 Hrs.)

Introduction to food quality management – Definition of quality, quality concepts, quality perception, quality attributes.

Concepts of quality management: Objectives, importance and functions of quality control and quality assurance; Quality management systems in India

Quality in the Agri- food production chain-Techno- managerial approach, food quality relationship and food quality management functions. Dynamics on the agri- food production chain, core developments in food quality management.

UNIT II (15 Hrs.)

Contamination in Food: Physical, chemical contaminants (heavy metals, pesticide residues, antibiotics, agrochemicals, veterinary drug residues, environmental pollutants, radionuclides, solvent residues, chemicals) and Natural toxins.

UNIT III (15 Hrs.)

Chemical, technological and toxicological aspects

Risk assessment studies: Safety and quality evaluation of additives and contaminants, Acute and chronic studies. Introduction, need of food additives in food processing and preservation, Characteristics and classification of food additives.

Antimicrobial agents. -Nitrites, sulphides, sulphur dioxide, sodium chloride, hydrogen peroxide.

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UNIT IV (15 Hrs.)

High fructose corn syrup, cryogenic freezing, supercritical fluid extraction, fat mimetics, flavour encapsulation, use of nano technology in foods etc.

Recommended Readings

1. Pieterman A, L. and Willem J. M., 'Food Quality Management Technological and Managerial principles and practices', Wageningen, 2009.
2. Brannen and et al., 'Food Additives', Marcel Dekker, New York, 1990.
3. Jones J. M., 'Food Safety', Eagan Press, 1992.
4. Shapton D.A. and Shapton N.F., 'Principles and Practices for the safe processing of Foods' CRC Press, 1998.
5. DeMan, 'Principles of Food Chemistry', 3rd edition, Springer, 2007.

FOOD QUALITY MANAGEMENT LAB XIX

Subject Code: BFOTD1-624

L T P C
0 0 4 2

Duration: 30 (Hrs.)

Course Objectives:

1. To aware students about qualitative analysis of various milk products.
2. To familiarize students with quality inspection of cereals, pulses and spices.
3. To determine various contaminants in water.
4. To provide students a platform for quality testing of various food products.

Course Outcomes:

1. Students become aware about qualitative analysis of various milk products.
2. Students become familiar with quality inspection of cereals, pulses and spices.
3. Students determine different contaminants in water.
4. Students learn about quality testing of different food.

PRACTICAL

1. Qualitative tests for hydrogenated fats, butter, and ghee.
2. Quality inspection of various food stuffs- cereals, pulses, spices and condiments etc.
3. Estimation of sulphur dioxide in foods
4. Chromatographic estimation of colour.
5. Analysis of edible common salt for moisture content, MIW and total chlorides.
6. Estimation of ammonia nitrogen in water.
7. Estimation of benzoic acid/ sorbic acid in foods.
8. To implement HACCP plan in particular phases of food chain.
9. To evaluate various processes in food plant for implementation of GMP.
10. Determination of insecticides in given food samples.
11. Determination of heavy metals in food samples.

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Recommended Readings

1. Pieterel A, L. and Willem J. M., 'Food Quality Management Technological and Managerial principles and practices', Wageningen, 2009.
2. Brannen and et al., 'Food Additives', Marcel Dekker, New York, 1990.
3. Jones J. M., 'Food Safety', Eagan Press, 1992.
4. Shapton D.A. and Shapton N.F., 'Principles and Practices for the safe processing of Foods' CRC Press, 1998.
5. DeMan, 'Principles of Food Chemistry', 3rd edition, Springer, 2007