



Anekant Education Society's  
**TULJARAM CHATURCHAND COLLEGE,**  
**BARAMATI, DIST-PUNE – 413102**

Revised Proposed Syllabus  
For  
**M. Voc.**  
**(Food Processing Technology)**  
**F.Y (Semester I & II)**  
**(Autonomous)**

Sponsored by  
**University Grant Commission**

Under  
**National Skill Qualification Framework**  
**(NSQF)**

To be implemented from  
2022-2023

**Title of the Course: M. Voc. (Food Processing Technology)**  
**(To be implemented from Academic Year - 2022-2023)**

**Course structure:**

- M. Voc. is two year degree programme with three theory and three practical courses in each semester.
- Each theory course will be of four credits and each credit is of 15 periods
- Each practical course will be of six credits and each credit is of 15 periods
- Each period is of one clock hour.
- In each practical course, there will be one visit to the relevant industry/ institute.
- In addition to the regular practicals based on the theory course, special emphasis will be on communications and soft skills development of the students.

**Eligibility:**

- 1) **First Year M.Voc:** A student who has completed the Graduation in Food Technology.
- 2) **Second Year M.Voc:** Keeping terms of First Year of M. Voc. and if they fulfill the eligibility conditions.

**Note:** Admissions will be given as per the selection procedure / policies adopted by the college, in accordance with conditions laid down by the Savitribai Phule Pune University, Pune.

**Examination Pattern:**

**Examination:**

➤ **Pattern of Examination.**

- i) Internal exam, Term end exam, Oral, Project, Presentation, GD, Viva voce
- ii) Pattern of the question paper:

- i) 25% Objective Question
- ii) 50% Short and Long Answer type question
- iii) 25% Problem based Case Study/long answer type

➤ **Theory Examination: -**

- i) Continuous Internal Assessment: 50 Marks (Unit Test I & II, Assignment-2No., Attendance) for each course of programme.
- ii) Semester End Examination: 50 Marks on the basis of Answer Sheet Evaluation for each course

➤ **Practical Examination: -**

- i) Continuous Internal Assessment: 75 Marks (Written exams, Visit Report, Journal, Viva Voce, Seminar/Presentation, Group Discussion and Attendance) for each course.
- ii) Semester End Examination: 75 Marks on the basis of Answer Sheet Evaluation with performance in practical examination which will be evaluated by external examiner for each course.

**Anekant Education Society's  
TULJARAM CHATURCHAND COLLEGE, BARAMATI  
DIST-Pune-413102**

**First year: Semester I**

Sr. No.	Subject Name	No. of Credits	Marks
<b>Theory (General Education Component)</b>			
FPT-101	Food Microbiology	4	100
FPT-102	Food Chemistry and Analysis	4	100
FPT-103	Nutrition Science	4	100
<b>Practicals (Skill Component)</b>			
FPT- 1.1	Food Microbiology	6	150
FPT- 1.2	Food Chemistry and Analysis	6	150
FPT- 1.3	Bakery and Confectionery Technology	6	150

**Semester II**

Sr. No.	Subject Name	No. of Credits	Marks
<b>Theory (General Education Component)</b>			
FPT- 201	Beverage and Snack Food Technology	4	100
FPT- 202	Food Additives, Contaminants and Toxicology	4	100
FPT- 203	Advances in Food Processing & Packaging	4	100
<b>Practicals (Skill Component)</b>			
FPT- 2.1	Beverage and Snack Food Technology	6	150
FPT- 2.2	Processing of Fruits and Vegetables	6	150
FPT- 2.3	Advances in Food Processing & Packaging	6	150

**Note:**

- One compulsory visit to field/industry/institute for practical papers in all semesters
- Report Submission and PPT presentation of visit report is mandatory
- Seminar Report preparation and PPT presentation mandatory for each theory papers.
- Group discussion/case study based on local/regional/national social economic aspects.

## First Year

## Semester I

### FPT-101: Food Microbiology

Theory

Paper No. – FPT-301

Maximum Marks: 100

Credits: 4

Teaching Period: 4/week

Teaching Load: 60 Theory Period/ Semester

#### Learning objectives:

To develop skills to understand the theoretical concepts related to food microbiology to learn about microorganisms which inhabit, create or contaminate food

#### Learning Outcomes:

Students will able to

1. Explain pathogens and spoilage microorganisms in foods and the conditions under which they will grow, conditions under which the important pathogens are commonly inactivated, killed or made harmless in food describe the processes, contamination and advantages of microbial involvement
2. Explain the theoretical basis of the tools, technologies and methods common to microbiology

#### Unit-1 Microorganisms and their growth

12P

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 Contamination of food

12P

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

#### Unit-3 Spoilage of Food

12P

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

#### Unit-4 Food Poisoning

12P

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

#### Unit-5 Fermentation

12P

Concept of Fermentation, important microorganisms in food fermentation, Processing of Fermented Food Products: Bread, traditional Indian foods, malt beverages, wines,

vinegar, fermented vegetables, fermented dairy products, oriental fermented products and Spoilage and defects of fermented food products

### **FPT: 1.1-Food Microbiology**

1. Microscopy and micrometry. 1P
2. Preparation of nutrient media, sterilization and inoculation techniques, Isolation of pure culture 3P
3. Staining of bacteria: Grams Staining, acid-fast, spore, capsule, motility of bacteria and staining of yeast and molds 7P
4. Microbial examination of natural food products. 3P
5. Identification of food pathogen in cereals, pulses, oilseeds, meat and poultry.4P
6. Bacteriological analysis of Water and Milk: Total count, MPN Coliform (count), MBRT, IMViC etc. 4P
7. Microbial production of alcohol (cereal based), acetic acid and lactic acid. 3P
8. Various biochemical tests used in identification of commonly found bacteria in foods:  
IMViC urease, H<sub>2</sub>S, Catalase, coagulase, gelatin and fermentation (acid/gas) 4P
9. HACCP 1P
10. Visit to food processing unit or any other organization dealing with advanced methods in food microbiology.

### **Suggested Readings**

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

Jay J.M. 1986. Modern Food Microbiology. 3rd Edn. VNR, New York.

Robinson, R.K. Ed. 1983. Dairy Microbiology. Applied Science, London.

Frazier, W. C. (1988) Food Microbiology, McGraw Hill Inc. 4<sup>th</sup> Edition

### **First Year**

**Theory**  
**Maximum Marks: 100**  
**Teaching Period: 4/week**

### **FPT-102: Food Chemistry and Analysis**

### **Semester I**

**Paper No. – FPT-102**  
**Credits: 4**  
**Teaching Load: 60 Theory Period/ Semester**

### **Learning objectives:**

- To develop the skills for structure, functions, metabolism of various components of food and to learn about working and principles of analytical instruments

### **Learning Outcomes:**

- Understand the properties of food components
- Develop an understanding of the principles of interactions of food molecules.

- Able to learn about analytical techniques and its importance in food industry
- Knowledge of proper procedures and methodologies in analytical.

**Unit I: Introduction to basic concepts and carbohydrates** **10 P**

Overview of food chemistry, Introduction to food groups, moisture in food, physico-chemical properties of water and ice, water structure, water interactions, water activity

**Unit II: Carbohydrates and proteins** **15 P**

Carbohydrates – sources, simple and complex sugars- basic chemistry, sugar derivatives, structures and properties of starch, cellulose, gums, hydrocolloids and dietary fibers.

Proteins – sources, properties and structure of amino acid, protein denaturation, functional properties of protein in food, wheat proteins (dough formation), common food proteins

**Unit III: Lipids, enzymes and minerals** **15 P**

Lipids – introduction, nomenclature and structure, characteristics, classes, processing, lipid oxidation, physical properties

Enzymes – nature, chemistry, applications in food industry, control of enzyme action in food

Minerals and vitamins – sources and structure, effect of processing and storage, pro vitamin A & D as antioxidants, food pigments and flavoring agents – importance, types and sources changes during processing and storage

**Unit IV: Basics in food analysis** **10 P**

Introduction, sample preparations, sampling methods, importance of analysis in industry

Basic Electrophoresis techniques used in food analysis

Chromatographic techniques – classification, Paper, TLC, HPLC, Column, Affinity, Ion exchange

**Unit V: Determinative Techniques** **10 P**

Methods used for Extraction, distillation, titration. Protein, fat, moisture, ash, fiber and carbohydrate analysis methods

**FPT: 1.2- Food Chemistry and Analysis**

1. Working principle of instruments used in food analysis
2. Estimation of moisture by oven method
3. Estimation of ash by muffle furnace
4. Estimation of fat by Soxhlet method
5. Estimation of protein by
  - a) Kjeldahl's
  - b) Biuret method
6. Estimation of iron in food sample
7. Determination of pigments in food sample
8. Determination of Vitamin C in food sample
9. Determination of acidity of beverages and juices
10. Determination of reducing and non – reducing sugars
11. Analysis of oil:
  - a) Saponification value
  - b) Acid value
  - c) Iodine Number

- d) peroxide value
- 12. Determination of essential amino acids
- 13. Quality analysis of food products
- 14. Analysis of water

## First Year

## Semester I

### FPT-103: Nutrition Science

**Theory**

**Paper No. – FPT-103**

**Maximum Marks: 100**

**Credits: 4**

**Teaching Period: 4/week**

**Teaching Load: 60 Theory Period/ Semester**

**Learning Objective:** To acquaint the students about importance of nutrition, balanced diets, therapeutic diets for health and role of food and nutraceuticals in health.

#### **Unit-I: Basics of nutrition**

**12P**

Introduction to human nutrition. Macronutrients and micronutrients- Classification and functions. Digestion, absorption and assimilation of nutrients.

#### **Unit- II: Energy metabolism**

**12P**

Energy metabolism - Components of energy expenditure, Basal Metabolic Requirements and Activity, Recommended Dietary Allowances, Food Groups, Concept of a balanced diet, Methods of evaluation of nutritive value of foods. Nutritional assessment and nutritional policies- Salient features, concept of community nutrition.

#### **Unit- III: Carbohydrates**

**12P**

Carbohydrates- Types, functions, sources, requirement, storage, Effect of deficiency and excess. Proteins- Types, functions, sources, requirement, storage, Effect of deficiency and excess.

#### **Unit- IV: Fat**

**12P**

Fat- Types, functions, sources, requirement, storage, Effect of deficiency and excess.

#### **Unit- V: Vitamins and minerals**

**12P**

Vitamin- Types, functions, sources, requirement, storage, Effect of deficiency and excess. Minerals- Types, functions, sources, requirement, storage, Effect of deficiency and excess.

Water and electrolytes- Concept and importance

#### **Reference books**

1. Nutrition Science by B. Srilakshmi Fundamentals of Foods & Nutrition by Sumati R. Mudambi Textbook of Nutrition: A Life cycle approach by Ravinder Chadha.

## **FPT: 1.3- Bakery and Confectionery and Technology**

### **Practicals:**

1. Classification of wheat based on physico-chemical properties	1P
2. Quality testing of flour and yeast	1P
3. Preparation of cookies evaluation of physical properties	1P
4. Preparation of biscuit	1P
5. Preparation of bread and evaluation of quality parameters	1P
6. Preparation of Cream roll	1P
7. Preparation of chocolate muffins	1P
8. Preparation of Fudge	1P
9. Preparation of Buns	1P
10. Preparation of sponge cake	1P
11. Preparation of Pastry	1P
12. Preparation of bread sticks	1P
13. Preparation of high boiled sweets	1P
14. Preparation of chocolates	1P
15. Preparation of groundnut chikki	1P
16. Preparation of milk chocolate	1P
17. Preparation of toffee	1P
18. Visit to bakery and Confectionary industry	2P
19. Preparation of report	2P



## First Year

## Semester II

### FPT-201: Beverages and Snack Food Technology

Theory

Paper No. – FPT-201

Maximum Marks: 100

Credits: 4

Teaching Period: 4/week

Teaching Load: 60 Theory Period/ Semester

#### Learning objectives:

- To develop the skills for processing of different types of alcoholic and non-alcoholic beverages with a brief knowledge of packaged drinking water manufacturing industry and Indian snack food markets.

#### Learning Outcomes:

After learning this subject

1. Students will be able to know different types of beverages found in Indian as well as international market.
2. Students will have better ideas regarding alcoholic and non-alcoholic beverages with water industry.
3. Students will have thorough knowledge of different types of cereal based snacks food items available in market.
4. Students will get brief knowledge of fruits and vegetables based snacks

#### Unit-I: Introduction to Beverages

12P

History, importance of beverages and status of beverage industry, Types of Beverages, packaged drinking water Processing

#### Unit-II: Processing of beverages

12P

Juice based beverages processing, Synthetic, still, carbonated, low-calorie and dry beverages, isotonic and sports drinks, dairy based, alcoholic beverages fruit beverages, speciality beverages, tea, coffee, cocoa, spices, plant extracts, etc.

#### Unit-III: Quality of Beverages

12P

FSSAI specifications for beverages, Ingredients, manufacturing and packaging processes and equipment for different beverages; Water treatment and quality of process water Sweeteners, colorants, acidulants, clouding and clarifying and flavouring agents for beverages Carbon dioxide and carbonation Quality tests and control in beverages; Miscellaneous beverages Coconut water, sweet toddy, sugar cane juice, coconut milk, flavoured syrups

**Unit IV: Grain Based Snacks****12P**

Overview of grain-based snacks: whole grains – roasted, toasted, puffed, popped and flakes Coated grains-salted, spiced and sweetened Flour based snack– batter and dough based products; savoury and farsans; formulated chips and wafers, papads.

**Unit V: Other Snack Foods****12P**

Technology for fruit and vegetable based snacks: chips, wafers, papads etc. Technology for coated nuts – salted, spiced and sweetened products- chikkis, Sing bhujia, Technology for RTE puffed snack- sand puffing, hot air puffing, explosion puffing, gun puffing etc

**FPT-2.1: Beverages and Snack Food Technology****Practicals:**

1. Quality analysis of water from different sources and treatments 1P
2. Determination of aqueous extraction of tea/coffee 1P
3. Detection of sodium benzoate in beverage 1P
4. Measurement of pH and acidity of beverage 1P
5. Detection of E. coli in beverage 1P
6. Measurement of CO<sub>2</sub> content of carbonated beverage 1P
7. Determination of caffeine in beverages 1P
8. Determination of tannins in wine 1P
9. Preparation of Instant Tea/coffee 1P
10. Preparation of carbonated beverage 1P
11. Specifications for different fruit beverages and preparation of fruits squash 1P
12. Preparation of artificial lemon juice 1P
13. Preparation of beverage using artificial sweetener 1P
14. Preparation of cereals based fried snack foods
15. Preparation of legume based fried snack foods
16. Preparation of cereal grain based puffed products
17. To study the effect of frying time and temperature on potato chips
18. Preparation of cereal and legume based roasted snack
19. Physical properties of extruded foods ( expansion, density, water index etc)
20. Preparation of protein isolate and concentrate
21. Preparation of noodles/vermicelli
22. Preparation of weaning foods
23. Determination of oil absorption capacity of noodles
24. Effect of extrusion cooking on anti-nutritional factor
25. Visit to bakery, confectionery and extrusion industry
26. Determination of shelf-life and packaging requirements of snack food products
27. Visit to carbonation unit

- 28. Visit to mineral water plant
- 29. Visit to industries Manufacturing snack foods.

### **First Year**

### **Semester II**

#### **FPT-202: Food Additives, Contaminants and Toxicology**

**Theory**

**Paper No. – FPT-201**

**Maximum Marks: 100**

**Credits: 4**

**Teaching Period: 4/week**

**Teaching Load: 60 Theory Period/ Semester**

#### **Unit-1: Additives**

Definitions of Food Additives, Classification and Functions, Legitimate uses of Additives in foods, Intentional & Non Intentional additives, Indirect food additives; Difference between Additives & Adulterants, Food uses and functions in formulations; Toxicological evaluation of food additives, Acute and chronic studies. LD50. Analytical methods: chemical and instrumental.

#### **Unit-2 Different food additives**

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

#### **Unit-3**

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

#### **Unit-4 Food Contaminants**

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

#### **Suggested Readings**

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

Potter, N.N. 1978. Food Science. 3rd Ed. AVI, Westport.

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

Furia, T.E. 1980, Handbook of food additives, Vol I and Vol II.

### **FPT: 2.2-Processing of Fruits and Vegetables**

- |  |    |
|--|----|
| 1. Determination of Total Soluble Solids | 1P |
| 2. Preparation of mixed fruit Jam        | 1P |

3. Preparation of Blended juice	1P
4. Preparation of Jelly	1P
5. Preparation of RTS	1P
6. Preparation of Squash	1P
7. Preparation of Syrup	1P
8. Preparation of Fruit butter	1P
9. Preparation of Fruit toffee	1P
10. Preparation of Tomato-Chilli sauce	1P
11. Preparation of Mushroom pickle	2P
12. Preparation of Potato flour	2P
13. Preparation of mango slices ( Amchur )	1P
14. Preparation of Ginger candy	2P
15. Preparation of Frozen peas	2P
16. Preparation of guava cheese	1P
17. Preparation of petha	2P
18. Preparation of fruit candy	2P
19. Adulteration of spices	2P
20. Visit to Fruit & Vegetable Processing Industries	2P
21. Preparation of visit report & presentation	2P

### First Year

### Semester II

#### FPT-203: Advances in Food Processing and Packaging

Theory

Paper No. – FPT-203

Maximum Marks: 100

Credits: 4

Teaching Period: 4/week

Teaching Load: 60 Theory Period/ Semester

**Learning objectives:**

To impart the basic knowledge of:

- Cold preservation and freezers
- Dehydration
- Irradiation
- Food Packaging
- Thermal Processing

**Learning Outcomes:**

1. Students will be able to understand major food preservation and Packaging techniques, and underlying principles.
2. Students will be able to determine suitable methods of processing and Packaging techniques for a chosen food
3. Students will be able to understand Novel food processing methods like thermal processing, cold preservation etc.

4. Students will be able to understand operations involved in packaging material manufacturing
5. Students will be able to understand major packaging material and methods used in food packaging

### **Unit I: Cold Preservation**

Freezing: requirements of refrigerated storage-controlled low temperature, air circulation and humidity, changes in food during refrigerated storage, progressive freezing, changes during freezing-concentration effect and ice crystal damage, freezer burn. Refrigeration load, factors determining freezing rate-food composition and non compositional influences.

### **Unit II: Food Irradiation and Microwave Heating**

Ionizing radiation and sources, unit of radiations, direct and indirect radiation effects, safety and wholesomeness of irradiated food. Microwave heating and applications.

### **Unit III: Thermal Processing**

Introduction, classification of Thermal Processes, Principles of thermal processing, Thermal resistance of microorganisms, Thermal death time, Lethality concept, Characterization of heat penetration data, Thermal process Calculations.

### **Unit IV: Packaging of Foods**

Packaging: Properties of packaging material, factors determining the packaging requirements of various foods and brief description of packaging of frozen products, dried products, fats and oils and thermally processed foods.

### **Unit V: Packaging accessories and advances in packaging technology-**

Introduction, Active packaging, Modified atmospheric packaging, Aseptic packaging, packages for microwave ovens, Biodegradable plastics, Edible gums, Coatings.

Packaging equipment and machinery-Vacuum packaging machine, CA and MA packaging machine, Gas packaging machine, Seal and shrink packaging machine. Form and fill sealing machine, Aseptic packaging systems, Retort pouches, Bottling machines, Package printing machines.

## **FPT: 2.3- Advances in Food processing and packaging**

### **Practical**

1. Comparison of conventional and microwave processing of food
2. Low Temperature processing
  - Experiment on storage of leafy vegetables, fruits, perishable produce at refrigerated temperature, cold storage, and chilling temperature.
  - By using appropriate pre-processing and various packaging materials.
3. Frozen food processing
  - Experiments on processing of Fruit pulp ,fruits, vegetables, eatables by using appropriate packaging and freezing
  - Quality evaluation and storage studies
4. Drying of food using tray dryer/ other dryers
5. Preservation of food by using canning ( Fruit/Vegetable)
6. Osmotic dehydration
7. Identification and testing of packaging materials
8. Determination of tensile strength of given packaging material
9. Cut out analysis of canned food
10. Determining water absorption capacity of packaging material
11. Determining bursting strength of packaging material
12. Determining tearing strength of packaging material
13. To perform vacuum packaging of food sample and carry out its storage study
14. Testing of lacquered tin plate sheets
15. Determination of water vapour transmission rate of package films
16. Pre-packaging practices followed for packaging fruits and vegetables
17. Packaging and labelling of the product-packaging design, graphics, labelling
18. Visit to packaging industry.