

**Rayat Shikshan Sanstha's**

**YASHAVANTRAO CHAVAN INSTITUTE OF  
SCIENCE, SATARA**

**(AN AUTONOMOUS COLLEGE)**

**Reaccredited by NAAC with 'A+' Grade**

**Bachelor of Science**

**Part - II**

**FOOD PROCESSING AND PACKAGING**

**Syllabus**

**to be implemented w.e. f. June, 2022**

## Structure of Course: B. Sc. II Semester III

YASHAVANTRAO CHAVAN INSTITUTE OF SCIENCE, SATARA									
COURSE STRUCTURE UNDER CHOICE BASED CREDIT SYSTEM (CBCS)									
B.Sc. FOOD PROCESSNG AND PACKAGING (ENTIRE)									
B.Sc. II SEMESTER– III (Duration– 6 Months)									
Paper No.	Course Code	Name of the Course	TEACHINGSCHEME						
			Theory			Practical			
			No. of lectures	Hours	Credits	Course Code	No. of lectures	Hours	Credits
1	BFPT- 301	Processing of fruits And vegetables	3	2.4	2	LabIXBFPP-307 Processing of Fruits, Vegetables ,Cereals and Pulses	8	6.4	4
2	BFPT- 302	Processing Of Cereals and pulses	3	2.4	2				
3	BFPT- 303	Processing of Milk and milk products	3	2.4	2	Lab XBFPP-308 Processing Of Milk and Milk products and Processing Of Meat and Poultry	8	6.4	4
4	BFPT- 304	Processing of Meat and poultry	3	2.4	2				
5	BFPT- 305	Processing of Sea foods	3	2.4	2	Lab XIBFPP-309 Processing of Sea Food Products and Food Engineering-I	8	6.4	4
6	BFPT- 306	Food Processing engineering -I	3	2.4	2				
7	AECC-3	Environmental science	3	2.4	2		---	--	
	<b>Total of SEM III</b>		<b>21</b>	<b>16.8</b>	<b>14</b>		<b>24</b>	<b>19.2</b>	<b>12</b>

## Structure of Course: B.Sc III Semester IV

YASHAVANTRAO CHAVAN INSTITUTE OF SCIENCE, SATARA									
COURSE STRUCTURE UNDER CHOICE BASED CREDIT SYSTEM (CBCS)									
B.Sc. FOOD PROCESSNG AND PACKAGING (ENTIRE)									
B.Sc. II SEMESTER– IV (Duration– 6 Months)									
Paper No	Course Code	Name of the Course	TEACHING SCHEME						
			Theory			Practical			
			No. of lectures	Hours	Credits	Course Code	No. of lectures	Hours	Credits
1	BFPT - 401	Processing of Bakery Products	3	2.4	2	LabXIIBFPP-407 Processing of Bakery and Confectionary products	8	6.4	4
2	BFPT - 402	Processing of Confectionary Products	3	2.4	2				
3	BFPT - 403	Processing of oil seeds and fats	3	2.4	2	Lab XIII BFPP -408 Processing of oil seed, fats and Plantation crops, spices	8	6.4	4
4	BFPT - 404	Processing of Plantation Crops And Spices	3	2.4	2				
5	BFPT - 405	Food biochemistry	3	2.4	2	Lab XIV BFPP-409 Biochemistry and Food Engineering-II	8	6.4	4
6	BFPT - 406	Food Processing engineering -II	3	2.4	2				
7	AECC-4	Environmental science	3	2.4	2		---	--	
	<b>Total of SEM IV</b>		<b>21</b>	<b>16.8</b>	<b>14</b>		<b>24</b>	<b>19.2</b>	<b>12</b>
	<b>Total of The Year</b>		<b>42</b>	<b>33.6</b>	<b>28</b>		<b>48</b>	<b>28.4</b>	<b>24</b>

### Evaluation Scheme- Semester III

Course Code	ESE	Internal Exam		Course Code	Practical		Internal Evaluation	
		ISE-I	ISE-II		Exam	Journal	Survey/Educational Tour/Seminar	Day to day Performance
BFPT-301	30	5	5	BFPP-308	50	10	05	05
BFPT-302	30	5	5					
BFPT – 303	30	5	5	BFPP-309	50	10	05	05
BFPT-304	30	5	5					
BFPT – 305	30	5	5	BFPP-310	50	10	05	05
BFPT – 306	30	5	5					
BFPT - AECC-307								
<b>Total of SEMII</b>	180	30	30		150	30	15	15
450								

## Evaluation Scheme-Semester IV

Course Code	ESE	Internal Exam		Course Code	Practical		Internal Evaluation	
		ISE-I	ISE-II		Exam	Journal	Survey /Educational Tour/Seminar	Day to day Performance
BFPT -401	30	5	5	BFPP-407	50	10	05	05
BFPT-402	30	5	5					
BFPT-403	30	5	5	BFPP-408	50	10	05	05
BFPT - 404	30	5	5					
BFPT-405	30	5	5	BFPP-409	50	10	05	05
BFPT-406	30	5	5					
AECC-4								
<b>Total of SEMIII</b>	180	30	30		150	30	15	15
<b>Total of year</b>	<b>TOTAL OF MARKS FOR SEMESTER III+IV: 900 Without AECC-3&amp;4</b>							

**Structure and titles of the course of B.Sc. II course- Semester-III**

<b>Code</b>	<b>Name of Course</b>	<b>Units</b>
BFPT 301	<b>PROCESSING OF FRUITS AND VEGETABLES</b> (CREDITS :02: TOTAL HOURS: 45)	<b>Unit I:</b> Introduction of Fruits and Vegetables <b>Unit II:</b> Jams, Jellies and Marmalades <b>Unit III:</b> Fruits Beverage <b>Unit IV :</b> Tomato Products and Potato Products
BFPT 302	<b>PROCESSING OF CEREALS AND PULSES</b> (CREDITS:02; TOTAL HOURS: 45)	<b>Unit I:</b> Wheat Processing <b>Unit II:</b> Rice Processing <b>Unit III :</b> Corn Processing <b>Unit IV :</b> Pulses Processing
BFPT 303	<b>PROCESSING OF MILK AND MILK PRODUCTS</b> (CREDITS:02; TOTAL HOURS : 45)	<b>Unit I:</b> Introduction of Dairy Industry <b>Unit II:</b> Introduction of Milk and Primary Processes <b>Unit III :</b> Different Milk Products <b>Unit IV :</b> By products Utilization
BFPT 304	<b>PROCESSING OF MEAT AND POULTRY</b> (CREDITS:02; TOTAL HOURS : 45)	<b>Unit I:</b> Introduction of Meat Products <b>Unit II:</b> Meat <b>Unit III :</b> Egg and Egg Products <b>Unit IV :</b> Poultry processing
BFPT 305	<b>PROCESSING OF SEA FOODS</b> (CREDITS:02; TOTAL HOURS : 45)	<b>Unit I:</b> Introduction of Sea Foods <b>Unit II:</b> Chilling and Freezing of Fish <b>Unit III:</b> Fish Curing and Smoking <b>Unit IV:</b> Canning of Fish
BFPT 306	<b>FOOD PROCESSING ENGINEERING - I</b> (CREDITS:02; TOTAL HOURS: 45)	<b>Unit I:</b> Introduction and Size Reduction <b>Unit II:</b> Filtration and Centrifugation <b>Unit III:</b> Distillation and Absorption. <b>Unit IV:</b> Grinding and mixing

**Structure and titles of the course of B.Sc. II course-Semester-IV**

Code	Name of Course	Units
BFPT 401	<b>PROCESSING OF BAKERY PRODUCTS</b> (CREDITS:02; TOTAL HOURS: 45)	<b>Unit I:</b> Introduction of Bakery Products <b>Unit II:</b> Raw Material of Bakery Products <b>Unit III:</b> Processing of Bakery Products <b>Unit IV :</b> Preservation of Bakery Products
BFPT402	<b>PROCESSING OF CONFECTIONARY PRODUCTS</b> (CREDITS:02; TOTAL HOURS: 45)	<b>Unit I:</b> Introduction of Confectionary Products. <b>Unit II:</b> Chocolate Processing <b>Unit III :</b> Sugar Confectionary <b>Unit IV :</b> Boiled and Gelatin Sweets.
BFPT 403	<b>PROCESSING OF OIL SEEDS AND FATS</b> (CREDITS:02; TOTAL HOURS: 45)	<b>Unit I:</b> Unit I: Introduction Processing of Oil Seeds and Fats <b>Unit II:</b> Extraction <b>Unit III :</b> Refining <b>Unit IV :</b> Processing of Butter
BFPT 404	<b>PROCESSING OF PLANTATION CROPS AND SPICES</b> (CREDITS:02; TOTAL HOURS: 45)	<b>Unit I:</b> Plantation Crops <b>Unit II:</b> Spices <b>Unit III :</b> Major Spices <b>Unit IV :</b> Minor Spices
BFPT 405	<b>FOOD BIOCHEMISTRY</b> (CREDITS:02; TOTAL HOURS: 45)	<b>Unit I:</b> Enzyme and Coenzyme <b>Unit II:</b> Utilization of Carbohydrates <b>Unit III:</b> Influence of Phenolic Substances on Health <b>Unit IV:</b> Utilization of Lipid and Lipid Oxidation
BFPT 406	<b>FOOD PROCESSING ENGINEERING - II</b> (CREDITS:02; TOTAL HOURS: 45)	<b>Unit I:</b> Evaporation, Crystallization and Extraction. <b>Unit II:</b> Thermal processing <b>Unit III:</b> Psychrometrics. <b>Unit IV:</b> Drying, Freezing and Refrigeration

### Semester – III

#### Course –BFPT 301 PROCESSING OF FRUITS AND VEGETABLES

**Course Objectives:** Student will be able to

1. Know classification and composition of fruits and vegetables.
2. Understand the process and defects of jam, jelly, and marmalade
3. Understand the process and preservation of different types of fruits and vegetables juices.
4. Imbibe the process tomato products.

<b>Credits (Total Credits 2)</b>	<b>SEMESTER-III BFPT 301 PROCESSING OF FRUITS AND VEGETABLES</b>	<b>No. of hours per unit/credits</b>
<b>UNIT - I</b>	<b>Introduction of Fruits and Vegetables</b>	(11)
	A) Classification and composition of fruits and vegetables Climacteric and no-climacteric fruits B) Postharvest handling, precooking, methods, post-harvest treatments C) Storage of Fruits and Vegetables–Ambient, Refrigerated, Modified atmosphere, evaporative Cold storage	
<b>UNIT - II</b>	<b>Jams, Jellies and Marmalades</b>	(11)
	A) Introduction, Jam: Constituents, selection of fruits, processing and technology. B) Jelly: Essential constituents (Role of pectin, ratio), Theory of jelly formation, Processing and technology, defects in jelly. C) Marmalade: Types, processing and technology, defects.	
<b>UNIT III</b>	<b>Fruits Beverage</b>	(12)



	A) Introduction, Processing of fruit juices Preservation of fruit juices: pasteurization, chemically preserved with sugars, freezing, drying, tetra-packing, carbonation, processing of RTS B) Processing of squashes, cordials, nectars, concentrates and powder.	
<b>UNIT IV</b>	<b>Tomato Products and Potato Products</b>	(11)
	A) Introduction, Preparation of tomato juice, Soup, Preparation of tomato puree, Ketchup B) Important consideration in potato processing, Potato chips, French fries.	

**Course outcomes:** Student should be able to

1. Explain the classification and composition of fruits and vegetables.
2. Apply the processing of jam, jellies and marmalades.
3. Demonstrate the processing of RTS, squashes, cordials, nectars, concentrates and powder.
4. Understand the important consideration in potato processing

**References-**

1. Thompson, Anthony Keith. Fruit and vegetables: harvesting, handling and storage. John Wiley & Sons, 2008. (Unit I)
2. Barta, Jozsef, M. Pilar Cano, Todd W. Gusek, Jiwan S. Sidhu, and Nirmal K. Sinha. Handbook of fruits and fruit processing. Wiley-Blackwell, 2006. (Unit II)
3. Zhao, Yanyun, and Jing Xie. "Practical applications of vacuum impregnation in fruit and vegetable processing." Trends in food science & technology 15, no. 9 (2004): 434-451. (Unit III)
4. Woodroof, Jasper, ed. Commercial fruit processing. Springer Science & Business Media, 2012. (Unit IV)

Course –**BFPT 302 PROCESSING OF CEREALS AND PULSES**

**Course Objectives:** Student will be able to

1. Know structure and composition of cereals and pulses.
2. Understand the different types of milling processes and different by products.
3. Know the barley malting process and study of different types of malts.
4. Study the different types of improved milling methods of pulses.

<b>Credits (Total Credits 2)</b>	<b>SEMESTER-III BFPT 302 PROCESSING OF CEREALS AND PULSES</b>	<b>No. of hours per unit/credits</b>
<b>UNIT - I</b>	<b>Wheat Processing</b>	<b>(11)</b>
	<p>A) Structure and chemical composition of wheat grain, Criteria of wheat quality–physical and chemical factors. Wheat milling–general principles and operations, cleaning, conditioning and roller mill system.</p> <p>B) Flour extraction rates and various flour grades and types, Criteria of flour quality, dough rheology and its measurement</p>	
<b>UNIT - II</b>	<b>Rice Processing</b>	<b>(11)</b>
	<p>A) Structure and chemical composition of rice grain, Milling of rice– types of rice mill; Sheller-cum-cone polisher mill</p> <p>B) Modern rice milling unit operation de husking, paddy separation, polishing and grading; Factors affecting rice yield during milling; rice bran as rice milling byproducts, Rice parboiling technology.</p>	
<b>UNIT - III</b>	<b>Corn Processing</b>	<b>(11)</b>
	<p>A) Structure and composition of corn grain, different types of corn.</p> <p>B) Wet and dry milling of corn, and their products, Corn sweeteners (high fructose corn syrups) and their uses.</p> <p>C) Barley malting process: steeping, germination and drying; significance of malting; Different types of malts and their food applications</p>	

<b>UNIT - IV</b>	<b>Pulses Processing</b>	<b>(12)</b>
	A) Structure, and composition of pulses, Toxic constituents in pulses, Processing of pulses, soaking, germination, decortications, cooking and fermentation B) Milling of pulses-Dry milling, Wet milling, Improved milling methods.	

**Course outcomes-**Students should be able to

1. Understand the structure and chemical composition, types and milling of rice.
2. Demonstrate the criteria for flour quality, milling methods of wheat.
3. Understand the structure and chemical composition, toxic constituents of pulses.
4. Apply the different types of improved milling methods of pulses.

#### **References**

1. Post Harvest Technology of Cereals, Pulses and Oilseeds, A. Chakraverty ,Oxfordand IBH PublishingCompany,2014.(Unit-I,IV)
2. Cereal Processing Technology, Gavin Owens, Wood Head Publishing Ltd,2000.(Unit-I,II)
3. Food Science, B.Srilakshmi, New Age International Pvt Ltd Publisher7<sup>th</sup> Edition,2018.(Unit-I,II,III)

**Course –BFPT 303 PROCESSING OF MILK AND MILK PRODUCTS****Course Objectives:** Student will able to

1. Know the present status and scope of dairy industry in India and its layout.
2. Understand the composition, food value and processing of milk.
3. Understand the processing of different milk products such as cream, butter, cheese.
4. Know the byproducts of milk and its utilization.

<b>Credits (Total Credits 2)</b>	<b>SEMESTER-III BFPT 303 PROCESSING OF MILK AND MILK PRODUCTS</b>	<b>No. of hours per unit/credits</b>
<b>UNIT - I</b>	<b>Introduction of Dairy Industry</b>	<b>(11)</b>
	A) Development of milk processing industry in India- present status and scope B) Dairy layout for small scale industry, sanitation layout, dairy equipment and sanitation.	
<b>UNIT - II</b>	<b>Introduction of Milk and Primary Processes</b>	<b>(11)</b>
	A) Food value and Composition of milk. B) Factors affecting Composition of milk, Buying, receiving, collection, Transportation of milk, storage and distribution of milk, processing of milk, filtration, clarification, cream separation and heat C) Treatment of milk.	
<b>UNIT - III</b>	<b>Different Milk Products</b>	<b>(11)</b>
	A) Milk product Processing – Cream, Butter, Khoa, Paneer, Ice-cream Condensed milk and evaporated milk. B) Judging and grading of milk and its products C) Manufacturing of Cheddar cheese–Introduction, Manufacturing process, packaging, storage, defects and their prevention D) Dried milk products–Buttermilk powder, Whey Powder, Ice Cream mix Powder, Infant milk food, WMP and SMP.	
<b>UNIT - IV</b>	<b>By products Utilization</b>	<b>(12)</b>
	A) Introduction, Classification and Composition of byproducts. B) Principles and methods of Utilization Whey utilization and whey-based beverages like lassi and buttermilk.	

**Course outcomes-**Students should be able to

1. Apply the processing of different milk products- cream, butter, khoa, paneer, ice-cream, condensed milk.
2. Demonstrate the processing of evaporated milk, cheddar cheese, dried milk products.
3. Understand the buying, receiving, collection, transportation, storage and distribution of milk
4. Explain the classification and composition of byproduct

**References**

1. OutlinesofDairyTechnology, SukumaDe, OxfordUniversityPress,1stedition,2001. (Unit-I)
2. Dairy Engineering Advanced Technologies and Their Applications, RupeshS Chavan, NetraRGoyal, MurlidharMeghwal, TaylorandFancis,1stedition,2017. (Unit-II)
3. DairyTechnology, Shivashraya Singh,illustrated, NewIndiaPublishingAgency-Nipa,2013. (Unit-III)
4. StructureofDairyProducts, A.Y.Tamime,Wiley-Blackwell,1stedition,2007. (Unit-IV)
5. IndianDairyProducts, RangappaK.S., AsiaPub.House,2ndedition,1975. (Unit-I and UnitII)

Course –**BFPT 304 PROCESSING OF MEAT AND POULTRY**

**Course Objectives:** Student will be able to

1. Know importance of meat production, chemical composition.
2. Understand the slaughtering methods and meat and poultry products
3. Understand the structure, composition and nutritive value, quality evaluation of eggs
4. Understand the chemical and nutritive value of poultry meat.

<b>Credits (Total Credits 2)</b>	<b>SEMESTER-III BFPT 304</b>	<b>No. of hours per unit/credits</b>
<b>UNIT - I</b>	<b>Introduction of Meat Products</b>	<b>(11)</b>
	A) Introduction and Importance of meat products in India B) Chemical Composition and microscopic structure of meat, Transportation, feeding of animal before slaughtering	
<b>UNIT - II</b>	<b>Meat</b>	<b>(11)</b>
	A) Ante-mortem examination of meat animals, Pre – slaughtering operation B) Scientific techniques of slaughtering, Post-mortem inspection, Storage, Preservation	
<b>UNIT - III</b>	<b>Egg and Egg Products</b>	<b>(12)</b>
	A) Egg: Structure, composition and nutritive value, Storage and shelf life problems B) Quality evaluation of eggs C) Egg products : egg powder, value added egg products, Preservation	
<b>UNIT - IV</b>	<b>Poultry Processing</b>	<b>(11)</b>
	A) Poultry products: types, chemical and nutritive value of poultry meat B) Slaughtering and evaluation of poultry carcasses C) Poultry cut-up parts and meat / bone ratio, Preservation of poultry meat	

**Course outcomes-**Students should be able to

1. Understand the meat production and chemical composition.
2. Apply the pre and post inspection, storage and preservation of meat and poultry products.
3. Understand the storage, shelf life, quality evaluation and preservation egg and egg products
4. Demonstrate the preservation of poultry meat.

**References**

1. Meat,Poultry&FishProductsTechnology,SyedImranHashmi,V  
NMAUParbhani ( Unit III and Unit- IV)
2. PrinciplesofMeatScienceAberleE.D.KendallHuntPublication,Fift  
hedition,2012 (Unit-II)
3. HandbookofHeatandMeatProcessingHueY.H.CRCPress,NewYork,2012
4. Meat Processing Improving Quality, Joseph Kerry.( (Unit-I and Unit II)
5. ProcessedMeats,A.M.Pearson,SecondEdition2011 (Unit-II)
6. Meat Science, Lawrie R A, Lawrie's, WoodheadPublisherEngland,5<sup>th</sup>Ed, 2017.  
(Unit-II)

Course –**BFPT 305 PROCESSING OF SEA FOODS**

**Course Objectives:** Student will be able to

1. Know fish processes and factors affecting the quality of fresh fish.
2. Understand the byproduct utilization of fish industry
3. Imbibe the preservation of fish preservation by smoking.
4. Study the principle of fish canning.

<b>Credits (Total Credits 2)</b>	<b>SEMESTER-III BFPT 305 PROCESSING OF SEAFOODS</b>	<b>No. of hours per unit/credits</b>
<b>UNIT - I</b>	<b>Introduction of Sea Foods</b>	<b>(11)</b>
	A) Introduction, fisheries resources of the world B) Types of fish, Water activity and shelf-life C) Factors affecting quality of fresh fish. D) Fish processing: manufacturing of fish paste and sauces, fish oil, fish protein concentrates and fishmeal. E) By-products of the fish industry and their utilization.	
<b>UNIT - II</b>	<b>Chilling and Freezing of Fish</b>	<b>(11)</b>
	A) Relationship between chilling and storage life, MAP, general aspects of freezing. B) Freezing systems (air blast freezing, plate or contact freezing, sprayer immersion freezing) C) Changes in quality in chilled and frozen storage, thawing.	
<b>UNIT - III</b>	<b>Fish Curing and Smoking</b>	<b>(12)</b>
	A) Drying and salting of fish, salting process. B) Salting methods (brining, pickling, kench curing, Gaspecuring) C) Dried and salted fish products-pindang, fish wood, dried shrimp. D) Preservation by smoking, smoke production, smoke components, quality, safety and nutritive value of smoked fish, processing and equipment, pre-smoking processes, smoking process control. E) Traditional chimney kiln, modern mechanical fish smoking kiln, Examples of smoked and dried products.	



<b>UNIT - IV</b>	<b>Canning of Fish</b>	<b>(11)</b>
	<p>A) Principles of canning, classification based on pH groupings</p> <p>B) Effect Of Heat Processing On fish, Pre- process operations and post process operations.</p> <p>C) Storage of- Canned fish Cannery operations for specific canned products-Tuna,Mackerel,Sardine.</p>	

**Course outcomes-**Students should be able to

1. Understand Fishery resources, types of fish, water activity and shelf-life.
2. Understand The General aspects of freezing.
3. Demonstrate the chilling and freezing of fish
4. Apply the pre and post process operations and storage of fish.

### **References**

1. Fish Processing Technology, George. M. Hall published by Backie academic and professional,2ndedition.( Unit I, II, III, IV)
2. Applications of Seafood By-products in food industry and Human Nutrition, Janak. K. Vidanarachchi, Senaka Ranadheera, Wijerathne, R.M.C,S.M.C, Himali, Udayagani and Jana Pickova published Springer New York, Editors: Se-Kwon Kim ( Unit I )
3. Post-harvest technology of fish and fish products, K. K. Balachandran published DAYA publishing house,2016. ( Unit II, III, IV)
4. Advances in Fish Processing Technology, D. P. Sen, published, Allied publishers, Feb2005.( UnitI , II , IV)

## Course –BFPT 306 FOOD PROCESSING ENGINEERING – I

**Course Objectives:** Student will be able to

1. Know the principle of unit operation.
2. Acquaint with fundamentals of food engineering and its process.
3. Understand the theory and applications of filtration, centrifugation and distillation
4. Imbibe the theory and applications of grinding and mixing.

<b>Credits (Total Credits 2)</b>	<b>SEMESTER-III BFPT 306 FOOD PROCESSING ENGINEERING – I</b>	<b>No. of hours per unit/credits</b>
<b>UNIT - I</b>	<b>Introduction and Size Reduction.</b>	<b>(11)</b>
	A) Introduction: Unit operations in food engineering, Units and dimensions, Unit conversions, dimensional analysis, Mass and energy balance. B) Size Reduction: Particle size analysis, equipments, application to food industries	
<b>UNIT - II</b>	<b>Filtration and Centrifugation</b>	<b>(11)</b>
	A) Filtration: Theory of filtration, industrial filters, equipments, applications to food industries B) Centrifugation: Theory of centrifugation, equipments, applications to food industries	
<b>UNIT - III</b>	<b>Distillation and Absorption</b>	<b>(12)</b>
	A) Vapor liquid equilibrium, batch and continuous distillation, azeotropes, steam distillation, equipments and applications to food industries, Diffusivity, B) Henry's law, equipments, scrubbers, applications to food industries.	
<b>UNIT - IV</b>	<b>Grinding and mixing</b>	<b>(11)</b>
	A) Basic theory of Solid – solid mixing, liquid- liquid mixing, equipments, applications to food industries, B) Principle and equipments used for grinding and mixing in food industry.	

**Course outcomes-Students should be able to**

1. Apply the principle of size reduction
2. Understand the theory and applications of filtration.
3. Demonstrate the different equipment used for distillation process
4. Explain the basic theory and applications of mixing.

**References**

1. Transport Process and Unit Operations: Christie J. Geankoplis ,Pearson College Div,3<sup>rd</sup>Edition,1 April 1993 (UNIT- I,II,III)
2. Introduction to food engineering. Singh RP and Heldman D.R., Academic press, 4th edition, 2008
3. Transport Process and Unit Operations: Christie J. Geankoplis ,Pearson College Div,3<sup>rd</sup>Edition,1 April 1993(UNIT- I,II,III)
4. Transport Process and Unit Operations: Christie J. Geankoplis ,Pearson College Div,3<sup>rd</sup>Edition,1 April 1993(UNIT- I,II,III)
5. Transport Process and Unit Operations: Christie J. Geankoplis ,Pearson College Div,3<sup>rd</sup>Edition,1 April 1993(UNIT- I,II,III)
6. Essentials of food process engineering: Rao C. G., BS publications,2006.(UNIT- I,II,III)
7. Food Processing Technology: Principles and Practice by P.J. Fellows,Elsevier Science,3rd edition,22 June 2009.(UNIT- I,II,III)

**BFPP307-PROCESSING OF FRUITS, VEGETABLES, CEREALS AND PULSES  
LAB IX**

**Course Objectives:** Student will be able to

1. Understand the principle and working of tray dryer, brixo meter.
2. Understand the process of different fruit and vegetable product.
3. Study the physico-chemical properties of food grains and pulses.
4. Learn the cooking quality of rice

<b>Credits (Total Credit 04)</b>	<b>SEMESTER-III BFPP 307</b>	<b>No. of hours per unit/credits</b>
<b>PART-I</b>	<b>PROCESSING OF FRUITS AND VEGETABLES</b>	
1	Preparation of squash.	
2	Preparation of RTS	
3	Identification of equipment required for fruit and vegetable processing	
4	Preparation of instant fruit juice.	
5	Preparation of Syrup	
6	Preparation of am, Marmalade	
7	Preparation of Jellies	
8	Preparation of Tomato Ketchup	
9	Preparation of Preserve and Candied Fruit	
10	Preparation of Pickle	
11	Preparation of food product by drying: Leafy vegetable	
<b>PART- II</b>	<b>PROCESSING OF CEREALS AND PULSES</b>	
1	Determination of gluten content in wheat flour	
2	Preparation of malt	
3	To study the cooking quality of rice using water up takes method	

4	To study physio-chemical properties of food grains	
5	Determination of physical properties pulses.	
6	Determination of Hundred grain weight of grains	
7	Determination of bulk density, true density, porosity of grains.	
8	Parboiling of paddy	
9	Preparation of instant dhokla mix	

**Course outcomes:** Students should be able to

1. Operate tray dryer, refractometer.
2. Prepare different types of fruit and vegetable products.
3. Learn physico-chemical properties of cereal and pulses.
4. Demonstrate different types of malts

#### **Practical references**

1. Hand book of Analysis and Quality Control for Fruit and Vegetable Products
2. S.Ranganna, Handbook of Analysis and Quality Control for Fruit and Vegetable Products
3. Dr.VishnuK. Garande, Post Harvest And Management And Value Addition Of Fruit And Vegetables. College Of Agricultural, Mahatma Phule KrishiVidyapeeth,Rahuri
4. <http://www.egyankosh.ac.in/bitstream/123456789/45805/1/Practical%20Manual.pdf>.
5. <https://www.fortunefoods.com/sites/default/files/Khaman%20Dhokla%20Recipe.pdf>

**BFPP-308 PROCESSING OF MILK , MEAT AND POULTRY PRODUCTS LAB: X****Course Objectives:** Student will be able to

1. Know the principle and working of hydrometer.
2. Understand the processing of milk products.
3. Learn the method of slaughtering and dressing of meat animals.
4. Understand the quality analysis of meat, egg etc.

<b>Credits (Total Credit 04)</b>	<b>SEMESTER-III BFPP 308</b>	<b>No. of hours per unit/credits</b>
<b>PART-I</b>	<b>PROCESSING OF MILK AND MILK PRODUCT</b>	
1	Platform tests in milk.(Acidity, COB, specific gravity, SNF, Organoleptic test)	
2	Estimation of milk fat	
3	Adulteration tests for different foods: Milk and milk products	
4	Preparation of Flavoured milk	
5	Preparation of Curd	
6	Preparation of Shrikhand	
7	Preparation of Khoa	
8	Preparation of Paneer	
9	Preparation of Condensed milk	
10	Preparation of whey based beverages	
11	Preparation of Ice-cream and Kulfimix	
12	MBRT and Phosphatase test for milk	
<b>PART- II</b>	<b>PROCESSING OF MEAT AND POULTRY</b>	
1	Slaughtering and dressing of meat animals	
2	Slaughtering and dressing of meat animals	

3	Preservation of meat by different methods	
4	Estimation of moisture content of meat	
5	Analysis of frozen meat/meat emulsion products (Chemical and Microbial)	
6	To study shelf-life of eggs by different methods of preservation	
7	Evaluation of eggs for quality parameters market eggs	
8	Evaluation of eggs for quality parameters of eggs	
9	To perform freezing of yolk/albumen	
10	Meat/Egg product formulation	

**Course outcomes:** Students should be able to

1. Perform plat form test of milk.
2. Prepare different types of dairy products like ice-cream paneer, khoa and condensed milk etc.
3. Understand about shelf-life of eggs.
4. Analyze the frozen meat/meat emulsion products.
5. Formulation meat/egg product.

#### **References-**

1. Outlines of Dairy Technology, Sukumar De, Oxford University Press, 1<sup>st</sup> edition, 2001.
2. Dairy Engineering Advanced Technologies and Their Applications, Rupesh S Chavan, Netra R Goyal, Murlidhar Meghwal, Taylor and Francis, 1<sup>st</sup> edition, 2017.
3. Dairy Technology, Shivashraya Singh, illustrated, New India Publishing Agency-Nipa, 2013.
4. Structure of Dairy Products, A. Y. Tamime, Wiley-Blackwell, 1<sup>st</sup> edition, 2007.
5. Indian Dairy Products, Rangappa K.S., Asia Pub. House, 2<sup>nd</sup> edition, 1975.
6. FSSAI manuals of analysis of foods, Milk and milk products, Food Safety and Standards Authority of India, Ministry of Health and Family Welfare, Government of India, New Delhi, 2016.

**7.** Meat,Poultry and Fish Products Technology, Syed Imran Hashmi, DAYA publishing house, 2<sup>nd</sup>Edition, 2015.

**8.** Manual Of Methods Of Analysis Of Foods Meat And Meat Products Food Safety And Standards, Authority Of India Ministry Of Health And Family Welfare Government Of India New Delhi,2016



**BFPP-309 PROCESSING OF SEA FOOD PRODUCTS AND FOOD ENGINEERING-I****Course Objectives:** Student will be able to

1. Know the Quality Of fish/prawn
2. Understand Cutout Examination Of Canned Fish
3. Learn the Principle and working and applications of filtration, centrifugation and distillation
4. Understand the physical properties of grains.

<b>Credits (Total Credit 04)</b>	<b>SEMESTER-III BFPP 309 PROCESSING OF SEAFOOD PRODUCTS AND FOOD ENGINEERING-I</b>	<b>No. of hours per unit/credits</b>
<b>PART-I</b>	<b>PROCESSING OF SEAFOOD PRODUCTS</b>	
1	Quality Evaluation Of Fish/prawn.(Physical Parameters)	
2	Formulation Of Fish Products.	
3	Study of the anatomy of fish	
4	Pre Canning operation of fish (selection, sorting, descaling, washing, nobbing, brining)	
5	Cutout Examination Of Canned Fish.	
6	Determination Of Acidity Of Brine From Canned Fish Sample	
7	Determination of moisture content from the different fish samples	
8	Determination of histamine from different fish samples by using TLC	
9	Quantitative determination of starch in the packing medium.	
10	To determine Ascorbic acid from different Sea food product	
<b>PART- II</b>	<b>FOOD ENGINEERING-I</b>	
1	Particle size analysis	

2	Size reduction- Grains/milling.	
3	Filtration- Fibers extraction	
4	Centrifugation- Starch, protein, cream	
5	Mixing- Dry solids	
6	Distillation- Spices, volatile oil	
7	Solvent extraction	
8	To check water absorption capacity of flour	
9	To check oil absorption capacity of flour	
10	Determine the physical characteristics of grains	

**Course outcomes:** Students should be able to

1. Evaluate quality of fish/prawn, formulation of fish products, determine histamine
2. Determine moisture content from the different fish samples.
3. Apply The Principle and working and applications of filtration, centrifugation and distillation
4. Demonstrate the physical properties of grains.

**References-**

1. Handbook of Analysis and Quality control for fruits and vegetable products S.Ranganna published by McGraw Hill Education(India) PVT.LTD, Chennai,2nd edition
2. FSSAI manual of methods of analysis of foods(meat and meat products and fish and fish Products) FSSAI Ministry of Health and Family welfare, Govt .of India,NewDelhi-16.
3. Freshness evaluation of fish by quality index method(QIM)and instrumental method at veraval fish landing centre bytes Solanki.  
4.Processing and fish preservation -nptel(<https://.ac.in>module5>lecture9>).
4. Cutout Analysis For Canned Fishery Products(ecourseonline.iasri.in>mod>view)
5. Food Engineering Laboratory Manual, Gustavo V. Barbosa- Canovas, Li Ma , Blas J. Barletta, 1st Edition.

## Semester – IV

### Course – BFPT-401: PROCESSING OF BAKERY PRODUCTS

**Course Objectives:** Students will be able to:

1. Know principle and importance of bakery.
2. Understand the different types of ingredients used in bakery products and their function.
3. Understand the types of baking procedures for different bakery products like bread, cake.
4. Study the preservation of bakery products and quality aspect.

<b>Credits (Total Credits 2)</b>	<b>SEMESTER-IV BFPT-401 PROCESSING OF BAKERY PRODUCTS</b>	<b>No. of hours per unit/credits</b>
<b>UNIT - I</b>	<b>Introduction of Bakery Products</b>	<b>(11)</b>
	A) Introduction and Importance of bakery B) Principle involved in bakery products, working, principles, application of Dough mixer, moulding machine, Oven Machines and equipment for batch and continuous processing of bakery products	
<b>UNIT - II</b>	<b>Raw Material of Bakery Products</b>	<b>(11)</b>
	A) Ingredients used in Bakery products and their functions B) Types and quality of flour, various doughs and their use, Process parameter. C) Heat transfer in baking, time temperature relationship in baking	
<b>UNIT - III</b>	<b>Processing of Bakery Products</b>	<b>(12)</b>
	A) Fermentation and proofing, Procedures of Different types of bakery products - bread, cookies, crackers, cake and biscuits B) Cooling and packaging of baked products. C) Defects of baked products and preventive measures, specialized baked products -diabetic baked products, pizza, Passover products.	

<b>UNIT - IV</b>	<b>Preservation of Bakery Products</b>	<b>(11)</b>
	A) Preservation of baked product, Freezing and frozen storage of baked product B) Equipment for frozen storage, Canned bakery product. C) Quality aspect of preserved baked products, D) Maintenance, safety and hygiene of bakery plants.	

**Course outcomes:** Student should be able to

1. Learn the importance, principle of bakery, working, and application of bakery Equipment.
2. Understand the batch and continuous processing of bakery products
3. Understand the ingredients and their function, types and quality of flour.
4. Apply the fermentation and proofing.

**References-**

1. Bakery Products Science and Technology, Y. H. Hui, Wiley Blackwell Publishing, 2014.(Unit-I,II,III)
2. Bakery and Confectionary products, Acharya N.G. Ranga Agricultural University(Unit-II)
1. 3.Cereal Processing Technology, Gavin Owens, Wood Head Publishing Ltd, 2000(Unit-III)
3. Handbook of Baking and Bakery products, Rashmi. S. Sharma.(Unit-III,IV)
4. FSSAI manuals of analysis of foods, Bakery, Food Safety and Standards Authority of India, Ministry of Health and Family Welfare, Government of India, New Delhi, 2016.(Unit-III)
2. 6.Professional Baking, Wayne Gisslen, Sixth Edition.(Unit-III)
3. 7.Preservation of baked product <https://sensoryeffects.com/sites/default/files/bake.pdf> (Unit-IV)

## Course-BFPT-402: PROCESSING OF CONFECTIONARY PRODUCTS

**Course Objectives:** Students will be able to:

1. Know the importance of confectionary
2. Understand the processing of different confectionary products
3. Understand the processing of sugar confectionary products.
4. Learn the processing of boiled sweets

<b>Credits (Total Credits 2)</b>	<b>SEMESTER-IV BFPT-402 PROCESSING OF CONFECTIONARY PRODUCTS</b>	<b>No. of hours per unit/credits</b>
<b>UNIT - I</b>	<b>Introduction of Confectionary Products</b>	<b>(11)</b>
	A) Importance of confectionery in food industry. B) Principle involved in confectionery products, Classification of confectionary. C) Types of confectionary products, ingredients in confectionary.	
<b>UNIT - II</b>	<b>Chocolate Processing</b>	<b>(11)</b>
	A) Chocolate Processing - Ingredients used in chocolate, Cocoa butter substitutes B) Processing of cocoa beans, chocolate refining, conching and molding, enrobing, panning.	
<b>UNIT - III</b>	<b>Sugar Confectionary</b>	<b>(12)</b>
	A) Sugar confectionary: Types of sugar- production, storage, alternative bulk sweeteners, corn syrup and glucose syrup, sorbitol, xylitol, maltitol, isomalt, lactitol, mannitol, polydextrose, Chewing gum and Bubble gum- Ingredients, functions, manufacture	
<b>UNIT - IV</b>	<b>Boiled and Gelatin Sweets.</b>	<b>(11)</b>
	A) Boiled Sweets - Hard and soft boiled sugar confectionary: fondant, fudge, caramel, toffee, nut Brittles, Gelatin Sweets - Fruit chews, jellies, gums, Defects in confectionary: sugar bloom, Fat bloom	

**Course outcomes:** Student should be able to

1. Demonstrate the chocolate processing
2. Understand the cocoa butter substitutes
3. Explain the types of sugar- production, storage, alternative sweeteners.
4. Apply the processing of gelatin sweet.

**References-**

1. Yogambal Ashok kumar, Textbook of Bakery and Confectionery , Prentice Hall India Learning Private Limited, 2012.
2. William P Edwards, The Science of Sugar confectionery, Royal Society of Chemistry, 2nd edition,2018.
3. Peter P. Greweling, Wiley, Chocolate and Confections; Formula, Theory and Technique for the Artisan Confectioner, 2nd edition, 2012.
4. Ferenc A. Mohos, Wiley-Blackwell, Confectionery and Chocolate Engineering: Principles and Applications, 2010.
5. Bakery and Confectionery, Acharya NG Ranga Agricultural University.

**Course- BFPT 403 PROCESSING OF OIL SEEDS AND FATS****Course Objectives:** Students will be able to:

1. Know physical and chemical characteristics of dietary oilseeds and fats.
2. Understand the extraction processes of oilseeds and fats.
3. Learn the refining process and its methods.
4. Understand the processing of butter and other products.

<b>Credits (Total Credits 2)</b>	<b>SEMESTER-IV BFPT-403 PROCESSING OF OIL SEEDS AND FATS</b>	<b>No. of hours per unit/credit s</b>
<b>UNIT - I</b>	<b>Introduction Processing of Oil Seeds and Fats</b>	<b>(11)</b>
	A) Sources; chemical composition; physical and chemical characteristics; Functional and nutritional importance of dietary oilseeds and fats. B) Post-harvest handling storage Processing of oilseeds for direct use and consumption.	
<b>UNIT - II</b>	<b>Extraction</b>	<b>(11)</b>
	A) Extraction of oil by mechanical expelling and solvent extraction and obtaining de oiled cakes suitable for edible purposes. B) Processing of other plant sources of edible oils and fats like coconut, cottonseed, rice bran, maize germ, etc.	
<b>UNIT - III</b>	<b>Refining</b>	<b>(12)</b>
	A) Refining: Clarification, degumming, neutralization (alkali refining), bleaching, deodorization techniques / processes. Blending of oils. B) Processing of refined oils: Hydrogenation, fractionation, winterization, inter-esterification etc. for obtaining tailor-made fats and oils.	
<b>UNIT - IV</b>	<b>Processing of Butter</b>	<b>(11)</b>
	A) Production of butter oil, lard, tallow, Margarine, Cocoa butter equivalents, shortenings, low fat spreads, peanut butter etc. Specialty fats and designer lipids for nutrition and dietetics, especially by biotechnology.	

**Course outcomes:** Student should be able to

1. Apply post-harvest storage processing of oilseeds for consumption.
2. Understand extraction methods for oil seeds and fats as mechanical and solvent extraction methods.
3. Demonstrate processing of butter.
4. Understand specialty fats and designer lipids.

**References-**

1. David Firestone, Physical and chemical characteristics of oils, fats and waxes, Amer oil chemists society, 3<sup>rd</sup> Edition, 2006
2. Frank D. Gunstone, Vegetables and oils in food technology.2002
3. Dimitrios Boskou, Olive oil chemistry, , 2<sup>edi</sup> ·1996.
4. John Wiley and Sons, Bailey's Industrial Oil and Fat Products, , 4<sup>th</sup> edition, 2004



**Course- BFPT-404: PROCESSING OF PLANTATION CROPS AND SPICES****Course Objectives:** Students will be able to:

1. Learn importance and processing of plantation crops
2. Understand the definition, classification and adulteration of spices
3. Know the production and processing of major spices
4. Know the production and processing of minor spices.

<b>Credits (Total Credits 2)</b>	<b>SEMESTER-IV BFPT-404 PROCESSING OF PLANTATION CROPS AND SPICES</b>	<b>No. of hours per unit/credits</b>
<b>UNIT - I</b>	<b>Plantation Crops</b>	<b>(11)</b>
	A) Importance of plantation crops, chemical composition, Processing of Tea leaves: Black tea, Greentea and Oolongtea, Instant tea. B) Processing of coffee: coffee beans, grinding, storage, Soluble /Instant coffee, Use of chicory in coffee, decaffeinated coffee. Processing of coconut and cashewnut	
<b>UNIT - II</b>	<b>Spices</b>	<b>(11)</b>
	A) Definition, Classification, Properties, Spice oil and Oleoresins - Definition, Technology of Manufacturing, Use of Spices, Production of spices in India, Adulteration of spices.	
<b>UNIT - III</b>	<b>Major Spices</b>	<b>(12)</b>
	A) Production and processing of Major Spices -Pepper, Cardamom, Ginger, Chilies, Turmeric, onion.	
<b>UNIT - IV</b>	<b>Minor Spices</b>	<b>(11)</b>
	A) Production and processing of Minor spices– ajwain, coriander, cumin, cinnamon, fenugreek, garlic, mustard, saffron, tamarind, cloves, mint, vanilla, asafoetida and spice production	

**Course outcomes:** Student should be able to

1. Analyse the chemical composition of plantation crops.
2. Understand the definition, classification and properties of spices
3. Understand the production of major spices on commercial scale.
4. Understand the production of minor spices on commercial scale.

**References-**

1. Swati, Barche, K. S. Kirad, Nair Reena, P. K. Jain, and S. K. Sengupta. "Production technology of spices, aromatic, medicinal and plantation crops." Production technology of spices, aromatic, medicinal and plantation crops. (2016). (Unit I)
2. Production technology of spices, N.kumar Aromatic, Medicinal, and Plantation crops,
3. Oxford and IBH publish ungeo.pvt.ltd.2018. (Unit II)
4. P.K. Abdul Khader, Plantation Crops, University of Calicut, 2005 (Unit 3)
5. Jitendra Singh, Spices and plantation crops, National Book Trust, 1996 (Unit IV)
6. Black pepper, Food and Agriculture Organization of the United Nations [http:// www.fao.org/3/a-au145e.pdf](http://www.fao.org/3/a-au145e.pdf).
7. Turmeric, Food and Agriculture Organization of the United Nations [http://www.fao.org/fileadmin/user\\_upload/inpho/docs/Post\\_Harvest\\_Co\\_mpendium\\_-\\_Turmeric.pdf](http://www.fao.org/fileadmin/user_upload/inpho/docs/Post_Harvest_Co_mpendium_-_Turmeric.pdf). (Unit IV)
8. K. V. Peter, Handbook of herbs and spices, Wood head Publishing, 2012 (Unit III)

## Course- BFPT-405: FOOD BIOCHEMISTRY

**Course Objectives:** Students will be able to:

1. Understand the utilization of carbohydrates disorders related to carbohydrate metabolism in body.
2. Study the utilization and free radical oxidation of lipids, disorders related to lipid metabolism in body.
3. Understand the utilization of phenolics and its metabolism in body.
4. Learn function and mechanism of enzyme and coenzymes.

<b>Credits (Total Credits 2)</b>	<b>SEMESTER-IV BFPT-405 FOOD BIOCHEMISTRY</b>	<b>No. of hours per unit/credits</b>
<b>UNIT - I</b>	<b>Enzyme and Coenzyme</b>	<b>(11)</b>
	A) Enzyme: Classification, nomenclature, activation energy, Michaelis-Menten equation, Lineweaver Burk Plot. B) Factors affecting on enzymes action, mechanism of enzyme action, Coenzymes: Classifications [metabolite derived /vitamin derived] function of various types, structure of NAD <sup>+</sup> , NADP <sup>+</sup> , and FAD and FMN.	
<b>UNIT - II</b>	<b>Utilization of Carbohydrates</b>	<b>(11)</b>
	A) Glycolysis, Kreb cycle, Pentose phosphate pathway, gluconeogenesis, glycogen metabolism, glycogen synthesis. B) Disorders in carbohydrate metabolism, Essential Metabolic pathways.	
<b>UNIT - III</b>	<b>Influence of Phenolic Substances on Health</b>	<b>(12)</b>
	A) Free radicals in biological system, Oxidative stress and chronic diseases, antioxidant in fruits and vegetables, absorption and metabolism of polyphenolics, B) Efficiency of polyphenolics in Promoting human health.	
<b>UNIT - IV</b>	<b>Utilization of Lipid and Lipid Oxidation</b>	<b>(11)</b>
	A) Utilization of fats, Disorders related to lipid metabolism, clinical disorders associated with fats. B) Lipid oxidation -active oxygen species and free radical theory. Hydroperoxide formation and decomposition photo-oxidation of unsaturated lipid.	

**Course outcomes:** Student should be able to

1. Understand the basics of enzyme, its classification, nomenclature and mechanism of action.
2. Understand the utilization of carbohydrates.
3. Evaluate the utilization of antioxidants and its effect on human body.
4. Understand the utilization of lipid and lipid oxidation.

**References-**

1. Principles of Biochemistry, Lehninger, David L. Nelson and Michael M. Cox; W. H. Freeman, , 7th ed. 2017. (Unit I, II, IV)
2. Biochemistry, Stryer, W. H. Freeman, , 6th Edition, 2006. (Unit I, II, IV)
3. Principles of biochemistry, Donald J. Voet, Judith G. Voet, Charlotte W. pratt. Wiley, , 4th Edition International Student Version edition 2012. (Unit I, II, IV)
4. Enzyme technology, Anusha Bhaskar, V. G.Vidhya, MJP Pub, 2009. (Unit I, II, IV)
5. Principles of enzyme technology, M.Y. Khan, Faraha Khan, , 1st edition, 2015. (Unit I)
6. Textbook of medical biochemistry, M.N.Chatterjea, Ranashinde, Jaypee Brothers Medical Publishers 2007. (Unit III)

**Course- BFPT-406: FOOD PROCESSING ENGINEERING – II**

**Course Objectives:** Students will be able to:

1. Learn the principle of evaporation, crystallization and extraction.
2. Understand the principles of blanching, pasteurization and sterilization
3. Understand the properties of dry-air, water-vapor and air-vapor mixtures.
4. Imbibe the principles of drying, drying rate kinetics.

Credits (Total Credits 2)	<b>SEMESTER-IV BFPT-406 FOOD PROCESSING ENGINEERING – II</b>	No. of hours per unit/credits
<b>UNIT - I</b>	<b>Enzyme and Coenzyme</b>	<b>(11)</b>
	<p>A) Principles of evaporation, types and selection of evaporators, mass and energy balance.</p> <p>B) Theory and principles of Crystallization. Nucleation, crystal growth, crystallization equipment, Application of crystallization in food processing, solvent extraction, leaching, equipments.</p> <p>C) Applications to food industries.</p>	
<b>UNIT - II</b>	<b>Thermal processing</b>	<b>(11)</b>
	<p>A) Principles of Blanching, Pasteurization and Sterilization.</p> <p>B) Microbial survivor curves, thermal death time, spoilage probability, methods for process calculations.</p>	
<b>UNIT - III</b>	<b>Psychrometrics.</b>	<b>(12)</b>
	<p>A) Properties of dry-air: composition of air, specific volume of air, specific heat of dry air, enthalpy of dry air, dry bulb temperature.</p> <p>B) 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.</p> <p>C) The psychrometric chart: Use of psychrometric chart to evaluate complex air conditioning processes.</p>	

<b>UNIT - IV</b>	<b>Drying, Freezing and Refrigeration</b>	<b>(11)</b>
	<p>A) Principles of drying, drying rate kinetics, Classification, mass and energy balance.</p> <p>B) 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.</p>	

**Course outcomes:** Student should be able to

1. Explain the theory of extraction and evaporation.
2. Demonstrate the microbial survivor curves and thermal death time.
3. Learn the properties of air-vapor mixtures.
4. Learn the concept and selection of a refrigerant food processing.

**References-**

1. Introduction to Food Engineering, R. Paul Singh and Heldman, Academic Press, 4th Ed. 2009. (UNIT -I,II,III)
2. The Fundamentals of Food Engineering, Charm SE, AVI Pub, 1963, (UNIT - I,II,III)
3. Fundamentals of Food Process Engineering, Toledo RT, CBS Publishers 2nd Ed, 2000. (UNIT -I,II,III)
4. Operations of Chemical Engineering TMH McCabe, Smith and Harriot, UNIT, McGraw-Hill Publishing Co.; 6th edition, 1 November 2000 (UNIT -I,II,IV)
5. Chemical Engineering volume 2, J.R. Backhurst, J.F. Richardson, J.H. Harker; 5th edition, 31 July 2002 II volume, 2002 (UNIT -I,II)

**Course- BFPT-407: PROCESSING OF BAKERY AND CONFECTIONARY PRODUCTS**

**Course Objectives:** Students should be able to:

1. Know the principle and working of microwave oven.
2. Understand the preparation of butter cake, sponge cake, instant cake
3. Understand the preparation of different types of chocolate products
4. Learn the preparation of different types of sugar products.

<b>Credits (Total Credits 4)</b>	<b>SEMESTER-IV BFPT-407 PROCESSING OF BAKERY AND CONFECTIONARY</b>	<b>No. of hours per unit/credit s</b>
<b>PART-I</b>	<b>PROCESSING OF BAKERY</b>	
<b>1</b>	Preparation of bread and assessment of its quality.	
<b>2</b>	Preparation of pizza base and assessment of its quality	
<b>3</b>	Preparation of butter cake, assessment of its quality.	
<b>4</b>	Preparation of sponge cake, assessment of its quality.	
<b>5</b>	Preparation of icings and introduction of decorating agents in sponge cake.	
<b>6</b>	Preparation of instant cake mix and assessment of its quality	
<b>7</b>	Preparation of biscuits and assessment of its quality.	
<b>8</b>	Preparation of almond butter cookies and assessment of its quality.	
<b>9</b>	Preparation of Chocolate chip cookies and assessment of its quality.	
<b>10</b>	Preparation of Rusk and assessment of its quality.	
<b>11</b>	Preparation of Crackers and assessment of its quality	
<b>12</b>	Preparation of toast and assessment of its quality.	
<b>PART-II</b>	<b>PROCESSING OF CONFECTIONARY PRODUCTS</b>	
<b>1</b>	Preparation of fondant, assessment of its quality.	
<b>2</b>	Preparation of fudge and assessment of its quality.	
<b>3</b>	Preparation of jujubes candy and assessment of its quality.	

4	Preparation of toffee and their quality assessment tests	
5	Preparation of Chocolate their quality assessment tests	
6	To study the process of inversion, melting and caramelization in sucrose	
7	Determination of the effect of heat on sugar solution	
8	Preparation of milk based confectionary product	
9	Preparation of brittles and assessment of its quality	
10	Preparation of hardboiled candy and their quality assessment tests.	

**Course outcomes:** Student should be able to

1. Operate microwave oven.
2. Understand the preparation of butter cake, sponge cake, instant cake.
3. Prepare different types of chocolate food.
4. Prepare different types of sugar based product.

**References-**

1. Handbook of Baking and Bakery products, Rashmi. S. Sharma
2. Textbook of Bakery and Confectionery, Yogambal Ashok kumar, Prentice Hall India Learning Private Limited, 2012.
- 3.FSSAI manuals of analysis of foods, Bakery, Food Safety and Standards Authority of India, Ministry of Health and Family Welfare, Government of India, New Delhi, 2016.
4. Professional Baking Sixth Edition by Wayne Gisslen.
5. Bakery Products Science and Technology Y. H.Hui, Wiley Blackwell Publishing, 2014.
- 6.Bakery and Confectionary products, Acharya N.G.Ranga Agricultural University



**Course- LAB XIII BFPP 408-PROCESSING OF OIL SEEDS, FATS AND PLANTATION CROPS, SPICES**

**Course Objectives:** Students should be able to:

1. Know the detection of adulteration in spices.
2. Understand the microscopic examination of spices
3. Find out adulteration in fats and oil samples.
4. Apply qualitative estimation of different fats and oils.

<b>Credits (Total Credits 4)</b>	<b>SEMESTER-IV LAB XIII BFPP408-PROCESSING OF OIL SEEDS, FATS AND PLANTATION CROPS, SPICES</b>	<b>No. of hours per unit/cre dits</b>
<b>PART-I</b>	<b>PROCESSING OF OIL SEEDS AND FATS</b>	
<b>1</b>	To prepare test samples and determine moisture content of fats and oils.	
<b>2</b>	Determination of Specific gravity and Refractive index of fats and oils.	
<b>3</b>	Qualitative estimation of Rice bran oil and mustard oil.	
<b>4</b>	Qualitative estimation of Sesame oil.	
<b>5</b>	Qualitative estimation of Cotton seed oil.	
<b>6</b>	Determination of Melting point of fats and oils.	
<b>7</b>	Determine carotenoid content in raw Palmoil	
<b>8</b>	To determine adulteration in fats and oils.	
<b>9</b>	Determination of animals fat in vegetables fat	
<b>10</b>	Detection of presence of rancidity	
<b>PART-II</b>	<b>PROCESSING OF PLANTATION CROPS AND SPICES</b>	
<b>1</b>	Microscopic Examination of Spices.	
<b>2</b>	Detection of adulteration of Argemone seeds in Mustard.	
<b>3</b>	Detection of adulteration of Mineral Oil in Black Pepper	
<b>4</b>	Detection of adulteration of Papaya seeds in Black Pepper.	
<b>5</b>	Detection of adulteration in Turmeric.	

6	Detection of adulteration in Chilies.	
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7	Detection of adulteration in Black pepper	
8	Detection of adulteration in Coriander	
9	Detection of adulteration in Saffron	
10	Detection of adulteration in Asafoetida.	
11	Preparation of hardboiled candy and their quality assessment tests.	

**Course outcomes:** Student should be able to

1. Prepare test samples and determine moisture content of fats and oils.
2. Determine specific gravity and refractive index of fats and oils
3. Determine melting point of fats and oils, carotenoid content in raw palm oil.
4. Detect adulteration of spices.

**References-**

1. Aleena, K. S., M. P. Divya, A. K. Beena, C. R. Rachana, and K. B. Divya. "Oxidative stability of sunflower oil on high temperature cooking." *Oxidative Stab. Sunflower Oil High Temp. Cook* 9 (2020): 552-554.
2. Dieffenbacher, A., and W. D. Pocklington. "1st Supplement to the 7th Edition of Standard Methods for the Analysis of Oils, Fats and Derivatives." (1992).
3. Gunstone, Frank, ed. *Vegetable oils in food technology: composition, properties and uses*. John Wiley & Sons, 2011.
4. FSSAI manuals of analysis of foods, Spices and Condiments, Food Safety and Standards Authority of India, Ministry of Health and Family Welfare, Government of India, New Delhi, 2016.
5. *Manuals of Food Quality Control*, 8, Food analysis: quality, adulteration and tests of identity, FAO, Food and Nutrition Paper, Swedish International Development Authority, 1986.

**Course- LAB XIV BFPP 409 BIOCHEMISTRY AND FOOD PACKAGING II****Course Objectives:** Students will be able to:

1. Imbibe the principle and working of different chromatographic techniques.
2. Understand the enzyme and its activity.
3. Study the vitamins, carbohydrates, lipids from food sample.
4. Learn the principle and working evaporator and dryers etc.

<b>Credits (Total Credits 4)</b>	<b>SEMESTER-IV LAB XIV BFPP 409 BIOCHEMISTRY AND FOOD PACKAGING II</b>	<b>No. of hours per unit/credits</b>
<b>PART-I</b>	<b>PART -I BIOCHEMISTRY</b>	
<b>1</b>	Estimate the quantity of ascorbic acid by titration (Volumetric) method in food sample	
<b>2</b>	Estimate the quantity of Vitamin A in food sample	
<b>3</b>	Estimate the quantity of iron in food sample.	
<b>4</b>	Qualitative detection of antioxidants by thin layer chromatography.	
<b>5</b>	Analysis of lipids present in food sample.	
<b>6</b>	Determination of carbohydrates present in food sample	
<b>7</b>	Separation of carotenoids by thin layer chromatography	
<b>8</b>	Separation of amino acids by column chromatography.	
<b>9</b>	Detection of enzymes in food sample.(urease, amylase, lipase)	
<b>10</b>	To estimate the quantity of enzyme activity.	
<b>11</b>	To study the effect of temperature on enzyme activity.	
<b>12</b>	To study the effect of substrate concentration on enzyme activity.	
<b>PART-II</b>	<b>FOOD ENGINEERING II</b>	

1	Study of evaporator	
2	Study of dryer	
3	Study of Freezing of foods by different methods.	
4	Study of crystallizer	
5	Numerical problem on Thermo bacteriology (D, Z,andF)	
6	Determination of freezing time of a food material,	
7	Determination of air properties using psychometric chart	
8	Comparative study on slow freezing and quick freezing.	
9	To study different methods of extraction.	
10	To study the thermal processing techniques-Blanching, Pasteurization	

**Course outcomes:** Student should be able to

1. Demonstrate the principle and working of different chromatographic techniques, estimate vitamins (vit. C and vit. A) from food sample.
2. Estimate the quantity of carbohydrates, amino acids
3. Understand the types of dryers
4. Apply the methods of extraction

**References-**

1. Handbook of Analysis and Quality control for fruits and vegetable products  
S. Ranganna, McGraw Hill Education (India) PVT.LTD, Chennai, 2<sup>nd</sup> edition, 2007.
2. Food Engineering Laboratory Manual, Gustavo V. Barbosa- Canovas, Li Ma , Blas J. Barletta, 1st Edition.
3. Food Engineering Laboratory Manual, Gustavo V. Barbosa- Canovas , Li Ma, 1st Edition
4. An introduction to practical biochemistry, Plummer, Tata McGraw Hill Publishing Co. NewDelhi.3<sup>rd</sup> edition, 2004.

5. Modern experimental biochemistry, Rodney Boyer, Dorling Kindersley (India ) Pvt Ltd 3rd Edition, 2000.