



**Anekant Education Society's**  
**Tuljaram Chaturchand College, Baramati**  
*(Autonomous)*  
**Two Year M.Voc Degree Program in**  
**Food Technology & Research**

**(Faculty of Food Technology & Research)**

**FY M.Voc (Food Technology) Semester –II**  
**For Department Food Technology & Research**

**Tuljaram Chaturchand College, Baramati**

**To be implemented from Academic Year 2022-2023**

**Title of the Programme: FY M.Voc (Food Technology & Research)**

**Proposed subjects / papers for the General Education & Skill component  
Food Processing Technology (M. Voc. Programme)**

**First year: Semester I**

Sr. No.	Subject Name	No. of Credits	Marks
<b>Theory (General Education Component)</b>			
PMFP111	Food Microbiology	4	100
PMFP112	Food Chemistry and Analysis	4	100
PMFP113	Nutrition Science	4	100
<b>Practicals (Skill Component)</b>			
PMFP114	Food Microbiology	6	150
PMFP115	Food Chemistry and Analysis	6	150
PMFP116	Bakery and Confectionery Technology	6	150

**Semester II**

Sr. No.	Subject Name	No. of Credits	Marks
<b>Theory (General Education Component)</b>			
PMFP121	Beverage and Snack Food Technology	4	100
PMFP122	Food Additives, Contaminants and Toxicology	4	100
PMFP123	Advances in Food Processing & Packaging	4	100
<b>Practicals (Skill Component)</b>			
PMFP124	Beverage and Snack Food Technology	6	150
PMFP125	Processing of Fruits and Vegetables	6	150
PMFP126	Advances in Food Processing & Packaging	6	150

**Second year: Semester III**

Sr. No.	Subject Name	No. of Credits	Marks
<b>Theory (General Education Component)</b>			
FPT- 301	Elective-1: Dairy Processing Technology Elective-2: Meat Processing Technology	4	100
FPT- 302	Post-Harvest Technology	4	100
FPT-303	Food Safety and Quality Management	4	100
<b>Practicals (Skill Component)</b>			
FPT- 3.1	Dairy Processing Technology	6	150
FPT- 3.2	Post-Harvest Technology	6	150
FPT- 3.3	Statistics and Research Methodology	4	100
FPT- 3.4	Industrial training/Dissertation part-I	2	50

**Semester IV**

Sr. No.	Subject Name	No. of Credits	Marks
<b>Practicals (Skill Component)</b>			
FPT-4.1	Seminar based on case study	6	150
FPT-4.2	Industrial Visit	6	150
FPT-4.2	Industrial training/Dissertation Part-2	18	450

**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.

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

**Course Structure:**

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

**Eligibility:**

- 1) First Year M.Voc. (Post Graduate Diploma): A student who has passed the graduation degree (10+2+3) in any stream or its equivalent examination.
- 2) Second Year M.Voc. (Post Graduate Degree): Satisfactorily 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 SavitribhaiPhule Pune University, Pune.

**Examination Pattern:**

**Pattern of Examination: Semester:**

- General education courses (Theory paper) - I, II, and III Semester.
- Skill Component (Practical Course): Practical examination will be conducted.
- Weight-age of marks in each course: Internal continues assessment (50%) and end semester examination (50%)

**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.

## Programme Specific Outcomes (PSOs)

<b>PO-1</b>	<b>Disciplinary Knowledge</b>	Understand the basic concepts, fundamental principles and experimental findings and the scientific theories related to food technology, food science and food technology & engineering and its other fields related to the program.
<b>PO-2</b>	<b>Communication Skills</b>	Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
<b>PO-3</b>	<b>Critical Thinking</b>	Propose novel ideas in explaining the scientific data, facts and figures related to science and technology.
<b>PO-4</b>	<b>Analytical Reasoning and Problem Solving</b>	To enable the students with good scientific and engineering knowledge so as to comprehend, design, and create food products and devices for the food industry and provide solutions for the challenges in the food industry as well as in agriculture.
<b>PO-5</b>	<b>Sense of Inquiry</b>	Curiously ask relevant questions for better understanding of fundamental concepts and principles, scientific theories and applications related to the study.
<b>PO-6</b>	<b>Use of Modern Tools</b>	Operate modern tools, equipment, instruments and laboratory techniques to perform the experiments and write the programs in different languages.
<b>PO-7</b>	<b>Research Skills</b>	Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to food technology.
<b>PO-8</b>	<b>Application of Knowledge</b>	Develop a scientific outlook and apply the knowledge with respect to food technology.
<b>PO-9</b>	<b>Ethical Awareness</b>	To train students in professional and ethical attitude, effective communication skills, teamwork skills and multidisciplinary approaches related to food technology and engineering.
<b>PO-10</b>	<b>Teamwork</b>	Understand the basic concepts, fundamental principles and experimental findings and the scientific theories related to food technology, food science and food technology & engineering and its other fields related to the program.
<b>PO-11</b>	<b>Environment and Sustainability</b>	Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
<b>PO-12</b>	<b>Lifelong Learning</b>	Propose novel ideas in explaining the scientific data, facts and figures related to science and technology.

## First Year

## Semester II

### PMFP-121: Beverages and Snack Food Technology

Theory

Paper No. – PMFP-121

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
- To develop the skills for processing of different types Indian snack food markets.
- To understand about the FSSAI specifications for beverages.
- To study about the Technology for fruit and vegetable based snacks
- To learn about the Quality tests and control in beverages
- To understand about the working of equipment in beverage industry.

### Course Outcomes:

After learning this subject,

CO1: Students will be able to know different types of beverages found in Indian aswell as international market.

CO2: Students will have better ideas regarding alcoholic and non-alcoholic beverages with water industry.

CO3: Students will have thorough knowledge of different types of cereal basedsnacks food items available in market.

CO4: Students will get brief knowledge of fruits and vegetables based snacks

CO5: Students will understand about the working of equipment in beverage industry.

CO6: Students may get knowledge about the Quality tests and control in beverages

CO7: Students will understand about the FSSAI specifications for beverages.

## TOPIC -

### 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 Snack****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 doughbased 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

**References:**

- Fruit & Vegetable Preservation, Shrivastava
- Food Science , Norman Potter
- Food Facts & Principles, Shakuntala Maney

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	4	-	-	3	4	2	-	-
CO2	-	-	2	-	-	-	-	-	3	-	-	2
CO3	3	-	-	2	2	-	-	1	2	3	-	-
CO4	2	1	1	-	2	2	1	-	-	2	1	1
CO5	2	2	1	-	-	2	5	-	-	2	2	1
CO6	-	2	-	4	-	-	1	-	1	-	2	-
CO7	-	-	1	-	-	-	-	-	-	-	-	1

Justification for the mapping

**PO1:- Disciplinary Knowledge -** Understand the basic concepts, fundamental principles and experimental findings and the scientific theories related to food technology, food science and Food technology & engineering and its other fields related to the program.

**CO1:** Students will be able to know different types of beverages found in Indian as well as international market and health benefits.

**CO3:** Students will have thorough knowledge of different types of cereal based snacks food items available in market and their preparation method.

**CO4:** Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.

**CO5:** Students will understand about the working of equipment in beverage industry and their cost and advantages.

**PO2:- Communication Skills:-** Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.

**CO4:** Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.

**CO5:** Students will understand about the working of equipment in beverage industry and their cost and advantages.

**CO6:** Students may get knowledge about the Quality tests and control in beverages

**PO3- Critical Thinking :-** Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.

**CO2:** Students will have better ideas regarding alcoholic and non-alcoholic beverages with water industry.

**CO4:** Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.

**CO5:** Students will understand about the working of equipment in beverage industry and their cost and advantages.

**CO7:** Students will understand about the FSSAI specifications for beverages.

**PO4- Analytical Reasoning and Problem Solving-** To enable the students with good scientific and engineering knowledge so as to comprehend, design, and create food products and devices for the food industry and provide solutions for the challenges in the food industry as well as in agriculture.

**CO1:** Students will be able to know different types of beverages found in Indian as well as international market and health benefit's.

**CO4:** Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.

**CO5:** Students will understand about the working of equipment in beverage industry and their cost and advantages.

**CO6:** Students may get knowledge about the Quality tests and control in beverages

**PO5- Sense of Inquiry:-** Curiously ask relevant questions for better understanding of fundamental concepts and principles, scientific theories and applications related to the study.

**CO1:** Students will be able to know different types of beverages found in Indian as well as international market and health benefit's.

**CO3:** Students will have thorough knowledge of different types of cereal based snacks food items available in market and their preparation method.

**CO4:** Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.

**PO6- Use of Modern Tools:-** Operate modern tools, equipment, instruments and laboratory techniques to perform the experiments and write the programs in different languages.

**CO4:** Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.

**CO5:** Students will understand about the working of equipment in beverage industry and their cost and advantages.

**PO7- Research Skills:-** Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to food technology.

**CO4:** Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.

**CO5:** Students will understand about the working of equipment in beverage industry and their cost and advantages.

**CO6:** Students may get knowledge about the Quality tests and control in beverages

**PO8- Application of Knowledge:-** Develop a scientific outlook and apply the knowledge with respect to food technology.

**CO1:** Students will be able to know different types of beverages found in Indian as well as international market and health benefit's.

**CO3:** Students will have thorough knowledge of different types of cereal based snacks food items available in market and their preparation method.

**PO9- Ethical Awareness-** To train students in professional and ethical attitude, effective communication skills, team work skills and multidisciplinary approaches related to food technology and engineering.

**CO1:** Students will be able to know different types of beverages found in Indian as well as international market and health benefit's.

**CO2:** Students will have better ideas regarding alcoholic and non-alcoholic beverages with water industry.

**CO3:** Students will have thorough knowledge of different types of cereal based snacks food items available in market and their preparation method.

**CO6:** Students may get knowledge about the Quality tests and control in beverages

**PO10:- Team Work -** Understand the basic concepts, fundamental principles and experimental findings and the scientific theories related to food technology, food science and Food technology & engineering and its other fields related to the program.

**CO1:** Students will be able to know different types of beverages found in Indian as well as international market and

health benefit's.

**CO3:** Students will have thorough knowledge of different types of cereal based snacks food items available in market and their preparation method.

**CO4:** Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.

**CO5:** Students will understand about the working of equipment in beverage industry and their cost and advantages.

**PO11:- Environment and Sustainability:-** Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.

**CO4:** Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.

**CO5:** Students will understand about the working of equipment in beverage industry and their cost and advantages.

**CO6:** Students may get knowledge about the Quality tests and control in beverages

**PO12:- Lifelong Learning:-** Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.

**CO2:** Students will have better ideas regarding alcoholic and non-alcoholic beverages with water industry.

**CO4:** Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.

**CO5:** Students will understand about the working of equipment in beverage industry and their cost and advantages.

**CO7:** Students will understand about the FSSAI specifications for beverages.



## First Year

## Semester II

### PMFP-124: Beverages and Snack Food Technology

Theory

Paper No. – PMFP-124

Maximum Marks: 150

Credits: 6

Teaching Period: 2/week

Teaching Load: 60 Practical 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
- To develop the skills for processing of different types Indian snack food markets.
- To understand about the standard specification for beverages.
- To study about the Technology for fruit and vegetable based snacks
- To learn about the Quality tests and control in beverages
- To understand about the working of equipment in beverage industry.

#### Course Outcomes:

After learning this subject,

CO1: Students will be able to know different types of beverages found in Indian as well as international market.

CO2: Students will have better ideas regarding alcoholic and non-alcoholic beverages with water industry.

CO3: Students will have thorough knowledge of different types of cereal based snacks food items available in market.

CO4: Students will get brief knowledge of fruits and vegetables based snacks

CO5: Students will understand about the working of equipment in beverage industry.

CO6: Students may get knowledge about the Quality tests and control in beverages

CO7: Students will understand about the standard specification for beverages.

#### TOPIC-

1. Quality analysis of water from different sources and treatments	3P
2. Determination of aqueous extraction of tea/coffee	2P
3. Detection of sodium benzoate in beverage	2P
4. Measurement of pH and acidity of beverage	3P
5. Detection of E. coli in beverage	3P
6. Measurement of CO <sub>2</sub> content of carbonated beverage	3P
7. Determination of caffeine in beverages	2P
8. Determination of tannins in wine	2P
9. Preparation of Instant Tea/coffee	2P
10. Preparation of carbonated beverage	3P
11. Specifications for different fruit beverages and preparation of fruits squash	3P
12. Preparation of artificial lemon juice	2P
13. Preparation of beverage using artificial sweetener	2P
14. Preparation of cereals based fried snack foods	2P
15. Preparation of legume based fried snack foods	2P
16. Preparation of cereal grain based puffed products	2P

17. To study the effect of frying time and temperature on potato chips	2P
18. Preparation of cereal and legume based roasted snack	3P
19. Physical properties of extruded foods ( expansion, density, water index etc)	2P
20. Preparation of protein isolate and concentrate	1P
21. Preparation of noodles/vermicelli	2P
22. Preparation of weaning foods	2P
23. Determination of oil absorption capacity of noodles	2P
24. Effect of extrusion cooking on anti-nutritional factor	2P
25. Visit to bakery, confectionery and extrusion industry	1P
26. Determination of shelf-life and packaging requirements of snack food products	1P
27. Visit to carbonation unit	1P
28. Visit to mineral water plant	1P
29. Visit to industries Manufacturing snack foods.	1P

### References:

- Food Science , Norman Potter
- Food Facts & Principles, Shakuntala Maney
- Food science, Shrilakshmi

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	4	-	-	3	4	2	-	-
CO2	-	-	2	-	-	-	-	-	3	-	-	2
CO3	3	-	-	2	2	-	-	1	2	3	-	-
CO4	2	1	1	-	2	2	1	-	-	2	1	1
CO5	2	2	1	-	-	2	5	-	-	2	2	1
CO6	-	2	-	4	-	-	1	-	1	-	2	-
CO7	-	-	1	-	-	-	-	-	-	-	-	1

### Justification for the mapping

**PO1:- Disciplinary Knowledge** - Understand the basic concepts, fundamental principles and experimental findings and the scientific theories related to food technology, food science and Food technology & engineering and its other fields related to the program.

**CO1:** Students will be able to know different types of beverages found in Indian as well as international market and health benefits.

**CO3:** Students will have thorough knowledge of different types of cereal based snacks food items available in market and their preparation method.

**CO4:** Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.

**CO5:** Students will understand about the working of equipment in beverage industry and their cost and advantages.

**PO2:- Communication Skills:-** Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.

**CO4:** Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.

**CO5:** Students will understand about the working of equipment in beverage industry and their cost and advantages.

**CO6:** Students may get knowledge about the Quality tests and control in beverages

**PO3- Critical Thinking :-** Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.

- CO2:** Students will have better ideas regarding alcoholic and non-alcoholic beverages with water industry.
- CO4:** Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.
- CO5:** Students will understand about the working of equipment in beverage industry and their cost and advantages.
- CO7:** Students will understand about the FSSAI specifications for beverages.

**PO4- Analytical Reasoning and Problem Solving-** To enable the students with good scientific and engineering knowledge so as to comprehend, design, and create food products and devices for the food industry and provide solutions for the challenges in the food industry as well as in agriculture.

- CO1:** Students will be able to know different types of beverages found in Indian as well as international market and health benefit's.
- CO4:** Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.
- CO5:** Students will understand about the working of equipment in beverage industry and their cost and advantages.
- CO6:** Students may get knowledge about the Quality tests and control in beverages

**PO5- Sense of Inquiry:-** Curiously ask relevant questions for better understanding of fundamental concepts and principles, scientific theories and applications related to the study.

- CO1:** Students will be able to know different types of beverages found in Indian as well as international market and health benefit's.
- CO3:** Students will have thorough knowledge of different types of cereal based snacks food items available in market and their preparation method.
- CO4:** Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.

**PO6- Use of Modern Tools:-** Operate modern tools, equipment, instruments and laboratory techniques to perform the experiments and write the programs in different languages.

- CO4:** Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.
- CO5:** Students will understand about the working of equipment in beverage industry and their cost and advantages.

**PO7- Research Skills:-** Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to food technology.

- CO4:** Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.
- CO5:** Students will understand about the working of equipment in beverage industry and their cost and advantages.
- CO6:** Students may get knowledge about the Quality tests and control in beverages

**PO8- Application of Knowledge:-** Develop a scientific outlook and apply the knowledge with respect to food technology.

- CO1:** Students will be able to know different types of beverages found in Indian as well as international market and health benefit's.
- CO3:** Students will have thorough knowledge of different types of cereal based snacks food items available in market and their preparation method.

**PO9- Ethical Awareness-** To train students in professional and ethical attitude, effective communication skills, team work skills and multidisciplinary approaches related to food technology and engineering.

- CO1:** Students will be able to know different types of beverages found in Indian as well as international market and health benefit's.
- CO2:** Students will have better ideas regarding alcoholic and non-alcoholic beverages with water industry.
- CO3:** Students will have thorough knowledge of different types of cereal based snacks food items available in market and their preparation method.
- CO6:** Students may get knowledge about the Quality tests and control in beverages

**PO10:- Team Work -** Understand the basic concepts, fundamental principles and experimental findings and the scientific theories related to food technology, food science and

Food technology & engineering and its other fields related to the program.

**CO1:** Students will be able to know different types of beverages found in Indian as well as international market and health benefit's.

**CO3:** Students will have thorough knowledge of different types of cereal based snacks food items available in market and their preparation method.

**CO4:** Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.

**CO5:** Students will understand about the working of equipment in beverage industry and their cost and advantages.

**PO11:- Environment and Sustainability:-** Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.

**CO4:** Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.

**CO5:** Students will understand about the working of equipment in beverage industry and their cost and advantages.

**CO6:** Students may get knowledge about the Quality tests and control in beverages

**PO12:- Lifelong Learning:-** Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.

**CO2:** Students will have better ideas regarding alcoholic and non-alcoholic beverages with water industry.

**CO4:** Students will get brief knowledge of fruits and vegetables based snacks and how to prepare it.

**CO5:** Students will understand about the working of equipment in beverage industry and their cost and advantages.

**CO7:** Students will understand about the FSSAI specifications for beverages.

## First Year

## Semester II

### PMFP-122: Food Additives, Contaminants and Toxicology

Theory

Paper No. – PMFP-122

Maximum Marks: 100

Credits: 4

Teaching Period: 4/week

Teaching Load: 60 Theory Period/ Semester

### Learning Objectives:

- To study about different food additives & their functions.
- To learn about toxicants in food processing industry.
- To learn about the laws related to food additives.
- To know about types of contamination in food industry.
- To understand about the formulation of food product by using additives.
- To get knowledge about difference between Additives & Adulterants

### Course Outcomes:

Students will be,

CO1: Able to get knowledge about different of food additives & their role in food processing industry.

CO2: Understand effect of toxicants to our food products.

CO3: Understand about the Laws related to food additives

CO4: Learn about types of contaminants & their hazard to our body.

CO5: get knowledge about difference between Additives & Adulterants

CO6: Understand about the formulation of food product by using additives.

CO7: Study about the use of additives in food products

## TOPIC -

### Unit-1: Additives

20P

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

15P

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

### Unit-3

15P

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

### Unit-4 Food Contaminants

10P

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. MarcelDekker, 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.

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	1	-	3	5	4	2	-	1	-	1
CO2	-	2	1	-	2	-	-	4	-	-	2	1
CO3	3	-	-	2	3	-	-	-	-	3	-	-
CO4	-	-	-	-	-	-	-	-	5	-	-	-
CO5	2	2	-	3	5	-	-	-	6	2	2	-
CO6	2	-	1	5	-	-	-	4	5	2	-	1
CO7	-	-	1	-	5	6	-	-	-	-	-	1

Justification for the mapping

**PO1:- Disciplinary Knowledge** - Understand the basic concepts, fundamental principles and experimental findings and the scientific theories related to food technology, food science and Food technology & engineering and its other fields related to the program.

**CO1:** Able to get knowledge about different of food additives & their role in food processing industry and how to use them.

**CO3:** Understand about the Laws related to food additives.

**CO5:** get knowledge about difference between Additives & Adulterants and their uses

**CO6:** Understand about the formulation of food product by using additives and their advantages .

**PO2:- Communication Skills:-** Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.

**CO2:** Understand effect of toxicants to our food products.

**CO5:** Student will get knowledge about difference between Additives & Adulterants and their uses

**PO3- Critical Thinking :-** Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.

**CO1:** Able to get knowledge about different of food additives & their role in food processing industry and how to use them.

**CO2:** Understand effect of toxicants to our food products.

**CO6:** Understand about the formulation of food product by using additives and their advantages.

**CO7:** Study about the use of additives in food products their advantages disadvantages & uses.

**PO4- Analytical Reasoning and Problem Solving-** To enable the students with good scientific and engineering knowledge so as to comprehend, design, and create food products and devices for the food industry and provide solutions for the challenges in the food industry as well as in agriculture.

**CO3:** Understand about the Laws related to food additives so they can use it during industrial audit.

**CO5:** get knowledge about difference between Additives & Adulterants and their uses

**CO6:** Understand about the formulation of food product by using additives and their advantages .

**PO5- Sense of Inquiry:-** Curiously ask relevant questions for better understanding of fundamental concepts and principles, scientific theories and applications related to the study.

**CO1:** Able to get knowledge about different of food additives & their role in food processing industry and how to use them.

**CO2:** Understand effect of toxicants to our food products.

**CO3:** Understand about the Laws related to food additives so they can use it during industrial audit.

**CO5:** get knowledge about difference between Additives & Adulterants and their uses

**CO7:** Study about the use of additives in food products their advantages disadvantages & uses.

**PO6- Use of Modern Tools:-** Operate modern tools, equipment, instruments and laboratory techniques to perform the experiments and write the programs in different languages.

**CO1:** Able to get knowledge about different of food additives & their role in food processing industry and how to use them

**CO7:** Study about the use of additives in food products their advantages disadvantages & uses.

**PO7- Research Skills:-** Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to food technology.

**CO1:** Able to get knowledge about different of food additives & their role in food processing industry and how to use them

**PO8- Application of Knowledge:-** Develop a scientific outlook and apply the knowledge with respect to food technology.

**CO1:** Able to get knowledge about different of food additives & their role in food processing industry and how to use them

**CO2:** Understand effect of toxicants to our food products.

**CO6:** Understand about the formulation of food product by using additives and their advantages .

**PO9- Ethical Awareness-** To train students in professional and ethical attitude, effective communication skills, team work skills and multidisciplinary approaches related to food technology and engineering.

**CO4:** Learn about types of contaminants & their hazard to our body and their effect on human body as well as food.

**CO5:** get knowledge about difference between Additives & Adulterants and their uses

**CO6:** Understand about the formulation of food product by using additives and their advantages .

**PO10:- Team Work -** Understand the basic concepts, fundamental principles and experimental findings and the scientific theories related to food technology, food science and Food technology & engineering and its other fields related to the program.

**CO1:** Able to get knowledge about different of food additives & their role in food processing industry and how to use them.

**CO3:** Understand about the Laws related to food additives.

**CO5:** get knowledge about difference between Additives & Adulterants and their uses

**CO6:** Understand about the formulation of food product by using additives and their advantages .

**PO11:- Environment and Sustainability:-** Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.

**CO2:** Understand effect of toxicants to our food products.

**CO5:** Student will get knowledge about difference between Additives & Adulterants and their uses

**PO12:- Lifelong Learning:-** Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.

**CO1:** Able to get knowledge about different of food additives & their role in food processing industry and how to use them.

**CO2:** Understand effect of toxicants to our food products.

**CO6:** Understand about the formulation of food product by using additives and their advantages.

**CO7:** Study about the use of additives in food products their advantages disadvantages & uses.

## First Year

### Theory

Maximum Marks: 150

Teaching Period: 4/week

## Semester II

### PMFP-125: Processing of Fruit & Vegetables

Paper No. – PMFP-125

Credits: 6

Teaching Load: 60 Theory Period/ Semester

### Learning Objectives:

- To study about processing of different fruit products in food industry.
- To study about processing of different vegetable products in food industry.
- To learn about the working of various equipments used in fruit & vegetable industry.
- To know about the adulteration of spices.
- To understand about the formulation of different fruit & vegetable products.
- To get knowledge about process of different carbonated & non-carbonated beverages.

### Course Outcomes:

Students will be,

CO1: Able to get knowledge about working of fruit & vegetable processing industry.

CO2: Study about processing of different fruit products in food industry

CO3: Learn about the working of various equipments used in fruit & vegetable industry.

CO4: Know about the adulteration of spices.

CO5: Understand about the formulation of different fruit & vegetable products.

CO6: Able to get knowledge about process of different carbonated & non-carbonated beverages.

CO7: Study about processing of different vegetable products in food industry.

## TOPIC-

1. Determination of Total Soluble Solids	2P
2. Preparation of mixed fruit Jam	3P
3. Preparation of Blended juice	2P
4. Preparation of Jelly	2P
5. Preparation of RTS	3P
6. Preparation of Squash	2P
7. Preparation of Syrup	2P
8. Preparation of Fruit L e a t h e r	2P 3P
9. Preparation of Fruit toffee	
10. Preparation of Tomato-Chilli sauce	2
11. Preparation of Mushroom pickle	2P
12. Preparation of Potato flour	4P
13. Preparation of mango slices ( Amchur )	4P
14. Preparation of Ginger candy	2P
15. Preparation of Frozen peas	3P
16. Preparation of guava cheese	2P
17. Preparation of petha	5P



18. Preparation of fruit candy	2P
19. Adulteration of spices	3P
20. Visit to Fruit & Vegetable Processing Industries	3P
21. Preparation of visit report & presentation	6P

### References

1. Subbulakshi G ,Udapishobha A, (2001) ,food processing and preservation , New age international (P) limited , publisher
2. Srivastava R.P, Kumar Sanjeev (1994) ,Fruits and vegetable preservation , first edition,International book distributing co.
3. S. Rangna (1977) ,Handbook of Analysis and quality control for fruit and vegetable products (second edition) ,Tata Mcgraw –hill publishing co. limited
4. Loesecke H.W.V. (2005), Drying and dehydration of foods, Updesh purohit for agrobios (India) jodhpur.
5. S. Saraswathy , T.L.preethi , S.Balsubramanyan , J.suresh ,N. Revanthy and S. naarajan (2008) : Post harvest Management of Horticulture Crops , Dr, Updesh
6. Purohit for Agrobios (India) Jodhpur Salunkhe D.K, Kadam S.S(2005) ,Handbook of fruit science and technology ,Marcel dekker, Inc.

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	1	-	3	5	4	2	-	1	-	1
CO2	-	2	1	-	2	-	-	-	-	-	2	1
CO3	3	-	-	2	3	5	4	5	-	3	-	-
CO4	-	-	-	-	-	-	-	-	5	-	-	-
CO5	2	-	-	3	3	-	5	-	-	2	-	-
CO6	2	-	1	5	-	4	-	4	5	2	-	1
CO7	-	-	1	-	3	4	5	2	-	-	-	1

Justification for the mapping

**PO1:- Disciplinary Knowledge** - Understand the basic concepts, fundamental principles and experimental findings and the scientific theories related to food technology, food science and Food technology & engineering and its other fields related to the program.

**CO1:** Able to get knowledge about working of fruit & vegetable processing industry.

**CO3:** Learn about the working of various equipments used in fruit & vegetable industry.

**CO5:** Understand about the formulation of different fruit & vegetable products.

**CO6:** Able to get knowledge about process of different carbonated & non-carbonated beverages.

**PO2:- Communication Skills:-** Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.

**CO2:** Study about processing of different fruit products in food industry

**PO3- Critical Thinking :-** Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.

**CO1:** Student will be able to get knowledge about working of fruit & vegetable processing industry.

**CO2:** Student will study about processing of different fruit products in food industry and their health benefits.

**CO6:** Able to get knowledge about process of different carbonated & non-carbonated beverages.

**CO7:** Study about processing of different vegetable products in food industry.

**PO4- Analytical Reasoning and Problem Solving-** To enable the students with good scientific and engineering knowledge so as to comprehend, design, and create food products and devices for the food industry and provide solutions for the challenges in the food industry as well as in agriculture.

**CO3:** Learn about the working of various equipments used in fruit & vegetable industry and their working.

**CO5:** Understand about the formulation of different fruit & vegetable products.

**CO6:** Able to get knowledge about process of different carbonated & non-carbonated beverages and their health benefits.

**PO5- Sense of Inquiry:-** Curiously ask relevant questions for better understanding of fundamental concepts and principles, scientific theories and applications related to the study.

**CO1:** Student will be able to get knowledge about working of fruit & vegetable processing industry.

**CO2:** Student will study about processing of different fruit products in food industry and their health benefits.

**CO3:** Learn about the working of various equipments used in fruit & vegetable industry and their working.

**CO5:** Understand about the formulation of different fruit & vegetable products.

**CO7:** Study about processing of different vegetable products in food industry.

**PO6- Use of Modern Tools:-** Operate modern tools, equipment, instruments and laboratory techniques to perform the experiments and write the programs in different languages.

**CO1:** Student will be able to get knowledge about working of fruit & vegetable processing industry.

**CO3:** Learn about the working of various equipments used in fruit & vegetable industry and their working.

**CO6:** Able to get knowledge about process of different carbonated & non-carbonated beverages and their health benefits.

**CO7:** Study about processing of different vegetable products in food industry

**PO7- Research Skills:-** Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to food technology.

**CO1:** Student will be able to get knowledge about working of fruit & vegetable processing industry.

**CO3:** Learn about the working of various equipments used in fruit & vegetable industry and their working.

**CO5:** Understand about the formulation of different fruit & vegetable products.

**CO7:** Study about processing of different vegetable products in food industry

**PO8- Application of Knowledge:-** Develop a scientific outlook and apply the knowledge with respect to food technology.

**CO1:** Student will be able to get knowledge about working of fruit & vegetable processing industry.

**CO3:** Learn about the working of various equipments used in fruit & vegetable industry and their working.

**CO6:** Able to get knowledge about process of different carbonated & non-carbonated beverages and their health benefits.

**CO7:** Study about processing of different vegetable products in food industry

**PO9- Ethical Awareness-** To train students in professional and ethical attitude, effective communication skills, team work skills and multidisciplinary approaches related to food technology and engineering.

**CO4:** Student will be able to know about the adulteration of spices and their effect on food.

**CO6:** Able to get knowledge about process of different carbonated & non-carbonated beverages and their health benefits.

**PO10:- Team Work -** Understand the basic concepts, fundamental principles and experimental findings and the scientific theories related to food technology, food science and

Food technology & engineering and its other fields related to the program.

**CO1:** Able to get knowledge about working of fruit & vegetable processing industry.

**CO3:** Learn about the working of various equipments used in fruit & vegetable industry.

**CO5:** Understand about the formulation of different fruit & vegetable products.

**CO6:** Able to get knowledge about process of different carbonated & non-carbonated beverages.

**PO11:- Environment and Sustainability:-** Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.

**CO2:** Study about processing of different fruit products in food industry

**PO12:- Lifelong Learning:-** Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.

**CO1:** Student will able to get knowledge about working of fruit & vegetable processing industry.

**CO2:** Student will Study about processing of different fruit products in food industry and their health benefits.

**CO6:** Able to get knowledge about process of different carbonated & non-carbonated beverages.

**CO7:** Study about processing of different vegetable products in food industry.

## First Year

Theory

Maximum Marks: 100

Teaching Period: 4/week

## Semester II

**PMFP-123: Advances in Food Processing and Packaging**

Paper No. – PMFP-123

Credits: 4

Teaching Load: 60 Theory Period/ Semester

### Learning objectives:

To impart the basic knowledge of:

- Cold preservation and freezers
- Dehydration & Irradiation
- Food Packaging
- Thermal Processing
- Properties of packaging material
- Working of packaging instruments

### Course Outcomes:

**CO1:** Students will be able to understand major food preservation techniques.

**CO2:** Students will learn about the packaging techniques, and underlying principles.

**CO3:** Students may know about the safety & wholesomeness

**CO4:** Students will be able to understand Novel food processing methods like thermal processing, cold preservation etc.

**CO5:** Students will be able to understand operations involved in packaging material manufacturing.

**CO6:** Students will be able to understand major packaging material and methods used in food packaging.

**CO7:** Students will learn about effect of advance processing techniques on food product.

## TOPIC-

### 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.

#### Reference:

- Food Science , Norman Potter
- Food Facts & Principles, Shakuntala Maney
- Fruit & Vegetable Preservation, Shrivastava

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	1	-	3	5	4	2	-	1	-	1
CO2	-	2	1	-	2	-	-	4	-	-	2	1
CO3	3	-	-	2	3	-	-	-	-	3	-	-
CO4	-	-	-	-	-	5	3	-	5	-	-	-
CO5	2	-	-	3	5	-	5	4	6	2	-	-
CO6	2	2	1	5	-	6	-	4	5	2	2	1
CO7	-	2	1	-	5	6	-	-	-	-	2	1

Justification for the mapping

**PO1:- Disciplinary Knowledge -** Understand the basic concepts, fundamental principles and experimental findings and the scientific theories related to food technology, food science and Food technology & engineering and its other fields related to the program.

**CO1:** Students will be able to understand major food preservation techniques.

**CO3:** Students may know about the safety & wholesomeness and their use.

**CO5:** Students will be able to understand operations involved in packaging material manufacturing

**CO6:** Students will be able to understand major packaging material and methods used in food packaging.

**PO2:- Communication Skills:-** Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.

**CO2:** Students will learn about the packaging techniques, and underlying principles.

**CO6:** Students will be able to understand major packaging material and methods used in food packaging.

**CO7:** Students will learn about effect of advance processing techniques on food product.

**PO3- Critical Thinking :-** Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.

**CO1:** Students will be able to understand major food preservation techniques.

**CO2:** Students will learn about the packaging techniques, and underlying principles.

**CO6:** Students will be able to understand major packaging material and methods used in food packaging.

**CO7:** Students will learn about effect of advance processing techniques on food product.

**PO4- Analytical Reasoning and Problem Solving-** To enable the students with good scientific and engineering knowledge so as to comprehend, design, and create food products and devices for the food industry and provide solutions for the challenges in the food industry as well as in agriculture.

**CO3:** Students may know about the safety & wholesomeness and their use.

**CO5:** Students will be able to understand operations involved in packaging material manufacturing and their advantages.

**CO6:** Students will be able to understand major packaging material and methods used in food packaging and how to use them.

**PO5- Sense of Inquiry:-** Curiously ask relevant questions for better understanding of fundamental concepts and principles, scientific theories and applications related to the study.

**CO1:** Students will be able to understand major food preservation techniques.

**CO2:** Students will learn about the packaging techniques, and underlying principles.

**CO3:** Students may know about the safety & wholesomeness and their use.

**CO5:** Students will be able to understand operations involved in packaging material manufacturing and their advantages.

**CO7:** Students will learn about effect of advance processing techniques on food product and their effect on the food.

**PO6- Use of Modern Tools:-** Operate modern tools, equipment, instruments and laboratory techniques to perform the experiments and write the programs in different languages.

**CO1:** Students will be able to understand major food preservation techniques.

**CO4:** Students will be able to understand Novel food processing methods like thermal processing, cold preservation etc.

**CO6:** Students will be able to understand major packaging material and methods used in food packaging and how to use them.

**CO7:** Students will learn about effect of advance processing techniques on food product and their effect on the food.

**PO7- Research Skills:-** Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to food technology.

**CO1:** Students will be able to understand major food preservation techniques.

**CO4:** Students will be able to understand Novel food processing methods like thermal processing, cold preservation etc.

**CO5:** Students will be able to understand operations involved in packaging material manufacturing and their advantages.

**PO8- Application of Knowledge:-** Develop a scientific outlook and apply the knowledge with respect to food technology.

**CO1:** Students will be able to understand major food preservation techniques.

**CO2:** Students will learn about the packaging techniques, and underlying principles.

**CO5:** Students will be able to understand operations involved in packaging material manufacturing and their advantages.

**CO6:** Students will be able to understand major packaging material and methods used in food packaging and how to use them.

**PO9- Ethical Awareness-** To train students in professional and ethical attitude, effective communication skills, team work skills and multidisciplinary approaches related to food technology and engineering.

**CO4:** Students will be able to understand Novel food processing methods like thermal processing, cold preservation etc.

**CO5:** Students will be able to understand operations involved in packaging material manufacturing and their advantages.

**CO6:** Students will be able to understand major packaging material and methods used in food packaging and how to use them

**PO10:- Team Work -** Understand the basic concepts, fundamental principles and experimental findings and the scientific theories related to food technology, food science and

Food technology & engineering and its other fields related to the program.

**CO1:** Students will be able to understand major food preservation techniques.

**CO3:** Students may know about the safety & wholesomeness and their use.

**CO5:** Students will be able to understand operations involved in packaging material manufacturing

**CO6:** Students will be able to understand major packaging material and methods used in food packaging.

**PO11:- Environment and Sustainability:-** Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.

**CO2:** Students will learn about the packaging techniques, and underlying principles.

**CO6:** Students will be able to understand major packaging material and methods used in food packaging.

**CO7:** Students will learn about effect of advance processing techniques on food product.

**PO12:- Lifelong Learning:-** Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.

**CO1:** Students will be able to understand major food preservation techniques.

**CO2:** Students will learn about the packaging techniques, and underlying principles.

**CO6:** Students will be able to understand major packaging material and methods used in food packaging.

**CO7:** Students will learn about effect of advance processing techniques on food product.

## First Year

### Theory

Maximum Marks: 150

Teaching Period: 4/week

## Semester II

### PMFP-125: Processing of Fruit & Vegetables

Paper No. – PMFP-125

Credits: 6

Teaching Load: 60 Theory Period/ Semester

### Learning objectives:

To impart the basic knowledge of:

- Cold preservation and freezers
- Dehydration & Irradiation
- Food Packaging
- Thermal Processing
- Properties of packaging material
- Working of packaging instruments

### Course Outcomes:

**CO1:** Students will be able to understand major food preservation techniques.

**CO2:** Students will learn about the packaging techniques, and underlying principles.

**CO3:** Students may know about the safety & wholesomeness

**CO4:** Students will be able to understand Novel food processing methods.

**CO5:** Students will be able to understand operations involved in packaging material manufacturing.

**CO6:** Students will be able to understand major packaging material and methods used in food packaging.

**CO7:** Students will learn about effect of advance processing techniques on food product.

## TOPIC-

### Practical:

1. Comparison of conventional and microwave processing of food 4P
2. Low Temperature processing 6P
  - 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 6P
  - 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 6P
5. Preservation of food by using canning ( Fruit/Vegetable) 3P
6. Osmotic dehydration 6P
7. Identification and testing of packaging materials 3P
8. Determination of tensile strength of given packaging material 2P
9. Cut out analysis of canned food 4P
10. Determining water absorption capacity of packaging material 3P
11. Determining bursting strength of packaging material 3P



12. Determining tearing strength of packaging material	3P
13. To perform vacuum packaging of food sample and carry out its storage study	3P
14. Testing of lacquered tin plate sheets	4P
15. Determination of water vapour transmission rate of package film	3P
16. Pre-packaging practices followed for packaging fruits and vegetables	2P
17. Packaging and labelling of the product-packaging design, graphics, labeling	2P
18. Visit to packaging industry	1P

**Reference:**

- Food Science , Norman Potter
- Food Facts & Principles, Shakuntala Maney
- Fruit & Vegetable Preservation, Shrivastava

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	1	-	3	5	4	2	-	1	-	1
CO2	-	2	1	-	2	-	-	-	-	-	2	1
CO3	3	-	-	2	3	5	4	5	-	3	-	-
CO4	-	-	-	-	-	-	-	-	5	-	-	-
CO5	2	-	-	3	3	-	5	-	-	2	-	-
CO6	2	-	1	5	-	4	-	4	5	2	-	1
CO7	-	-	1	-	3	4	5	2	-	-	-	1

Justification for the mapping

**PO1:- Disciplinary Knowledge** - Understand the basic concepts, fundamental principles and experimental findings and the scientific theories related to food technology, food science and Food technology & engineering and its other fields related to the program.

**CO1:** Able to get knowledge about working of fruit & vegetable processing industry.

**CO3:** Learn about the working of various equipments used in fruit & vegetable industry.

**CO5:** Understand about the formulation of different fruit & vegetable products.

**CO6:** Able to get knowledge about process of different carbonated & non-carbonated beverages.

**PO2:- Communication Skills:-** Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.

**CO2:** Study about processing of different fruit products in food industry

**PO3- Critical Thinking :-** Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.

**CO1:** Student will able to get knowledge about working of fruit & vegetable processing industry.

**CO2:** Student will Study about processing of different fruit products in food industry and their health benefits.

**CO6:** Able to get knowledge about process of different carbonated & non-carbonated beverages.

**CO7:** Study about processing of different vegetable products in food industry.

**PO4- Analytical Reasoning and Problem Solving-** To enable the students with good scientific and engineering knowledge so as to comprehend, design, and create food products and devices for the food industry and provide solutions for the challenges in the food industry as well as in agriculture.

**CO3:** Learn about the working of various equipments used in fruit & vegetable industry and their working.

**CO5:** Understand about the formulation of different fruit & vegetable products.

**CO6:** Able to get knowledge about process of different carbonated & non-carbonated beverages and their health benefits.

**PO5- Sense of Inquiry:-** Curiously ask relevant questions for better understanding of fundamental concepts and principles, scientific theories and applications related to the study.

**CO1:** Student will able to get knowledge about working of fruit & vegetable processing industry.

**CO2:** Student will Study about processing of different fruit products in food industry and their health benefits.

**CO3:** Learn about the working of various equipments used in fruit & vegetable industry and their working.

**CO5:** Understand about the formulation of different fruit & vegetable products.

**CO7:** Study about processing of different vegetable products in food industry.

**PO6- Use of Modern Tools:-** Operate modern tools, equipment, instruments and laboratory techniques to perform the experiments and write the programs in different languages.

**CO1:** Student will able to get knowledge about working of fruit & vegetable processing industry.

**CO3:** Learn about the working of various equipments used in fruit & vegetable industry and their working.

**CO6:** Able to get knowledge about process of different carbonated & non-carbonated beverages and their health benefits.

**CO7:** Study about processing of different vegetable products in food industry

**PO7- Research Skills:-** Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to food technology.

**CO1:** Student will able to get knowledge about working of fruit & vegetable processing industry.

**CO3:** Learn about the working of various equipments used in fruit & vegetable industry and their working.

**CO5:** Understand about the formulation of different fruit & vegetable products.

**CO7:** Study about processing of different vegetable products in food industry

**PO8- Application of Knowledge:-** Develop a scientific outlook and apply the knowledge with respect to food technology.

**CO1:** Student will able to get knowledge about working of fruit & vegetable processing industry.

**CO3:** Learn about the working of various equipments used in fruit & vegetable industry and their working.

**CO6:** Able to get knowledge about process of different carbonated & non-carbonated beverages and their health benefits.

**CO7:** Study about processing of different vegetable products in food industry

**PO9- Ethical Awareness-** To train students in professional and ethical attitude, effective communication skills, team work skills and multidisciplinary approaches related to food technology and engineering.

**CO4:** Student will able to Know about the adulteration of spices and their effect on food.

**CO6:** Able to get knowledge about process of different carbonated & non-carbonated beverages and their health benefits.

**PO10:- Team Work -** Understand the basic concepts, fundamental principles and experimental findings and the scientific theories related to food technology, food science and Food technology & engineering and its other fields related to the program.

**CO1:** Able to get knowledge about working of fruit & vegetable processing industry.

**CO3:** Learn about the working of various equipments used in fruit & vegetable industry.

**CO5:** Understand about the formulation of different fruit & vegetable products.

**CO6:** Able to get knowledge about process of different carbonated & non-carbonated beverages.

**PO11:- Environment and Sustainability:-** Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.

**CO2:** Study about processing of different fruit products in food industry

**PO12:- Lifelong Learning:-** Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.

- CO1:** Student will able to get knowledge about working of fruit & vegetable processing industry.
- CO2:** Student will Study about processing of different fruit products in food industry and their health benefits.
- CO6:** Able to get knowledge about process of different carbonated & non-carbonated beverages.
- CO7:** Study about processing of different vegetable products in food industr



