



**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 –I**  
**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 I**

**PMFP-111: Food Microbiology**

**Theory**

**Paper No. – PMFP-111**

**Maximum Marks: 100**

**Credits: 4**

**Teaching Period: 4/week**

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

**Learning objectives:**

- To understand about the history of microbiology of food and Types of micro-organism.
- To develop skills to understand the theoretical concepts related to food microbiology.
- To learn about microorganisms which inhabit, create or contaminate food.
- To study about the Micro-organisms in natural food products and their control.
- To learn about the processing of Fermented Food Products
- To study about Food poisoning and microbial toxins

**Course Outcomes:**

Students will able to

CO1: 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

CO2: Explain the theoretical basis of the tools, technologies and methods common to microbiology.

CO3: Study about Food poisoning and microbial toxins

CO4: Learn about the processing of Fermented Food Products.

CO5: Study about the Micro-organisms in natural food products and their control.

CO6: Learn about the contamination of food.

CO7: Understand about the important microorganisms in food fermentation.

**TOPIC -**

**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

#### References:

- Food microbiology (IVth edition) - William C. Frazier and Dennis C. Westoff- Tata McGraw Hill Pub. Co. Ltd, New Delhi, 1995)
- Basic food microbiology-George G. Banwart (CBS publishers & distributors, New Delhi, 1987)
- Food microbiology- M. R. Adams & M. O. Moss (New Age International (P). Ltd. 2000)
- Jay, James M. Modern Food Microbiology, CBS Publication, New Delhi, 2000
- Introduction to Microbiology, M.H.Gajbhiye& S.J. Sathe et al, Career Publications, Nashik, 2015
- Garbutt, John. Essentials of Food Microbiology, Arnold, London, 1997
- Pelczar MJ, Chan E.C.S and Krieg, Noel R. Microbiology, 5th Ed., TMH, New Delhi, 1993

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	4	3	-	2	-	-	-	-
CO2	3	2	1	-	2	-	-	4	-	3	2	1
CO3	1	-	-	2	3	-	-	-	-	1	-	-
CO4	-	-	-	4	-	5	3	-	-	-	-	-
CO5	2	2	1	3	-	2	-	-	-	2	2	1
CO6	2	2	1	4	-	-	1	1	-	2	2	1
CO7	3	2	1	-	-	-	-	-	-	3	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 know role of microbes in food technology by getting information with practical.

**CO2:**Students will have a thorough understanding of microbes responsible for food spoilage like spoilage in milk and various food products.

**CO3:**The students will know the specifications of various contamination sources and disease developed in certain processed products like food poisoning.

**CO5:**Students will get knowledge about emerging technologies related to microbes through the thermal information.

**CO6:**Students will know production of various substances by using microbes

**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 have a thorough understanding of microbes responsible for food spoilage like spoilage in milk and various food products.

**CO5:**Students will get knowledge about emerging technologies related to microbes through the thermotical information.

**CO6:**Students will know production of various substances by using microbes

**CO7:**Students will know importance of microorganisms in food technology with different equipment and microorganisms.

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

**CO2:**Students will have a thorough understanding of microbes responsible for food spoilage like spoilage in milk and various food products

**CO5:**Students will get knowledge about emerging technologies related to microbes through the thermotical information.

**CO6:**Students will know production of various substances by using microbes

**CO7:**Students will know importance of microorganisms in food technology with different equipment and microorganisms.

**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:**To know the specifications of various contamination sources and disease developed in certain processed products.

**CO4:**Students will get thorough knowledge of harmful and beneficial microbes which used in food industries also get information about different equipment used to grow the microorganisms.

**CO5:**Students will get knowledge about emerging technologies related to microbes through the thermotical information.

**CO6:**Students will know production of various substances by using microbes and their uses in food industries.

**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 know role of microbes in food technology by getting information with practical.

**CO2:** Students will have a thorough understanding of microbes responsible for food spoilage like spoilage in milk and various food products

**CO3:**To know the specifications of various contamination sources and disease developed in certain processed products.

**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 thorough knowledge of harmful and beneficial microbes which used in food industries also get information about different equipment used to grow the microorganisms.

**CO5:**Students will get knowledge about emerging technologies related to microbes through the thermotical information.

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

**CO4:**Students will get thorough knowledge of harmful and beneficial microbes which used in food industries also get information about different equipment used to grow the microorganisms.

**CO6:**Students will know production of various substances by using microbes and their uses in food industries.

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

technology.

**CO1:**Students will know role of microbes in food technology by getting information with practical.

**CO2:**Students will have a thorough understanding of microbes responsible for food spoilage like spoilage in milk and various food products.

**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.

**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 have a thorough understanding of various food processing techniques, by using various equipment's and also by using traditional methods.

**CO2:**The students will know the importance of various preservation techniques like preservation by salt, sugar oil and other various preservation techniques.

**CO4:** Students will get practical skills for processing of food after postharvest like preparation of various food products.

**CO5:** Students will have a thorough understanding of types of food preservatives like natural preservatives, chemical preservatives and their uses, advantages disadvantages etc.

**CO6:** Students will get thorough knowledge of current scenario of food preservation.

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

**CO1:**Students will know role of microbes in food technology by getting information with practical.

**CO2:**Students will have a thorough understanding of microbes responsible for food spoilage like spoilage in milk and various food products.

**CO3:**The students will know the specifications of various contamination sources and disease developed in certain processed products like food poisoning.

**CO5:**Students will get knowledge about emerging technologies related to microbes through the thermotical information.

**CO6:**Students will know production of various substances by using microbes

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

**CO2:**Students will have a thorough understanding of microbes responsible for food spoilage like spoilage in milk and various food products

**CO5:**Students will get knowledge about emerging technologies related to microbes through the thermotical information.

**CO6:**Students will know production of various substances by using microbes

**CO7:**Students will know importance of microorganisms in food technology with different equipment and microorganisms.



**First Year**

**Semester I**

**PMFP-114: Food Microbiology**

**Theory**

**Paper No. – PMFP-114**

**Maximum Marks: 150**

**Credits: 6**

**Teaching Period: 2/week**

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

**Learning objectives:**

- To understand about the history of microbiology of food and Types of micro-organism.
- To develop skills to understand the theoretical concepts related to food microbiology.
- To learn about microorganisms which inhabit, create or contaminate food.
- To study about the HACCP program in food microbiology.
- To learn about the processing of Fermented Food Products
- To study about Food poisoning and microbial toxins

**Course Outcomes:**

Students will able to

CO1: 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

CO2: Explain the theoretical basis of the tools, technologies and methods common to microbiology.

CO3: Study about Various biochemical tests used in identification of commonly found bacteria in Food

CO5: Study about the HACCP program in food microbiology.

CO6: Learn about the contamination of food.

CO7: Understand about the important microorganisms in food fermentation.

**TOPIC-**

**Practicals:**

1. Microscopy and micrometry. 4P
2. Preparation of nutrient media, sterilization and inoculation techniques, Isolation of pure culture 5P
3. Staining of bacteria: Grams staining, acid-fast, spore, capsule, motility of bacteria and staining of yeast and mold. 7P
4. Microbial examination of natural food products. 5P
5. Identification of food pathogen in cereals, pulses, oilseeds, meat and poultry. 6P
6. Bacteriological analysis of Water and Milk: Total count, MPN Coliform (count), MBRT, IMViC etc. 7P
7. Microbial production of alcohol (cereal based), acetic acid and lactic acid. 8P
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) 10P
9. HACCP 4P
10. Visit to food processing unit or any other organization dealing with advanced methods in food microbiology. 4P

### 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

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	3	3	-	-
CO2	1	1	-	-	-	3	-	-	-	1	1	-
CO3	-	1	-	2	1	-	-	3	-	-	1	-
CO4	1	-	2	-	-	-	1	-	-	1	-	2
CO5	2	-	-	-	1	-	-	2	1	2	-	-
CO6	1	-	-	-	1	-	-	-	1	1	-	-
CO7	-	-	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:**The students will classify the products according to composition and nutritional value.

**CO2:**Provide nutrition counseling and education to individuals, groups, and communities throughout the lifespan using a variety of communication strategies

**CO4:** The students will be able to identify cause of deficiency diseases and their diagnostics.

**CO5:**The students will have thorough knowledge of importance of nutrients in daily life.

**CO6:**The students will have thorough knowledge of effect of cooking on nutrients and the uses of the cooked food as well as the cooking equipment.

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

**CO2:**Provide nutrition counseling and education to individuals, groups, and communities throughout the lifespan using a variety of communication strategies

**CO3:** The students will explain role of each food group products

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

**CO4:** The students will be able to identify cause of deficiency diseases and their diagnostics and also get information about balanced diet for healthy life and healthy body.

**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:** The students will explain role of each food group products

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

**CO3:** The students will explain role of each food group products

**CO5:**The students will have thorough knowledge of importance of nutrients in daily life.

**CO6:**The students will have thorough knowledge of effect of cooking on nutrients and the uses of the cooked food as well as the cooking equipment.

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

**CO2:**Provide nutrition counseling and education to individuals, groups, and communities throughout the lifespan using a variety of communication strategies

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

**CO4:** The students will be able to identify cause of deficiency diseases and their diagnostics and also get information about balanced diet for healthy life and healthy body.

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

**CO3:** The students will explain role of each food group products

**CO5:**The students will have thorough knowledge of importance of nutrients in daily life.

**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:**The students will classify the products according to composition and nutritional value.

**CO5:**The students will have thorough knowledge of importance of nutrients in daily life.

**CO6:**The students will have thorough knowledge of effect of cooking on nutrients and the uses of the cooked food as well as the cooking equipment.

**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:**The students will classify the products according to composition and nutritional value.

**CO2:**Provide nutrition counseling and education to individuals, groups, and communities throughout the lifespan using a variety of communication strategies

**CO4:** The students will be able to identify cause of deficiency diseases and their diagnostics.

**CO5:**The students will have thorough knowledge of importance of nutrients in daily life.

**CO6:**The students will have thorough knowledge of effect of cooking on nutrients and the uses of the cooked food as well as the cooking equipment.

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

**CO2:** Provide nutrition counseling and education to individuals, groups, and communities throughout the lifespan using a variety of communication strategies

**CO3:** The students will explain role of each food group products

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

**CO4:** The students will be able to identify cause of deficiency diseases and their diagnostics and also get information about balanced diet for healthy life and healthy body.

**First Year**

**Semester I**

**PMFP-112: Food Chemistry and Analysis**

**Theory**

**Paper No. – PMFP-112**

**Maximum Marks: 100**

**Credits: 4**

**Teaching Period: 4/week**

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

**Learning objectives:**

- To develop the skills for structure, functions, metabolism of various components of food
- To learn about working and principles of analytical instruments.
- To study about the various determinative Techniques.
- To understand about the sample preparations, sampling methods sample preparations & sampling methods.
- To learn about the nomenclature and structure, characteristics of different food molecules.
- To study about the control of action of various food molecules.

**Course Outcomes:**

**Students will:**

CO1: Understand the properties of food components

CO2: Develop an understanding of the principles of interactions of food molecules.

CO3: Able to learn about analytical techniques and its importance in food industry

CO4: Knowledge of proper procedures and methodologies in analytical.

CO5: Understand about the sample preparations, sampling methods in food analysis.

CO6: Study about the control of action of various food molecules.

CO7: Learn about the nomenclature and structure, characteristics of different food molecules.

**TOPIC-**

**Unit I: Introduction to basic concepts and carbohydrates 15P**

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

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

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 15P**

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**

**10P**

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, Ionexchange

**Unit V: Determinative Techniques**

**10P**

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

**References:**

1. Morris B. Jacobs The chemical analysis of foods and food products, III Edition, CBS Publishers and distributors New Delhi.
2. S. Ranganna, Hand book of analysis and quality control for fruit and vegetable products, II Ed., Tata McGraw Hill Publishing Co. New Delhi.
3. D.T.Plummer An introduction to practical biochemistry, III Ed. Tata McGraw Hill Publishing Co. New Delhi
4. Pomeranz Y., Meloan, Clifton E. 1994. Food Analysis : Theory and practice, 3rd Edn. IS: 6273 (Part-1& Part-2). Chapman and Hall. 8
5. Hand Book of analysis and quality control for fruit and Vegetable Products”. IInd edition. Tata McGraw-Hill Publishing Company Ltd. New Delhi.

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

**CO2:** Develop an understanding of the principles of interactions of food molecules.

**CO3:** Student will be able to learn about analytical techniques and its importance in food industry and their use in food industries.

**CO5:** Understand about the sample preparations, sampling methods in food analysis.

**CO6:** Study about the Analysis of water so they can understand the quality of water.

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

**CO2:** Develop an understanding of the principles of interactions of food molecules.

**CO5:** Understand about the sample preparations, sampling methods in food analysis.

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

**CO1:** To understand the properties of food components by scientific way also can get information and facts related to food components.

**CO2:** Develop an understanding of the principles of interactions of food molecules.

**CO3:** Student will able to learn about analytical techniques and its importance in food industry and their use in food industries.

**CO5:** Understand about the sample preparations, sampling methods in food analysis.

**CO6:** Study about the Analysis of water so they can understand the quality of water.

**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:** Student will be able to learn about analytical techniques and its importance in food industry.

**CO4:** Students can get knowledge of proper procedures and methodologies in analytical.

**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:** To understand the properties of food components by scientific way also can get information and facts related to food components.

**CO2:** Develop an understanding of the principles of interactions of food molecules.

**CO3:** Student will able to learn about analytical techniques and its importance in food industry and their use in food industries.

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

**CO3:** Student will able to learn about analytical techniques and its importance in food industry and their use in food industries

**CO4:** Students can get knowledge of proper procedures and methodologies in analytical.

**CO5:** Understand about the sample preparations, sampling methods in food analysis.

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

**CO1:** To understand the properties of food components by scientific way also can get information and facts related to food components.

**CO4:** Students can get knowledge of proper procedures and methodologies in analytical.

**CO5:** Understand about the sample preparations, sampling methods in food analysis.

**CO6:** Study about the Analysis of water so they can understand the quality of water.

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

**CO1:** To understand the properties of food components by scientific way also can get information and facts related to food components.

**CO2:** Develop an understanding of the principles of interactions of food molecules.

**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 can get knowledge of proper procedures and methodologies in analytical.

**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.

**CO2:** Develop an understanding of the principles of interactions of food molecules.

**CO3:** Student will be able to learn about analytical techniques and its importance in food industry and their use in food industries.

**CO5:** Understand about the sample preparations, sampling methods in food analysis.

**CO6:** Study about the Analysis of water so they can understand the quality of water.

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

**CO2:** Develop an understanding of the principles of interactions of food molecules.

**CO5:** Understand about the sample preparations, sampling methods in food analysis.

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

**CO1:** To understand the properties of food components by scientific way also can get information and facts related to food components.

**CO2:** Develop an understanding of the principles of interactions of food molecules.

**CO3:** Student will be able to learn about analytical techniques and its importance in food industry and their use in food industries.

**CO5:** Understand about the sample preparations, sampling methods in food analysis.

**CO6:** Study about the Analysis of water so they can understand the quality of water.

**First Year**

**Semester I**

**PMFP-112: Food Chemistry and Analysis**

**Theory**

**Paper No. – PMFP-115**

**Maximum Marks: 150**

**Credits: 4**

**Teaching Period: 2/week**

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

**Learning objectives:**

- To develop the skills for structure, functions, metabolism of various components of food
- To learn about working and principles of analytical instruments.
- To study about the various determinative Techniques.
- To study about the Analysis of oil.
- To learn about the Quality analysis of food products
- To study about the Analysis of water

**Course Outcomes:**

**Students will:**

CO1: Understand the properties of food components

CO2: Develop an understanding of the principles of interactions of food molecules.

CO3: Able to learn about analytical techniques and its importance in food industry

CO4: Knowledge of proper procedures and methodologies in analytical.

CO5: Understand about the sample preparations, sampling methods in food analysis.

CO6: Study about the Analysis of water

CO7: Learn about the Quality analysis of food products

**TOPIC -**

**Practicals:**

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



## References:

1. Morris B. Jacobs The chemical analysis of foods and food products, III Edition, CBS Publishers and distributors New Delhi.
2. S. Ranganna, Hand book of analysis and quality control for fruit and vegetable products, II Ed., Tata McGraw Hill Publishing Co. New Delhi.
3. D.T.Plummer An introduction to practical biochemistry, III Ed. Tata McGraw Hill Publishing Co. New Delhi
4. Pomeranz Y., Meloan, Clifton E. 1994. Food Analysis : Theory and practice, 3rd Edn. IS: 6273 (Part-1& Part-2). Chapman and Hall. 8
5. Hand Book of analysis and quality control for fruit and Vegetable Products". IInd edition. Tata McGraw-Hill Publishing Company Ltd. New Delhi.

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

**CO2:** Develop an understanding of the principles of interactions of food molecules.

**CO3:** Student will be able to learn about analytical techniques and its importance in food industry and their use in food industries.

**CO5:** Understand about the sample preparations, sampling methods in food analysis.

**CO6:** Study about the Analysis of water so they can understand the quality of water.

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

**CO2:** Develop an understanding of the principles of interactions of food molecules.

**CO5:** Understand about the sample preparations, sampling methods in food analysis.

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

**CO1:** To understand the properties of food components by scientific way also can get information and facts related to food components.

**CO2:** Develop an understanding of the principles of interactions of food molecules.

**CO3:** Student will be able to learn about analytical techniques and its importance in food industry and their use in food industries.

**CO5:** Understand about the sample preparations, sampling methods in food analysis.

**CO6:** Study about the Analysis of water so they can understand the quality of water.

**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:** Student will be able to learn about analytical techniques and its importance in food industry.

**CO4:** Students can get knowledge of proper procedures and methodologies in analytical.

**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:** To understand the properties of food components by scientific way also can get information and facts related to food components.

**CO2:** Develop an understanding of the principles of interactions of food molecules.

**CO3:** Student will able to learn about analytical techniques and its importance in food industry and their use in food industries.

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

**CO3:** Student will able to learn about analytical techniques and its importance in food industry and their use in food industries

**CO4:** Students can get knowledge of proper procedures and methodologies in analytical.

**CO5:** Understand about the sample preparations, sampling methods in food analysis.

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

**CO1:** To understand the properties of food components by scientific way also can get information and facts related to food components.

**CO4:** Students can get knowledge of proper procedures and methodologies in analytical.

**CO5:** Understand about the sample preparations, sampling methods in food analysis.

**CO6:** Study about the Analysis of water so they can understand the quality of water.

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

**CO1:** To understand the properties of food components by scientific way also can get information and facts related to food components.

**CO2:** Develop an understanding of the principles of interactions of food molecules.

**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 can get knowledge of proper procedures and methodologies in analytical.

**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.

**CO2:** Develop an understanding of the principles of interactions of food molecules.

**CO3:** Student will able to learn about analytical techniques and its importance in food industry and their use in food industries.

**CO5:** Understand about the sample preparations, sampling methods in food analysis.

**CO6:** Study about the Analysis of water so they can understand the quality of water.

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

**CO2:** Develop an understanding of the principles of interactions of food molecules.

**CO5:** Understand about the sample preparations, sampling methods in food analysis.

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

**CO1:** To understand the properties of food components by scientific way also can get information and facts related to food components.

**CO2:** Develop an understanding of the principles of interactions of food molecules.

**CO3:** Student will able to learn about analytical techniques and its importance in food industry and their use in food industries.

**CO5:** Understand about the sample preparations, sampling methods in food analysis.

**CO6:** Study about the Analysis of water so they can understand the quality of water

**First Year**

**Semester I**

**PMFP-113: Nutrition Science**

**Theory**

**Paper No. – PMFP-113**

**Maximum Marks: 100**

**Credits: 4**

**Teaching Period: 4/week**

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

**Learning Objectives:**

- To understand nutrients and food component that supply nourishment to the body.
- To know about the functions, deficiency and toxicity of nutrients.
- To understand Effect of deficiency and excess of nutrients..
- To understand the basic knowledge of protein, carbohydrate & fat in terms of nutrient.
- To understand the relation between nutrition & health.
- To understand the national nutritional policies for malnutrition.

**Course Outcomes:**

Students will be able to:

**CO1:** Utilize knowledge to understand the role of food and nutrients in health and disease processes.

**CO2:** Provide nutrition counseling and education to individuals, groups, and communities throughout the lifespan using a variety of communication strategies.

**CO3:** Evaluate nutrition information based on scientific reasoning for clinical, community, and food service application.

**CO5:** Know about the importance of protein, carbohydrate & fat in terms of nutrient.

**CO6:** Suggest the national nutritional policies for malnutrition.

**CO7:** Know about the importance of therapeutic diets.

**TOPIC-**

**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.
2. B. Srilakshmi (2007) Dietetics, Revised Fifth Edition, New Age International Publishers
3. B. Srilakshmi (2011) Nutrition Science, Third Edition, New Age International Publishers
4. Dr. M. Swaminathan (2006) Advanced Text book on Food and Nutrition, Volume 1 and 2, Second Edition, BAPPCO Publication.
5. Jim Mann and A. Stewart Truswell (2010) Essentials of Human Nutrition, Third Edition, Oxford Publication.
6. Michael J. Gibney, Hester H. Vorster and Frans J. Kok (2002) Introduction to Human Nutrition, First Indian Reprint, Blackwell Publishing.
7. Biochemistry of Foods-N.A.M Eskin, H.M. Henderson, R.J. Townsend.
8. Introduction to Biochemistry of Foods, Z. Berk

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	3	3	-	-
CO2	1	1	-	-	-	3	-	-	-	1	1	-
CO3	-	1	-	2	1	-	-	3	-	-	1	-
CO4	1	-	2	-	-	-	1	-	-	1	-	2
CO5	2	-	-	-	1	-	-	2	1	2	-	-
CO6	1	-	-	-	1	-	-	-	1	1	-	-
CO7	-	-	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:**The students will classify the products according to composition and nutritional value.

**CO2:**Provide nutrition counseling and education to individuals, groups, and communities throughout the lifespan using a variety of communication strategies

**CO4:** The students will be able to identify cause of deficiency diseases and their diagnostics.

**CO5:**The students will have thorough knowledge of importance of nutrients in daily life.

**CO6:**The students will have thorough knowledge of effect of cooking on nutrients and the uses of the cooked food as well as the cooking equipment.

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

**CO2:**Provide nutrition counseling and education to individuals, groups, and communities throughout the lifespan using a variety of communication strategies

**CO3:** The students will explain role of each food group products

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

**CO4:** The students will be able to identify cause of deficiency diseases and their diagnostics and also get information about balanced diet for healthy life and healthy body.

**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:** The students will explain role of each food group products

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

**CO3:** The students will explain role of each food group products

**CO5:** The students will have thorough knowledge of importance of nutrients in daily life.

**CO6:** The students will have thorough knowledge of effect of cooking on nutrients and the uses of the cooked food as well as the cooking equipment.

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

**CO2:** Provide nutrition counseling and education to individuals, groups, and communities throughout the lifespan using a variety of communication strategies

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

**CO4:** The students will be able to identify cause of deficiency diseases and their diagnostics and also get information about balanced diet for healthy life and healthy body.

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

**CO3:** The students will explain role of each food group products

**CO5:** The students will have thorough knowledge of importance of nutrients in daily life.

**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:** The students will classify the products according to composition and nutritional value.

**CO5:** The students will have thorough knowledge of importance of nutrients in daily life.

**CO6:** The students will have thorough knowledge of effect of cooking on nutrients and the uses of the cooked food as well as the cooking equipment.

**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:** The students will classify the products according to composition and nutritional value.

**CO2:** Provide nutrition counseling and education to individuals, groups, and communities throughout the lifespan using a variety of communication strategies

**CO4:** The students will be able to identify cause of deficiency diseases and their diagnostics.

**CO5:** The students will have thorough knowledge of importance of nutrients in daily life.

**CO6:** The students will have thorough knowledge of effect of cooking on nutrients and the uses of the cooked food as well as the cooking equipment.

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

**CO2:** Provide nutrition counseling and education to individuals, groups, and communities throughout the lifespan

using a variety of communication strategies

**CO3:** The students will explain role of each food group products

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

**CO4:** The students will able to identify cause of deficiency diseases and their diagnostics and also get information about. balanced diet for healthy life and healthy body.

**First Year**

**Semester I**

**PMFP-116: Bakery & confectionary Technology**

**Theory**

**Paper No. – PMFP-116**

**Maximum Marks: 150**

**Credits: 4**

**Teaching Period: 2/week**

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

**Learning Objective:**

- To study the role of different types of major and minor ingredients
- To provide the knowledge about different bakery equipments
- To learn process for manufacturing bakery and confectionery products.
- To learn about different types of bakery & confectionary products.
- To learn about the quality test of flour.
- To develop knowledge and skills in the preparation and storage of Bakery and Confectionery items

**Course Outcome:**

**CO1:** Students will have a thorough understanding on effect of blending and baking on final product of bakery.

**CO2:** Students will able to prepare different bakery products.

**CO3:** The students will be able to understand bakery and confectionery technology

**CO4:** The students may learn about the quality test of flour.

**CO5:** Students will know about the working of different bakery equipments in bakery industry.

**CO6:** Students may learn about the process of sugar & chocolate based confectionary products.

**CO7:** Students will know about manufacturing of various techniques in bakery and confectionery industry.

**TOPIC-**

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



18. Visit to bakery and Confectionary industry  
19. Preparation of report

3P  
4P

### References:

1. Matz S. A. (1996): Bakery technology and engineering, 1st edition, Arya book depot New delhi.
2. Practical Baking Cooking, 1st edition, Queen street house, U.K.
3. Kamel B. S. and Stauffer C. E. (1993): Advances in baking technology, 1<sup>st</sup> edition, Blackie academic and professional.
4. Aylwaed F. (2001): Food Technology Processing and Quality control \, 1<sup>st</sup> edition, Agrobios (India)
5. Harry W, Loesecke (2001): Outlines of food technology, 2nd edition, Agribios (India)
6. Khetarpaul N, Grewal R. B. and Jood S. (2005): Bakery Science and Cereal Technology, 1st edition, Daya publishing house, Delhi.
7. Manay S.N. and Shadaksharaswamy M. (2001); Food facts and principles, 2<sup>nd</sup> edn, New Age International (P) limited publishers.
8. Minife B.W. (1997): Chocolate, cocoa and confectionery science and technology, 3rd edition, CBS Publishers and Distributors, New Delhi.

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	3	3	-	-
CO2	1	1	-	-	-	3	-	-	-	1	1	-
CO3	-	1	-	2	1	-	-	3	-	-	1	-
CO4	1	-	2	-	-	-	1	-	-	1	-	2
CO5	-	-	-	3	-	3	2	-	-	-	-	-
CO6	2	-	-	2	-	3	2	-	1	2	-	-
CO7	-	-	1	3	2	3	-	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 have a thorough understanding on effect of blending and baking on final product of bakery.

**CO2:** Students will be able to prepare different bakery products with different equipments.

**CO4:** The students may learn about the quality test of flour and what will be the effect of the flour quality on food.

**CO6:** Students may learn about the process of sugar & chocolate based confectionary products and they can easily classify the sugar & chocolate based confectionary products.

**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 be able to prepare different bakery products with different equipments.

**CO3:** The students will be able to understand bakery and confectionery technology

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

**CO4:** The students may learn about the quality test of flour and what will be the effect of the flour quality on food.

**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:** The students will be able to understand bakery and confectionery technology.

**CO5:** Students will know about the working of different bakery equipments in bakery industry.

**CO6:** Students may learn about the process of sugar & chocolate based confectionary products and they can easily classify the sugar & chocolate based confectionary products.

**CO7:** Students will know about manufacturing of various techniques in bakery and confectionery industry.

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

**CO3:** The students will be able to understand bakery and confectionery technology.

**CO7:** Students will know about manufacturing of various techniques in bakery and confectionery 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.

**CO2:** Students will be able to prepare different bakery products with different equipments.

**CO5:** Students will know about the working of different bakery equipments in bakery industry.

**CO6:** Students may learn about the process of sugar & chocolate based confectionary products and they can easily classified the sugar & chocolate based confectionary products.

**CO7:** Students will know about manufacturing of various techniques in bakery and confectionery industry.

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

**CO4:** The students may learn about the quality test of flour and what will be the effect of the flour quality on food.

**CO5:** Students will know about the working of different bakery equipments in bakery industry.

**CO6:** Students may learn about the process of sugar & chocolate based confectionary products and they can easily classified the sugar & chocolate based confectionary products.

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

**CO3:** The students will be able to understand bakery and confectionery technology.

**CO7:** Students will know about manufacturing of various techniques in bakery and confectionery 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.

**CO1:** Students will have a thorough understanding on effect of blending and baking on final product of bakery.

**CO6:** Students may learn about the process of sugar & chocolate based confectionary products and they can easily classified the sugar & chocolate based confectionary products.

**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 have a thorough understanding on effect of blending and baking on final product of bakery.

**CO2:** Students will able to prepare different bakery products with different equipments.

**CO4:** The students may learn about the quality test of flour and what will be the effect of the flour quality on food.

**CO6:** Students may learn about the process of sugar & chocolate based confectionary products and they can easily classified the sugar & chocolate based confectionary products.

**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 able to prepare different bakery products with different equipments.

**CO3:** The students will be able to understand bakery and confectionery technology

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

**CO4:** The students may learn about the quality test of flour and what will be the effect of the flour quality on food.