Anekant Education Society's

Tuljaram Chaturchand College, Baramati

(Autonomous)

Three Year B.Voc Degree Program in Food Technology & Research

(Faculty of Food Technology & Research)

SY B.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 B.Voc(Food Technology & Research)

First Year: Semester-I

Subj. Code	Subject Name	No. of Credits	Marks
Theory (General Component)			
UBFP111	Principles of Food Preservation	4	100
UBFP112	Food Microbiology – I	4	100
UBFP113	Food Science – I	4	100
Practical (Skill Component)			
UBFP1111	Principles of Food Preservation	6	150
UBFP1112	Computer Application	6	150
UBFP1113	Food Science-I	6	150

First Year: Semester-II

Subj. Code	Subject Name	No. of Credits	Marks
Theory (General Component)			
UBFP121	Nutrition Science	4	100
UBFP122	Food Microbiology-II	4	100
UBFP123	Food Science – II	4	100
Practical (Skill Component)			
UBFP1211	Nutrition Science	6	150
UBFP1212	Food Microbiology-II	6	150
UBFP1213	Soft Skill Development	6	150

Second Year: Semester-III

Subj. Code	Subject Name	No. of Credits	Marks
Theory (General Component)			
FP-7	Processing of Fruits, Vegetables & Plantation Crops	4	100
FP-8	Food Analytical Techniques	4	100
FP-9	Food Chemistry-I	4	100
Practical (Skill Component)			
FP-3.1	Processing of Fruits, Vegetables & Plantation crops	6	150
FP-3.2	Food Analytical Techniques	6	150
FP-3.3	Fundamentals in Bio-Statistics	6	150

Second Year: Semester-IV

Subj. Code	Subject Name	No. of Credits	Marks
Theory (General Component)			
FP-10	Processing of Cereal, Pulses and Oilseeds	4	100
FP-11	Bakery and Confectionery Technology	4	100
FP-12	Food Chemistry-II	4	100

Practical (Skill Component)			
FP-4.1	Processing of Cereal, Pulses and Oilseeds	6	150
FP-4.2	Bakery and Confectionary Technology	6	150
FP-4.3	Food Chemistry -II	6	150

Third Year: Semester-V

Subj. Code	Subject Name	No. of Credits	Marks
Theory (General Component)			
FP-13	Dairy Technology	4	100
FP-14	Food Quality and Safety Management	4	100
FP-15	Principle of Post-Harvest Technology	4	100
Practical (Skill Component)			
FP-5.1	Dairy Technology	6	150
FP-5.2	Entrepreneurship Development	6	150
FP-5.3	Project	6	150

Third Year: Semester-VI

Subj. Code	Subject Name	No. of Credits	Marks
Theory (General Component)			
FP-16	Animal Product Technology	4	100
FP-17	Food Safety, Hygiene & Sanitation	4	100
FP-18	Packaging Technology	4	100
Practical (Skill Component)			
FP-6.1	Animal Product Technology	6	150
FP-6.2	Packaging Technology	6	150
FP-6.3	Internship	6	150

Title of the Course: B. Voc. (Food Processing & Post Harvest Technology)
(To be implemented from Academic Year - 2022-2023)

Course structure:

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

Eligibility:

1) **First Year B.Voc. (Diploma):** A student who has passed the Higher Secondary School Certificate (10+2) in any stream or its equivalent examination

2) **Second Year B.Voc. (Advanced diploma):** Keeping terms of First Year of B. Voc. and if they fulfill the eligibility conditions.

3) **Third Year B.Voc. (Degree):** Student shall pass all First Year B. Voc. courses and satisfactorily keeping terms of Second Year of B. Voc.

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

Examination Pattern:

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

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

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

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

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**
                Processing of Fruits, Vegetables and Plantation Crops
                Theory   **Paper No. FP-7**
                Maximum Marks: 100   **Credits: 4**
                Teaching Period: 4 Theory   Teaching Load: 60 Theory Period/Semester

Learning Objectives:
- To impart knowledge of different methods of fruits and vegetable processing.
- To learn about nutritional importance of fruits, vegetable and plantation crops
- To learn about processing of various spices, tea, coffee and cocoa.
- To develop the skills of various postharvest technologies and processing of food after postharvest
- To study preservation of fruits, vegetables and plantation crops
- To study various processed product, their preparation and storage methods

Course Outcome:
CO1: Students will have a thorough understanding of various food processing techniques.
CO2: The students will know the importance of various preservation techniques.
CO3: The students will knowabout nutritional importance of fruits, vegetable and plantation crops
CO4: The students will knowprocessing of various spices, tea, coffee and cocoa
CO5: The students will know various postharvest technologies and processing of food after postharvest
CO6: The students will know preservation of fruits, vegetables and plantation crops
CO7: The students will know various processed product, their preparation and storage methods

TOPIC-

Unit 1: Introduction to Fruit and Vegetable Processing   12 P
Fruit and vegetable processing industry in India, Importance, Status of fruit and vegetable processing industry and fruit product orders. Climacteric and Non-climacteric fruits, Poly-nutrients in fruits and vegetables, ripening process, handling, transportation, controlled atmosphere ripening process, modified atmosphere packaging.

Unit 2: Canning, Freezing and Dehydration of Fruits and Vegetables   12 P
Process of Canning, Equipments used in canning, Process of Freezing, Equipments used and problems associated with specific fruits and Vegetable, Dehydration- Pre-processing methods, Osmotic dehydration, Indian Food Regulations and Quality assurance

Unit 3: Fruit and Vegetable Products   12 P
Fruit Beverages, Jam, Jelly, Marmalade, preserve, candied and crystallized fruits and vegetables, pickles, chutney, sauces/Ketchups, Nectar, Cordials, Fruit Cheese, Potato products and Pectin.

Unit-4 Quality Control and Waste Utilization   12P

Quality Characteristics of Fruits and Vegetable for Processing, Quality Control in Food Processing Industry, utilization of Fruit and Vegetable waste, water for Fruit and Vegetable Processing Industries.

Unit-5: Spices, Tea, Coffee and Cocoa   **12 Period**

Processing and properties of major and minor spices, essential oils & oleoresins. Tea, coffee and cocoa processing.

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

Justification for the mapping

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

PO6- Use of Modern Tools:-

Operatemoderntools,equipment,instrumentsandlaboratorytechniquesto perform the experiments and write the programs in different languages.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Second Year   **Semester III**
Processing of Fruits, Vegetables & Plantation Crops
PRACTICAL   **Paper No. FP-3.1**
Maximum Marks: 150   **Credits: 6**
Teaching Period: 2practicals/weak   Teaching Load: 30 Practical/Semester (4 Period each)
Learning Objectives:

- To impart knowledge of different methods of fruits and vegetable processing.
- To learn about nutritional importance of fruits, vegetable and plantation crops
- To learn about processing of various spices, tea, coffee and cocoa.
- To develop the skills of various postharvest technologies and processing of food after postharvest
- To study preservation of fruits, vegetables and plantation crops
- To study various processed product, their preparation and storage methods

Course Outcome:
CO1: Students will have a thorough understanding of various food processing techniques.
CO2: The students will know the importance of various preservation techniques.
CO3: The students will knowabout nutritional importance of fruits, vegetable and plantation crops
CO4: The students will knowprocessing of various spices, tea, coffee and cocoa
CO5: The students will know various postharvest technologies and processing of food after postharvest
CO6: The students will know preservation of fruits, vegetables and plantation crops
CO7: The students will know various processed product, their preparation and storage methods

TOPIC-
1. Maturity analysis of Fruits   1P
2. Preparation of Fruit Beverages   7P
    a. Juice
    b. RTS
    c. Squash
    d. Syrup
    e. Cordial
    f. Nectar
    g. Wine
3. Preparation of Mixed Fruit Jam   1P
4. Preparation of Jelly   1P
5. Preparation of Fruit Cheese   1P
6. Preparation of Fruit Butter   1P
7. Preparation of Fruit Juice Powder   1P
8. Vegetable Pickle Preparation   2P
9. Preparation of Tomato Products   2P
    a. Ketchup/Sauce
    b. Tomato Soup
10. Preparation of Fruit Juice Powder   2P
11. Preparation of Potato Products   2P

a. Potato Wafers/chips
b. French Fries
12. Canning of fruits and vegetables   2P
13. Adulteration of spices   2P
14. Visit to Industry   3P
15. Preparation of Report on Industrial Visit   2P

References

1. Subbulakshi G ,Udapi shobha A, (2001) ,food processing and preservation , New age international (P) limited , publisher
2. Srivastava R.P, Kumar Sanjeev (1994) ,Fruits and vegetable preservation , first edition, International book distributing co.
3. S. Rangnna (1977) ,Handbook of Analysis and quality control for fruit and vegetable products (second edition) ,Tata Mcgraw –hill publishing co. limited
4. Loesecke H.W.V. (2005), Drying and dehydration of foods, Updesh purohit for agrobios (India) jodhpur.
5. S. Saraswathy , T.L.preethi , S.Balsubramanyan , J.suresh ,N. Revanthy and S. naarajan (2008) : Post harvest Management of Horticulture Crops , Dr, Updesh
6. Purohit for Agrobios (India) Jodhpur Salunkhe D.K, Kadam S.S(2005) ,Handbook of fruit science and technology ,Marcel dekker, Inc.
7. Bose T.k ,Mitra S.K ,Sanyal D (2001) , Fruits : Tropical and subtropical (vol .1), Third edition ,Partha sankar basu naya udyog.
8. Bhatiya Vijaya (2004),Preservation of fruit and vegetables, 2nd edition, Kalyani publishers

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

Justification for the mapping

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

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

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

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

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

PO2:- Communication Skills:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
CO2: Study about processing of different fruit products in food industry

PO3- Critical Thinking :- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO1: Student will able to get knowledge about working of fruit & vegetable processing industry.
CO2: Student will Study about processing of different fruit products in food industry and their health benefits.
CO6: Able to get knowledge about process of different carbonated &non-carbonated beverages.
CO7: Study about processing of different vegetable products in food industry.

PO4- Analytical Reasoning and Problem Solving- To enable the students with good scientific and engineering knowledge so as to comprehend, design, and create food products and devices for the food industry and provide solutions for the challenges in the food industry as well as in agriculture.
CO3: Learn about the working of various equipments used in fruit & vegetable industry and their working.
CO5: Understand about the formulation of different fruit & vegetable products.
CO6: Able to get knowledge about process of different carbonated &non-carbonated beverages and their health benefits.

PO5- Sense of Inquiry:- Curiously ask relevant questions for better understanding of fundamental concepts and principles, scientific theories and applications related to the study.
CO1: Student will able to get knowledge about working of fruit & vegetable processing industry.
CO2: Student will Study about processing of different fruit products in food industry and their health benefits.
CO3: Learn about the working of various equipments used in fruit & vegetable industry and their working.
CO5: Understand about the formulation of different fruit & vegetable products.
CO7: Study about processing of different vegetable products in food industry.

PO6- Use of Modern Tools:-
Operatemoderntools,equipment,instrumentsandlaboratorytechniquesto perform the experiments and write the programs in different languages.
CO1: Student will able to get knowledge about working of fruit & vegetable processing industry.
CO3: Learn about the working of various equipments used in fruit & vegetable industry and their working.

CO6: Able to get knowledge about process of different carbonated &non-carbonated beverages and their health benefits.
CO7: Study about processing of different vegetable products in food industry

PO7- Research Skills:- Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to food technology.
CO1: Student will able to get knowledge about working of fruit & vegetable processing industry.
CO3: Learn about the working of various equipments used in fruit & vegetable industry and their working.
CO5: Understand about the formulation of different fruit & vegetable products.
CO7: Study about processing of different vegetable products in food industry

PO8- Application of Knowledge:- Develop a scientific outlook and apply the knowledge with respect to food technology.
CO1: Student will able to get knowledge about working of fruit & vegetable processing industry.
CO3: Learn about the working of various equipments used in fruit & vegetable industry and their working.
CO6: Able to get knowledge about process of different carbonated &non-carbonated beverages and their health benefits.
CO7: Study about processing of different vegetable products in food industry

PO9- Ethical Awareness- To train students in professional and ethical attitude, effective communication skills, team work skills and multidisciplinary approaches related to food technology and engineering.
CO4: Student will able to Know about the adulteration of spices and their effect on food.
CO6: Able to get knowledge about process of different carbonated &non-carbonated beverages and their health benefits.
PO10:- Team Work - Understand the basic concepts, fundamental principles and experimental findings and the scientific the ories related to food technology, food science and
Food technology & engineering and its other fields related to the program.
CO1: Able to get knowledge about working of fruit & vegetable processing industry.
CO3: Learn about the working of various equipments used in fruit & vegetable industry.
CO5: Understand about the formulation of different fruit & vegetable products.
CO6: Able to get knowledge about process of different carbonated &non-carbonated beverages.

PO11:- Environment and Sustainability:- Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively.
CO2: Study about processing of different fruit products in food industry

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

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

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

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

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

Second Year   **Semester III**
                        Food Analytical Techniques
                Theory   **Paper No. FP-8**
            Maximum Marks: 100   **Credits: 4**
            Teaching Period: 4 Theory   **Teaching Load: 60 Theory Period/Semester**

Learning Objectives:
- To study importance and methods of food analysis
- To study qualitative and quantitative methods of food analysis
- To study different techniques used in analysis of food
- To study the subjective and objective evaluation of food
- To study the working principle of instruments used for analysis
- To develop the skills on the quantification technique of various components, allergens present in food products.

Course Outcome:

CO1: Students will have a thorough understanding on the working principle and instrumentation of various instruments used in food analysis

CO2: The students will know the importance of various methods to identify any malfunction aspect of food.

CO3: The students will know qualitative and quantitative methods of food analysis

CO4: The students will know different techniques used in analysis of food

CO5: The students will know the subjective and objective evaluation of food

CO6: The students will know the working principle of instruments used for analysis

CO7: The students will know the quantification technique of various components, allergens present in food products.

TOPIC-

Unit-1: Proximate analysis of food and types of solutions: 15 Periods
  Preparation of sample, Methods for estimation of moisture, protein, fat, fibre, ash and carbohydrate
  Types of Solutions: Molar Solution, Normal solution, Colloidal solutions, Buffer solutions, Measurement of pH

Unit-2: Colorimetry and spectro-photometry: 10 periods
  Principle, Beer's - Lambert's law, Construction, Working, Care of colorimeter, Standard solutions, Blank solutions

Unit-3: Spectroscopy: 10 Periods
  Electromagnetic radiation, IR spectroscopy, UV spectroscopy, AAS, NMR Spectroscopy, Mass Spectroscopy

Unit-4: **Electrophoresis:**   10 Periods

Principle, Types of electrophoresis, Moving boundary electrophoresis, Zone electrocphoresis, Isoelectric focusing, Factors affecting electrophoresis, applications

Unit-5: Flame photometer and Fluorimetry: 15 Periods
Principle, Construction, Working, Applications Fluorimetric determination of thiamin & Riboflavin
Chromatographic Techniques: Principle, Classification, Partition chromatography, Adsorption chromatography, Gel chromatography, Ion exchange chromatography, Affinity chromatography, Paper chromatography, Column chromatography, HPLC

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 the ories 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.

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:-
Operatemoderntools,equipment,instrumentsandlaboratorytechniquesto 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 the ories 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.

Second Year   **Semester III**

Food Analytical Techniques

PRACTICAL   **Paper No. FP-3.2**

Maximum Marks: 150   **Credits: 6**

Teaching Period: 2/weak   **Teaching Load: 30 Practical/Semester (4 Period each)**

Learning Objectives:
- To study importance and methods of food analysis
- To study qualitative and quantitative methods of food analysis
- To study different techniques used in analysis of food
- To study the subjective and objective evaluation of food
- To study the working principle of instruments used for analysis
- To develop the skills on the quantification technique of various components, allergens present in food products.

Course Outcome:

- **CO1:** Students will have a thorough understanding on the working principle and instrumentation of various instruments used in food analysis
- **CO2:** The students will know the importance of various methods to identify any malfunction aspect of food.
- **CO3:** The students will know qualitative and quantitative methods of food analysis
- **CO4:** The students will know different techniques used in analysis of food
- **CO5:** The students will know the subjective and objective evaluation of food
- **CO6:** The students will know the working principle of instruments used for analysis
- **CO7:** The students will know the quantification technique of various components, allergens present in food products.

TOPIC-

1. Principle and working of analytical instrument such as colorimeter, balances, oven, muffle furnace, incubator, centrifuge   3P
2. Estimation of Moisture from food sample   3P
3. Estimation of total minerals from food sample   3P
4. Estimation of Protein from food sample   3P
5. Estimation of Fat from food sample   3P
6. Qualitative test for carbohydrates   2P
7. Phenol sulphuric acid test for carbohydrates   2P
8. Estimation of starch by anthrone reagent   2P
9. Verification of Beer's and lambert's law   2P
10. Estimation of Fiber from food sample   2P
11. Determination of acidity of honey sample   1P
12. Determination of protein by Biuret method   2P
13. Visit to Food Analysis Laboratory   1P
14. Preparation of visit report & presentation   2P

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7. S. Ranganna, Hand book of analysis and quality control for fruit and vegetable products, II Ed., Tata McGraw Hill Publishing Co. New Delhi.

8. D.T.Plummer An introduction to practical biochemistry, III Ed. Tata McGraw Hill Publishing Co. New Delhi

9. Pomeranz Y., Meloan, Clifton E. 1994. Food Analysis : Theory and practice, 3rd Edn. IS: 6273 (Part-1& Part-2). Chapman and Hall. 8

10. 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 the ories 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.

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:-
Operatemoderntools,equipment,instrumentsandlaboratorytechniquesto 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 the ories 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

Second Year   **Semester III**

Food Chemistry-I

Theory	**Paper No. FP-9**
Maximum Marks: 100	**Credits: 4**
Teaching Period: 4 Theory	**Teaching Load: 60 Theory Period/Semester**

Learning Objectives:
- To understand the chemistry of foods - composition of food, role of each component and their interactions.
- To understand the functional aspects of food components and highlight their role in food processing.
- To develop the skills for structure, functions, metabolism of various components of food and their role in body.
- To study different functions of water and other nutrients in body
- To study structure and working of all nutrients
- To learn different natural and artificial colors and flavours

Course Outcome:

CO1: Students will have a thorough understanding of water as a molecule and its importance in food.

CO2: The students will know about the major and minor minerals and its importance

CO3: The students will know molecular structure of water, its reactions and filtration techniques

CO4: Students will learn different functions of water and other nutrients in body

CO5: The students will know about structure and working of all nutrients

CO6: Students will know different natural and artificial colors and flavours

CO7: Students will know role of different components of food material during metabolism and processing

TOPIC

Unit-1: Carbohydrates   **12 Periods**

General classification, distribution and importance, physical and chemical properties,synthesis and breakdown of glucose, starch, cellulose and pectic acid

Unit-2: Lipids   **12 Periods**

General classification, structure, physical and chemical properties, components of fattyacid, Technology of edible fats and oils- Refining, Hydrogenation and Inter-esterification

Unit-3: Amino acid and Proteins   **12 Periods**

Importance, classification, structure of amino acid, peptide and proteins, primary,secondary, tertiary and quaternary structure of proteins, source and distribution,physical and chemical properties, Functional properties of proteins eg. Organoleptic, solubility, viscosity, binding gelation / texturization, emulsification, foaming.

Unit-4: Food Industry Enzyme   **12 Periods**

Introduction, nature, classification, nomenclature, role, specificity, hypothesis- lock andkey, induced to fit, Enzymatic and Non-Enzymatic Browning, Maillard Reaction, Caramelization reaction, Enzymes in food industry, Industrial Uses of Enzymes.

Unit-5 Vitamins   **12 Periods**

Vitamin: Chemistry, bioavailability and role of vitamins in food- outline.

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3. Wong, Dominic WS, Food Enzymes, Chapman and Hall, New York, 1995
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5. DeMan, John M., Principles of Food Chemistry ,3rd Ed., Springer 1999
6. Desrosier, Norman W. and Desrosier.,James N.,The technology of food preservation , 4th Ed.,Westport, Conn. : AVI Pub. Co., 1977.
7. Fuller, Gordon W, New Product Development From Concept to Marketplace, CRC Press,2004.
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9. Ranganna S, Handbook of Analysis and Quality Control for Fruits and Vegetable Products, 2nd ed. TMH Education Pvt. Ltd, 1986
10. Essentials of Food Science – Vickie A. Vaclavik, Elizabeth W. Chrishtian

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	1	-	3	-	1	2	-	3	-	1
CO2	3	2	1	-	2	-	-	2		3	2	1
CO3	1	-	3	2	3	3	-	-	-	1	-	-
CO4	-	-	-	6	-	-	2	-	2	-	-	-
CO5	2	2	1	-	-	2	-	-	-	2	2	1
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 the ories 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 water as a molecule and its importance in food.
CO2: The students will know about the major and minor minerals and its importance
CO3: The students will know molecular structure of water, its reactions and filtration techniques
CO5: The students will know about structure and working of all nutrients

CO6: Students will know different natural and artificial colors and flavours
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 know about the major and minor minerals and its importance
CO5: The students will know about structure and working of all nutrients

PO3- Critical Thinking :- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO1: Students will have a thorough understanding of water as a molecule and its importance in food.
CO2: The students will know about the major and minor minerals and its importance
CO3: The students will know molecular structure of water, its reactions and filtration techniques
CO5: The students will know about structure and working of all nutrients
CO6: Students will know different natural and artificial colors and flavours
CO7: Students will know role of different components of food material during metabolism and processing

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 know molecular structure of water, its reactions and filtration techniques
CO4: Students will learn different functions of water and other nutrients in body

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 have a thorough understanding of water as a molecule and its importance in food.
CO2: The students will know about the major and minor minerals and its importance
CO3: The students will know molecular structure of water, its reactions and filtration techniques

PO6- Use of Modern Tools:-
Operatemoderntools,equipment,instrumentsandlaboratorytechniquesto perform the experiments and write the programs in different languages.
CO3: The students will know molecular structure of water, its reactions and filtration techniques
CO5: The students will know about structure and working of all nutrients

PO7- Research Skills:- Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to food technology.
CO1: Students will have a thorough understanding of water as a molecule and its importance in food.
CO4: Students will learn different functions of water and other nutrients in body
CO6: Students will know different natural and artificial colors and flavours
PO8- Application of Knowledge:- Develop a scientific outlook and apply the knowledge with respect to food technology.
CO1: Students will have a thorough understanding of water as a molecule and its importance in

food.

CO2: The students will know about the major and minor minerals and its importance

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

CO4: Students will learn different functions of water and other nutrients in body

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 have a thorough understanding of water as a molecule and its importance in food.

CO2: The students will know about the major and minor minerals and its importance

CO3: The students will know molecular structure of water, its reactions and filtration techniques

CO5: The students will know about structure and working of all nutrients

CO6: Students will know different natural and artificial colors and flavours

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 know about the major and minor minerals and its importance

CO5: The students will know about structure and working of all nutrients

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

CO1: Students will have a thorough understanding of water as a molecule and its importance in food.

CO2: The students will know about the major and minor minerals and its importance

CO3: The students will know molecular structure of water, its reactions and filtration techniques

CO5: The students will know about structure and working of all nutrients

CO6: Students will know different natural and artificial colors and flavours

CO7: Students will know role of different components of food material during metabolism and processing

Second Year   **Semester III**
Fundamentals in Bio-Statistics
        PRACTICAL   **Paper No. FP-3.3**
    Maximum Marks: 150   **Credits: 6**
    Teaching Period: 2/weak   Teaching Load: 30 Practical/Semester (4 Period each)
Learning Objectives:
- To know the role and importance of biostatistics in food technology
- To know the principles and concepts of biostatistics
- To teach techniques of collection of data and its statistical analysis
- To study different methods of sampling
- To get thorough knowledge of MS-Excel
- To develop the various skills of graphical representation of data

Course Outcome:

    CO1: Students will have a thorough understanding ofMS-Excel

    CO2: The students will know the importance of biostatistics in food technology

    CO3: Students will know about emerging technologies related to collection of data and its statistical analysis

    CO4: Students will learn different methods of sampling

    CO5: Students will learn different techniques of graphical representation of data

    CO6: Students will know about Computation of Measures of Dispersion

    CO7: Students will know about Analyzing and interpreting a given data set by using hypothesis tests

TOPIC-

1. Graphical Representation of statistical data   2P
2. Diagrammatic Representation of statistical data   2P
3. To study the methods of sampling   2P
4. Measures of central tendency   2P
5. To calculate the probability of given sample   1P
6. Determination of chi-square test   2P
7. Determination of t-test   1P
8. Computation of raw and central moment   2P
9. Measures of skewness and kurtosis   2P
10. Correlation and regression   2P
11. Curve fitting   2P
12. Computation of Measures of Dispersion.   2P
13. Analyzing and interpreting a given data set by using hypothesis tests.   2P
14. Graphical and diagrammatic Representation of statistical data using **MS-Excel**   2P
15. Computation of summary statistics using **MS-Excel**   2P
16. Correlation and regression using **MS-Excel**   2P

References:

1. Funmentals of biostatistics- Veer Bala Rastogi, Ane books publication
2. Biostatistics- P Rama Krishanan, Saras publication
3. An introduction to biostatistics- N. Gurumani, MJP publication**.**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	4	-	1	-	3	-	1	2	-	4	-	1
CO2	3	2	1	-	2	3	5	4		3	2	1
CO3	3	2	-	2	2	-	3	2	-	3	2	-
CO4	-	-	-	6	-	5	3	-	5	-	-	-
CO5	2	2	1	-	-	2	5	-	-	2	2	1
CO6	2	2	-	4	-	-	1	-	-	2	2	-
CO7	-	-	1	-	-	-	-	-	-	-	-	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: Students will have a thorough understanding ofMS-Excel
CO2: The students will know the importance of biostatistics in food technology
CO3: Students will know about emerging technologies related to collection of data and its statistical analysis
CO5: Students will learn different techniques of graphical representation of data
CO6: Students will know about Computation of Measures of Dispersion

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 know the importance of biostatistics in food technology
CO3: Students will know about emerging technologies related to collection of data and its statistical analysis
CO5: Students will learn different techniques of graphical representation of data
CO6: Students will know about Computation of Measures of Dispersion

PO3- Critical Thinking :- Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO1: Students will have a thorough understanding ofMS-Excel
CO2: The students will know the importance of biostatistics in food technology
CO5: Students will learn different techniques of graphical representation of data
CO7: Students will know about Analyzing and interpreting a given data set by using hypothesis tests

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 know about emerging technologies related to collection of data and its statistical analysis
CO4: Students will learn different methods of sampling
CO6: Students will know about Computation of Measures of Dispersion

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 have a thorough understanding ofMS-Excel

CO2: The students will know the importance of biostatistics in food technology

CO3: Students will know about emerging technologies related to collection of data and its statistical analysis

PO6- Use of Modern Tools:-

Operatemoderntools,equipment,instrumentsandlaboratorytechniquesto perform the experiments and write the programs in different languages.

CO2: The students will know the importance of biostatistics in food technology

CO4: Students will learn different methods of sampling

CO5: Students will learn different techniques of graphical representation of data

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

CO1: Students will have a thorough understanding ofMS-Excel

CO2: The students will know the importance of biostatistics in food technology

CO3: Students will know about emerging technologies related to collection of data and its statistical analysis

CO4: Students will learn different methods of sampling

CO5: Students will learn different techniques of graphical representation of data

CO6: Students will know about Computation of Measures of Dispersion

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

CO1: Students will have a thorough understanding ofMS-Excel

CO2: The students will know the importance of biostatistics in food technology

CO3: Students will know about emerging technologies related to collection of data and its statistical analysis

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

CO4: Students will learn different methods of sampling

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 have a thorough understanding ofMS-Excel

CO2: The students will know the importance of biostatistics in food technology

CO3: Students will know about emerging technologies related to collection of data and its statistical analysis

CO5: Students will learn different techniques of graphical representation of data

CO6: Students will know about Computation of Measures of Dispersion

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 know the importance of biostatistics in food technology
CO3: Students will know about emerging technologies related to collection of data and its statistical analysis
CO5: Students will learn different techniques of graphical representation of data
CO6: Students will know about Computation of Measures of Dispersion

PO12:- **Lifelong Learning:-** Propose novel ideas in explaining the scientific data, facts and figures related to Science and technology.
CO1: Students will have a thorough understanding ofMS-Excel
CO2: The students will know the importance of biostatistics in food technology
CO5: Students will learn different techniques of graphical representation of data
CO7: Students will know about Analyzing and interpreting a given data set by using hypothesis tests