

SRI VENKATESWARA UNIVERSITY :: TIRUPATI
Programme: B.Sc. Honours in Food Science & Technology (Major)
w.e.f. AY 2025-26

V SEMESTER COURSE STRUCTURE

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits	
III	V	12	Food Safety and Quality Control	3	3	
			Food Safety and Quality Control Practical Course	2	1	
13		Baking Science & Technology	3	3		
		Baking Science & Technology Practical Course	2	1		
14A		Technology of Meat, Fish Poultry and their Products	3	3		
		Technology of Meat, Fish Poultry and their Products Practical Course	2	1		
OR						
14 B		Food Process engineering	3	3		
		Food Process engineering Practical Course	2	1		
15 A		Technology Fruits, Vegetable and Plantation Crops	3	3		
		Technology Fruits, Vegetable and Plantation Crops Practical Course	2	1		
OR						
15 B		Fermentation Technology	3	3		
		Fermentation Technology Practical Course	2	1		
	VI	Internship				

SEMESTER- V

COURSE 5: FOOD SAFETY AND QUALITY CONTROL

Theory

Credits: 3

3 hrs/week

Learning Objectives:

To study the various aspects of quality control and sensory evaluation process in food industries.

Learning Outcomes: On successful completion of the course, students will be able to

LO1: To gain the knowledge about the food safety of various hazards involved in it.

LO2: To understand the quality assurance & various voluntary & obligatory food standards.

LO3: To learn the sampling methods & testing of raw materials & finished food products.

LO4: To learn about sensory parameters & its associated subjective & objective tests.

LO5: To study about the sanitation, hygiene & quality assurance in food industries.

Unit – I

- Food safety: Definition, meaning – Importance of food safety
- Food hazards: Physical, chemical and biological hazards for food safety.
- Food Safety and standard bill, Food safety and standards act (FSSA)
- Hazard Analysis Critical Control Point (HACCP) and its implementation.
- Worldwide food safety issues.

Unit-II

- Quality assurance: Theoretical and practical considerations, description of different systems: GAP, GMP, TQM, ISO.
- Indian food standards - voluntary and obligatory standards (PFA, FPO, MMPO, Meat and Meat Products order, AGMARK etc.) Codex-Alimentarius
- Fair average quality(FAQ) Specification for food grains ISO 9000series

Unit-III

- Quality assessment of various Raw food materials – Cereals, pulses, Fruits & Vegetables, Milk & Milk Products, bakery, Egg, Flesh foods etc.
- Quality assessment of various Process food materials
- Sampling methods & techniques for food analysis – Random, Systematic, Stratified and Cluster.
- Inspection techniques – Pre-process, In-process, & Post-process inspection

Unit-IV

- Sensory evaluation - Requirements and methods.
- Sensory parameters: colour, flavour, texture, taste, aroma, general acceptability
- Subjective and objective test of sensory parameters - (Differential tests, Descriptive test, Rating tests, Sensitivity threshold test)

Unit-V

- Cleaning In Place (CIP) – cleaning cycle, Different Sanitizers and detergents
- Cost of quality (COQ), importance and benefits of COQ
- Supplier development – steps in supplier development, importance.
- Food analyst – Role and responsibilities.

References:

1. Pomeranz Y and Meloan C E, “ Food analysis: Theory And Practice”. 3rd ed. CBS Publishers, New Delhi.1996.
2. Nielsen S S, “ Introduction to the chemical analysis of foods”Jones and Bartlett Publishers, London.1994.
3. Nielson S S. “Food analysis laboratory manual”. Chips Ltd, USA.2003.
4. Lawless H T and Heymann H. “ Sensory Evaluation of Foods Principles And Practices”, Chapman and Hall, New York1998.
5. AOAC, “Official methods of analysis. Association of OfficialAnalytical Chemists”, Arlington 1995.

SEMESTER-V

COURSE 12: FOOD SAFETY AND QUALITY CONTROL

Practical

Credits: 1

2 hrs/week

1. Layout of quality control laboratory for food processing unit the requirements of glassware and equipments.
2. Microbiological quality control of utensils and glassware SWAB, RINSE methods
3. Evaluation of personnel hygiene
4. Evaluation of detergents AOAC method.
5. Evaluation (Sensory and chemical) of canned foods
6. Evaluation (Sensory and chemical) of dairy products
7. Evaluation (Sensory and chemical) of confectionery products
8. Detection of common adulterants
9. Good Laboratory Practices
10. Visit to food industry quality control lab

SEMESTER-V

COURSE 13: BAKING SCIENCE & TECHNOLOGY

Theory

Credits: 4

3 hrs/week

Learning Objectives: To understand the principles of baking science & technology of production.

Learning Outcomes: On successful completion of the course, students will be able to

LO1: To gain knowledge about the bread, formulation & ingredients.

LO2: To learn the bread making & its baking process.

LO3: To understand the methods & ingredients used in biscuit production.

LO4: To learn the principles & procession preparation of cakes.

LO5: To learn the preparation of frozen dough products & application of starches in bakery industry.

UNIT-1

- Baking – Importance of baking, Principles of baking, Traditional & Modern Baking.
- Ingredients used in baking- Flour, Yeast, Fat, Eggs, Baking powder, sugar, their need, importance and functions
- Minor ingredients used in baking: Salt, Essence, Improving agents, foods enzymatic supplements, oxidizing agents, salt, dairy products, mold inhibitors, dough strengtheners/ softeners and enrichments etc.
- Role and importance of time and temperature in baking.

Unit – II

- Breads- Types of breads, Methods of Bread making
- Bread making process - Mixing and dough processing; Fermentation of dough, dough make up, dividing, rounding and pre-molding of dough
- Changes taking place during fermentation and baking of bread and bread cooling
- Faulty breads and causes and preventive measures to control faults, perfect breads - properties
- Bread spoilage and staling, causative factors and control measures

Unit – III

- Biscuits; biscuits, cookies and crackers - ingredient used and their functions,
- granulation, Shortening, sweeteners, chemical leaveners
- Preparation of biscuits dough's mixing objectives, mixer types
- fermentation of shaped dough pieces
- Biscuit baking, heat transfer mechanism, changes during baking
- Cooling, packaging and storage.

Unit – IV

- Cakes: Types of cakes, Cake making methods
- Various ingredients used in cake making, their role and functions.
- Cake faults and their remedies
- Equipment used in cake making
- Cake decoration- importance, Types of icings and its usage.

Unit – V

- Waffles: Types of waffles, ingredients used and their function,
- Method of preparation of waffles.
- Puff pastries – types and methods of preparation
- Meringue – Hot & Cold meringues, Boiled/Italian Meringue,
- Method of preparation of Meringue and care to be taken in preparation of meringue.

Reference Books

1. Cauvain & Linda S.Y, “ Technology of Bread making”, Blackie Academy & Professional, London 1998.
2. Matz, S.A. “Bakery Technology & Engineering” 3rd edition, CBS publications Delhi. 1996.
3. Plyer, E.J “Baking Science & Technology” Vol.-I & II, 3rd edition, Sopsland Pub. Kansas, U.S.A 1988.
4. Pomeroy, Y, “Wheat chemistry & Technology” Vol.I & II, 3rd edition A.A.C.C.
5. Wade, P, “Biscuits Cookies & Crackers” Vol.I, Elsevier. 1998.
6. Almond, “Biscuits Cookies & Crackers” Vol.II, Elsevier 1998.

SEMESTER-V

COURSE 13: BAKING SCIENCE & TECHNOLOGY

Practical

Credits: 1

2 hrs/week

1. Testing of Gluten quality
2. Cake preparation
3. Bread making
4. Buns and other types of bread preparations
5. Puff pastry preparation
6. Types of Waffles making
7. Biscuits making
8. Cookie preparation
9. Icing preparations
10. Decoration of cakes.

SEMESTER-V
COURSE 14 A: TECHNOLOGY OF MEAT, FISH, POULTRY & THEIR PRODUCTS

Theory

Credits: 3

3 hrs/week

Objective: To study the various aspects of meat, fish and poultry processing technology.

Learning Outcomes

Students after Success full completion of the course will be able to

LO1: To gain knowledge about various sources, feed, breed & structure of meat. LO2: To study about the various steps involved in slaughtering of meat animals. LO3: To know about the preservative & processing methods of meat. LO4: To understand the steps involved in the processing of poultry meat. LO5: To gain knowledge about the types of fish, its composition & processing & preservation methods.

Unit – I

- Sources of meat and meat products in India, Its importance in national economy
- Microscopic structure of meat, Physico-chemical properties of meat
- Nutritive value of meat
- Effect of feed, breed and management on meat production and quality
- Conversion of muscle to meat

Unit-II

- Premortem inspection and care of animals
- stunning types, slaughtering types
- Slaughter house operations
- Dressing, anti- and postmortem changes in carcass composition
- grading of meat and meat cuts

Unit – III

- Processing and preservation of meat: canning, freezing, salting, dehydration, Aging, pickling and smoking of meat
- Spoilage of meat and its control
- Comminuted and non-comminuted meat products
- Meat by- products

Unit – IV

- Poultry: Classes of poultry meat
- Commercial methods of slaughtering, dressing of poultry
- Post-slaughter handling, storage and preservation of poultry meat
- Spoilage of poultry meat and its control
- Freezing of poultry (whole and cuts)
- Eggs: Composition, handling, candling washing, coating, packaging and storage
- Egg processing (Egg powder manufacturing)
- Spoilage of eggs and its control

Unit-V

- Types of fish, and its composition
- structure, post-mortem changes in fish
- Fish processing & Preservation: Canning, smoking, freezing and dehydration of fish
- Fish by-products
- shrimp and its processing

References:

1. Lawrie, R.A. “Meat Scienc”e, 2nd Edn. Pergamon Press, Oxford UK. 1975.
2. Lavie A. “ Meat Handbook”. 4th Edn. AVI, Westport 1980.
3. Portsmouth, J.I. “Commercial Rabbit Meat Production”. 2nd Edn. Saiga Survey,England.1979.
4. Stadelmen, W.J. and Cotterill, O.J., “Egg. Science and Technology”. 2nd Edn. AVI, Westport.1977.

**COURSE 14 A: TECHNOLOGY OF MEAT, FISH, POULTRY & THEIR
PRODUCTS**

Practical

Credits: 1

2 hrs/week

1. Study the anatomy of poultry.
2. Study of different primal meat cuts/ dressing of fish
- 3 Cutting and handling of meat/fish
- 4 Preservation of meat/fish by freezing
- 5 Preservation of meat/ fish by curing and pickling
- 6 Preservation of meat/ fish by dehydration
- 7 Evaluation of quality and grading of raw and boiled eggs
- 8 Preparation of value added poultry/meat/ egg
- 9 Evaluation of meat quality
- 10 Evaluation of meat quality by determination of pH and dye reduction test.
- 11 Visit to abattoir

COURSE 14 B: FOOD PROCESS ENGINEERING

Theory

Credits: 3

3 hrs/week

Learning Objectives:

To enable students to develop understanding on food process engineering concepts.

Learning Outcomes

Students after Success full completion of the course will be able to

LO1: Study about units & dimensions.

LO2: Solve problems involved in dilution, concentration & dehydration.

LO3: Study about fluid dynamics

LO 4: Understand about heat

transfer

LO5: To understand about filtration sedimentation & reverse osmosis.

UNIT – I

Units & Dimensions: Definition of terms – System of measurements – The S.I System – Conversion of Units – Dimensional Consistency – Conversion of Dimensional equations – Examples. Material Balances: basic Principles – Problems involved in dilution, Concentration and dehydration – Blending of Food Ingredients – Examples.

Energy Balances: Basic Principles – Energy terms – Heat properties of saturated and super heated steam – heat balances – Examples. Gases and vapors: definition-equation of state for an ideal and real gases- ideal gas equation - P.V.T relationship for ideal gases-gas mixture.

UNIT – II

Thermodynamics: thermodynamic variables- define enthalpy- the relationship between C_p and C_v for gases- P.V.T relationship for ideal gases in thermodynamic process- changes in thermodynamic properties, Work and Heat associated with thermodynamic processes. Refrigeration- mechanical refrigeration system- refrigeration cycle- use of refrigerant charts- condenser-evaporator-compressor-refrigeration load- Freezing: types

UNIT-III

Fluid Mechanics Flow of Fluids – Concept of viscosity – Rheology, Newtonian and Non-Newtonian fluids –Viscometry- types-determination of rheological Properties of fluids using rotational viscometry- Continuous viscosity monitoring and control-Transportation of Fluids- Continuity principle and Bernoulli equation- Reynolds number-flow measuring instruments: Orifice meter- Venturimeter-Rotometer-Problems.**Mass Transfer** Mass transfer:- Psychrometry – heat and Mass transfer in dehydration – Stage of drying- Prediction of drying from drying rate data- Types of driers – Problems-Extraction- types- principles- systems- Problems.

UNIT-IV

Heat Transfer Theory- types- Estimation of thermal conductivity of food products- Fourier's law of heat transfer-Temperature profile of unidirectional heat transfer through conduction-Heat transfer by convection- Forced convection and Free convection.Heat transfer by radiation- Kirchhoff's law- Stephan- boltzman - plank's distribution law-Wein's displacements law Microwave and direct electric heating ,Temperature measuring devices- various thermometers- Examples.Steady state heat transfer- calculation- heat exchanger equipment- types- local heat transfer coefficients- equation-heat transfer to non-Newtonian fluids in laminar flow- examples-unsteady state heat transfer – Fourier number – Biot number – heisler and gurney- Lurie charts-calculations- evaporation – single effect evaporators- improving the economy of evaporators- Dehydration- water activity.

UNIT-V

Physical separation process- Types, Filtration – Filtrate flow through filter cake-Types of filtrations – Constant pressure filtration and constant rate filtration, Reverse osmosis Sieving and Gravity separation- problems-Sedimentation,Material handling equipment.

References

1. Methods of Physico-Chemical analysis of fruits: B.C.Muzumdar&K.Muzumdar, 2003
Dayapublishers , New Delhi.
2. Fundamentals of food process engineering, Romeo T. Toledo 2nd edition
CBS Pub. Delhi.
3. Pandey H. *et al.*, “Experiments in Food Process Engineering” 1st edition, CBS Pub. Delhi.
4. R. Paul Singh, “Introduction to Food Process Engineering” 3rd Edition. Academic Press, London, 2004.
5. R. E. Earley, “Unit Operations in Food Process Engg”.
6. Refrigeration & Air conditioning P Kurmy&Guptha
7. Warren L Macabe, Julian C Smith, Peter Hariot, “Unit Operations of Chemical Engineer
8. Experiments in Food Process Engineering : Pandey H. *et al.*, I edition.
CBS Pub. Delhi.
9. Introduction to Food Process Engineering: R. Paul Singh.
10. Unit Operations in Food Process Engg. : R. E. Earley
11. Lal G, Siddapa GS & Tandon GL. “Preservation of Fruits and vegetables”. ICAR, 1986.

COURSE 14 B: FOOD PROCESS ENGINEERING

Practical

Credits: 1

2 hrs/week

1. Preparation of syrups and brine solution
2. Preparation and Preservation of Squashes, Cordial, Crush etc.
3. Preparations and Preservation of Jams, Jellies, Marmalades, and Pickles
4. Drying of fruits and vegetables (Banana, Resins, Potatoes, Tomatoes, etc.)
5. Preparations of Canned Foods.
6. Visits to ICMRI.
7. Visit to Rice Mill, Dhal Mill and Flour Mill

COURSE 15 A: TECHNOLOGY FRUITS, VEGETABLE AND PLANTATION

Theory

Credits: 3

3 hrs/week

Learning Objectives:

To understand the concepts of processing and preservation of fruits, vegetables and plantations crop

Learning Objectives

LO 1 Student will learn overview of fruit and vegetable production and its handling

LO 2 Student will learn how to preserve the harvested fruits and vegetables

LO 3 Student will learn how to prepare various products from fruits as per FASSAI standards

LO 4 Student will learn how to prepare various products Vegetables fruits as per FASSAI Standards

LO 5 Student will learn how to prepare value added products from fruit and vegetable waste

Unit I

- Production and processing of fruits and vegetables in India and world;
- Scope of fruit and vegetable processing industry in India.
- Overview of principles and preservation methods of fruits and vegetables;
- Primary processing and pack house handling of fruits and vegetables; Peeling, slicing, cubing, cutting and other size reduction operations for fruits and vegetables.

Unit 2

- Minimal processing of fruits and vegetables; Blanching- operations and equipment.
- Canning: Definition, processing steps, and equipment;
- Cans and containers, quality assurance and defects in canned products.

Unit -3

- FSSAI specifications and preparation and preservation of juices, squashes, syrups, sherbets, nectars, cordials, etc.;
- Processing and equipment for above products.
- FSSAI specifications of crystallized fruits and preserves, jam, jelly and marmalades, candies.
- Preparation, preservation and machines for manufacture of above products.

Unit- 4

- Preparation, preservation and machines for manufacture of chutney, pickles,
- sauce, puree, paste, ketchup; toffee, cheese, leather, dehydrated,
- wafers and papads, soup powders;

Unit -5

- Production of pectin and vinegar.
- Commercial processing technology of selected fruits and vegetables for production of various value added processed products.
- By-products of fruit and vegetable processing industry.

Reference

1. U.D. Chavan and J.V. Patil. 2013. Industrial Processing of Fruits and Vegetables. Astral International Pvt. Ltd., New Delhi.
2. S. Rajarathnam and R.S. Ramteke. 2011. Advances in Preservation and Processing Technologies of Fruits and Vegetables. New India Publishing Agency, New Delhi.
3. Y.H. Hui. 2006. Handbook of Fruits and Fruit Processing. Blackwell Publishing Ltd., Oxford, UK.
4. W.V. Cruess. 2004. Commercial Fruit and Vegetable Products. Agrobios India, Jodhpur. 49
5. Y. H. Hui, Sue Chazala, Dee M. Graham, K.D. Murrell and Wai-Kit Nip. 2004. Handbook of Vegetable Preservation and Processing. Marcel Dekker, Inc., NY, USA.
6. A.K. Thompson. 2003. Fruit and Vegetables: Harvest, Handling and Storage, 2nd Ed. Blackwell Publishing Ltd., Oxford, UK.

7. AmalenduChakraverty, Arun S. Mujumdar, G.S. Vijaya Raghavan and Hosahalli S. Ramaswamy. 2003. Handbook of Post Harvest Technology: Cereals, Fruits, Vegetables, Tea, and Spices. Marcel Dekker, Inc., NY, USA.
8. R.P. Srivastava and Sanjeev Kumar. 2002. Fruit & Vegetable Preservation: Principles and Practices, 3 rd Ed. International Book Distribution Co., Delhi.
9. P.H. Pandey. 1997. Post Harvest Technology of Fruits and Vegetables. Saroj Prakashan, Allahabad.
10. Mircea EnachescuDauthy. 1995. Fruit and Vegetable Processing. FAO Agricultural Services Bulletin No.119. FAO of UN, Rome.
11. Girdhari Lal, G.S. Siddappa and G.L. Tandon. 1959.Preservation of Fruits and Vegetables. ICAR, New Delhi.
12. EIRI Board of Consultants and Engineers. Manufacture of Snacks, Namkeen, Papads and Potato Products. EIRI, New Delhi.

COURSE 15 A: TECHNOLOGY FRUITS, VEGETABLE AND PLANTATION

Practical

Credits: 1

2 hrs/week

1. Determination of salt concentration in processed/ preserved product
2. Preparation of jam from selected fruits
3. Preparation of jelly from selected fruits
4. Preparation of fruit marmalade
5. Preparation of RTS/ nectar
6. Preparation of squash/ crush
7. Preparation of cordial
8. Preparation of Anardana
9. Preparation of pickles
10. Dehydration of ginger, onion and garlic
11. Preparation of banana and potato wafers;
12. Preparation of vegetable sauces.

COURSE 15 B: FERMENTATION TECHNOLOGY

Theory

Credits: 3

3 hrs/week

Learning Objective: To study the various aspects Fermentation Technology

Learning Outcomes

LO1: Learn the Basics of Fermenter and types of fermentation

LO2: Learn about traditional fermented food.

LO3: Learn about various types about beverages.

LO4: Learn about fruit based Juices and beverages, tea, coffee, cocoa processing

LO5: Learn about fermentation of various alcoholic. To know types of beverages & quality control in beverage industry.

Unit- I

- Types of Fermentation Processes-Solid state fermentation, Liquid state fermentation (Surface, Submerged),
- Design and functioning of a Fermenter
- Types of Fermenters batch, Fed Batch, Continuous, Airlift Solid state fermenter, Packed bed reactors, Photo bio reactor
- Importance of Primary and secondary Metabolites
- Screening and isolation of Industrially Important Microorganisms

Unit – II

- Fermented Foods: Introduction to fermentation
- Lactic acid fermentation of cabbage, cucumber, olives, Production of sauerkraut

- Preparation of pickles ,Fermentation of dill pickles
- Oriental fermented foods, Soy sauce, Masco, Tempe, Ontjons, Hamanatto, Tofu, Natto
- Traditional fermented foods – Idli, Dosa
- Fermented meat and milk Products

Unit – III

- Beverages: Introduction, classification
- beverage industry in India
- Ingredients for beverages: Water - sources and purification
- types of water Purification systems
- Fruit pulps, juices, concentrates, and other additives
- Sweeteners - sugars, artificial sweeteners
- Colours, flavours, preservatives

Unit-IV

- Fruit based beverages:
- Nectar, cordial, squash
- syrup, juice concentrates, fruit flavored powders
- Barley water
- Carbonated beverages, synthetic, low calorie beverages, dry mix formulation
- Tea, coffee, cocoa processing

Unit – V

- Alcoholic Beverages: Alcoholic fermentation of grape juice
- Brief study of yeast in fermenting ‘Must’
- Wine Types, Technology of wine making - Aroma of wines
- Types and Production of beer

- Elements of brewing process
- Distilled Beverages
- Types and production Technology of whisky, brandy
- Quality control in beverage industry

References:

1. A. H. Patel, Industrial Microbiology, 2/e, MacMillan Publishers, 2012.
2. N. Okafor, Modern Industrial Microbiology and Biotechnology, Science Publishers, 2007.
3. Casida, L E JR., Industrial Microbiology, New Age International Publishers, 1968.
4. E. M. T. El Mansi, C. F. A. Bryce, A. L. Demain, A. R. Allaman, Fermentation Microbiology and Biotechnology, 3/e, Taylor and Francis, 2011.
5. W. C. Frazier, D. C. Westhoff and N. M. Vanitha, Food Microbiology, 4/ e, McGraw Hill, 2014.
6. A. N. Glazer and H. Nikaido, Microbial Biotechnology: Fundamentals of Applied Microbiology, 2/e, Cambridge University Press, 2007.
7. G. Reed, Prescott and Dunn's Industrial Microbiology, 4/e, CBS Publishers and Distributors, 2004.
8. W. Cruger and A. Cruger, Biotechnology: A Textbook of Industrial Microbiology, Panima Publishing Corporation, 2003
9. Nduka Okafor. 2007. Modern Industrial Microbiology and Biotechnology. Science Publishers, Enfield, New Hampshire, USA.
10. Dennis E. Briggs, Chris A. Boulton, Peter A, Brookes and Roger Stevens. 2004. Brewing Science and Practice. Woodhead Publishing Ltd. Cambridge, England.
11. G. Reed. 2004. Prescott & Dunn's Industrial Microbiology, 4th Ed. AVI Publishers, Connecticut, USA.
12. Peter F. Stanbury, Allan Whitakar and Stephen J. Hall. 1995. Principles of Fermentation Technology, 2nd Ed. Elsevier Science Ltd., Burlington, MA, USA

SEMESTER-V

COURSE 15 B: FERMENTATION TECHNOLOGY

Practical

Credits: 1

2 hrs/week

1. Screening and isolation of few industrially important Microorganisms.
2. Preparation of Yoghurt
3. Preparation of buttermilk
4. Preparation of whey based fermented beverage
5. Preparation of pickles
6. Preparation and maintenance of starter cultures
7. Preparation of distilled ethanol by yeast.