



Rayat Shikshan Sanstha's
Yashwantrao Chavan Institute of Science, Satara

SYLLABUS

FOR
B.Sc. Food Processing and Packaging (Entire)
Choice Based Credit System

First Year

SEMESTER SYSTEM

I / II SEMESTERS

Effective from JUNE 2018
Year 2018-19 onwards

Syllabus for Bachelor of Science Part I: Food Processing and Packaging (Entire)

1. TITLE: Food Processing and Packaging (Entire)

2. YEAR OF IMPLEMENTATION: Syllabus will be implemented from June, 2018 onwards.

3. PREAMBLE:

This syllabus is framed to accommodate the widening horizons of the discipline of food processing and packaging. They reflect the current changing needs of the students.

Students learn Food Processing and Packaging as a separate subject from B.Sc.I, which increase the employability of students in food processing sector of Indian economy which now a days given priority in policy making. The exposure of students to the subject will enable them of independent handling of food processing and packaging unit.

The syllabus is based on basic and applied approach with vigor and depth. At the same time precaution is taken to make the syllabus comparable to the syllabi of other universities and the needs of industries and research. The units of the syllabus are well defined, taking into consideration the level and capacity of students.

4. GENERAL OBJECTIVES OF THE COURSE:

- 1) To impart knowledge of various areas related to food processing and packaging.
- 2) To enable the students to understand food composition and its physical chemical, nutritional, microbiological and sensory aspects.
- 3) To familiarize the students about the processing and preservation techniques of variety of foods.
- 4) To emphasize the importance of food safety, food quality, food laws and regulations
- 5) To expose the students to different food processes used in industries and in research field.
- 6) To prepare the students to accept the challenges in life sciences.
- 7) To develop skills required in various industries, research labs and in the field of agriculture, food, human health.
- 8) To enable the students to understand packaging materials and effective packaging processes.

5. ELIGIBILITY:

HSC or std. 12th Science of Maharashtra State Board or any other equivalent with Science

6. DURATION: The course shall be a full time of 3 years duration with 2 semesters per year

7. EXAMINATION PATTERN:

Theory – Semester Wise

Practical – Semester Wise

8. MEDIUM OF INSTRUCTION: The medium of instruction shall be in English.

9. PASSING MARKS FOR B. SC.FOOD PROCESSING AND PACKAGING:

A minimum of 40% marks in both theory and practical is required for passing.

10 .Program Structure of B.Sc.-I

YASHAVANTRAO CHAVAN INSTITUTE OF SCIENCE ,SATARA									
COURSE STRUCTURE UNDER CHOICE BASED CREDIT SYSTEM (CBCS)									
B. Sc. FOOD PROCESSNG AND PACKAGING (ENTIRE)									
B. Sc. I SEMESTER – I (Duration – 6 Months)									
Sr. No.	Course Code	Name of the Course	TEACHING SCHEME						
			Theory			Practical			
			No.of lectures	Hou rs	Credi ts	Course Code	No. of lectures	Hours	Credits
1	BFPE - 101 T	Principles of food processing and packaging -I	3	2.4	2	BFPE LAB 109 P (Food Processing& Food Additives)	4	3.2	2
2	BFPE - 102 T	Food Additives and Contaminants -I	3	2.4	2				
3	BFPE - 103 T	Food Microbiology –I	3	2.4	2	BFPE LAB 110 P (Food Microbiology& Preservation)	4	3.2	2
4	BFPE - 104 T	Food Preservation –I	3	2.4	2				
5	BFPE -105 T	Food Chemistry -I	3	2.4	2	BFPE LAB 111 P (Food Chemistry &Analytical Techniques)	4	3.2	2
6	BFPE - -106 T	Analytical Techniques -I	3	2.4	2				
7	BFPE - 107 T	Human Nutrition -I	3	2.4	2	BFPE LAB 112 P (Human Nutrition & Food processing engineering -I)	4	3.2	2
8	BFPE - 108 T	Food engineering - I	3	2.4	2				
9	BFPE - AECC-1 T	Eng-I	3	2.4	2		---	--	
	Total of SEM I		27	21.6	18		16	12.8	8

YASHAVANTRAO CHAVAN INSTITUTE OF SCIENCE ,SATARA									
COURSE STRUCTURE UNDER CHOICE BASED CREDIT SYSTEM (CBCS)									
B. Sc. FOOD PROCESSNG AND PACKAGING (ENTIRE)									
B. Sc. I SEMESTER – II (Duration – 6 Months)									
S r . N o .	Course Code	Name of the Course	TEACHING SCHEME						
			Theory			Practical			
			No.of lectures	Hours	Credits	Subject	No. of lectures	Hours	Credits
1	BFPE - 201 T	Principles of food processing and packaging-II	3	2.4	2	BFPE- LAB 209 P (Food Processing& Food Additives)	4	3.2	2
2	BFPE –202 T	Food Additives and Contaminants –II	3	2.4	2				
3	BFPE -203 T	Food Microbiology -II	3	2.4	2	BFPE- LAB 210P (Food Microbiology& Preservation)	4	3.2	2
4	BFPE –204 T	Food Preservation –II	3	2.4	2				
5	BFPE -205 T	Food Chemistry – II	3	2.4	2	BFPE- LAB 211 P (Food Chemistry Analytical Techniques)	4	3.2	2
6	BFPE -206 T	Analytical Techniques -II	3	2.4	2				
7	BFPE -207 T	Human Nutrition –II	3	2.4	2	BFPE -LAB 212 P (Human Nutrition & Food processing engineering)	4	3.2	2
8	BFPE -208 T	Food engineering -II	3	2.4	2				
9	BFPE AECC-2T	Eng-II	3	2.4	2		---	--	
	Total of SEM II		27	21.6	18		16	12.8	8
	Total of SEM I& SEM II		54	43.2	36		32	25.6	16

• Student contact hours per week : ---Hours (Min.)	• Total Marks for B.Sc.-I (Including English) : 1100
• Theory lectures and practical : 48 Minutes Each	• Total Credits for B.Sc.-I (Semester I & II) : 52
• AECC1- Ability Enhancement Compulsory Course (109 T&209 T)- English	
• Course list as per enclosed Annexure. Separate passing is mandatory for Theory, Internal and Practical.	
• Practical Examination will be conducted at semester end for 50 Marks per DSC course (subject).	

Evaluation Scheme

Semester I

Course Code	ESE	Internal Exam		Course Code	Practical		Submission	
		CCE-I	CCE-II (Online Test)		Exam	Journal	Case study/ Educational Tour/Semin ar	Day to day Performance
BFPE- 101 T	30	5	5	BFPE LAB 109 P	30	05	05	05
BFPE - 102 T	30	5	5					
BFPE - 103 T	30	5	5	BFPE LAB 110 P	30	05	05	05
BFPE - 104 T	30	5	5					
BFPE - 105 T	30	5	5	BFPE LAB -111 P	30	05	05	05
BFPE - 106 T	30	5	5					
BFPE - 107 T	30	5	5	BFPE LAB -112 P	30	05	05	05
BFPE - 108 T	30	5	5					
BFPE-AECC-109T	40	5	5					
Total of SEM I	240	40	40		120	20	20	20
	500							

Semester II

Course Code	ESE	Internal Exam		Course Code	Practical		Submission	
		CCE-I	CCE-II (Online Test)		Exam	Journal	Case study/ Educational Tour/Semin ar	Day to day Performance
BFPE - -201 T	30	5	5	BFPE LAB 209 P	30	05	05	05
BFPE - 202 T	30	5	5					
BFPE - 203 T	30	5	5	BFPE LAB -210 P	30	05	05	05
BFPE -204 T	30	5	5					
BFPE -205 T	30	5	5	BFPE LAB -211 P	30	05	05	05
BFPE -206 T	30	5	5					
BFPE -207 T	30	5	5	BFPE LAB -212 P	30	05	05	05
BFPE -208 T	30	5	5					
BFPE -AECC-2T	40	5	5					
Total of SEM II	240	40	40		120	20	20	20
	500							
TOTAL OF MARKS FOR SEMESTER I+ II: 1000 without AECC 1 and 2								

<ul style="list-style-type: none"> • Student contact hours per week : ---Hours (Min.) 	<ul style="list-style-type: none"> • Total Marks for B.Sc.-I (Excluding English) : 1000
<ul style="list-style-type: none"> • Theory lectures and practical : 48Minutes Each 	<ul style="list-style-type: none"> • Total Credits for B.Sc.-I (Semester I & II) : 52
<ul style="list-style-type: none"> • AECC1- Ability Enhancement Compulsory Course (BFPE -AECC-109T & BFPE -AECC-209T) - English • BFPE – Bachelors of Food Processing & Packaging (Entire) • ESE – End Semester Exam • CCE I&II – Comprehensive Continuous Evolution • T- Theory • P- Practical • Course list as per enclosed Annexure. <i>Separate passing is mandatory for Theory, Internal and Practical.</i> 	
<ul style="list-style-type: none"> • Practical Examination will be conducted at semester end for 50 Marks per subject. • Except English combined passing for two theory papers. Minimum 40 marks requires for passing out of 100. • There shall be separate passing for theory and practical courses. 	
<ul style="list-style-type: none"> • For Sem I & II there shall be compulsory soft skill course (SSC) under self-study mode which are as follows SSC-I: Democracy, Election, Good governance (2 Credits) SSC-II: Personality Development (2 Credits) 	

Semester –I

SR.NO	Course Code	SUBJECT TITLE
1	BFPE - 101 T	Principles of food processing and packaging -I
2	BFPE - 102 T	Food Additives and Contaminants -I
3	BFPE - 103 T	Food Microbiology -I
4	BFPE - 104 T	Food Preservation -I
5	BFPE - 105 T	Food Chemistry -I
6	BFPE - 106 T	Analytical Techniques -I
7	BFPE - 107 T	Human Nutrition -I
8	BFPE - 108 T	Food processing engineering -I
9	BFPE P-AECC-1T	Eng-I
10	BFPE LAB -109P	Food Processing & Additives-I
11	BFPE LAB 110 P	Food Microbiology & Preservation-I
12	BFPE LAB -111 P	Food Chemistry & Analytical Techniques -I
13	BFPE LAB -112 P	Human Nutrition & Food engineering -I

Semester-II

SR.NO	Course Code	SUBJECT TITLE
1	BFPE - 201 T	Principles of food processing and packaging-II
2	BFPE - 202 T	Food Additives and Contaminants -II
3	BFPE - 203 T	Food Microbiology -II
4	BFPE - 204 T	Food Preservation -II
5	BFPE - 205 T	Food Chemistry -II
6	BFPE - 206 T	Analytical Techniques -II
7	BFPE - 207 T	Human Nutrition -II
8	BFPE - 208 T	Food processing engineering -II
9	BFPE -AECC-2 T	Eng-II
10	BFPE LAB -209 P	Food Processing & Additives-II
11	BFPE LAB -210 P	Food Microbiology & Preservation-II
12	BFPE LA -211 P	Food Chemistry & Analytical Techniques --II
13	BFPE LAB -212 P	Human Nutrition & Food engineering -II

List of Instruments

1. Hot air oven
2. Incubator
3. Refrigerate
4. Tray Dryer
5. Water bath
6. Muffler Furnas
7. Auto clave
8. Food processer
9. Chromatography assembly/ analyzer
10. Soxhlet (oil/Solvent extrication)
11. Kjeldahl (Protein Extrication)
12. Clevenger apparatus (Volatile oil extrication)
13. Centrifuge
14. Crude fiber assembly
15. Deep freezer
16. Homogenizer
17. Microscope
18. Mixer Grinder
19. Muffle furnace
20. Oven
21. PH Meter
22. Refractometer
23. Texture analyzer
24. Titration assembly
25. Weighing Balance (sensitivity• according to the requirements) Any other equipment as per• requirement

SEMESTER – I

BFPE – 101- T: PRINCIPLES OF FOOD PROCESSING AND PACKAGING – I

Objectives-

- 1) To know the introduction, classification & method of primary and secondary processing for different foods.
- 2) To know the Objectives and functions of food packaging.

Unit I: Primary processing

(9 lectures)

Introduction, Classification & Method of Cleaning, Sorting, Grading, Cutting, Seeding, Chilling and freezing

Unit II: Secondary processing

(9 lectures)

Introduction, Classification & Method of Slicing, Pulping, Paste, Frying, Chilling and freezing, Milling

Unit III: Common food processing

(9 lectures)

Introduction, Classification & Method of Cooking, Baking, Frying, Roasting, Toasting, Grilling, Blanching, Extrusion

Unit IV: Introduction to Food Packaging

(9 lectures)

Objectives and functions of food packaging, Requirements for effective food packaging, Types of packaging Materials, General properties of packaging material

Recommended Readings:

1. Paine FA and Paine HY, 1992 A Handbook of Food Packaging, Blackie Academic Professional (Unit IV)
2. Rao CG. 2006, Essentials of food process engineering. B S publications(Unit I,II, III&IV)
3. Rao DG, 2010, Fundamentals of food engineering. PHI learning private Ltd. (Unit I,II, III)
4. Robertson GL, 2012, Food Packaging – Principles and Practice, CRC Press TaylorandFrancis (Unit IV)
5. Singh RP and Heldman DR, 1993, 2003, 2009, 2nd, 3rd and 4th Ed., Introduction to food engineering. Academic press. (Unit I,II, III&IV)

Learning outcomes-

1. The student should able to understand the primary processing as cleaning, sorting, grading, cutting, and blanching.
2. The student should able to understand the secondary processing as slicing, pulping, paste, frying, chilling, freezing and milling.
3. The student should able to understand the common food processes as cooking, baking, frying, toasting , roasting, grilling, blanching, extrusion.
4. The student should able to understand packaging rules, labeling, packaging techniques, bar coding.

BFPE - 102 -T: FOOD ADDITIVES, CONTAMINANTS AND TOXICOLOGY-I

Objectives-

This course will enable the student to:

- 1) Know the classification and functions of additives in food processing and preservation.
- 2) Understand the safety and quality evaluation of food additives and contaminants.

Unit I: INTRODUCTION OF FOOD ADDITIVES

(9 lectures)

Additives in food processing and preservation – classification and their functions, ADI, GRAS and naturally occurring compounds, Nutritional and non nutritional food additives

Unit II: SAFETY AND QUALITY EVALUATION

(6 lectures)

Safety and quality evaluation of food additives and contaminants, International numbering system for food additives

Unit III: Direct food additives

(12 lectures)

Preservatives, Antioxidants, Acidulants, Chelating/ Sequesterants – Introduction, their chemistry, types and functions

Unit IV: Color as Direct food additives

(9 lectures)

Colors-Types and properties, regulatory aspects, safety issues and Natural food colors- heme pigments, chlorophylls, carotenoids, anthocyanins and flavonoids, tannins, caramel and other artificial food colors

Recommended Readings

1. Fennema, O.R. Ed. 1976. Principles of Food Science: Part-I Food Chemistry. Marcel Dekker, New York. (unit I & II)
2. Potter, N.N. 1978. Food Science. 3rd Ed. AVI, Westport. (Unit I,II, III&IV)
3. Furia, T.E. 1980. Handbook of food additives. Vol I and Vol II (Unit I,II, III&IV)
4. George A.B, Encyclopedia of food color additives, Vol III;CRC Press(Unit IV)

Learning outcomes-

1. The student should be able to define food additives & learn classification of food additives
2. The student should be able to understand Safety and quality evaluation of food additives
3. The student should be able to define & understand properties and functions of Preservatives, Antioxidants, Acidulants & Chelating/ Sequesterants
4. The student should be able to define colors and learn classification of colors

BFPE LAB -109 P- FOOD PROCESSING & ADDITIVES-I

Objectives-

This lab course will enable the student :

- 1) To know the principle & working of baking, frying, roasting, grilling and blanching processes.
- 2) To understand the method of determination of adulteration in milk, cereals, oils and fats, spices etc.
- 3) To know the application of additives in bakery, fruits, vegetables, milk and meat products.

Practicals-

1. Principle & Working of baking process.
2. Principle & Working of frying process.
3. Principle & Working of Roasting process.
4. Principle & Working of grilling process.
5. Principle & Working of blanching process.
6. Identification of packaging material
7. Spectrophotometric method for total chlorophyll A & B.
8. Clarification of fruit juices.
9. Use of additives (according to GRAS) in bakery, fruits, vegetables, milk and meat products.
10. Determination of adulteration in milk, cereals, oils and fats, spices

Recommended Readings-

1. Manual of method of analysis of food(Food additives) –Food Safety and Standard Authority of India, Ministry of family welfare, Government of India, New Delhi-2012
2. Food Additives Databook-second edition-edited by Jim smith and Lily Hong-Shum.
3. Potter, N.N. 1978. Food Science. 3rd Ed. AVI, Westport.
5. Furia, T.E. 1980. Handbook of food additives. Vol I and Vol II
6. Fennema, O.R. Ed. 1976. Principles of Food Science: Part-I Food Chemistry. Marcel Dekker, New York. (unit I & II)

Learning outcomes-

1. The student should able to learn operate oven.
2. The student should able to understand end point of frying, roasting, and grilling.
3. The student should able to learn estimation of chlorophyll pigments.
4. The student should able to understand techniques of clarification of juices.
5. The student should able to select specific food additives for specific food.
6. The student should able to detect adulteration in different foods.

BFPE – 103- T: FOOD MICROBIOLOGY-I

Objectives -

- 1) To know the important contributions of various scientists & Scope of microbiology.
- 2) To know the important genera of microorganisms associated with food and their characteristics.

Unit I: History and Scope of Microbiology (9 Lectures)

Important contributions of various scientists, Scope of microbiology, Introduction to microorganisms - bacteria, algae, fungi, protozoa and viruses, importance of bacteria ,yeast , and moulds in foods.

Unit II: General Characteristics of Microorganisms (9 Lectures)

Structure of Prokaryotic and Eukaryotic cell, Morphology of bacteria: Size, Shape and Arrangements, Cytology of bacteria - structure & functions of cell wall, cell membrane, Capsules & slime layer, flagella, Pilli, nuclear material, mesosome, ribosome and spores.

Unit III: Cultivation of Micro-organisms (9 Lectures)

Pure culture technique, Methods of isolation and cultivation, Enumeration of Microorganisms- qualitative and quantitative

Unit IV: Control of Microorganisms (9 Lectures)

Definitions Sterilization, Disinfection, Antiseptic, Germicide, Microbiostasis, Antisepsis, Sanitization. Mode of action, application and advantages of: Physical agents, Chemical Agents , Gaseous Agent

Recommended Readings

1. Prescott Dunn,“ Industrial Microbiology” CBS Publisher (Unit I, II,III,IV)
2. Purohit S.S. “Microbiology fundamentals and applications” Edition 6. Publisher, Agrobios, 2003. (Unit I, II, III, IV)
3. Doyle, Beuchat and Montville “Food Microbiology” ASM press Washington. (Unit I, II, III, IV)
4. Frazier, W.C., and Westhoff, D.C.1988.Food Microbiology, 4th ed.McGraw-Hill, New York. (Unit I, II, III, IV)
5. Jay J.M. 2000. Modern Food Microbiology.6th ed.Chapman & Hall.New York, N.Y. (Unit I, II, III, IV)
6. Mossel, D.A.A., Corry, J. E. L., Struijk, C. B., and Baird, R. M. 1995. Essentials of the Microbiology of Foods. John Wiley & Sons. New York, NY. (Unit I, II, III, IV)

Learning outcomes-

1. The student should be able to define microorganism & understand scope of microbiology
2. The student should be able to draw Structure of Prokaryotic and Eukaryotic cell and understand functions of cell organelles.
3. The student should be able to learn techniques required for isolation and purification.
4. The student should be able to understand techniques required for control of microorganism

BFPE -104- T: FOOD PRESERVATION – I

Objectives:

- 1) To introduce the scope of food preservation, Principles of preservation, Preservatives and its types, Shelf life of food products.
- 2) To introduce the basics of various food processing and preservation technologies.

Unit I: Introduction of food preservation (9 lectures)

Definition and scope of food preservation, principles of preservation, preservatives and its types, shelf life of food products

Unit II: Food Preservation by high temperature (9 lectures)

Introduction, classification & method of sterilization, pasteurization, blanching and canning

Unit III: Food Preservation by Drying and dehydration (9 lectures)

Definition, drying as a means of preservation, Differences between sun drying and Dehydration (i.e. Mechanical drying), Factors affecting rate of drying, normal drying curve, Types of driers used in the food industry

Unit IV: Food Preservation by Low temperature (9 lectures)

Introduction to refrigeration, cool storage and freezing, definition & principle of freezing, freezing curve, Changes occurring during freezing, Types of freezing i.e. slow freezing, quick freezing, freeze drying, Introduction to thawing, changes during thawing and its effect on food.

Recommended Readings

1. B. Srilakshmi, Food science, New Age Publishers,2002 (Unit I,II,III,IV)
2. Meyer, Food Chemistry, New Age,2004 (Unit III)
3. Bawa. A.S, O.P Chauhan etal. Food Science. New India Publishing agency, 2013 (Unit I, II, III, IV)
4. FrazierWC and Westhoff DC, Food Microbiology, TMH Publication, New Delhi, 2004 (Unit I, II, III, IV)

Learning outcomes-

1. The student should be able to define food preservation, understand principle of preservation & learn classification of preservatives.
2. The student should be able to define and processes of Sterilization, Pasteurization, Blanching, and Canning.
3. The student should be able to understand differences between sun drying and dehydration & learn methods of dehydration
4. The student should be able to understand freezing techniques

BFPE LAB 1 -110 P-FOOD MICROBIOLOGY & PRESERVATION-I

Objectives-

This lab course will enable the student :

- 1) To know the principle & working of instruments such as incubator, oven, autoclave, water bath colorimeter, weighing balances, muffle furnace and centrifuge etc.
- 2) To know the method of weighing, adjusting the pH of media and sterilize the media by autoclaving.
- 3) To pasteurize the fluids using different methods.

Practicals-

1. Introduction to the Basic Microbiology Laboratory Practices
2. Study of instruments used for microbiology (Incubator, oven, autoclave, water bath etc.).
3. Principle and working of analytical instrument such as colorimeter, weighing Balances, muffle furnace and centrifuge
4. Functioning and use of compound microscope
5. Cleaning and sterilization of glassware
6. Preparation and sterilization of media
(Nutrient broth, Nutrient agar, MacConkeys agar, Sabouraud's agar)
7. Preparation of slant, stab and plates using nutrient agar
8. Concept of shelf life of different foods.
9. To study the concept of Asepsis and Sterilization.
10. To study the quality characteristics of foods preserved by drying/dehydration/freezing.
11. To perform the pasteurization of fluids using different methods.
12. To perform the of different plant foods.
13. Comparison of conventional and microwave processing of food.

Recommended Readings-

1. Manual of method of analysis of food(microbial testing) –Food Safety and Standard Authority of India, Ministry of family welfare, Government of India, New Delhi-2012
2. Laboratory manual for food microbiology (4th ed.) by William G. Walter.
3. Laboratory manual of Food Microbiology by Neelima Garg, K.L Garg, K.G.Mukerji.
4. Laboratory manual in food preservation, author(s): Field,M.L.Author affiliation :Uni. Of Missouri,Colombia, Missouri
5. Handbook of food preservation,2nd edition, edited by M.Shafar Rahman

Learning outcomes-

1. The student should able to learn basic microbiology laboratory practices
2. The student should able to learn how to operate different instruments used for microbiology (Incubator, oven, autoclave, water bath etc.).
3. The student should able to learn media preparation required for cultivation of different microorganism
4. The student should able to understand techniques of Cleaning and sterilization
5. The student should able to understand Preparation and sterilization of different media..
6. The student should able to learn Preparation of slant, stab and plates using nutrient agar.
7. The student should able to estimate the shelf life of different foods.
8. The student should able to understand the concept of Asepsis and Sterilization.
9. The student should able to learn the quality characteristics of foods preserved by drying/dehydration/freezing.

10. The student should be able to learn the different methods of pasteurization for different fluids.
11. The student should be able to compare the conventional and microwave processing of food.

BFPE - 105 -T: FOOD CHEMISTRY – I

Objectives:

- 1) To understand the chemistry of foods - composition of food, role of each component and their interaction.
- 2) To understand the functional aspects of food components and to study their role in food processing

Unit I : Introduction to Food Chemistry and water

(9 lectures)

Definition of food, food science, food chemistry, Composition of food, Importance of food chemistry, Water-Structure of water and ice, Phase diagram of water, Types of water, Sorption isotherms, Moisture content and Water activity

Unit II : Carbohydrates

(9 lectures)

Definition of carbohydrates, Nomenclature, Classification of Carbohydrates, Structure of carbohydrates, Chemical reactions of carbohydrates – oxidation, reduction, crystallization.

Unit III: Proteins

(9 lectures)

Definition of proteins, Chemical composition of proteins, classification and structure, Plant proteins and animal proteins

Unit IV: Lipids

(9 lectures)

Definition of fats and oils, Chemical composition of fats and oils, Classification of lipids, Physical properties of fats and oils, Chemical properties of fats and oils

Learning outcomes-

1. The student should be able to define food, food science, food chemistry and importance of food chemistry.
2. The student should be able to define Carbohydrate, its nomenclature, classification, structure and chemical reactions.
3. The student should be able to define Proteins, its classification, structure and chemical reactions.
4. The student should be able to define Lipids, its classification, structure and physical and chemical properties.

Recommended Readings:

1. Fennema, Owen R, Food Chemistry, 3rd Ed., Marcell Dekker, New York, 1996(Unit I,II,III,IV)
2. Potter,N.N.and Hotchkiss,J.H, Food Science, 5th Ed., Chapman & Hall,1995(Unit I,II,III,IV)
3. DeMan, J.M., Principles of Food Chemistry, AVI, New York, 1980. (Unit I, II, III, IV)
4. Fuller, Gordon W, New Product Development from Concept to Marketplace, CRC Press, (Unit IV) 2004.

BFPE – 106- T: ANALYTICAL TECHNIQUES – I

Objectives-

This course will enable the student to:

- 1) Know the methods of proximate analysis of food.
- 2) Understand the different types of solution.
- 3) Understand the principle of Colorimetry, Spectrophotometry and Atomic absorption spectroscopy .

Unit I : Proximate analysis of food

(9 lectures)

Introduction, Preparation of sample, Methods for estimation of moisture, protein, fat, fiber, ash and carbohydrate

Unit II: Types of Solution

(9 lectures)

Molar Solution, Normal solution, Colloidal solutions, Buffer solutions, Measurement of pH

Unit III: Colorimetry and spectrophotometry

(9 lectures)

Principle, Beer's - Lambert's law, Construction, Working, Care of colorimeter, Standard solutions, Blank solutions

Unit IV: Atomic absorption spectroscopy

(9 lectures)

Principles, Instrumentation, Applications

Recommended Readings

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

Learning outcomes-

1. The student should be able to understand Methods for estimation of moisture, protein, fat, fiber, ash and carbohydrate
2. The student should be able to understand Molar Solution, Normal solutions, Colloidal solutions, Buffer solutions etc.

3. The student should be able to understand Principle, Construction and Working of Colorimetry and spectrophotometry.
4. The student should be able to understand Principle, Instrumentation and application of Atomic absorption spectroscopy.

BFPE LAB 3-112 P FOOD CHEMISTRY & ANALYTICAL TECHNIQUES –I

Objectives-

This lab course will enable the student:

- 1) To know the method of estimation of carbohydrates, protein, reducing and non-reducing sugars, starch in food samples.
- 2) To know the method of determination of pH, acidity, Moisture Content, Ash content in different food sample.

Practical-

1. Determination of hardness of water.
2. Estimation of carbohydrates by phenol sulfuric acid method.
3. Estimation of protein by Biuret method.
4. Estimation of reducing and non-reducing sugars.
5. Estimation of starch by anthrone method.
6. Determination of smoke point for different fat and oil's.
7. Preparation of Primary and Secondary solutions.
8. Determination of pH of different food samples.
9. Determination of acidity of given food samples.
10. Determination of Moisture Content from given food samples.
11. Determination of Ash content from given food samples.
12. Estimation of Calorific value using Calorimeter

Recommended Readings-

1. The Food Chemistry Laboratory: A Manual for Experimental Foods, Dietetics, and Food Scientists, Second Edition-Connie M. Weaver, James R. Daniel
2. Food Chemistry: A Laboratory Manual -Dennis D. Miller
3. Morris B. Jacobs The chemical analysis of foods and food products, IIIrd Edition, CBS Publishers and distributors New Delhi.
4. S. Ranganna, Hand book of analysis and quality control for fruit and vegetable products, II Ed., Tata McGraw Hill Publishing Co. New Delhi.

Learning outcomes

1. The student should be able to understand the method of determination of hardness of water.
2. The student should be able to estimate total carbohydrates, protein, starch, Ash, Moisture Content from different food samples.
3. The student should be able to estimate reducing and non-reducing sugars from different food samples.

4. The student should be able to understand the method of determination of smoke point for different fats and oils.
5. The student should be able to understand preparation of Primary and Secondary solutions.
6. The student should be able to understand the method for determination of pH and acidity from different food samples.
7. The student should be able to estimate Calorific value by using Calorimeter.

BFPE – 107- T: HUMAN NUTRITION-I

Objectives-

This course will enable the student to:

- 1) Understand the relationship between food, nutrition and health.
- 2) Understand the functions of food.
- 3) Understand digestion, absorption and function of various nutrients and their sources.

Unit I: Introduction Of Food And Nutrition (9 lectures)

Basic terms used in study of Food and Nutrition, Functions of Food-physiological, psychological and social Introduction to nutrient's

Understanding relationship between food and health of people, recommended dietary allowances (RDA)

Unit II: Energy Value (9 lectures)

Introduction, Energy value of food, Daily BMR activities, Biological value of food, Basal metabolic rate (BMR)

Unit III: Nutrients (9 lectures)

Introduction, Classification, Digestion, Absorption, Metabolism, Dietary sources, RDA, Deficiency and excess of -

- a) Macronutrients- Carbohydrate, Lipids and Proteins
- b) Micronutrients -Introduction
 - Fat soluble vitamins - A, D, E, K
 - Water soluble vitamins- thiamin, riboflavin, niacin, pyridoxine, Folic acid, Pantothenic acid Vitamin B12, and vitamin C

Unit IV: Nutritional Aspect's & Composition Of Cereal & Pulses (9 lectures)

Nutritional aspects & composition Fruit's and Vegetable's, Nutritional aspects & composition of milk & milk product's, Nutritional aspects & composition fish, meat & poultry, Nutritional aspects & composition sugar & sugar products.

Recommended Readings

1. Food Science and Nutrition II Edition, Sunetra Roday, Oxford publication (Unit I, II, III, IV)
2. Advanced text book on Food and Nutrition, Vol.I and II, Second Edition. Dr. M. Swaminathan (2006), BAPPCO Publication (Unit I,II,III,IV)
3. Essentials of Human Nutrition, Third Edition: Jim Mann and A. Stewart Truswell (2010), Oxford publication (Unit I, II, III, IV)
4. Introduction to Human Nutrition, First Indian Reprint. Michel J. Gibney, Hester H. Vorster and Frans J. Kok (2002), Blackwell Publishing. (Unit I, II, III, IV)

Learning outcomes-

1. The student should be able to define food, nutrition, nutrients and the functions of food.
2. The student should be able to define energy value of food, Biological value of food, Basal metabolic index(BMI)
3. The student should be able to define nutrients, their Classification, Digestion, Absorption, Metabolism, Dietary sources, RDA, Deficiency and excess.
4. The student should be able to understand the Nutritional aspects & composition of Fruit's and Vegetable's, cereal & pulses, milk & milk products, fish, meat & poultry, sugar & sugar products etc.

BFPE – 108- T: FOOD PROCESSING ENGINEERING – I

Objectives:

- 1) To understand the principle of Unit operation
- 2) To acquaint with fundamentals of food engineering and its process

Unit I: Introduction & Size Reduction

(9 lectures)

Introduction: Unit operations in food engineering, Units and dimensions, Unit conversions, dimensional analysis, Mass and energy balance. Size Reduction: Particle size analysis, equipments, application to food industries

Unit II: Filtration & Centrifugation

(9 lectures)

Filtration: Theory of filtration, industrial filters, equipments, applications to food industries
Centrifugation: Theory of centrifugation, equipments, applications to food industries

Unit III: Distillation & Absorption

(9 lectures)

Vapour liquid equilibrium, batch & continuous distillation, azeotropes, steam distillation, equipments and applications to food industries. Diffusivity, Henry's law, equipments, scrubbers, applications to food industries

Unit IV: Grinding and mixing

(9 lectures)

Basic theory of Solid – solid mixing, liquid- liquid mixing, equipments, applications to food industries, Principle and equipments used for grinding and mixing in food industry

Recommended Readings:

- 1) Rao DG. 2010. Fundamentals of food engineering. PHI learning private ltd.
- 2) Singh RP and Heldman DR. 1993, 2003, 2009. Introduction to food engineering. Academic press 2nd, 3rd and 4th edition.
- 3) Rao C G 2006 Essentials of food process engineering. B S publications
- 4) Fellow P. 1988 Food processing technology
- 5) McCabe and Smith "Unit Operations" McGraw-Hill, New York
- 6) Transport Process and Unit Operations: Geankoplis, 3rd Edn. PHI

Learning outcomes-

5. The student should be able to understand principle of unit operation & size reduction

6. The student should be able to understand the theory of filtration & Centrifugation
7. The student should be able to understand types of distillation
8. The student should be able to understand the basic theory of grinding and mixing.

BFPE LAB -113 P HUMAN NUTRITION & FOOD PROCESSING ENGINEERING – I

Objectives-

This lab course will enable the student :

- 1) To identify the food sources for various nutrients using food composition tables.
- 2) To estimate the BMI of different age groups.
- 3) To design Nutritional labeling of food products.
- 4) To understand the process for the particle size analysis, Filtration ,Size reduction
- 5) To understand the methods of Centrifugation, Mixing, Solvent extraction

Practicals-

1. Identification of food sources for various nutrients using food composition tables.
2. Record diet of self using 24 hour dietary recall and it's nutritional analysis.
3. Introduction to meal planning concept of food exchange system
4. Planning of nutritious snacks for different age and income groups.
5. Nutritional labeling of food products.
6. Estimation of BMI of different age groups.
7. Particle size analysis.
8. Size reduction- Grains / milling,
9. Filtration- Fibers extraction,
10. Centrifugation- Starch, protein, cream,
11. Mixing- Dry solids ,
12. Distillation- Spices, volatile oil,
13. Solvent extraction

Recommended Readings:

1. Food engineering laboratory manual Author: Gustavo Barbosa-Canovas, Li Ma, Blas Barletta
2. Food Engineering Laboratory Manual 1st Edition by Gustavo V. Barbosa-Canovas (Author), Li Ma (Author), Blas J. Barletta (Author)
3. Food and nutrition; laboratory manual, Department of household science, University of Illinois by Bevier, Isabel, 1860-1942; Usher, Susannah, 1863- joint author; University of Illinois (Urbana- Champaign campus)
4. Human Nutrition For Bsc Nursing Students by B Srilakshmi Published by New Age International (P) Ltd
5. Laboratory Manual for Human Nutrition Lab Manual Edition by T. Dashman (Author)

Learning outcomes-

1. The student should be able to understand how to identify the food sources for various nutrients using food composition tables.
2. The student should be able to learn how to record diet of self using 24 hour dietary recall and it's nutritional analysis.
2. The student should be able to understand meal planning concept of food exchange system.
3. The student should be able to understand how to plan of nutritious snacks for different age and income groups.
4. The student should be able to understand how to prepare nutritional labeling of food products.
3. The student should be able to understand estimation of BMI of different age groups.
4. The student should be able to understand principal and method of Size reduction

5. The student should be able to understand principle of Filtration and select proper filtration methods for specific food.
6. The student should be able to operate centrifuge and apply centrifugation process for different food
7. The student should be able to understand method of solvent extraction, able to select proper solvent & techniques.

SEMESTER – II

BFPE - 201 -T: PRINCIPLES OF FOOD PROCESSING AND PACKAGING – II

Objectives-

- 1) To know the Scope, Importance and Future Prospects of food processing industry.
- 2) To know the classification, Scope & Importance of plant and animal food processing.

Unit I: Processing Industry

(9 Lectures)

Scope of food processing industry, Importance, Future Prospects, Sectors of food processing industry, Classification of food – perishable and semi perishable food

Unit II: Principle of plant food processing

(9 lectures)

Introduction, Classification, Scope & Importance of plant food processing- Fruit and vegetable processing, Cereal and legume processing, Oil seeds processing

Unit III: Principle of animal food processing

(9 lectures)

Introduction, Classification, Scope & Importance of animal food processing-Milk processing, Meat processing, Fish processing, Poultry processing

Unit IV: Packaging of Food

(9 lectures)

Packaging Rules, Labeling, Packaging Techniques, Bar-coding

Recommended Readings

1. Coles R, McDowell D and Kirwan MJ, Food Packaging Technology, CRC Press, 2003(Unit IV)
2. De S, Outlines of Dairy Technology, Oxford Publishers, 1980 (Unit III)
3. Jenkins WA and Harrington JP, Packaging Foods with Plastics, Technomic Publishing Company Inc., USA, 1991(IV)
4. Manay NS and Shadaksharaswamy M, Food-Facts and Principles, New Age International (P) Ltd. Publishers, New Delhi, 1987(Unit I, II, III, IV)
5. Potter NH, Food Science, CBS Publication, New Delhi, 1998 (Unit I, II, III, IV)
6. Ramaswamy Hand Marcott M, Food Processing Principles and Applications CRC Press, 2006 (Unit I, II, III, IV)
7. Ranganna S, Handbook of Analysis and Quality Control for Fruits and Vegetable, Products, 2ed. (Unit I, II, III, IV)

Learning outcomes-

1. The student should be able to understand scope of food processing sector & classify the food
2. The student should be able to learn classification plant food processing & explain processing of Fruit, vegetable, Cereal, legume & Oil seeds
3. The student should be able to learn classification of animal food processing & explain processing of Milk, Meat, Fish, Poultry
4. The student should be able to define food packaging and understand function and properties of food packaging

BFPE - 202 -T: FOOD ADDITIVES, CONTAMINANTS AND TOXICOLOGY-II

Objectives-

- 1) To know the chemistry, types and functions of direct and indirect food additives.
- 2) To understand methods for detection of Food Additives

Unit I: DIRECT FOOD ADDITIVES-I

(9 lectures)

Sweeteners- Natural and low calorie/ Non –nutritive sweeteners, Their Chemistry, Types and Functions, Emulsifiers, - Their Chemistry, Types and Function ,Stabilizers and Thickening agents- Their Chemistry, Types and Functions

Unit II: DIRECT FOOD ADDITIVES-II

(9 lectures)

Flour bleaching agents, Antimicrobial agents – Their Chemistry, Types and Functions, Anticaking agents, Humectants – Their Chemistry, Types and Functions, Flavor and flavor enhancers-Types of flavors, extraction techniques of flavors, flavor emulsions, essential oils and oleoresins.

Unit III: INDIRECT FOOD ADDITIVES

(9 lectures)

Food Contaminants – Definition, Types, Food Toxicants – Definition, Types, Terminologies in Toxicology

Unit IV: METHODS FOR DETECTION OF FOOD ADDITIVES (9lectures)

Acute and Chronic studies, Methods for Detection of Food Additives, LD50 Value

Recommended Readings

1. Fennema, O.R. Ed. 1976. Principles of Food Science: Part-I Food Chemistry. Marcel Dekker, New York. (unit I & II)
2. Potter, N.N. 1978. Food Science. 3rd Ed. AVI, Westport. (Unit I,II, III&IV)
3. Branen A.L. and Davidson, P.M. 1983. Antimicrobials in Foods. Marcel Dekker, New York. (Unit II)
4. Furia, T.E. 1980. Handbook of food additives. Vol I and Vol II (Unit I,II, III&IV)

Learning outcomes-

1. The student should able to understand chemistry, types and functions of Sweeteners , Emulsifiers, Stabilizers and Thickening agents
2. The student should able to understand chemistry, types and functions of Flour bleaching agents, Antimicrobial agents, Anticaking agents, Humectants, Flavor and flavor enhancers.
3. The student should able to define and explain the types of Food Contaminants and Food Toxicants.
4. The student should able to understand the methods for detection of food additives and LD50value.

BFPE LAB 1 -210 P-FOOD PROCESSING & ADDITIVES-II

Objectives-

This lab course will enable the student:

- 1) To know the principle & working of pulping, paste making, frying, toasting processes.
- 2) To know the method for detection of emulsifiers, stabilizers, thickeners, natural colors, benzoic acid, saccharin from different food samples.

Practicals-

1. Principle & Working of pulping process
2. Principle & Working of Paste process
3. Principle & Working of frying process
4. Principle & Working of toasting process
6. Detection of emulsifiers, stabilizers and thickeners from different food samples.
7. Isolation and estimation of synthetic food colors.
8. Identification & Estimation of natural colors.
9. Detection of Benzoic acid from food sample
10. Estimation of Saccharin from food samples

Learning outcomes-

1. The student should be able to understand and perform the processes as pulping, paste making, frying and toasting.
2. The student should be able to understand method of identification of packaging material.
3. The student should be able to learn method for detection of emulsifiers, stabilizers and thickeners from different food samples.
4. The student should be able to understand method of identification of natural colors.
5. The student should be able to understand method for detection of Benzoic acid from food sample.
6. The student should be able to understand estimation of Saccharin from food samples.

Recommended Readings-

6. Manual of method of analysis of food(Food additives) –Food Safety and Standard Authority of India, Ministry of family welfare, Government of India, New Delhi-2012
7. Food Additives Databook-second edition-edited by Jim smith and Lily Hong-Shum.
8. Potter, N.N. 1978. Food Science. 3rd Ed. AVI, Westport.
7. Furia, T.E. 1980. Handbook of food additives. Vol I and Vol II
8. Fennema, O.R. Ed. 1976. Principles of Food Science: Part-I Food Chemistry. Marcel Dekker, New York. (unit I & II)

BFPE – 203- T: FOOD MICROBIOLOGY- II

Objectives-

- 1) To know the role of microbes in fermentation, spoilage and food borne diseases.
- 2) To understand methods for isolation of pure culture and nutritional requirements of microorganisms

Unit I: Microbial contamination of food and spoilage Contamination (9 Lectures)

Contamination from air, water, soil, sewage, Techniques for evaluation of contamination, Spoilage of Specific Food Products, Food poisoning, Intoxication, Food borne illness

Unit II: Stains and staining techniques (9 Lectures)

Classification of stains- acidic, basic & neutral, Principles, Procedures, mechanisms & applications of staining procedures, Simple staining, Negative staining, Gram staining, Differential staining

Unit III: Approaches to the isolation and identification of bacteria. (9 Lectures)

Methods for isolation of pure culture-Maintenance of stock cultures – (Agar slants and Agar stabs)

Systematic study of pure cultures :

- i. Morphological characteristics.
- ii. Cultural characteristics -
- iii. Biochemical Characteristics -Sugar fermentation, Production of metabolites - H₂S gas, Production of enzymes - Amylase, Caseinase & Catalase
- iv. Serological and genetic characteristic

Unit IV: Microbial nutrition And Culture Media (9 Lectures)

Microbial Nutrition- Nutritional requirements of microorganisms, Nutritional types of microorganism based on carbon and energy sources, Culture media : Common components of media and their functions, Types of media : Living Media and Non living media

Recommended Readings:

1. Microbiology by Pelczar, M.J.Jr., Chan E.C.S., Krieq, N.R. 5th edition, 1986 (McGraw Hills Pub.) - (Unit I,II, III&IV)
2. Fundamental principles of bacteriology by A. J.Salle, Tata Mcgraw hill. (Unit I,II, III&IV)
3. Fundamentals of microbiology by Frobisher, Hindsdill, Crabtree, Good heart, W.B.Saunders Company, 7th edition. (Unit I,II, III&IV)
4. General microbiology by Stanier R.Y.Vth edition, Macmilan, London. (Unit I,II, III&IV)
5. Medical bacteriology by Dey and Dey- Allied agency, Calcutta. (Unit I,II, III&IV)
6. Food microbiology by W.C. Frazier. (Unit I,II, III&IV)
7. Introduction to Microbial Techniques by Gunasekaran.(Unit II & III)

Learning outcomes-

1. The student should able to explain Microbial contamination of food from air, water, soil, sewage, techniques for evaluation of contamination, Food poisoning, intoxication and food borne illness.
2. The student should able to explain classification of stains, the principle, mechanism, procedure and applications of different staining procedures as simple staining, gram staining, negative staining, differential staining etc.

3. The student should be able to understand the methods for isolation of pure culture, maintenance of stock culture, morphological, cultural, biochemical, serological and genetical characteristics.
4. The student should be able to understand nutritional requirements of micro-organisms, culture media, their types, media components and their functions.

BFPE – 204- T: FOOD PRESERVATION II

Objectives:

To impart basic knowledge of:

- 1) Radiation
- 2) Principles of non-thermal processing
- 3) Plasma, Bio preservation and hurdle technology

Unit I: Food preservation by Radiation

(9 lectures)

Introduction & units of irradiation, Mechanism of action of radiation, Radiation process, Effect of radiation on food, Effect of radiation on microorganisms

Unit II: Non-thermal preservation of food

(9 lectures)

Pulsed electric field processing, Ohmic heating, Dielectric heating, Microwave processing

Unit III: Other methods non-thermal food preservation

(9 lectures)

Infrared heating, High pressure processing, processing using ultrasound

Unit IV: Recent methods of food preservation

(9 lectures)

Plasma, Bio preservation, Hurdle technology

Recommended Readings:

1. Potter NH, 1998, Food Science, CBS Publication, New Delh(Unit I,II, III&IV)i
2. Ramaswamy H and Marcotte M,2009, Food Processing Principles and Applications CRC Press (Unit I,II, III&IV)
3. Deman JM,2007, Principles of Food Chemistry, 3rd Ed.Springer (Unit I,II, III&IV)
4. Manay NS and Shadaksharaswamy M,1987, Food-Facts and Principles, New Age International (P) Ltd. Publishers, New Delhi (Unit I,II, III&IV)

Learning outcomes-

1. The student should be able to define radiation, its unit, its mechanism, process and effect of radiation on food and microorganisms.
2. The student should be able to explain the non thermal preservation techniques as Pulsed electric field, Ohmic heating, Dielectric heating and microwave processing.
3. The student should be able to understand the non thermal preservation techniques as infrared heating, high pressure processing and processing using ultrasound.
4. The student should be able to understand the preservation techniques as plasma, bio preservation, hurdle technology etc.

BFPE LAB 2 -211 P FOOD MICROBIOLOGY & PRESERVATION-II

Objectives-

This lab course will enable the student :

- 1) To know the Techniques of incubation, Staining methods, Isolation of bacteria by pure culture techniques, Isolation of molds from foods
- 2) To know the method of preservation of food such as freezing, Drying, canning, Osmotic dehydration etc.

Practical-

1. Techniques of incubation (aerobic / anaerobic)
2. Cultivation and sub-culturing of microbes
3. Staining methods- (Monochrome staining, Gram staining, Negative staining, Flagella staining, Capsule staining and Endospore staining)
4. Morphological study of fungi
5. Isolation of bacteria by Pure culture techniques (streak plate / pour plate)
6. Isolation of molds from foods
7. Microbial analysis of different food samples
8. Preservation of food by the process of freezing
9. Drying of food using Tray dryer/other dryers
10. Preservation of food by canning(Fruit/Vegetable/meat)
11. Cut-out analysis of canned food.
12. Preservation by Osmotic dehydration.

Recommended Readings-

1. Manual of method of analysis of food(microbial testing) –Food Safety and Standard Authority of India, Ministry of family welfare, Government of India, New Delhi-2012
2. Laboratory manual for food microbiology (4th ed.) by William G. Walter.
3. Laboratory manual of Food Microbiology by Neelima Garg, K.L Garg, K.G.Mukerji.
4. Laboratory manual in food preservation, author(s):Field,M.L.Author affiliation :Uni. Of Missouri,Colombia, Missouri
5. Handbook of food preservation,2nd edition, edited by M.Shafar Rahman

Learning outcomes-

1. The student should able to learn techniques of incubation (aerobic / anaerobic)
2. The student should able to learn the method of cultivation and sub-culturing of microbes .
3. The student should able to perform the different staining methods –(Monochrome staining, Gram staining, Negative staining, Flagella staining, Capsule staining and Endospore staining)
4. The student should able to understand the morphological study of fungi.
5. The student should able to understand the isolation of bacteria by Pure culture techniques (streak plate / pour plate)
6. The student should able to learn the method for Isolation of molds from foods.
7. The student should able to perform the microbial analysis of different food samples.
8. The student should able to understand the method of food preservation by the process of freezing.
9. The student should able to learn how to operate tray dryer and method of drying of food in tray dryer.
10. The student should able to learn the method of preservation of Fruit/Vegetable/meat by using canning.
11. The student should able to learn method of performing cut-out analysis of canned food.
12. The student should able to learn method preservation by Osmotic dehydration and Minimal Processing of food.

BFPE -205 -T: FOOD CHEMISTRY II

Objectives:

- 1) To understand the chemistry of food components and their interactions.
- 2) To know about the role of enzymes, Enzymes in food processing, Industrial Uses of Enzymes

Unit I: Vitamins (9 Lectures)

Classification, Structure, Water soluble vitamins, Fat soluble vitamins, Effect of processing on vitamins

Unit II: Minerals (9 Lectures)

Major Minerals: Calcium, Iron, Phosphorus etc., Minor Minerals: Zinc, Magnesium, Manganese etc. Effect of processing on minerals

Unit III: Food Colors and Food Flavors (9 lectures)

Food Colors-Types, Structure, Effect of processing on color, Food Flavor-Natural flavor- Types, Structure Artificial flavor- Types, Structure Effect of processing on flavor

Unit IV: Enzymes (9 Lectures)

Introduction, Classification, General characteristics, Enzymes in food processing, Industrial Uses of Enzymes

Recommended Readings

1. DeMan, John M., Principles of Food Chemistry, 3rd Ed., and Springer 1999 (Unit I, II, III&IV)
2. Desrosier, Norman W. and Desrosier, James N., The technology of food preservation, 4th Ed., Westport, Conn. : AVI Pub. Co., 1977. (Unit I, II, III&IV)
3. Fennema, Owen R, Food Chemistry, 3rd Ed., Marcell Dekker, New York, 1996 (Unit I, II, III&IV)
4. Fuller, Gordon W, New Product Development from Concept to Marketplace, CRC Press, (Unit IV) 2004.
5. Whitehurst and Law, Enzymes in Food Technology, CRC Press, Canada, 2002 (Unit IV)

Learning outcomes-

1. The student should be able to define vitamins, its classification, structure, and type of vitamins.
2. The student should be able to explain major and minor minerals and effect of processing on minerals.
3. The student should be able to understand type and structure of color and flavor and effect of processing on food color and flavor.
4. The student should be able to define enzymes and explain their classification, general characteristics and industrial uses of enzymes.

BFPE -206 T: ANALYTICAL TECHNIQUES –II

Objectives:

To impart basic knowledge of:

- 1) Principle, construction, types and applications of electrophoresis, Flame photometer and Fluorimetry.
- 2) Principle, construction, types and applications of different Chromatographic Techniques.

Unit I: Electrophoresis

(9 lectures)

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

Unit II: Flame photometer

(9 lectures)

Principle, Construction, Working, Applications

Unit III: Fluorimetry

(9 lectures)

Principle, Working, Applications, Fluorimetric determination of thiamin & Riboflavin

Unit IV: Chromatographic Techniques

(9 lectures)

Principle, Classification, Partition chromatography, Adsorption chromatography, Gel chromatography, Ion exchange chromatography, Affinity chromatography, Paper chromatography, Column chromatography, HPLC

Learning outcomes-

1. The student should be able to explain principle of electrophoresis, its types, factors affecting electrophoresis and its application.
2. The student should be able to explain principle, construction, working and application of Flame photometer.
3. The student should be able to explain principle, working and application of Fluorimetry.
4. The student should be able to explain principle of chromatography and classification of chromatography techniques as Partition chromatography, Adsorption chromatography, gel chromatography, Ion exchange chromatography, Affinity chromatography, Paper chromatography, Column chromatography, HPLC etc.

Recommended Readings

1. Morris B. Jacobs The chemical analysis of foods and food products, III Edition, CBS Publishers and distributors New Delhi. (Unit I,II, III&IV)
2. S. Ranganna, Hand book of analysis and quality control for fruit and vegetable products, II Ed., Tata McGraw Hill Publishing Co. New Delhi. (Unit I,II, III&IV)
3. D.T.Plummer An introduction to practical biochemistry, III Ed. Tata McGraw Hill Publishing Co. New Delhi. (Unit I,II, III&IV)
4. Pomeranz Y., Meloan, Clifton E. 1994. Food Analysis: Theory and practice, 3rdEdn. IS: 6273 (Part1&Part-2). Chapman and Hall. (Unit I, II, III&IV)
5. Hand Book of analysis and quality control for fruit and Vegetable Products". II nd edition. Tata McGraw-Hill Publishing Company Ltd. New Delhi. (Unit I,II, III&IV)
6. Maynard 1970. Methods in food analysis. Academic Press Inc. U.S. (Unit I,II, III&IV)

BFPE LAB -212 P FOOD CHEMISTRY & ANALYTICAL TECHNIQUES II.

Objectives-

This lab course will enable the student :

- 1) To know the method of estimation of Fat, Volatile oil, Vitamins, Salt, Minerals, Iodine value, Saponification value from food samples.
- 2) To know the method of separation of amino acids /coal tar dyes from food sample.
- 3) To know the method determination of percent free fatty acids from food sample.
- 4) To know the working, principle and application of GLC, HPLC, Atomic Absorption, Photometer, Farinograph, UV-Spectrophotometer.

Practicals-

1. Separation of amino acids /coal tar dyes by two dimensional paper chromatography.
2. Demonstration of Kjeldahl's method for estimation of Protein content.
3. Estimation of Fat by Soxhlet method.
4. Estimation of Volatile oil by Clevenger's method.
5. Determination of Thin Layer Chromatography.
6. Demonstration of instruments: GLC, HPLC, Atomic Absorption, Photometer, Farinograph, UV-Spectrophotometer.
7. Determination of carotenoids with respects to flour pigments.
8. Estimation of vitamins.
9. Estimation of salt content in brine.
10. Estimation of salt content in butter.
11. Estimation of Minerals.
12. Estimation of iodine value of oil.
13. Estimation of saponification value of fat or oil
14. Determination of percent free fatty acids.

Recommended Readings-

1. The Food Chemistry Laboratory: A Manual for Experimental Foods, Dietetics, and Food Scientists, Second Edition-Connie M. Weaver, James R. Daniel
2. Food Chemistry: A Laboratory Manual -Dennis D. Miller
3. Morris B. Jacobs The chemical analysis of foods and food products, IIIrd Edition, CBS Publishers and distributors New Delhi.
4. S. Ranganna, Hand book of analysis and quality control for fruit and vegetable products, II Ed., Tata McGraw Hill Publishing Co. New Delhi.
5. Food Analysis and Quality Control -A Practical Manual
©Vedpal Yadav, Lecturer in Food Technology, Government Polytechnic, Mandi Adampur, Hisar, Haryana, India- 125052.

Learning outcomes-

1. The student should be able to learn method of Separation of amino acids /coal tar dyes by two dimensional paper chromatography
2. The student should be able to learn Demonstration of Kjeldahl's method for estimation of Protein content.
3. The student should be able to learn method of estimation of Fat by Soxhlet method.
4. The student should be able to understand estimation of Volatile oil by Clevenger's method.
5. The student should be able to understand method of determination of Thin Layer Chromatography.
- 7 The student should be able to learn Demonstration of instruments : GLC, HPLC, Atomic Absorption, Photometer, Farinograph, UV-Spectrophotometer.
- 8 The student should be able to learn method of Determination of carotenoids with respects to flour pigments .
- 9 The student should be able to understand method of estimation of Vitamins.
- 10 The student should be able to understand method of estimation of salt content in brine.
- 11 The student should be able to understand method of estimation of salt content in butter.
- 12 The student should be able to understand method of estimation of Minerals
- 13 The student should be able to understand method of estimation of iodine value of oil.
- 14 The student should be able to understand method of estimation of saponification value of fat or oil
- 15 The student should be able to understand method for determination of percent free fatty acids.

BFPP 207-T: HUMAN NUTRITION- II

Objectives-

- 1) To understand the concept of balanced diet, planning balanced meals, factors influencing meal planning.
- 2) To know the nutrition and food requirements of Expectant Mother, Lactating Women, Infants, Pre-school children and school children, Adolescents and During Old Age.

UNIT I: Balanced Diet and Concepts of Meal planning (9 lectures)

Concept of balanced diet, Food groups, Food Pyramids, Meal planning – Introduction, planning balanced meals, factors influencing meal planning

UNIT II : Nutritional Care Of Women's And Infants (9 lectures)

- A) Expectant Mother -Preconceptual nutrition, Nutrition and food requirements
- b) Lactating Women-Role of hormones in milk production , Nutrition and food requirements
- c) Infants -Nutrition and food requirements

UNIT III: Nutritional Care Of Children's, Adolescents and during Old Age (9 lectures)

- a) Pre-school children and school children-Nutrition and food requirements, Nutritional related problems of preschooler, packed lunches and school lunch program
- b) Adolescents and During Old Age-Nutrition requirements, food requirements, Nutritional related problems

UNIT IV: Nutritional Care Of Sport Nutrition and Diet Therapy (9 lectures)

- a) Sports Nutrition -Nutrition and food requirements, Pre-event meal
- b) Diet Therapy- Introduction, Diet in obesity and underweight, Diet in diabetes mellitus, Diet in kidney disease

Recommended Readings

1. . B.Srilakshami , Dietetics", 7th edition (Unit I,II,III,IV)
2. Food Science and Nutrition II Edition, Sunetra Roday, Oxford publication (Unit I, II, III, IV)
3. Advanced text book on Food and Nutrition, Vol.I and II, Second Edition. Dr. M. Swami Nathan (2006), BAPPCO Publication (Unit I, II, III, IV)
4. Essentials of Human Nutrition, Third Edition: Jim Mann and A. Stewart Truswell (2010), Oxford publication(Unit I,II,III,IV)
5. Introduction to Human Nutrition, First Indian Reprint. Michel J. Gibney, Hester H. Vorster and Frans J. Kok (2002), Blackwell Publishin (Unit I, II, III, IV)

Learning outcomes-

1. The student should be able to explain the concept of balanced diet, food groups, food pyramids and meal planning.
2. The student should be able to explain the nutrition and food requirements for Expectant Mother, Lactating Women, and Infants.
3. The student should be able to explain the nutrition and food requirements for Pre-school children and school children, Adolescents and During Old Age.
4. The student should be able to explain the nutrition and food requirements for sport persons and diet therapy for obesity, underweight, in diabetes mellitus, in kidney disease.

BFPE – 208- T: FOOD PROCESSING ENGINEERING – II

Objectives:

- 1) To understand the principle of blanching, pasteurization and sterilization
- 2) To understand the properties of dry-air, water-vapour & air-vapor mixtures

Unit I: Evaporation, Crystallization & Extraction, (9 lectures)

Principles of evaporation, types and selection of evaporators, mass and energy balance. Theory and principles of Crystallization. Nucleation, crystal growth, crystallization equipment. Application of crystallization in food processing
Solvent extraction, leaching, equipments. Applications to food industries

Unit II: Thermal processing (9 lectures)

Principles of Blanching, Pasteurization and Sterilization. Microbial survivor curves, thermal death time, spoilage probability, methods for process calculations

Unit III: Psychrometrics (9 lectures)

Properties of dry-air : composition of air, specific volume of air, specific heat of dry air, enthalpy of dry air, dry bulb temperature. Properties of water-vapor: Specific volume of water vapor, specific heat of water vapor, enthalpy of water vapor. Properties of air-vapor mixtures: Gibbs-Dalton law, Dew-point temp, humidity ratio (or moisture content), relative humidity, wet bulb temperature. The psychrometric chart: Use of psychrometric chart to evaluate complex air conditioning processes

Unit IV: Drying, Freezing and Refrigeration (9 lectures)

Principles of drying, drying rate kinetics, Classification, mass and energy balance. Different types of dryers and components - roller, spray, tray, fluidized bed etc Types, Concept and selection of a refrigerant, effect of low temperature on quality, equipments and freeze drying, freezing time, Pressure enthalpy charts and tables, Calculation methods.

Recommended Readings:

1. R. Paul Singh and Heldman "Introduction to Food Engg.", Academic Press, 4th ed., 2009.
2. Charm SE; "The Fundamentals of Food Engineering" AVI Pub. 1963,
3. Toledo RT "Fundamentals of Food Process Engineering"; CBS Publishers 2nd ed, 2000,
4. McCabe, Smith & Harriot; "UNIT Operations of Chemical Engineering"; 6th ed, TMH.
5. Geankopolis "Transport Processes & UNIT Operation" 3rd ed, PHI.
6. Coulson, J. M. & Richardson, J. F. "Chemical Engineering" (Vol. I & II) Second Edition,

Learning outcomes-

1. The student should be able to define & explain theory of extraction, evaporation, crystallization & select evaporators
2. The student should be able to understand principle of evaporation, blanching, pasteurization and sterilization
3. The student should be able to understand the properties of dry-air, water-vapour & air-vapor mixtures
4. The student should be able to understand the concept and selection of a refrigerant, dryer in food processing

BFPE LAB 4 -213 P - HUMAN NUTRITION AND FOOD PROCESSING ENGINEERING II

Objectives-

This lab course will enable the student:

- 1) To know the method of planning of diet chart for Pre-school children, school children, Adolescent, sport persons (an athlete), old age person.
- 2) To know the method of planning of diet chart for old age person suffering from diabetes and an Adolescent suffering from kidney stone.
- 3) To understand the process of evaporation, drying, crystallization & freezing
- 4) To understand the freezing time of a food material

Practicals-

- 1) Planning of diet chart for Pre-school children.
- 2) Planning of diet chart for school children.
- 3) Planning of diet chart for an Adolescent.
- 4) Planning of diet chart for sport persons (an athlete).
- 5) Planning of diet chart for an old age person.
- 6) Planning of diet chart for an old age person suffering from diabetes.
- 7) Planning of diet chart for an Adolescent suffering from kidney stone.
- 8) Study of evaporator
- 9) Study of dryers
- 10) Study of Freezing of foods by different methods
- 11) Study of crystallizer
- 12) Numerical problem on Thermo bacteriology (D, Z, & F)
- 13) Determination of freezing time of a food material,
- 14) Determination of air properties using psychometric chart

Recommended Readings:

1. Food engineering laboratory manual Author: Gustavo Barbosa-Canovas, Li Ma, Blas Barletta
2. Food Engineering Laboratory Manual 1st Edition by Gustavo V. Barbosa-Canovas (Author), Li Ma (Author), Blas J. Barletta (Author)
3. Food and nutrition; laboratory manual, Department of household science, University of Illinois by Bevier, Isabel, 1860-1942; Usher, Susannah, 1863- joint author; University of Illinois (Urbana- Champaign campus)
4. Human Nutrition For Bsc Nursing Students by B Srilakshmi Published by New Age International (P) Ltd
5. Laboratory Manual for Human Nutrition Lab Manual Edition by T. Dashman (Author)

Learning outcomes-

1. The student should able to learn how to plan diet chart for Pre-school children, school children, and adolescent, sport persons (an athlete), an old age person.
2. The student should able to learn how to plan diet chart an old age person suffering from diabetes.
3. The student should able to learn how to plan diet chart an Adolescent suffering from kidney stone.
4. The student should able to operate evaporator, dryer, freezer
5. The student should able to calculate problem of thermo bacteriology.
6. The student should able to operate centrifuge and apply centrifugation process for different food.
7. The student should able to determine air properties.
8. The student should able to solve problem on Thermo bacteriology (D, Z, & F)

**Nature of question paper and distribution of marks
Food processing and packaging (Except English)**

(Semester I and II)

Theory Examination

1. CCE-I:-Marks =10: Unit –I : Descriptive Short Questions (2 x 5)
 2. CCE-II : Marks =10:Unit II and III : The multiple choice: Online Examination (1x 10)
 3. ESE: Marks =50: Unit I to IV
 - Q.1 Multiple Choice Questions (1x 10)
 - Q.2 Attempt any two of out of three (2x10=20)
 - Q.3 Attempt any three of out of six (4x5=20)
- A (ECC – Comprehensive Continuous Evaluation ,ESE –End Semester Examination)

Practical Examination

Marks

Q.1 Major Experiment	15
Q.2 Minor Experiment	10
Q.4 Spotting	05
Q.5 Journal	05

35
