Anekant Education Society's

Tuljaram Chaturchand College, Baramati

(Autonomous)

Two Year M.Voc Degree Program in Food Technology & Research

(Faculty of Food Technology & Research)

SY M.Voc (Food Technology) Semester –**III**
For Department Food Technology & Research

Tuljaram Chaturchand College, Baramati

To be implemented from Academic Year 2022-2023

Title of the Programme: SY 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
Theory (General Education Component)			
PMFP111	Food Microbiology	4	100
PMFP112	Food Chemistry and Analysis	4	100
PMFP113	Nutrition Science	4	100
Practicals (Skill Component)			
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
Theory (General Education Component)			
PMFP121	Beverage and Snack Food Technology	4	100
PMFP122	Food Additives, Contaminants and Toxicology	4	100
PMFP123	Advances in Food Processing & Packaging	4	100
Practicals (Skill Component)			
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
Theory (General Education Component)			
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
Practicals (Skill Component)			
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
Practicals (Skill Component)			
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)

PO-1	**Disciplinary Knowledge**	Understandthebasicconcepts,fundamentalprinciplesandexperimental findingsandthescientifictheoriesrelatedtofoodtechnology,foodscienceand foodtechnology&engineeringanditsotherfieldsrelatedtothe program.
PO-2	**Communication Skills**	Developvariouscommunicationskillssuchasreading,listeningandspeaking skills to express ideas and views clearly and effectively.
PO-3	**Critical Thinking**	Proposenovelideasinexplainingthescientificdata,factsandfiguresrelatedto scienceandtechnology.
PO-4	**Analytical Reasoningand Problem Solving**	Toenable the studentswithgoodscientific andengineeringknowledge soasto comprehend,design,andcreatefoodproductsanddevicesforthefoodindustry and provide solutions for the challenges in the food industry as well as in agriculture.
PO-5	**Senseof Inquiry**	Curiously ask relevant questions for better understanding of fundamental conceptsandprinciples,scientifictheoriesandapplicationsrelatedtothestudy.
PO-6	**UseofModern Tools**	Operatemoderntools,equipment,instrumentsandlaboratorytechniquesto perform the experiments and write the programs in different languages.
PO-7	**Research Skills**	Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to food technology.
PO-8	**Applicationof Knowledge**	Developascientificoutlookandapplytheknowledgewithrespecttofood technology.
PO-9	**Ethical Awareness**	Totrainstudentsinprofessionalandethicalattitude,effectivecommunication skills, teamworkskillsandmultidisciplinaryapproachesrelatedtofoodtechnology and engineering.
PO-10	**Teamwork**	Understandthebasicconcepts,fundamentalprinciplesandexperimental findings and the scientific theories related to food technology, food science and food technology & engineering and its other fields related to the program.
PO-11	**Environmentand Sustainability**	Developvariouscommunicationskillssuchasreading,listeningandspeaking skills to express ideas and views clearly and effectively.
PO-12	**LifelongLearning**	Propose novel ideas in explaining the scientific data, facts and figures related to science and technology.

Second Year Semester III

Elective-1: Dairy Processing Technology

Theory **Paper No. – FPT-301**
Maximum Marks: 100 **Credits: 4**
Teaching Period: 4/week **Teaching Load: 60 Theory Period/ Semester**

Learning Objectives:

- To gain knowledge of biochemical foundation to understand the composition of milk with the chemistry structure and function of its individual components.
- To optimize the learning process including various dairy products from the perspective of changes in milk and its constituents, upon processing.
- To develop the skills for processing of milk products by different methods.
- To understand about the Challenges faced by the IndianDairy Supply Chain.
- To study about the Legal standards of dairy industry.
- To learn about the Packaging storage and distribution of dairy products.

Course Outcome:

CO1: Students will understand the concept of processing of milk and milk products.
CO2: The students will able to explain the basics behind milk process technology that would comparatively help to get the knowledge of technical views regarding industrial aspect.
CO3: Students will develop the skills for processing of milk products by different methods.
CO4: Students will study about the Legal standards of dairy industry.
CO5: The students may know about the packaging storage and distribution of dairy products.
CO6: The students will understand about the Challenges faced by the IndianDairy Supply Chain.
CO7: Students will learn about the types of dairy products.

Unit I: Chemistry of milk **12 P**

Definition of milk, present scenario of milk and milk products in India and Global. Structure and composition of milk, Enzymes in milk. Structural elements in milk: Surface phenomenon, colloidal interactions, casein micelles, fat globules.

Unit II: Cheese Technology **12 P**

Definition, Standards, Classification, Nutritive value and basic principles of milk for cheese making. Role of starter culture in cheese making, Rennet importance, preparation and its properties, varieties and types of cheese with packaging, Storage and distribution of cheese.

Unit III: Condensed and Dried milk Products **12 P**

Introduction, Status, Legal standards of condensed and dried milk, Manufacturing of condensed and evaporated milk. Drying Mechanics: Drum roller drying, freeze drying, Vacuum, Foam drying and Spray drying, Pilot sterilization and heat stabilization for evaporated milk,

Unit IV: Fat Rich Dairy Products **12P**

Status of lipids in milk, Types of fat rich dairy products, Production and processing of cream, butter and ghee, Packaging storage and distribution of cream, butter and ghee.

Unit V: Supply Chain Management of Dairy Products **12 P**

Need for the cooperative model, Distortions in supply chain, Challenges faced by the Indian Dairy Supply Chain.

References:-

1. De Sukumar, Outlines of Dairy Technology, Oxford University Press, Oxford.2007
2. Robinson, R.K. (2 vol.) 1986. Modern Dairy Technology. Elsevier Applied Science, UK.
3. Warner, J.M. 1976. Principles of Dairy Processing. Wiley Eastern Ltd., New Delhi.
4. Yarpar, W.J. and Hall, C.W. 1975. Dairy Technology and Engineering. AVI, Westport.
5. Rosenmal, I. 1991. Milk and Milk Products. VCH. New York.
6. Webb and Johnson, Fundamentals of Dairy Chemistry

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

Justification for the mapping

PO1:- Disciplinary Knowledge - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and
Food technology & engineering and its other fields related to the program.
CO1: Student will be able to comprehensive view of the composition of milk, its chemical, physical and organoleptic properties that can be applied in technological processing of milk.
CO2: Student can get knowledge about the production of milk and pre-treatment of milk and different equipment.
CO3: Student can get information about the dairy processing technologies and they can use in dairy plant.
CO6: Student can understand about the working of various dairy equipments.

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

CO2: Student can get knowledge about the production of milk and pre-treatment of milk and different equipment.
CO5: Student can create a dairy product and evaluate relevant physical properties.
CO7: To study about the planning, layout and requirement of dairy barns so they can use it for their business.

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 comprehensive view of the composition of milk, its chemical, physical and organoleptic properties that can be applied in technological processing of milk.
CO2: Student can get knowledge about the production of milk and pre-treatment of milk and different equipment.
CO3: Student can get information about the dairy processing technologies and they can use in dairy plant.
CO5: Student can create a dairy product and evaluate relevant physical properties.
CO6: Student can understand about the working of various dairy equipments.

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 can get information about the dairy processing technologies and they can use in dairy plant.
CO4: Apply methods of analysis for dairy products and relate differences in composition and structure to

differences in manufacturing processes.
CO6: Student can understand about the working of various dairy equipments.

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 comprehensive view of the composition of milk, its chemical, physical and organoleptic properties that can be applied in technological processing of milk.
CO2: Student can get knowledge about the production of milk and pre-treatment of milk and different equipment.
CO3: Student can get information about the dairy processing technologies and they can use in dairy plant.
PO6- Use of Modern Tools:- Operatemoderntools,equipment,instrumentsandlaboratorytechniquesto perform the experiments and write the programs in different languages.
CO4: Apply methods of analysis for dairy products and relate differences in composition and structure to differences in manufacturing processes.
PO7- Research Skills:- Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to food technology.
CO4: Students will get practical skills for processing of food after postharvest like preparation of various food products.
CO5: Student can create a dairy product and evaluate relevant physical properties.

PO8- Application of Knowledge:- Develop a scientific out look and apply the knowledge with respect to food technology.
CO1: Student will be able to comprehensive view of the composition of milk, its chemical, physical and organoleptic properties that can be applied in technological processing of milk.
CO2: Student can get knowledge about the production of milk and pre-treatment of milk and different equipment.

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 the ories related to food technology, food science and
Food technology & engineering and its other fields related to the program.
CO1: Student will be able to comprehensive view of the composition of milk, its chemical, physical and organoleptic properties that can be applied in technological processing of milk.
CO2: Student can get knowledge about the production of milk and pre-treatment of milk and different equipment.
CO3: Student can get information about the dairy processing technologies and they can use in dairy plant.
CO6: Student can understand about the working of various dairy equipments.

PO11:- Environment and Sustainability:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
CO2: Student can get knowledge about the production of milk and pre-treatment of milk and different equipment.
CO5: Student can create a dairy product and evaluate relevant physical properties.
CO7: To study about the planning, layout and requirement of dairy barns so they can use it for their business.

Po12:- Lifelong Learning:- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO1: Student will be able to comprehensive view of the composition of milk, its chemical, physical and organoleptic properties that can be applied in technological processing of milk.
CO2: Student can get knowledge about the production of milk and pre-treatment of milk and different equipment.
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Second Year **Semester III**

Elective-2: Meat Processing Technology

Theory **Paper No. – FPT-301**
Maximum Marks: 100 **Credits: 4**
Teaching Period: 4/week **Teaching Load: 60 Theory Period/ Semester**

Learning Objectives:

- To understand need and importance of livestock, egg, Fish and poultry industry
- To study structure, composition and nutritional quality of animal products.
- To study processing and preservation of animal foods.
- To understand technology behind preparation of various animal food products and by-product utilization.
- To learn about the slaughter house by product utilization and waste management.
- To study about the pre and post slaughter operations.

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

CO1: Explain the composition, structure and function of meat, eggs, milk and fish;
CO2: Identify and describe the physical and biochemical changes occurring during the conversion of muscle to meat;
CO3: Describe and evaluate the implication of storage and processing operations on the quality of selected foods of animal origin;
CO4: Collect and interpret the data of experiments on the effect of processing conditions on quality parameters of animal food products;
CO5: Identify and explain the product composition, quality and production process of commercially available selected animal food products.
CO6: Study about the pre and post slaughter operations.
CO7: Learn about the slaughter house by product utilization and waste management.

TOPIC-

Unit I: Introduction to Meat technology **15 P**

Sources of meat and meat products in India, scope of meat chicken and seafood processing, terminologies related to meat, chemical composition and microscopic structure of meat, slaughtering of animals, inspection and grading of meat

Factors affecting post mortem changes, properties and shelf life of meat, meat quality, meat refrigeration, evaluation, mechanical deboning, tenderization, aging, pickling and smoking of meat, meat plant sanitation, meat based value added products

Unit II: Poultry **10 P**

Poultry classification, composition, preservation and processing - slaughtering, stunning methods, ante-mortem handling, cuts

Unit III: Egg **10 P**

Structure, composition, nutritive value and functional properties of egg, preservative by different methods, processing of egg products, factors affecting quality of egg

Unit IV: Fisheries **10 P**

Introduction to fisheries, Composition and Nutritive value of fish, types of fish, composition, structure, post-mortem changes, handling, canning, smoking, salting, dehydration and icing and preparation

Unit-V: **15P**

- **Introduction of Animal By product:** Need & Importance of by product processing, handling & utilization of skin, intestine, glands and fallen animals
- **By-product processing plants:** By-product processing plant layout, rendering & poultry by products and utilization of bone, blood, hoof, horn, wool and hair.
- **Waste disposal:** Utilization & disposal of organic waste from slaughterhouse and effluent treatment

References:

1. Manay S.N. and Shadaksharaswamy M. (2001); Food facts and principles, 2nd edn, New Age International (P) limited publishers.
2. Potter N. N. and Hotchkiss J.H. (1966); Food Science, 5th edn., CBS Publishers and distributors.
3. Y.H. Huiet at (2001) Meat Science & Applications, Marcel Dekker Inc.
4. NIIR Board; Preservation of Meat and Poultry Products, 1st, Asia Pacific Business Press Inc.
5. Stadelman W.J. and Cotterill O.J. (1973); Egg Science & Technology, 1st, The AVI Publishing Company, Inc.

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

Justification for the mapping

PO1:- Disciplinary Knowledge - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and
Food technology & engineering and its other fields related to the program.
CO1: Student will be able to comprehensive view of the composition of milk, its chemical, physical and organoleptic properties that can be applied in technological processing of milk.
CO2: Student can get knowledge about the production of milk and pre-treatment of milk and different equipment.
CO3: Student can get information about the dairy processing technologies and they can use in dairy plant.
CO6: Student can understand about the working of various dairy equipments.

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

CO2: Student can get knowledge about the production of milk and pre-treatment of milk and different equipment.
CO5: Student can create a dairy product and evaluate relevant physical properties.
CO7: To study about the planning, layout and requirement of dairy barns so they can use it for their business.

PO3- Critical Thinking :- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
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PO8- Application of Knowledge:- Develop a scientific out look and apply the knowledge with respect to food technology.
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Second Year **Semester III**

Dairy Processing Technology

Practical **Paper No. – FPT-3.1**

Maximum Marks: 150 **Credits: 6**

Teaching Period: 6/week **Teaching Load: 30 Practicals Period/ Semester (4 Period each)**

Learning Objectives:

- To know the need and importance of dairy industry
- To know the compositional and technological aspects of milk.
- To study processed milk products.
- To learn about the chemical analysis of milk.
- To study about the processing of different milk based products.
- To understand about the working of various dairy equipments.

Course Outcomes:

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

CO1: Give a comprehensive view of the composition of milk, its chemical, physical and organoleptic properties that can be applied in technological processing of milk.

CO2: Explain the production of milk and pre-treatment of milk.

CO3: Explain the dairy processing technologies.

CO4: study about the processing of different milk based products.

CO5: Create a dairy product and evaluate relevant physical properties.

CO6: Understand about the chemical analysis of milk.

TOPIC

1. Study of manufacturing of cheese 5P
2. Preparation of acid casein 3P
3. Preparation of sweet condensed milk 3P
4. Skim milk Powder making by spray drying 4P
5. Preparation of protein enriched ice cream 5P
6. Preparation of table cream 4P
7. Preparation of butter 5P
8. Preparation of ghee 5P
9. Preparation of fermented milk product 8P
    a) Preparation of chakka
    b) Preparation of flavoured yoghurt
    c) Preparation of whey-based beverages
    d) Preparation of sour milk (kefir)
10. Preparation of traditional milk product 4P
11. Study of plant layout design of milk industries 4P
12. Visit to Industry 4P
13. Preparation of Report on Industrial Visit 6P

References:

1. K. S. Sharma-Dairy chemistry.

2. Milk and Milk Products by Eckles and Eckles .
3. Outlines of Dairy Technology by Sukmar De
4. Dairy Plant System and Layout by Tufail Ashmed
5. Principles of Dairy Technology by Woarner 5. Dairy Engineering by Forvall
6. Milk & Milk Products by CBSE 7. Chemistry & Testing of Dairy Products by Atherton Newlander

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

Justification for the mapping

PO1:- Disciplinary Knowledge - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and
Food technology & engineering and its other fields related to the program.
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PO2:- Communication Skills:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.

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PO3- Critical Thinking :- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
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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.
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PO5- Sense of Inquiry:- Curiously ask relevant questions for better understanding of fundamental concepts and principles, scientific theories and applications related to the study.
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CO1: Student will be able to comprehensive view of the composition of milk, its chemical, physical and organoleptic properties that can be applied in technological processing of milk.
CO2: Student can get knowledge about the production of milk and pre-treatment of milk and different equipment.

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 the ories related to food technology, food science and
Food technology & engineering and its other fields related to the program.
CO1: Student will be able to comprehensive view of the composition of milk, its chemical, physical and organoleptic properties that can be applied in technological processing of milk.
CO2: Student can get knowledge about the production of milk and pre-treatment of milk and different equipment.
CO3: Student can get information about the dairy processing technologies and they can use in dairy plant.
CO6: Student can understand about the working of various dairy equipments.

PO11:- Environment and Sustainability:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
CO2: Student can get knowledge about the production of milk and pre-treatment of milk and different equipment.
CO5: Student can create a dairy product and evaluate relevant physical properties.
CO7: To study about the planning, layout and requirement of dairy barns so they can use it for their business.

Po12:- Lifelong Learning:- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO1: Student will be able to comprehensive view of the composition of milk, its chemical, physical and organoleptic properties that can be applied in technological processing of milk.
CO2: Student can get knowledge about the production of milk and pre-treatment of milk and different equipment.
CO3: Student can get information about the dairy processing technologies and they can use in dairy plant.
CO5: Student can create a dairy product and evaluate relevant physical properties.
CO6: Student can understand about the working of various dairy equipments.

Second Year Semester III

Post- Harvest Technology

Theory **Paper No. – FPT-302**
Maximum Marks: 100 **Credits: 4**
Teaching Period: 4/week **Teaching Load: 60 Theory Period/ Semester**

Learning Objectives:

- To obtain that the student has the knowledge of the post-harvest physiology and technology of foods and the necessary abilities
- To design different post-harvest treatments and strategies, understanding the scientific basis.
- To study about the equipments used in post harvest technology..
- To learn about the processing of different plant foods.
- To study about the CAC & WTO guidelines for post harvest materials.
- To understand the history and role of post-harvest technology.

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

CO1: Understand technologies of post harvest technology and its role in providing better quality produce to the consumer.
CO2: Understand importance prevention of losses
CO3: Understand utilization of the produce and methods for shelf life extension
CO4: Understand cold chain management
CO5: Learn quality control and various standards required for domestic and export market.
CO6: Understand the history and role of post-harvest technology.
CO7: Learn about the Food storage systems.

TOPIC

Unit-I Unit Operations in Post -Harvest Technology **15P**

Unit operations of food processing viz. grading, sorting, peeling and size reduction machineries for various unit operations, energy balance in food processing. Size reduction process: Principles, theories and laws, energy considerations, equipments. Mixing and forming, theory and applications, mixing indices, equipments for solid and liquid.

Mass, Energy balance and Heat transfer: Steam injection, steam infusion, plate heat exchangers, tubular heat exchangers and scraped surface heat exchangers, Thermal processing: Death kinetics, thermal death curve, decimal reduction time. Z-factor, heat penetration curve, process time calculations, mathematical curve, mathematical and graphical solutions

Unit II: Post-harvest technology of fruits, vegetables & plantation crops **15 P**

Importance of post-harvest technology in fruits vegetables and horticultural produce. Maturity indices, harvesting,handling, grading of fruits, vegetables, plantation crops. Pre-harvest factors affecting quality, factors responsible for deterioration of fruits and vegetables, physiological and bio-chemical changes, hardening and delaying ripening process.Post-harvest treatments of plantation crops. Quality parameters and specification

Unit II: Processing and packaging operations **10 P**

Cooling treatments for fruits, vegetables and plantation crops including cold chain operations.
Pack house operations: Cleaning, sorting, grading, disinfection & packaging. Ripening methods and study of ripening agents (Ethylene). Technology involved in pack house operations. Physical, physiological and biochemical changes during ripening of fruits andvegetables. Products and by products of plantation crops: cashew, areca nut, coconut

Unit IV: Transport, postharvest disorders, and post-harvest loss 10P
Modes of transportation, postharvest disorders, pest anddiseases and their management in major horticultural crops, Factors affecting the quality of fruits and vegetables.

Unit V: Export of post -harvest produces 10 P
WTO guidelines for export of horticultural produces – CODEX standards and exportstandards for major fruits, vegetables and plantation crops.

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

Justification for the mapping

PO1:- Disciplinary Knowledge - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and
Food technology & engineering and its other fields related to the program.
CO2: Understand importance prevention of losses
CO3: Understand utilization of the produce and methods for shelf life extension
CO5: Learn quality control and various standards required for domestic and export market.
CO6: Understand the history and role of post-harvest technology.
CO7: Learn about the Food storage systems.

PO2:- Communication Skills:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
CO2: Understand importance prevention of losses
CO5: Learn quality control and various standards required for domestic and export market.
CO6: Understand the history and role of post-harvest technology.

PO3- Critical Thinking :- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO1: Understand technologies of post harvest technology and its role in providing better quality produce to the consumer.
CO2: Understand importance prevention of losses
CO5: Learn quality control and various standards required for domestic and export market.
CO6: Understand the history and role of post-harvest technology.

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 utilization of the produce and methods for shelf life extension
CO4: Understand cold chain management so they can use it in industries.
CO5: Learn quality control and various standards required for domestic and export market.
CO6: Understand the history and role of post-harvest technology.

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: Understand technologies of post harvest technology and its role in providing better quality produce to the consumer.
CO2: Understand importance prevention of losses
CO3: Understand utilization of the produce and methods for shelf life extension
PO6- Use of Modern Tools:- Operatemoderntools,equipment,instrumentsandlaboratorytechniquesto perform the experiments and write the programs in different languages.
CO4: Understand cold chain management so they can use it in industries.
CO5: Learn quality control and various standards required for domestic and export market.

PO7- Research Skills:- Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to food technology.
CO1: Understand technologies of post harvest technology and its role in providing better quality produce to the consumer.
CO4: Understand cold chain management so they can use it in industries.
CO5: Learn quality control and various standards required for domestic and export market.
CO6: Understand the history and role of post-harvest technology.

PO8- Application of Knowledge:- Develop a scientific out look and apply the knowledge with respect to food technology.
CO1: Understand technologies of post harvest technology and its role in providing better quality produce to the consumer.
CO2: Understand importance prevention of losses

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: Understand cold chain management so they can use it in industries.

PO10:- Team Work - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and
Food technology & engineering and its other fields related to the program.
CO2: Understand importance prevention of losses
CO3: Understand utilization of the produce and methods for shelf life extension
CO5: Learn quality control and various standards required for domestic and export market.
CO6: Understand the history and role of post-harvest technology.
CO7: Learn about the Food storage systems.
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 importance prevention of losses
CO5: Learn quality control and various standards required for domestic and export market.
CO6: Understand the history and role of post-harvest technology.

Po12:- Lifelong Learning:- Propose novel ideas in explaining the scientific data, facts and figures related to

Science and technology.

CO1: Understand technologies of post harvest technology and its role in providing better quality produce to the consumer.

CO2: Understand importance prevention of losses

CO5: Learn quality control and various standards required for domestic and export market.

CO6: Understand the history and role of post-harvest technology.

Second Year — Semester III

Post- Harvest Technology

Practical | **Paper No. – FPT-3.2**
Maximum Marks: 150 | **Credits: 6**
Teaching Period: 6/week | **Teaching Load: 30 Practicals Period/ Semester (4 Period each)**

Learning Objectives:

- To obtain that the student has the knowledge of the post-harvest physiology and technology of foods and the necessary abilities
- To design different post-harvest treatments and strategies, understanding the scientific basis.
- To study about the equipments used in post harvest technology..
- To learn about the processing of different plant foods.
- To study about the processing different food products.
- To understand the history and role of post-harvest technology.

Course Outcomes:

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

CO1: Understand technologies of post harvest technology and its role in providing better quality produce to the consumer.
CO2: Understand importance prevention of losses
CO3: Understand utilization of the produce and methods for shelf life extension
CO4: Understand cold chain management
CO5: Learn quality control and various standards required for domestic and export market.
CO6: Understand the history and role of post-harvest technology.
CO7: Learn about the processing different food products.

TOPIC-

1. Study of maturity indices of 8P
   a) Fruits
   b) Vegetables
   c) Plantation crops
2. Study of post-harvest methods in fruits and vegetables with its harvest indices 4P
3. Evaluation of physical, and biochemical changes during ripening of fruits. 5P
4. Assessment of storage technologies involved during post- harvest practices 4P
5. Study of post-harvest diseases 4P
6. Demonstration of different packaging material used in fruits, vegetables and plantation crops packing 4P
7. Evaluation of physiological loss in weight and quality of horticultural produce.4P
8. Practices in pack house treatment of fruits, vegetables and plantation crops 5P
9. Study of cold storage of grapes and bananas 5P
10. Assessment of grading of plantation crops and fruits 4P
11. Preparation of value-added product from plantation crop 5P
12. Visit to cold storage units/ Packaging house units 4P
13. Preparation of Report on Industrial Visit 4P

References:

1. Haid, N.F. and S.K. Salakahe.1997. Post -harvest physiology and hardening of fruits

andvegetables. Greada Publication, London.
2. Chadha, K .L. and O. P. Pareek, 1996. Advances in horticulture. Malhotra Publishers,New Delhi. 1997.
3. Pandey, P. H. Post- harvest technology of fruits and vegetables 1997. Technicalpublishers of India, Allahabad.
4. Jacob John, P., 2008. A Handbook on postharvest management of fruits and
5. Joseph, J. Jen. 1989. Quality factors of fruits and vegetables. Chemistry and technology1989. American Chemical Society, Washington.
6. Pandey, P. H. 1998. Principles and practices of post -harvest technology. KalyaniPublishers, New Delhi.

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

Justification for the mapping

PO1:- Disciplinary Knowledge - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and
Food technology & engineering and its other fields related to the program.
CO2: Understand importance prevention of losses
CO3: Understand utilization of the produce and methods for shelf life extension
CO5: Learn quality control and various standards required for domestic and export market.
CO6: Understand the history and role of post-harvest technology.
CO7: Learn about the Food storage systems.

PO2:- Communication Skills:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
CO2: Understand importance prevention of losses
CO5: Learn quality control and various standards required for domestic and export market.
CO6: Understand the history and role of post-harvest technology.

PO3- Critical Thinking :- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO1: Understand technologies of post harvest technology and its role in providing better quality produce to the consumer.
CO2: Understand importance prevention of losses
CO5: Learn quality control and various standards required for domestic and export market.
CO6: Understand the history and role of post-harvest technology.

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 utilization of the produce and methods for shelf life extension
CO4: Understand cold chain management so they can use it in industries.
CO5: Learn quality control and various standards required for domestic and export market.
CO6: Understand the history and role of post-harvest technology.

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: Understand technologies of post harvest technology and its role in providing better quality produce to the consumer.
CO2: Understand importance prevention of losses
CO3: Understand utilization of the produce and methods for shelf life extension
PO6- Use of Modern Tools:- Operatemoderntools,equipment,instrumentsandlaboratorytechniquesto perform the experiments and write the programs in different languages.
CO4: Understand cold chain management so they can use it in industries.
CO5: Learn quality control and various standards required for domestic and export market.

PO7- Research Skills:- Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to food technology.
CO1: Understand technologies of post harvest technology and its role in providing better quality produce to the consumer.
CO4: Understand cold chain management so they can use it in industries.
CO5: Learn quality control and various standards required for domestic and export market.
CO6: Understand the history and role of post-harvest technology.

PO8- Application of Knowledge:- Develop a scientific out look and apply the knowledge with respect to food technology.
CO1: Understand technologies of post harvest technology and its role in providing better quality produce to the consumer.
CO2: Understand importance prevention of losses

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: Understand cold chain management so they can use it in industries.

PO10:- Team Work - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and
Food technology & engineering and its other fields related to the program.
CO2: Understand importance prevention of losses
CO3: Understand utilization of the produce and methods for shelf life extension
CO5: Learn quality control and various standards required for domestic and export market.
CO6: Understand the history and role of post-harvest technology.
CO7: Learn about the Food storage systems.

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 importance prevention of losses
CO5: Learn quality control and various standards required for domestic and export market.
CO6: Understand the history and role of post-harvest technology.

Po12:- Lifelong Learning:- Propose novel ideas in explaining the scientific data, facts and figures related to

Science and technology.

CO1: Understand technologies of post harvest technology and its role in providing better quality produce to the consumer.

CO2: Understand importance prevention of losses

CO5: Learn quality control and various standards required for domestic and export market.

CO6: Understand the history and role of post-harvest technology.

Second Year **Semester III**

Food safety and Quality Management

Theory **Paper No. – FPT-303**
Maximum Marks: 100 **Credits: 4**
Teaching Period: 4/week **Teaching Load: 60 Theory Period/ Semester**

Learning Objectives

To understand the following:

- Food safety, hygiene and sanitation
- Industrial waste utilization
- Design and implementation of food safety management systems such as ISO series, HACCP and its prerequisites such as GMP, GHP etc.
- Study about the factors affecting food safety
- Learn about the importance of Importance of Safe Foods.
- Understand about the Control methods using physical and chemical agents

Course Outcomes:

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

CO1: Identify food safety hazards and their control
CO2: Identify & prevent potential sources of food contamination
CO3: Apply the principles of Hazard Analysis Critical Control Points (HACCP)
CO4: Recognize the principal legal responsibilities of food handlers regarding personal hygiene
CO5: Apply a range of food quality systems
CO6: Prepare a food safety plan
CO7: Study about the Industrial by-products and waste utilization

TOPIC.

Unit I: Food safety: Overview **12 P**
Importance of food safety, Food quality attributes, Factors affecting food safety

Unit II: Food quality management **12 P**
Food quality management systems, HACCP: Principles, examples, Application of HACCP in field level

Unit III: Good manufacturing practices (GMP) **12P**
personal cleanliness, buildings and facilities, sanitary operations, sanitary facilities and controls. Equipment and utensils, production and process control, warehousing and distribution, traceability and recall

Unit IV: Food Safety Management Systems (FSMS) **12P**
ISO, Codex Alimentarius Commission (CAC) guidelines for food quality management

Unit V: Food safety and Food Quality **12 P**
Approach of food industries to the food safety and food quality interpretation

References:

1. CAC (Codex Alimentarius Commission). 2007. Codex Alimentarius Commission – Procedural manual. Joint FAO/WHO Food Standards Programme. FAO, Rome, Italy.
2. James SJ, and James C (2010) Advances in the cold chain to improve food safety, food qualityand the food supply chain. In: Mena C, Stevens G (Eds) Delivering performance in

food supplychains.

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

Justification for the mapping

PO1:- Disciplinary Knowledge - Understand the basic concepts, fundamental principles and experimental findings and the scientific the theories related to food technology, food science and
Food technology & engineering and its other fields related to the program.
CO3: Apply the principles of Hazard Analysis Critical Control Points (HACCP)
CO5: Apply a range of food quality systems so student will Understand the basic concepts
CO7: Study about the Industrial by-products and waste utilization

PO2:- Communication Skills:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
CO2: Identify & prevent potential sources of food contamination and express their ideas for prevention.
CO5: Apply a range of food quality systems so student will Understand the basic concepts
CO6: Prepare a food safety plan so their thinking power can be grow more.

PO3- Critical Thinking :- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO2: Identify & prevent potential sources of food contamination and express their ideas for prevention.
CO5: Apply a range of food quality systems so student will Understand the basic concepts
CO6: Prepare a food safety plan so their thinking power can be grow more.
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: Apply the principles of Hazard Analysis Critical Control Points (HACCP)
CO6: Prepare a food safety plan so their thinking power can be grow more.
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: Identify food safety hazards and their control
CO3: Apply the principles of Hazard Analysis Critical Control Points (HACCP)
PO6- Use of Modern Tools:- Operatemoderntools,equipment,instrumentsandlaboratorytechniquesto perform the experiments and write the programs in different languages.
CO5: Apply a range of food quality systems so student will Understand the basic concepts
PO7- Research Skills:- Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to food technology.
CO4: Recognize the principal legal responsibilities of food handlers regarding personal hygiene

PO8- Application of Knowledge:- Develop a scientific out look and apply the knowledge with respect to food technology.
CO1: Identify food safety hazards and their control

CO2: Identify and describe the physical and biochemical changes occurring during the conversion of muscle to meat;

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 the ories related to food technology, food science and
Food technology & engineering and its other fields related to the program.

CO3: Apply the principles of Hazard Analysis Critical Control Points (HACCP)
CO5: Apply a range of food quality systems so student will Understand the basic concepts
CO7: Study about the Industrial by-products and waste utilization

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

CO2: Identify & prevent potential sources of food contamination and express their ideas for prevention.
CO5: Apply a range of food quality systems so student will Understand the basic concepts
CO6: Prepare a food safety plan so their thinking power can be grow more.

Po12:- Lifelong Learning:- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO2: Identify & prevent potential sources of food contamination and express their ideas for prevention.
CO5: Apply a range of food quality systems so student will Understand the basic concepts
CO6: Prepare a food safety plan so their thinking power can be grow more.

Second Year Semester III

Statistics and Research Methodology

Practical **Paper No. – FPT-3.3**
Maximum Marks: 100 **Credits: 4**
Teaching Period: 4/week **Teaching Load: 30 Practicals Period/ Semester (4 Period each)**

Learning Objectives:

- Study of research methodologies.
- To gain knowledge of different technical aspect of research and statistical steps involved in research process.
- To study about the Intellectual property rights (IPRs)
- To learn about Data Sampling and Collection Techniques.
- To understand about the Coding and Thematic development.
- To study the preparation of reviewing literature.

Course Outcome:

CO1: Students will understand the statistical error in the research and to overcome the research problems
CO2: The students will acknowledge the methods of research as well as Stastical background of anyresearch.
CO3: Students will learn about Data Sampling and Collection Techniques.
CO4: Students will study the preparation of Reviewing literature.
CO5: Students will study about the Intellectual property rights (IPRs)
CO6: Students will understand about the Coding and Thematic development.
CO7: The students will understand about the Qualitative Data Analysis Procedures

TOPIC

Module-1: Introduction of Research Design **4 P**
Steps in the Process of Research
Identifying a hypothesis and/or research problem, specifying a purpose, creating research questions, Reviewing literature, Ethics of research and informed consent.

Module II:Introduction to Qualitative Research **4 P**
Essence of Qualitative data, Data Sampling and Collection Techniques

Module III:Introduction to Quantitative Research **4 P**
Essence of Quantitative Data and Collection and Analysis Techniques

Module IV: Interpreting Qualitative Data **4 P**
Qualitative Data Analysis Procedures, Coding and Thematic development

Module V: Preparation of Research article **4 P**
Use of techniques and writing about findings, Intellectual property rights (IPRs): Concept of IP and IPR; Patents; Copyright; Industrial designs; Trade secrets; Ethics in publication; Plagiarism and open access publishing

References:
John Creswell Research Design: Qualitative, Quantitative, and Mixed Methods Approaches

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

Justification for the mapping

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

CO1: Students will understand the statistical error in the research and to overcome the research problems They will Understand the basic concepts of statistical error in the research.
CO3: Students will learn about Data Sampling and Collection Techniques in statistical error in the research.
CO5: Students will study about the Intellectual property rights (IPRs)
CO6: Students will understand about the Coding and Thematic development and they can use in their project.

PO2:- Communication Skills:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
CO2: The students will acknowledge the methods of research as well as Stastical background of anyresearch.
CO5: Students will study about the Intellectual property rights (IPRs) and develop various communication skills.
CO7: The students will understand about the Qualitative Data Analysis Procedures

PO3- Critical Thinking :- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO1: Students will understand the statistical error in the research and to overcome the research problems They will Understand the basic concepts of statistical error in the research.
CO2: The students will acknowledge the methods of research as well as Stastical background of anyresearch.
CO4: Students will study the preparation of Reviewing literature propose novel ideas in explaining the scientific data.
CO5: Students will study about the Intellectual property rights (IPRs)
CO6: Students will understand about the Coding and Thematic development and they can use in their project.
CO7: The students will understand about the Qualitative Data Analysis Procedures

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 will learn about Data Sampling and Collection Techniques in statistical error in the research.
CO4: Students will study the preparation of Reviewing literature propose novel ideas in explaining the scientific data.
CO5: Students will study about the Intellectual property rights (IPRs)
CO6: Students will understand about the Coding and Thematic development and they can use in their project.

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 understand the statistical error in the research and to overcome the research problems They will Understand the basic concepts of statistical error in the research.
CO2: The students will acknowledge the methods of research as well as Stastical background of anyresearch.
CO3: Students will learn about Data Sampling and Collection Techniques in statistical error in the research.
CO5: Students will study about the Intellectual property rights (IPRs)

PO6- Use of Modern Tools:- Operatemoderntools,equipment,instrumentsandlaboratorytechniquesto perform the experiments and write the programs in different languages.
CO4: Students will study the preparation of Reviewing literature propose novel ideas in explaining the scientific data.
CO5: Students will study about the Intellectual property rights (IPRs)

PO7- Research Skills:- Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to food technology.
CO4: Students will study the preparation of Reviewing literature propose novel ideas in explaining the scientific data.
CO6: Students will understand about the Coding and Thematic development and they can use in their project.

PO8- Application of Knowledge:- Develop a scientific out look and apply the knowledge with respect to food technology.
CO1: Students will understand the statistical error in the research and to overcome the research problems. They will Understand the basic concepts of statistical error in the research.
CO2: The students will acknowledge the methods of research as well as Stastical background of anyresearch.
CO5: Students will study about the Intellectual property rights (IPRs)

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 the ories related to food technology, food science and
Food technology & engineering and its other fields related to the program.
CO1: Students will understand the statistical error in the research and to overcome the research problems. They will Understand the basic concepts of statistical error in the research.
CO3: Students will learn about Data Sampling and Collection Techniques in statistical error in the research.
CO5: Students will study about the Intellectual property rights (IPRs)
CO6: Students will understand about the Coding and Thematic development and they can use in their project.

PO11:- Environment and Sustainability:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
CO2: The students will acknowledge the methods of research as well as Stastical background of anyresearch.
CO5: Students will study about the Intellectual property rights (IPRs) and develop various communication skills.
CO7: The students will understand about the Qualitative Data Analysis Procedures

Po12:- Lifelong Learning:- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO1: Students will understand the statistical error in the research and to overcome the research problems. They will Understand the basic concepts of statistical error in the research.
CO2: The students will acknowledge the methods of research as well as Stastical background of anyresearch.
CO4: Students will study the preparation of Reviewing literature propose novel ideas in explaining the scientific data.
CO5: Students will study about the Intellectual property rights (IPRs)
CO6: Students will understand about the Coding and Thematic development and they can use in their project.
CO7: The students will understand about the Qualitative Data Analysis Procedures

Second Year **Semester III**

Dissertation part-1

Practical **Paper No. – FPT-3.4**
Maximum Marks: 50 **Credits: 2**
Teaching Period: 2/week **Teaching Load: 10 Practicals Period/ Semester (4 Period each)**

Learning Objectives:

- To understand the importance of Product Development.
- To learn about the new product development
- To study about the perform market survey about new product.
- To learn about to analysis of new product.
- To understand the working of food processing industry.
- To impart knowledge and skills related to food processing industries

Course Outcomes:

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

CO1: Understand the working of food processing industry.
CO2: Impart knowledge and skills related to food processing industries
CO3: understand about the marketing survey of food product.
CO4: Understand the operations used in food processing industry.
CO5: Study about the Preparation of project report
CO6: learn about the publication of research paper into national &international journal.
CO7: understand the process of launching a new product.

INFORMATION

The dissertation shall consist of a report on any research work or a comprehensive and critical review of recent development in the subject or detailed report of the project work consisting of a design and / or development work being carried out by the candidate. The report must include comprehensive literature work and detailed work plan on the topic selected for dissertation.

Term work:

The dissertation part-I will be in the form of seminar report on the project work being carried out by the candidate and will be assessed by review committee with minimum three examiners (guide/co-guide, examiners and senior faculty member from the department).

Viva-Voce:

It shall consist of a PPT presentation by the examinee on his work in the presence of examination committee.

Note: Dissertation/research work/in-plant training will be distributed according to merit basis. E.g. 1st 50% students on the basis of merit can choose in-plant training/dissertation work while next 50% student dissertation/research work mandatory. Monthly report submission is compulsory in case of industrial training.

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

Justification for the mapping

PO1:- Disciplinary Knowledge - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and
Food technology & engineering and its other fields related to the program.
CO2: Impart knowledge and skills related to food processing industries understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science
CO5: Study about the Preparation of project report Understand the basic concepts of project report
CO6: learn about the publication of research paper into national &international journal and understand the basic fundamental principles and experimental findings.

PO2:- Communication Skills:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
CO2: Impart knowledge and skills related to food processing industries and develop various communication skills
CO5: Study about the Preparation of project report Understand the basic concepts of project report
CO6: learn about the publication of research paper into national &international journal and understand the basic fundamental principles and experimental findings.

PO3- Critical Thinking :- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO2: Impart knowledge and skills related to food processing industries and develop various communication skills
CO5: Study about the Preparation of project report Understand the basic concepts of project report
CO6: learn about the publication of research paper into national &international journal and understand the basic fundamental principles and experimental findings.

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: Study about the perform market survey about new product so the understand the marketing skill.
CO4: Learn about to analysis of new product so student can do analysis of any new product in any food industry.
CO6: learn about the publication of research paper into national &international journal.

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: understand the importance of Product Development so student can ask many questions related to their topic and understand the new product and their uses.
CO3: Study about the perform market survey about new product so the understand the marketing skill.

PO6- Use of Modern Tools:- Operatemoderntools,equipment,instrumentsandlaboratorytechniquesto perform the experiments and write the programs in different languages.

CO4: Learn about to analysis of new product so student can do analysis of any new product in any food industry.
CO5: Study about the Preparation of project report so student can easily published their research paper

PO7- Research Skills:- Understand how to design, collect, analyze, interpret **CO3:** To Study about the develop & perform market survey format for their business.
CO4: Learn about to analysis of new product so student can do analysis of any new product in any food industry.
CO6: learn about the publication of research paper into national &international journal.

PO8- Application of Knowledge:- Develop a scientific out look and apply the knowledge with respect to food technology.
CO1: understand the importance of Product Development so student can ask many questions related to their topic and understand the new product and their uses.

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 the ories related to food technology, food science and
Food technology & engineering and its other fields related to the program.
CO2: Impart knowledge and skills related to food processing industries - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science
CO5: Study about the Preparation of project report Understand the basic concepts of project report
CO6: learn about the publication of research paper into national &international journal and understand the basic fundamental principles and experimental findings.

PO11:- Environment and Sustainability:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
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Po12:- Lifelong Learning:- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
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CO5: Study about the Preparation of project report Understand the basic concepts of project report
CO6: learn about the publication of research paper into national &international journal and understand the basic fundamental principles and experimental findings.