

SRI VENKATESWARA UNIVERSITY:TIRUPATI
B.Sc. Honours in Food Science &Technology (Major)
SEMESTER-III
W. E. F. 2024-25
COURSE 5: FOOD MICROBIOLOGY

Theory

Credits: 3

3 hrs/week

LEARNING OBJECTIVES

To introduce the fundamental concepts of microbiology.

LEARNING OUTCOMES

Upon successful completion of the course, a student will be able to:

LO1: To understand about scope of microbiology & classification of micro organisms & sterilization methods.

LO2: To study about the prokaryotic cells like bacteria, yeast, molds & viruses which are associated with food.

LO3: To learn about physical & chemical factors affecting growth of micro organisms.

LO4: To understand about metabolism & growth of micro organisms.

LO5: To study bacterial genetics & mutation.

UNIT – I

Historical aspects, Scope of microbiology, General classification of microorganisms, morphology, Structure and function of prokaryotic cells and their organelles – Structure and function of eukaryotic cells and their organelles morphological and biochemical characteristics of important groups. Brief survey of microbes as friends and foes. Characteristics, growth and reproduction, Sterilization and disinfections.

UNIT – II

Characteristics of growth and reproduction. Physical and chemical factors affecting growth of microorganisms like temperature, pH, oxygen, Osmotic pressure, nutrients etc, bacteriostatic and

bactericidal. Physiology, Nutritional requirement of bacteria, yeast and fungi, bacterial growth curve. Structure of DNA, Types of RNA and difference between DNA & RNA.

UNIT – III

Microorganisms associated with foods, Sources of microorganisms – Soil, water, plants and of animal origin. Useful microorganisms – Endospore formers, Irregular non-sporing gram positive rods. Yeasts & molds their role in food spoilage, Estimating number of microorganisms, sampling, sample size. Aseptic collection of samples, total cell counts and viable cell counts, plate counters. Indicator organisms. Alternative and Rapid methods for detection of specific microbes and toxins : Dye-reduction tests, Electrical methods, ATP determination – Pure cultures-preparation, maintenance and preservation – Microbiological quality control and HACCP

UNIT – IV

Microbiology of Food commodities, Contamination, preservation and spoilage & beneficial role of microorganisms in Cereals, Pulses, Nuts and Oilseeds, Fruits and Fruit products ,Vegetables and Vegetable products Meat , dairy and their products.

Microbiology of water- Contamination and microbial standards.

Food Borne Illnesses Food poisoning, Food borne infections, Food borne Intoxications (*Aeromonashydrophila*, *Bacillus cereus*, *Brucella*, *Camphylobacter*, *Clostridium botulinum*, *Clostridium perfringenes*, *Escherichia coli*, *Salmonella*, *Staphylococcus aureus*, *vibrio*, *yersinia*, *Listeria*) Hepatitis A and B Gastroenteritis viruses.

Spongiform encephalopathy - occurrence, symptoms, Preventive and control measures

UNIT – V

Food preservation Heat processing: Pasteurization and appertization, Determination of D and z values. Heat sensitivity of micro-organisms & Spoilage of canned foods. Aseptic packaging, Irradiation Brief account of microwave, UV and ionizing radiation. Brief account of High pressure

processing Low temperature storage –Chilling and freezing. Effect of chemical and natural preservatives on microbes in food.

REFERENCES:

1. General microbiology – Pelzar
2. Food Microbiology – Frazier
3. Molecular biology of the Cell – Bruce Alberts
4. Cell and molecular biology – De Robertis&De Robertis
5. W.C.Frazier: *Food Microbiology (IV edition)* Mcgraw Hill Book Company, New York (1995)
6. James M jay: *Modern food microbiology IV edition*, CBS publishers, New Delhi (1996)
7. M.R. Adams and M.O. Moss, *Food Microbiology*, Second Edition, Panima Publishing corporation, New Delhi. Third reprint 2004.
8. Gustavo F Gutierrez-Lopez, Gustavo V Barbosa-Canovas *Food Science and Food Biotechnology: CRCPress* 2003
9. Bibek Ray: *Fundamental Food Microbiology*, (Third Edition) CRC Press December 2003

SRI VENKATESWARA UNIVERSITY:TIRUPATI
B.SC. HONOURS IN FOOD SCIENCE &TECHNOLOGY (MAJOR)
SEMESTER-III

W. E. F. 2024-25

COURSE 5: FOOD MICROBIOLOGY

Practical

Credits: 1

2 hrs/week

1. Identification of microbes by Simple staining
2. Identification of microbes by Gram staining
3. Microbial mobility test (hanging drop method)
4. Determination of size of microbes (micrometry)
5. Direct microscopic count (DMC) of microorganisms
6. Identification of common microorganisms.
7. Identification of fungi in bread, pickles, jam, groundnut etc.
8. Microbiological examination of fresh fruits, vegetables and spices.
9. Microbiological examination of canned foods (acidic and non-acidic foods)
10. Microbiological examination of bottled and aseptically packed beverages a. water (MPN method for determination of coliform count)
11. Microbiological examination of flour, bread, cakes, sugar and cocoa confectionery products
12. Microbiological examination of meat, milk and their products
13. Visit to food microbiology lab.

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COURSE 6: CHEMISTRY OF FATS AND OILS

Theory _____ Credits: 3 _____ 3 hrs/week

Learning Objectives

To study the composition, chemistry and processing aspects of oils and fats

Learning Outcomes

Upon successful completion of the course, a student will be able to:

LO1: To study about the composition & classification of fats.

LO2: To study about the nutritional aspects & characteristics of fats.

LO3: To know about the processing aspects of fats.

LO4: To gain knowledge about the various value added products from facts of technologies to improve.

LO5: To understand the utilization of byproducts from oil & fat industry.

Unit – I

Composition & Classification of Fats

Fat - Definition, Importance, Chemical composition of fats, Triglycerides – their structure and composition, Mono glycerides and diglycerides, Free fatty acids – phosphatides, Sterols – fatty alcohols, Tocopherols

Unit – II

Characteristics of fat

Nutritional aspects of fats and oils, Metabolism – fat level in the diet and effect on health , Non-allergenicity of edible oils, Fat reduction in foods, Factors affecting physical characteristics of fats and oils, Chemical reactions of fats and fatty acids, Important characteristics of oils from coconut, cotton seeds, Palm, Sunflower, sesame, safflower, rice bran, rape seed, Mustard, Linseed, soybean, castor and lard

Unit – III

Processing of fats

Processing methods of oils – Degumming, refining, bleaching, Deodorizing, fractionation, Hydrogenation, inter esterification & esterification, Common products preparation – Salad and cooking oils, shortenings (baking and frying fats), Hard butters, margarine and spreads, Dressings for food -(Mayonnaise and Salad dressings), Pourable – type dressings, reduced calorie dressing, Toppings, coffee whiteners, confectionaries coatings, Low Fat spreads for traditional breakfast foods

Unit – IV

Value Added Products from fats

Growing demands on oils & lipids from traditional and convenience food markets in terms of quality,

Functional, sensory and nutritional strengths, Technologies to improve the edible oil pool in India,

Stability of oils and fats, Value added products from vegetable oil refining industry: lecithin, wax, Value added products from vegetable oil refining industry: Vitamin-E, oryzanol, Alternative methods for extraction & processing of oils

UNIT-V

By Product Utilization

Value added products from non-traditional oils and fats, By-products from bran oil and oil refining industry, Utilization of lingo cellulosic waste from oil industry, Bakery fats with zero trans fatty acids, Refining procedures for edible oils with a note on analytical techniques in lipids

REFERENCES

- 1) D.Swern, “Bailey’s industrial oils and fat products” Wiley Inter Science Publications, New york
- 2) B.B. Min & C.C Akoh, “Food lipids” Marcel & Decker Publishers,1998.
- 3) D.B. Min, R.E. McDonald, “Food Lipids and Health”, Marcel & Decker Publishers, 1996.

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COURSE 6: CHEMISTRY OF FATS AND OILS

Practical

Credits: 1

2 hrs/week

- ✓ Common Test methods for Fats
 - 1) Cold Test
 - 2) Colour, (Lovibond)
 - 3) Dropping point
 - 4) Flavour
 - 5) FFA
 - 6) Melting Point
 - 7) Oil stability index
 - 8) Peroxide Value
 - 9) solid fat index
 - 10) Solid fat content
 - 11) Total lipids and thiobarbituric acid reactive substances (TBARS)
 - 12) Karl-Fischer titration- application
- ✓ B) Oil Seeds
 1. Experimental expeller processing
 2. Experimental solvent extraction
 3. Production of protein concentrates and isolates.
 4. Lab model hydrogenator (for hydrogenation of vegetable oils).
 5. Visit to oil mills

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COURSE 7: DAIRY TECHNOLOGY

Theory

Credits: 3

3 hrs/week

Learning Objectives

To study the composition and manufacture of dairy products

Learning Outcomes

Upon successful completion of the course, the students will be able to

LO1: To study about the different methods of processing.

LO2: To study about the knowledge

LO3: The understanding about freezing food industry.

LO4: To understand about micro organisms.

LO5: To understand about sterilization method.

UNIT-I

Processing of Milk

- ✓ Milk Industries in India – Role of operation flood program
- ✓ Definition of milk – Source as food composition and nutritive value
- ✓ Physical and Chemical Properties of milk
- ✓ Processing of milk: Receiving of milk, Platform tests, Filtration and
- ✓ Clarification, Standardization
- ✓ Pasteurization methods– Sterilization methods,
- ✓ Homogenization, Packaging and distribution of milk
- ✓ Definition – Standardized milk, Single toned, Double toned milk
- ✓ Manufacture and shelf life of Sterilized bottle milk and flavored milk

UNIT-II

Cream & Butter

- ✓ Cream – cream separation, cream separator,
- ✓ Methods of cream separation-
- ✓ Factors governing richness of cream, factors governing fat percentage.

- ✓ Butter- introduction, composition process involved, cream neutralization, addition of starter cultures, cream ripening, churning, packing of butter
- ✓ Packing- factors influencing churning, over-run in butter,
- ✓ Butter defects- their causes and prevention.

UNIT- III

Cheese

- ✓ Cheese- introduction, history, definition,
- ✓ Classification, composition, nutritive value, legal standards.
- ✓ Manufacturing of cheddar cheese, their defects and control
- ✓ Manufacture of processed cheese their defects and control
- ✓ Manufacture of Swiss cheese and their defects and control
- ✓ Manufacture of cottage cheese, their defects and control.

UNIT – IV

Concentrated & Dehydrated Milk Products

- ✓ Condensed milk- history, composition, and types
- ✓ Methods of manufacture, vacuum pan condensing, and defects in condensed milk.
- ✓ Dried milk (Milk Powder)- history, types, composition of dried milk-
- ✓ Methods of manufacture- drum drying, spray drying, freeze-drying,
- ✓ Packaging of milk powder- Properties of dry milk- bulk density, solubility, solubility index, wettability, dispersability-
- ✓ Defects in dried milk, Reconstitution- instant milk powder-
- ✓ Malted milk beverages like horlicks, viva, etc.

UNIT- V

Ice Cream

- ✓ Ice cream – history, definition, classification, composition
- ✓ Ingredients sweethearts, stabilizers, flavours, etc-

- ✓ Preparation of ice cream, calculation of ice cream mix,
- ✓ Pasteurization of milk, homogenization, ageing, freezing, packaging of ice cream-defects and over run in ice cream.
- ✓ Indigenous milk products:
Rabri, kheer, channa, paneer, rasogolla, ghee, khoa, Kalakhand, srikhand & lassi
- ✓ Methods of preparation of Indigenous milk products & composition.
- ✓ Cultured milk products: Dahi / Yoghurt – their composition,
- ✓ Changes in constituents during fermentation and flavor development.

REFERENCES

1. Sukumar De, “Outlines of Dairy Technology, Oxford Univ. Press, 1980.
2. Aneja RP, Mathur BN, Chandan RC & Banerjee AK. “ Technology of Indian Milk Products”, Dairy India Publications, 2002.
3. Rathore NS et.al. “ Fundamentals of Dairy Technology – Theory & Practices”, Himanshu Pub., 2008.
4. Henderson JL, “Fluid Milk Industry”, AVI Pub.1971.
5. Web BH, Johnson AH & Lford JA, “ Fundamentals of Dairy Chemistry”, 3rd Edition. AVI Pub.1987.

SEMESTER-III
COURSE 7: DAIRY TECHNOLOGY

Practical

Credits: 1

2 hrs/week

- ✓ Determination of pH, Specific gravity in milk
- ✓ Estimation of Fat and Total Solids (TS)
- ✓ Estimation of Solids-Not-Fat (SNF) in milk.
- ✓ Estimation of Protein and Casein in milk.
- ✓ Detection of Adulterants in milk.
- ✓ Detection of Preservatives in milk.
- ✓ Preparation of Milk Products.
- ✓ Quality Evaluation of Milk Products.
- ✓ Cream Separation using Separator
- ✓ Visit to Milk Chilling and Processing Center

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COURSE 8: CONFECTIONERY TECHNOLOGY

Theory _____ Credits: 3 _____ 3 hrs/week

LEARNING OBJECTIVES

To understand composition and manufacture of various confections

LEARNING OUTCOMES:

Upon successful completion of the course, a student will be able to:

LO1: To gain knowledge about the status of confectionery industries & information about sugar.

LO2: To learn about the various ingredients used in confectionery product.

LO3: To learn the manufacturing methods of chocolates.

LO4: To study the technology & ingredients involved in production of jams & jellies.

LO5: To understand the causes of cereal bars.

UNIT –I

Status of confectionery industries in India – Types of sugar: granulated, Caster, Icing, Liquid sugars, Brown Sugars, Molasses, and microcrystalline sugars. Composition of sugars- Properties of sugar and sugar solutions – Glucose syrups and refined glucose syrups in sugar confectionery manufacture.

UNIT –II

Oils and Fats – uses in confectionery items, Milk and related products, Composition of milk and functional properties of its major components, Application of milk and milk based ingredients. Colors – Factors influencing choice – natural and Synthetics colors. Flavoring - Natural and Artificial – Flavor Strength, factors effecting stability of flavoring compounds. General technical aspects of industrial sugar confectionery manufacture, Compositional effects, change of state, evaporation, sweetness and taste.

UNIT – III

Manufacture of hard-boiled sweets: ingredients, Prevention of recrystallization and stickiness, Manufacturing methods of toffee and fudge, Product types: Caramel, toffee and fudge: -
Ingredients, Structure of toffee, formulation, processing, toffee stability. Cocoa beans, cocoa fruit, pulp. Cocoa chocolate and related products: Sequence of processes, Chocolate recipes, Cocoa powder, mixing, refining and conching, tempering of chocolates.

UNIT-IV

Gums and Jellies: Technology and Chemistry of hydrocolloids, Hydrocolloid pretreatment process, Liquor preparation, shaping, drying, finishing treatment, re-work, common faults, causes and cures. Liquorices paste, cream paste and aerated confectionery, Ingredients of liquorices paste and manufacture, ingredients of cream paste, Manufacture and extrusion of cream paste. Liquorices all shorts, aerated confectionery, Methods of aeration – Marshmallow – Nougat.

UNIT – V

Tablets, Lozenges and Sugar panning: Tablets granulation, ingredients compression, lozenges, Sugar panning, hard panning soft panning, polishing. Additional panning techniques. Chewing gums technology: Gum base, sugar, flavors, humectants, Fruit acids, sugar-free chewing gum ingredients, formulation Chewing gum mixing, count line components, Manufacturing of count-lines, Cereal bars.

REFERENCES

1. Sugar Confectionery Manufacture E.B. Jackson, 2nd edition, 1995 Blackie Academic and Professional, Glasgow.
2. Sugar Confectionery and Chocolate Manufacture: R.Lees 197 Leonard Hill Books, International Text Book Company Limited.
3. Meade-Chen Cae Sugar Handbook :Chen, J C PO,11th edition,1985 John Wiley and Sons, New York
4. Sugar Technology for Students Lionnet, G R E, 1999 Lang Fred, Durban, S.Africa

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COURSE 8: CONFECTIONERY TECHNOLOGY

Practical Credits: 1 2 hrs/week

1. Analysis of sucrose (Liquid and sugar Crystals)
2. Analysis of confectionery products
3. Handling of processing equipment in sugar confectionery
4. Preparation of Hard boiled sweets
5. Preparation of Chocolate syrup and moulded chocolates
6. Preparation of Fudge
7. Preparation of fondant
8. Preparation of marshmallow
9. Study of working principles of Evaporator,
10. Study of working principles of Crystallizer and Centrifugal machines
11. Visit to the Sugar Confectionary Industry.
12. Cost benefit analysis of Confectionery industry