Rayat Shikshan Sanstha's
Yashavantrao Chavan Institute of Science,Satara(Autonomous)

SYLLABUS

FOR

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

Second Year

SEMESTER SYSTEM

III / IV SEMESTERS

Effective from JUNE 2019

1 Program Structure of B.Sc.-II

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	**TEACHING SCHEME**						
			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	BFPP -307	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	BFPP -308	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	BFPP - 309	8	6.4	4
6	BFPT - 306	Food packaging I	3	2.4	2				
9	BFPT -AECC-3	Environmental science	3	2.4	2		---	--	
	Total of SEM I		**21**	**16.8**	**14**		**24**	**19.2**	**12**

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 oil seeds and fats	3	2.4	2	BFPP -407	8	6.4	4
2	BFPT - 402	Processing of Bakery products	3	2.4	2				
3	BFPT - 403	Processing of Confectionary products	3	2.4	2	BFPP -408	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	BFPP -409	8	6.4	4
6	BFPT - 406	Food packaging II	3	2.4	2				
7	AECC-4	Environmental science	3	2.4	2		---	--	
	Total of SEM I		**21**	**16.8**	**14**		**24**	**19.2**	**12**
	Total Of The Year		42	33.6	28		**48**	**28.4**	**24**

• Student contact hours per week : ---Hours (Min.)	• Total Marks for B.Sc.-II (Including Env) : **1000**
• Theory lectures and practical : 48 Minutes Each	• Total Credits for B.Sc.-II (Semester III & IV) : **52**
• **AECC**- Ability Enhancement Compulsory Course (407 T&408 T)- Environmental Science • 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 course	

Evaluation Scheme

Semester III

Course Code	ESE	Internal Exam		Course Code	Practical		Internal Evaluation	
		CCE-I	CCE-II (Online Test)		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								
Total of SEM II	180	30	30		150	30	15	15
	450							

Course Code	ESE	Internal Exam		Course Code	Practical		Internal Evaluation	
		CCE-I	CCE-II (Online Test)		Exam	Journal	Survey / Educational Tour/Seminar	Day to day Performance
BFPT -401 T	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								
Total of SEM II	180	30	30		150	30	15	15
Total of year	**TOTAL OF MARKS FOR SEMESTER III+ IV: 900 Without AECC-3 & 4**							

• Student contact hours per week : ---Hours (Min.)	• Total Marks for B.Sc.-I (Excluding English) : **1100**
• Theory lectures and practical : 48Minutes Each	• Total Credits for B.Sc.-I (Semester I & II) : **52**
• **AECC1**- Ability Enhancement Compulsory Course (BFPE -AECC-109T & BFPE -AECC-209T) - English • **BFPT** Bachelors of Food Processing & Packaging Theory • **ESE** – End Semester Exam • **CCE I&II** – Comprehensive Continuous Evolution • **T**- Theory • **P**- Practical • 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 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.	

Semester-III

Paper No.	Course Code	SUBJECT TITILE
1	BFPT - 301	Processing of fruits and vegetables
2	BFPT - 302	Processing of Cereals and pulses
3	BFPT - 303	Processing of Milk and milk products
4	BFPT - 304	Processing of Meat and poultry
5	BFPT - 305	Processing of Sea foods
6	BFPT - 306	Food packaging I
7	- AECC -3	Environmental science
8	BFPP - 308	Processing Of Fruits, Vegetables, Cereals And Pulses
9	BFPP -309	Processing Of Sea Food Products & Packaging-I
10	BFPP -310	Processing of sea food & Food packaging I

Semester-IV

Paper No	Course Code	SUBJECT TITILE
1	BFPT - 401	Processing of Bakery products
2	BFPT - 402	Processing of Confectionary products
3	BFPT - 403	Processing of oil seeds and fats
4	BFPT - 404	Processing of Plantation crops and spices
5	BFPT - 405	Food biochemistry
6	BFPT – 406	Food packaging II
7	BFPT – AECC-	Environmental science
8	BFPP - -408	Processing of Bakery & Confectionary products
9	BFPP - -409	Processing of oil seed ,fats &Plantation crops, spices
10	BFPP - -410	Biochemistry& Food packaging II

B.Sc.-II (SEMESTER – III) FOOD PROCESSNG AND PACKAGING (ENTIRE)

BFPT – 301: PROCESSING OF FRUITS AND VEGETABLES

Theory: 45 Credits: 2

Learning Objectives:

1) To know classification & composition of fruits and vegetables.
2) To understand the process and defects of jam, jelly, and marmalade
3) To understand the process and preservation of different types of fruits and vegetables juices.
4) To understand the process tomato products.

Unit I: Introduction of Fruits and Vegetables (11)

Classification and composition of fruits and vegetables, Climacteric and no-climacteric fruits; Post harvest handling, precooling methods , post harvest treatments .
Storage of fresh Fruits and Vegetables–Ambient, Refrigerated, Modified atmosphere, evaporative cool storage

Unit II: Jams, Jellies and Marmalades (11)

Introduction**,** Jam: Constituents, selection of fruits, processing & technology**,** Jelly: Essential constituents (Role of pectin, ratio), Theory of jelly formation, Processing & technology, defects in jelly, Marmalade: Types, processing & technology, defects.

Unit III: Fruits Beverages (12)

Introduction, Processing of fruit juices, Preservation of fruit juices: pasteurization, chemically preserved with sugars, freezing, drying, tetra-packing, carbonation. Processing of RTS, Processing of squashes, cordials, nectars, concentrates and powder.

Unit IV: Tomato Products and Potato Products (11)

Introduction, Preparation of tomato juice, Soup, Preparation of tomato puree, Ketchup. Important consideration in potato processing, Potato chips, French fries.

Learning outcomes:

1. The student should able to understand the Classification ,composition ,post harvest treatment ,methods & storage of fruits and vegetables
2. The student should able to understand the processing of jam, jelly, marmalade and also their defects in process.
3. The student should able to understand the types , process & preservation of fruit juices.
4. The student should able to understand process of tomato and potato products

Recommended Books:

1) Preservation of fruits and vegetables: principles and practices by Dr.Shrivastav and Dr. Sa**njeev** kumar, Hardback Published : (Unit II, III, IV)
2) Preservation of Fruits and Vegetables – Girdhari Lal, Siddhapa and Tondon, ICAR, l' Bllshed By Indian Council Of Agricultural Research New Delhi (Unit II, III, IV)
3) Fruit and Vegetable Processing, Sri S.Chenna Kesava Reddy, Acharya Ng Ranga Agricultural University (Unit II, III, IV)
4) Fruit and Vegetables Harvesting, Handling and Storage, A. K. Thompson,© 2003 by Blackwell Publishing Ltd (Unit I)
5) Handbook of Fruits and Fruit Processing, Editor Y. H. Hui Associate Editors J´ozsef Barta, M. Pilar Cano, Todd W. Gusek, (Unit I, II)

BFPT-302: PROCESSING OF CEREALS AND PULSES

Theory: 45 Credits: 2

Learning Objectives:

1) To know structure and composition of cereals and pulses.
2) To understand the different types of milling processes and different byproducts.
3) To know the barley malting process and study of different types of malts.
4) To understand the different types of improved milling methods of pulses.

Unit I: Wheat processing (11)

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. Flour extraction rates and various flour grades and types, Criteria of flour quality, dough rheology and its measurement

Unit II: Rice processing (11)

Structure and chemical composition of rice grain, Milling of rice– types of rice mill; huller millR1, Sheller-cum-cone polisher mill; Modern rice milling unit operation dehusking, paddy separation, polishing and grading; Factors affecting rice yield during milling; rice bran as rice milling byproducts , Rice parboiling technology.

Unit III: Corn processing (12)

Structure and composition of corn grain, different types of corn. Wet and dry milling of corn, and their products, Corn sweeteners (high fructose corn syrups) and their uses. Barley malting process: steeping, germination and drying; significance of malting; Different types of malts and their food applications.

Unit IV: Pulses Processing (11)

Structure, and composition of pulses, Toxic constituents in pulses, Processing of pulses, soaking , germination, decortications, cooking and fermentation, Milling of pulses- Dry milling, Wet milling, Improved milling methods.

Learning outcomes:

1. The student should able to understand structure and chemical composition, criteria for flour quality, milling methods of wheat.
2. The student should able to understand structure and chemical composition, types and milling of rice, parboiling technology of rice.
3. The student should able to understand structure and chemical composition, wet and dry milling methods of corn and barley malting process.
4. The student should able to understand structure and chemical composition, toxic constituents and milling methods of pulses.

Recommended Books

1) Post Harvest Technology of Cereals ,Pulses & Oilseeds By A.Chakraverty, Oxford and IBH Publishing Company, 2014.(Unit I, II, III, t IV)
2) Cereal Processing Technology By Gavin Owens(Unit III)
5) Food Science 7th Edition By B. Srilakshmi.(Unit I, II, IV)
6) Modern rice milling http://milltecmachinery.com/wp-content/uploads/2018/07/rice-milling.pdf (Unit II)

BFPT-303: PROCESSING OF MILK AND MILK PRODUCTS

Theory: 45 Credits: 2

Learning Objectives:

1) To know the present status and scope of dairy industry in India and its layout.
2) To understand the composition, food value and processing of milk.
3) To understand the processing of different milk products such as cream, butter, cheese.
4) to know the byproducts of milk and it's utilization.

Unit I: Introduction of Dairy Industry (11)

Development of milk processing industry in India- present status & scope.
Dairy layout for small scale, Dairy design & sanitation layout. Dairy equipments & sanitation.

Unit II: Introduction of milk & primary processes (11)

Food value & Composition of milk. Factors affecting Composition of milk.
Buying, receiving, collection, Transportation of milk, storage & distribution of milk.
Processing of milk, filtration, clarification, cream separation & heat
Treatment of milk.

Unit III: Different Milk products (12)

Milk product Processing – Cream, Butter , Khoa, Paneer, Ice-cream
Condensed milk & evaporated milk, Judging & grading of milk & its products, Manufacturing of Cheddar cheese – Introduction, Manufacturing process, packaging, storage, defects and their prevention,Dried milk products – Buttermilk powder, Whey Powder, IceCream mix Powder , Infant milk food, WMP& SMP

Unit IV: Byproducts Utilization (11)

Introduction, Classification & Composition of byproducts. Principles & methods of Utilization Whey utilization & whey based, beverages like lassi & buttermilk

Learning outcomes:

1. The student should able to know the scope of dairy industry in India, dairy layout and its sanitation.
2. The student should able to understand food value, composition of milk and processing of milk.
3. The student should able to explain processing of different milk products- cream, butter, khoa, paneer, Ice-cream, condensed milk, evaporated milk, cheddar cheese, dried milk products (WMP, SMP).
4. The student should able to understand utilization of byproducts.

Recommend Books

1) Outline of Dairy technology by Sukumar De.(Unit I, II, III, IV)
2) Dairy chemistry and biochemistry – P. F. Fox & P.L.H. McSweeney. (Unit II, III, IV)
3) Dairy processing and assurance by R. C. Chandan. (Unit I, II, III, IV)
4) Dairy ingredients for food processing by R. C. Chandan, Arun Kilara. (Unit II, II, IV)
5) Dairy industry in India current perspective & status (review article) by Biology Essay. (Unit I)

BFPT-304: PROCESSING OF MEAT AND POULTRY

Theory: 45 Credits: 2

Learning Objectives-

1. To know importance of meat production, chemical composition in India
2. To understand the slaughtering methods and meat and poultry products
3 .To understand the Structure, composition and nutritive value, Quality evaluation of eggs
4. To understand the chemical and nutritive value of poultry meat

UNIT I: Introduction of meat products (11)

Introduction & Importance of meat products in India, Chemical Composition & microscopic structure of meat, Transportation, feeding of animal before slaughtering

UNIT II: Meat (12)

Ante-mortem examination of meat animals, Pre –slaughtering operation, Scientific techniques of slaughtering, Post-mortem inspection, Storage, Preservation

UNIT III: Egg & egg products (11)

Egg: Structure, composition and nutritive value, Storage and shelf life problems Quality evaluation of eggs , Egg products: egg powder, value added egg products Preservation

UNIT IV: Poultry processing (11)

Poultry products: types, chemical and nutritive value of poultry meat. Slaughtering and evaluation of poultry carcasses. Poultry cut-up parts and meat/bone ratio.
Preservation of poultry meat.

Learning outcomes:

1. The student should able to understand meat production, chemical composition in India
2. The student should able to understand Ante-mortem examination of meat animals
3. The student should able to understand Egg: Structure, composition and nutritive value
4. The student should able to understand Poultry products: types, chemical and nutritive value of poultry meat.

Recommended Books:

1) Meat , Poultry & Fish Products Technology by Syed Imran Hashmi. (Unit I, II, III, IV)
2) Principles of Meat Science Aberle E.D. Kendall Hunt Publication ISBN: 9780787247201: (Unit I,II)
3) Handbook of Heat and Meat Processing Hue Y.H. CRC Press, New York ISBN(Unit I,II)
4) Meat Processing Improving Quality, Edited byJoseph Kerry (Unit I)
5) Processed Meats ,Second Edition, A. M. Pearson(Unit I, Unit II)
6) Lawrie R A, Lawrie's Meat Science, 5th Ed, Woodhead Publisher, England, 1998 (Unit II)

BFPT-305: PROCESSING OF SEA FOODS

Theory: 45 Credits: 2

Learning Objectives:

1) To know Fish processing and factors affecting quality of fresh fish.
2) To understand the byproduct utilization of fish industry
3) To understand the fish preservation by smoking.
4) To understand the principle of fish canning.

UNIT I: Introduction (11)

Introduction, fisheries resources of the world.

Types of fish, water activity and shelf-life, Factors affecting quality of fresh fish. Fish processing: manufacturing of fish paste and sauces, fish oil, fish protein concentrate and fish meal. By-products of fish industry and their utilization.

UNIT II: Chilling and Freezing of fish (11)

Relationship between chilling and storage life, MAP, general aspects of freezing

Freezing systems (air blast freezing, plate or contact freezing, spray or immersion freezing) Changes in quality in chilled and frozen storage, thawing.

UNIT III: Fish Curing and Smoking (12)

Drying and salting of fish, , salting process. Salting methods (brining, pickling, kench curing, Gaspe curing), Dried and salted fish products- pindang, fishwood, dried shrimp.Preservation by smoking, smoke production,smoke components, quality, safety and nutritive value of smoked fish, processing and equipment, pre-smoking processes, smoking process control.Traditional chimney kiln, modern mechanical fish smoking kiln, Examples of smoked and dried products.

UNIT IV: Canning of fish (11)

Principles of canning, classification based on pH groupings Effect of heat processing on fish

Pre- process operations and post process operations Storage of

Canned fish Cannery operations for specific canned products.(Tuna, Mackerel, Sardine)

Learning outcomes:

1. The student should able to understand shelf-life of fish & Factors affecting quality of fresh fish.
2. The student should able to understand Chilling and Freezing of fish.
3. The student should able to understand Fish Curing and Smoking.
4. The student should able to understand principle of canning process.

Reference books:

1) Fish Processing Technology(2nd edition)Edited by George M Hall published by Backie academic & professional(Unit I, II, II, IV)
2) Applications of Seafood By-products in the food industry and Human Nutrition by Janak K.Vidanarachchi, Senaka Ranadheera, Wijerathne, R.M.C,S.M.C, Himali, Udayagani and Jana Pickova published by Springer New York, Editors: Se-Kwon Kim (Unit I)
3) Post-harvest technology of fish and fish products by K.K.Balachandran published by DAYA publishing house,2016. (Unit II, III, IV)
4) Advances in Fish Processing Technology by D.P.Sen published by Allied publishers,21Feb-2005 (Unit I)

BFPT-306: FOOD PACKAGING I

Theory: 45 Credits: 2

Learning Objectives:

1) To know the importance, functions and types of food packaging
2) To know the properties and functions of Wood and paper
3) To understand the properties and functions of Glass and Metal Packaging
4) To know the different packaging techniques

UNIT I: Introduction (11)

History, Importance and functions of Food packaging. Properties of packaging material in relation to these functions, package design. Tests for flexible packaging materials. Materials used in packaging- rigid, semi rigid and flexible. Types of containers-primary & secondary, flexible & rigid, hermetic & non hermetic.

UNIT II: Wood and Paper Packaging (11)

Packaging materials: Wood- structure, types, properties and wooden containers used in packaging, types of wooden boxes. Paper and paper board- structure, making, properties, types and uses of paper and paper board, CFB boxes and their comparison with wooden containers.

UNIT III: Glass and Metal Packaging (12)

Packaging materials: Glass – composition, properties, structure, types & manufacture of glass containers, their uses, breakage in glass, closure for glass containers.
Metals- properties of metals, different metals used in food packaging, steel plate and functions of various constituents of steel, formation of two piece and three piece cans, tinning process, tin free steel, aluminium containers, lacquering –type and applications, aluminium foil, corrosion of metal cans.

UNIT IV: Packaging Methods (11)

Aseptic packaging of foods: sterilization of packaging material, food contact surfaces & aseptic packaging systems.
Active food packaging – definition, scope, physical and chemical principles involved.
Edible films and coatings.

Learning outcomes-

1. The student should able to understand importance, functions and types of food packaging materials.
2. The student should able to understand the Wood, Paper and paperboards-their types, making properties, uses etc.
3. The student should able to understand Glass and Metals- their types, making properties, uses etc.
4. The student should able to understand different packaging methods as Aseptic packaging, Active packaging ,Edible films and coatings etc.

Reference Books:

1) Robertson, G.L.(2006). Food Packaging: Principles and Practice (3rd ed.) published by CRC, Taylor and Francis Group Boca raton, London New York press (Unit I, II III, IV)
2) Food Packaging Technology-Edited by Richard coles, Derek McDowell and Mork J Kirwan published by Blackwell publishing CRC Press (Unit I)
3) Food Science by B. Shrilakshmi published by New Age International,2003(Unit II, III, IV)
4) Novel Food Packaging Techniques-Edited by Raija Ahvenainen published by Woodhead Publishing Limited(Unit I)

BFPP LAB -307 - PROCESSING OF FRUITS, VEGETABLES, CEREALS AND PULSES

Learning Objectives:

This lab course will enable the students :

1) To know the principle & working of tray dryer, brixometer
2) To understand the process of different fruit and vegetable product .
3) To know the physico-chemical properties of food grains and pulses.
4) To know the cooking quality of rice

Practical's-

PART – I PROCESSING OF FRUITS AND VEGETABLES

1. Judging the maturity indices of important fruits
2. Judging the maturity indices of important vegetables
3. Identification of equipment required for fruit and vegetable processing
4. Preparation of instant fruit juice, soup mix, vegetable juice
5. Preparation of squash, RTS ,Juice, Nectar
6. Preparation of Cordial, Crush, Syrup
7. Preparation of Jam ,Marmalade
8. Preparation of Jellies
9. Preparation of Tomato Ketchup
10. Preparation of Preserve and Candied Fruit
11. Preparation of Potato chips
12. Preparation of Pickle
13. Preparation of food product by drying: Onion flakes ,Raw mango powder / Leafy vegetable powder, Vegetables

PART - II PROCESSING OF CEREALS AND PULSES

1. Determination of gluten content in wheat flour.
2. Preparation of malt.
3. To study the cooking quality of rice using water up take method.
4. To study physico-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. Fermenting power of yeast
10. Preparation of instant dhokla mix

Learning outcomes-

1. The student should able to learn operate tray dryer ,refratometer .
2. The student should able to prepare different types of fruit and vegetable products .
3. The student should able to learn physic-chemical properties of cereal and pulses.
4. The student should able to understand cooking quality of rice, prepare different types of malts

Reference Books:

1) Manual Of Methods Of Analysis Of Foods Fruit And Vegetable Products By Food Safety And Standards Authority Of India Ministry Of Health And Family Welfare (Practical 4, 5, 7, 8, 10, 12.)
2) Handbook of Analysis And Quality Control For Fruit And Vegetable Products ,Second Edition ,S.Ranganna , 2nd Ed. Tata-McGraw-Hill. 2001. (Practical 4,7, 8,12.)
3) Post Harvest And Management And Value Addition Of Fruit And Vegetables By Dr.Vishnu K. Garande, College Of Agricultural,Mahatma Phule Krishi Vidyapeeth,Rahuri (Practical 1 to 13)
4) http://www.egyankosh.ac.in/bitstream/123456789/45805/1/Practical%20Manual.pdf.(Practical 14, 16, 17,18, 19, 20, 21)
5) Bakery Products Science & Technology by Y.H.Hui, (Practical 15)
6) http://www.dakotayeast.com/yeast_testing.html.pdf (Practical 9)
7) https://www.fortunefoods.com/sites/default/files/Khaman%20Dhokla%20Recipe.pdf (Practical 10)

BFPP LAB -308- PROCESSING OF MILK, MEAT AND POULTRY PRODUCT

Learning Objectives:

This lab course will enable the students :

1) To know the principle & working of Gerber centrifuge & butyrometer, hydrometer
2) To understand the processing of milk products
3) To know the applications of additives
4) To understand the quality analysis of meat, egg etc.

Practical's-

PART – I PROCESSING OF MILK AND MILK PRODUCT

1. Platform tests in milk.(Acidity, COB, MBRT, specific gravity, SNF)
2. Estimation of milk fat by Gerber method.
3. Estimation of lactose from given milk sample by Benedict's method.
4. Adulteration tests for different foods: Milk and milk products.
5. Preparation of Skim Milk Powder and Whole Milk Powder.
6. Preparation of Flavoured milk using additives.
7. Preparation of Curd and Shrikhand.
8. Preparation of Khoa and instant gulab jamun mix.
9. Preparation of Paneer and instant rasgulla.
10. Preparation of Condensed milk.
11. Preparation of instant kheer mix.
12. Preparation of Ice-cream and Kulfi mix.

PART - II PROCESSING OF MEAT AND POULTRY

1. Slaughtering and dressing of meat animals.
2. Study of post-mortem changes in meat
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 branded eggs
9. To perform freezing of yolk/albumen
10. Meat/Egg product formulation

Learning outcomes-

1. The student should able to understand end point OF Paneer, Khoa
2. The student should able to prepare different types of Dairy products like Ice-cream, Paneer, Khoa,Condensed milk etc.
3. The student should able to study shelf-life of eggs.
4. The student should able to analyse the frozen meat/meat emulsion products.
5. . The student should able to operate Gerber centrifuge & butyrometer, hydrometer
6. The student should able to prepare different types of milk products.
7. The student should able to learn adulteration in milk and milk product.

Recommend Books

1. Outline of Dairy technology by Sukumar De.(Practical 1, 5, l 6, 7, 8, 9, 10, 11, 12.)
2. Dairy processing and assurance by R. C. Chandan. (Practical 1, 2, 3, 4.)
3. Dairy industry in India current perspective & status (review article) by Biology Essay.(Practical 1,3,4,5)
4. Meat , Poultry & Fish Products Technology by Syed Imran Hashmi (Practical 13 to 19)
5. 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 2015 (Practical 16)

BFPP LAB -309- PROCESSING OF SEA FOOD PRODUCTS & PACKAGING-I

Learning Objectives-

This lab course will enable the students :

1) To evaluate quality of fish/prawn

2) To understand cut out examination of canned fish

3) To know the principle & working of Vernier Calliper to measure thickness of paper and paperboard

4) To understand the measurement of Cobb's value and GSM value of paper & paperbord

Practicals-

PART – I PROCESSING OF SEA FOOD PRODUCTS

1. Quality evaluation of fish/prawn.(Physical Parameters)
2. Formulation/canning of fish products.
3. Determination of Total Volatile Bases.
4. Determination of Histamine.
5. Determination of acidity of brine from canned fish sample.
6. Cut out examination of canned fish.
7. Determination of moisture content from the different fish samples.
8. Determination of sodium chloride from different fish samples.
9. Quantitative determination of starch in the packing medium.
10. To determine Ascorbic acid from different Sea food products.

PART – II FOOD PACKAGING-I

1. To determine GSM (gram per square meter) of paper and paper board.
2. To determine thickness of paper and paper board.
3. To determine Cobb's value of a paper board.
4. To determine the thermal shock resistance of a glass container.
5. To find out the porosity of tin plate.
6. To find out the tin coating weight.

7. To identify the different types of packaging materials.
8. To evaluate shelf life of packaged foods.
9. To study the different parts of glass container.
10. To study the defects in glass containers.

Learning outcomes-

1. The student should able to evaluate quality of fish/prawn, formulation of fish products, determine Histamine
2. The student should able to determine moisture content from the different fish samples.
3. The student should able to calculate GSM of paper and paper board, measure thickness of paper, measure the porosity of tin plate
4. The student should able to identify the different types of packaging materials, evaluate shelf life of packaged foods

Reference Readings-

1) R Handbook of Analysis and Quality control for fruits and vegetable products(2nd edition)by S.Ranganna published by McGraw Hill Education(India) PVT.LTD, Chennai (Practical 14, 15,16,18,19,20)
2) Food Packaging Technology-Edited by Richard coles, Derek McDowell and Mork J Kirwan. published by Blackwell publishing CRC Press (Practical 17)
3) Novel Food Packaging Techniques-Edited by Raija Ahvenainen. published by WOODHEAD PUBLISHING LIMITED(Practical 17)
4) Determination of water absorptivity of corrugated fiberboard(Cobb test)-FEFCO TESTING METHOD-April 1986(amended in 1985,1994,March1997). TAPPI Standards:Regulations and Guidelines.Revision of T410om-08.(Practical 11)
5) TAPPI Standards:Regulations and Guidelines.Revision of T4 l 11om-97(Practical 12)
6) FSSAI manual of methods of analysis of foods (meat and meat products & fish and fish Products) FSSAI Ministry of Health and Family welafare, Gov.of India , New Delhi-16. (Practical 3, 4, 5,7,9,10)
7) Freshness evaluation of fish by quality index method (QIM) and instrumental method at veraval fish landing centre by Jitesh Solanki. (Practical 1)
8) Processing and fish preservation-nptel(https://.ac.in>module5>lecture9). (Practical 2)
9) Cut out analysis for canned fishery products(ecourseonline.iasri.in>mod>view) (Practical 6)

B.Sc.-II (SEMESTER – IV) FOOD PROCESSNG AND PACKAGING (ENTIRE)

BFPT-401: PROCESSING OF BAKERY PRODUCTS

Theory: 45 Credits: 2

Learning Objectives-

1) To know principle and importance of bakery.
2) To understand the different types of ingredients used in bakery products and their function.
3) To understand the types of baking procedures for different bakery products like bread,cake.
4) To study the preservation of bakery products and quality aspect.

Unit I: Introduction of Bakery Products (11)

Introduction and Importance of bakery,Principle involved in bakery products ,working ,principles, application of Dough mixer, moulding machine,OvenMachines and equipment for batch and continuous processing of bakery products.

Unit II: Raw Material Of Bakery Products (11)

Ingredients used in Bakery products and their functions, Types and quality of flour, Various dough and their use ,Process parameter. Heat transfer in baking ,time temperature relationship in baking,

Unit III: Processing Of Bakery Products (12)

Fermentation and proofing, Procedures of Different types of bakery products - bread, cookies, crackers, cake and biscuits, Cooling and packaging of baked products. Defects of baked products and preventive measures, specialized baked products (diabetic baked products, pizza, Passover products)

Unit IV: Preservation Of Bakery Products (11)

Preservation of baked product, Freezing & frozen storage of baked product, equipment for frozen storage, Canned bakery product .Quality aspect of preserved baked products, Maintenance, safety and hygiene of bakery plants.

Learning outcomes-

1. The student should able to understand importance, principle of bakery, working, application of bakery equipments, batch and continuous processing of bakery products.
2. The student should able to understand ingredients and their function, types and quality of flour, various dough and their use, process parameters.
3. The student should able to understand fermentation and proofing, procedures of different types of bakery products like bread, cookies, etc packaging of bakery products.
4. The student should able to understand preservation, and canned bakery product,quality and maintenance of bakery products.

Recommended Readings

1) Bakery Products Science & Technology by Y.H.Hui. (Unit I,II,III)
2) Bakery & Confectionary products , Acharya N.G.Ranga Agricultural University(Unit I,II,III)
3) Cereal processing and cereal based foods Prof. Dr. Véha Antal- Dr. Szabó P. Balázs(Unit II,III)
4) Handbook of Baking & Bakery products (Unit I)
5) Food Safety Management System, Guidance Document ,Bakery & Bakery products(Unit IV)
6) Professional Baking Sixth Edition By Wayne Gisslen. (Unit IV)
7) Cereal Processing Technology By Gavin Owens(Unit IV)
8) Preservation of baked product https://sensoryeffects.com/sites/default/files/bake.pdf (Unit IV

BFPT-402: PROCESSING OF CONFECTIONARY PRODUCTS

Theory: 45 Credits: 2

Learning Objectives-

1) To know importance of confectionary
2) To understand the processing of different confectionary products
3) To understand the processing of Sugar confectionary products.
4) To understand the processing of Boiled Sweets

Unit I: Introduction Of Confectionary Products (11)

Importance of confectionery in food industry, Principle involved in confectionery products Classification of confectionary, Types of confectionary products, Characteristics of confectionary products

UNITII: Chocolate Processing (11)

Chocolate Processing - Ingredients used in chocolate, Cocoa butter substitutes, Processing of cocoa beans, chocolate refining, conching and molding, enrobing, panning.

UNITIII: Sugar Confectionary (12)

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.

UNIT IV: Boiled And Gelatin Sweets (11)

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

Learning outcomes-

1. The student should able to understand Importance of confectionery in food industry
2. The student should able to understand Chocolate Processing
3. The student should able to understand Sugar confectionary
4. The student should able to understand Boiled Sweets

Recommended Readings

1) Bakery & Confectionary products , Acharya N.G.Ranga Agricultural University(Unit I,III,IV)
2) http://jfoodprotection.org/doi/pdf/10.4315/0022-2747-35.7.424(Unit I,III).
3) Professional Baking Sixth Edition By Wayne Gisslen (Unit II)
4) http://www.eiilmuniversity.co.in/downloads/Bakery_&_confectionery.pdf (Unit I,III,IV)

BFPT-403: PROCESSING OF OIL SEEDS AND FATS

Theory: 45 Credits: 2

Learning Objectives-

1) To know physical and chemical characteristics of dietary oil seeds and fats
2) To understand the extraction processes of oilseeds and fats.
3) To understand the refining process and its methods.
4) To understand the processing of butter and other products.

UNIT:I Introduction (11)

Sources; chemical composition; physical and chemical characteristics; Functional and nutritional importance of dietary oil seeds and fats. Post-harvest handling storage Processing of oilseeds for directs use and consumption

(12)

UNIT:II Extraction

Extraction of oil by mechanical expelling and solvent extraction and obtaining deoiled cakes suitable for edible purposes. Processing of other plant sources of edible oils and fats like coconut, cottonseed, rice bran, maze germ, etc.

(11)

UNIT:III Refining

Refining: Clarification, degumming, neutralization (alkali refining), bleaching, deodorization techniques / processes. Blending of oils. Processing of refined oils: Hydrogenation, fractionation, winterization, inter-esterification etc. For obtaining tailor-made fats and oils.

UNIT:IV Processing of butter (11)

Production of butter oil, lard, tallow, Margarine, Cocoa butter equivalents, shortenings, low fat spreads, peanut butter etc. Speciality fats and designer lipids for nutrition and dietetics, especially by biotechnology.

Learning outcomes-

1. The student should able to understand physical and chemical characteristics of dietary oil seeds and fats
2. The student should able to understand different extraction methods for oil seeds and fats as mechanical and solvent extraction methods etc.
3. The student should able to understand the different refining processes of fats and oils.
4. The student should able to understand processing of butter.

Books Recommended

1. Physical and chemical characteristics of oils, fats and waxes, 3rd Edition. David Firestone.(Unit I)
2. Vegetables and oils in food technology by Frank D. Gunstone. (Unit I, Unit II, Unit III, Unit IV)
3. Olive oil chemistry 2nd ed. Dimitrios Boskou.(Unit I)
4. Bailey's Industrial Oil & Fat Products, 4th ed.John Wiley & Sons.(Unit I,II,)

BFPT-404: PROCESSING OF PLANTATION CROPS AND SPICES

Theory: 45 Credits: 2

Learning Objectives-

1) To know importance and processing of plantation crops
2) To understand the definition, Classification & Adulteration of spices
3) To know the production and processing of major Spices
4) To know the production and processing of minor Spices

UNIT: I Plantation crops (11)

Importance of plantation crops,chemical composition, Processing of Tea leaves: Black tea, Green tea and Oolong tea, Instant tea, Processing of coffee : coffee beans, grinding, storage, Soluble /Instant coffee, Use of chicory in coffee, decaffeinated coffee
Processing of coconut and cashew nut

UNIT: II Spices (11)

Definition , Classification, , Properties ,Spice oil and Oleoresins - Definition, Technology of, Manufacturing, Use of Spices, Production of spices in India, Adulteration of spices

UNIT: III Major spices (12)

Production and processing of Major Spices -
Pepper, Cardamom, Ginger, Chilies, Turmeric, onion.

UNIT: IV Minor spices (11)

Production and processing of Minor spices – Ajwain, coriander, cumin, cinnamon, fenugreek, garlic, mustard, saffron, tamarind, cloves, mint, vanilla, asafetida and spice production

Learning outcomes-

1. The student should able to understand importance ,chemical composition of plantation crops and processing of tea ,coffee ,coconut, cash nut
2. The student should able to understand definition ,classification and properties of spices
3. The student should able to explain the process of major spices
4. The student should able to explain the process of minor spices

Books Recommended

1) -Production technology of spices ,Aromatic, Medicinal,& Plantation crops - acharya ng (Unit I, II, III, IV)
2) Plantation Crops, P.K. Abdul Khader, University Of Calicut, 2005. (Unit I)
3) Spices &plantation crops, Jitendra Singh, National Book Trus, 1996 .(Unit I)
4) BLACK PEPPER, Food and Agriculture Organization of the United Nations http://www.fao.org/3/a-au145e.pdf. (Unit III)
5) Ginger, Food and Agriculture Organization of the United Nations http://www.fao.org/fileadmin/user_upload/inpho/docs/Post_Harvest_Compendium_-_Ginger.pdf. (Unit III)
6) Turmeric, Food and Agriculture Organization of the United Nations http://www.fao.org/fileadmin/user_upload/inpho/docs/Post_Harvest_Compendium_-_Turmeric.pdf. (Unit III)
7) Handbook of herbs and spices, Edited by K. V. Peter. Woodhead Publishing 2012 (Unit II, III, IV)
8) Spices and Plantation Crops K.G. Shanmugavelu Agrotech Publication, Delhi (Unit I,II,II,I)

BFPT-405: FOOD BIOCHEMISTRY

Theory: 45 Credits: 2

Learning Objectives-

1) To know the utilization of carbohydrates disorders related to carbohydrate metabolism in body.
2) To know the utilization and biosynthesis of lipids disorders related to lipid metabolism in body.
3) To know the utilization of protein and disorders related to protein metabolism in body.
4)To know about nucleic acid and types of DNA and RNA.
5) To understand the nucleic acids; classification, function & mechanism of enzyme and coenzymes.

UNIT: I Enzyme and Coenzyme (12)

Enzyme: Classification, nomenclature, activation energy, Michaelis-Menten equation, Lineweaver Burk Plot, factors affecting on enzymes action, mechanism of enzyme action. Coenzymes: Classifications [metabolite derived /vitamin derived] function of various types, structure of NAD+, NADP+, FAD & FMN.

UNIT: II Utilization of Carbohydrates (11)

Utilization of carbohydrates in body .,Disorders in carbohydrate metabolism.

UNIT: III Utilization of Protein, Nucleic acids (11)

Proteins: Utilization of protein in body , proteins products of protein metabolism. Disorders in protein metabolism, clinical disorders associated with excess and deficiency of proteins. Nucleic acids: Nucleotides, Nitrogenous Bases- Purines and Pyrimidines; tautomers of bases, nucleotide derivatives, nucleotides as regulating molecules, different types of DNA and RNA.

UNIT-: IV Utilization of Lipid (11)

Utilization of fats, biosynthesis of fatty acids and fats.,Disorders related to lipid metabolism, clinical disorders associated with fats.

Learning outcomes-

1. The student should able to explain utilization of carbohydrates and its disorders.
2. The student should able to understand structure and function of nucleic acids & utilization of proteins and its disorders.
3. The student should able to understand utilization of lipids and its disorders.
4. The student should able to explain classification, function & mechanism of enzyme and coenzymes.

Books Recommended:

1) Principles of Biochemistry-Lehninger (Unit I, II, III, IV)
2) Biochemistry – Stryer. (Unit I, II, III, IV)
3) Principles of biochemistry- Donald J. Voet, Judith G. Voet, Charlotte W.pratt. (Unit I, III)
4) Enzyme technology- Anusha Bhaskar, V. G. Vidhya.(Unit I)
5) Principles of enzyme technology- M.Y. Khan, Faraha Khan. (Unit I)
6) Textbook of medical biochemistry- M.N.Chatterjea,Rana shinde. (Unit II, III, IV)

BFPT-406: FOOD PACKAGING II

Theory: 45 **Credits: 2**

Learning Objectives-

1) To know classification and uses of plastic polymers.
2) To know the techniques & methods used for Packaging.
3) To know the types of oxygen absorbents and its application.
4) To understand the safety considerations in food packaging.

UNIT:I Plastic Packaging (11)

Plastic packaging materials: plastic banned in India, classification of polymers, functional and mechanical properties of thermoplastic polymers;
Processing and converting of thermoplastic polymers, testing of plastic packages.

UNIT:II Techniques & Methods Used For Packaging (11)

Techniques & methods used for Packaging of cereals and cereal product, fruits and vegetables & their products, milk and milk products and meat and meat products, beverages.
Shelf life evaluation of packed products.

UNIT:III Oxygen Absorbents (11)

Classification and main types of oxygen absorbents, factors influencing the choice of oxygen absorbents, Application of oxygen absorbents for shelf-life extension of food and advantages and disadvantages of oxygen absorbents.

UNIT:IV Safety Considerations In Food Packaging (12)

Labeling, Types of food safety problems associated with package, package labeling and food safety.
Food packaging & environment-recycling, composting, thermal treatment & land fill.

Learning outcomes-

1.The student should able to understand classification of polymers, functional and mechanical properties and converting of thermoplastic polymers
2. The student should able to understand techniques of shelf life evaluation of packed products
3. The student should able to explain classification, types advantages and disadvantages of oxygen absorbent
4. The student should able to explain the labeling and food safety problems associated with package, package labeling and food safety

Reference Books:

1) Robertson, G.L.(2006). Food Packaging: Principles and Practice (3rd ed.) published by CRC, Taylor and Francis Group Boca raton, London New York press (Unit I, II, III, IV)
2) Food Packaging Technology-Edited by Richard coles, Derek McDowell and Mork J Kirwan, published by Blackwell publishing CRC Press (Unit I, IV)
3) Food Science by B. Shrilakshmi published by New Age International,2003 (Unit II, IV)
4) Novel Food Packaging techniques-Edited by Raija Ahvenainen published by WOODHEAD PUBLISHING LIMITED (Unit III)

BFPP LAB -407- PROCESSING OF BAKERY & CONFECTIONARY PRODUCTS

Learning Objectives-

This lab course will enable the students:

1) To know the principle & working of microwave oven.
2) To understand the preparation of butter cake, sponge cake , instant cake
3) To understand the preparation of different types of instant foods.
4) To understand the preparation of different types of sugar

Practicals-

PART – I PROCESSING OF BAKERY PRODUCTS

1. Preparation of bread and assessment of its quality.
2. Preparation of pizza base and assessment of its quality
3. Preparation of butter cake , assessment of its quality.
4. Preparation of sponge cake, assessment of its quality. .
5. Preparation of icings and introduction of decorating agents in sponge cake.
6. Preparation of instant cake mix and assessment of its quality
7. Preparation of biscuits and assessment of its quality.
8. Preparation of butter cookies and assessment of its quality.
9. Preparation of almond butter cookies and assessment of its quality.
10. Preparation of Chocolate chip cookies and assessment of its quality.
11. Preparation of Rusk and assessment of its quality.
12. Preparation of Crackers and assessment of its quality.
13. Preparation of toast and assessment of its quality.

PART - II PROCESSING OF CONFECTIONARY PRODUCTS

14. Preparation of fondant, assessment of its quality.
15. Preparation of fudge and assessment of its quality.
16. Preparation of jujubes candy and assessment of its quality.
17. Preparation of toffee and their quality assessment tests.
18. Preparation of Chocolate their quality assessment tests.
19. To study the process of inversion, melting and caramelization in sucrose.
20. Determination of the effect of heat on sugar solution.
21. Preparation of Cocoa
22. Preparation of brittles and assessment of its quality
23. Preparation of hard boiled candy and their quality assessment tests

Learning outcomes-

1. The student should able to learn operate microwave oven.
2. The student should able to understand the Preparation of butter cake , sponge cake , instant cake
3. The student should able to prepare different types of instant foods.
4. The student should able to prepare different types of sugar

Books Recommended

1) Professional Baking Sixth Edition By Wayne Gisslen. (Practical 1, 3, 4, 5, 8, 9, 10,14, 15, 18, 19, 20,22)
2) Bakery Products Science & Technology by Y.H.Hui (Practical 6,7,12.)
3) Bakery & Confectionary products , Acharya N.G.Ranga Agricultural University(Practical 2,17,21)

BFPP LAB -408- PROCESSING OF OIL SEEDS, FATS & PLANTATION CROPS, SPICES

Learning Objectives-

This lab course will enable the students :

1) To know the detection of adulteration in Spices.
2) To understand the microscopic Examination of Spices
3) To find out adultration in fats and oil samples.
4) To carry out qualitative estimation of different fats and oils.

Practicals-

PART -I PROCESSING OF OIL SEEDS & FATS

1. To prepare test samples and determine moisture content of fats and oils.
2. Determination Of Specific gravity and Refractive index of fats and oils.
3. Qualitative estimation of Rice bran oil & mustard oil.
4. Qualitative estimation of Seasame oil.
5. Qualitative estimation of Cotton seed oil.
6. Determination of Melting point of fats and oils.
7. .Determine carotenoid content in raw Palm oil.
8. Determination of Nickel in Vanaspati.
9. Determination of Phosphorous in soya bean oil.
10. To determine adultration in fats and oils.

PART -II PROCESSING OF PLANTATION CROPS & SPICES

11. Microscopic Examination of Spices
12. Detection of adultration of Argemone seeds in Mustard
13. Detection of adultration of Mineral Oil in Black Pepper
14. Detection of adultration of Papaya seeds in Black Pepper
15. Detection of adulteration of Turmeric.
16. Detection of adulteration of Chilies and Coriander
17. Detection of Oil Soluble Colour
18. Determination of Light and Heavy Filth in Spices and Condiments
19. Method for capsaicin content in chilli powder
20. Method for measuring colour value in chillies

Learning outcomes-

1. The student should able to prepare test samples and determine moisture content of fats and oils.
2. The student should able to determine Specific gravity and Refractive index of fats and oils
3. The students should able to determine Melting point of fats and oils, carotenoid content in raw Palm oil.
4. The students should able to determine adulteration of spices.

Recommended readings-

1. FSSAI manual of analysis of food- oils and fats Food Safety And Standards Authority Of India Ministry Of Health And Family Welfare Government Of India New Delhi 2015.(Practical 1 to 9.)
2. Animal and vegetable fats and oils., EAS 319 (2002) 2nd ED. (Practical 6,11)
3. Manual Of Methods 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 2015 Spices And Condiments: (Practical 11 to 20)
4. Manuals Of Food Quality Control 8. Food Analysis: Quality, Adulteration And Tests Of Identity, Fao Foodand Nutrition Paper, © Fao 1986 (Practical 11 to 20)

BFPP LAB -409- BIOCHEMISTRY& FOOD PACKAGING II

Learning Objectives-

This lab course will enable the students :

1) To know the principle & working of different chromatographic techniques.
2) To understand the enzyme and its activity.
3) To estimate and analyze the vitamins, minerals, carbohydrates, lipids from food sample.
4) To know the principle & working of Tearing, Bursting ,Tensile Strength Tester etc.

Practical's-

PART -I BIOCHEMISTRY

1. Estimate the quantity of ascorbic acid by Titrimetric (Volumetric) method in food sample.
2. Estimate the quantity of Vitamin A in food sample.
3. Estimate the quantity of iron in food sample.
4. Estimate the quantity of lead in food sample.
5. Estimate the quantity of arsenic in food sample.
6. Analysis of lipids present in food sample.
7. Determination of carbohydrates present in food sample.
8. Separation of carotenoids by thin layer chromatography,
9. Separation of amino acids by column chromatography.
10. Detection of enzymes in food sample.(urese,amylase,lipase)
11. To estimate the quantity of enzyme activity
12. To study the effect of temperature and substrate concentration on enzyme activity

PART -II FOOD PACKAGING II

13. To determine grease resistance of packaging materials.
14. To determine the chemical resistance of packaging material.
15. Determination of water vapour transmission rate of various packaging materials.
16. To prepare Labels for different types of food products according to package labeling laws.
17. Determination of continuty of Tin coating.
18. To carried out grading of glass bottles for alkalinity.
19. To determine Tear resistance of different packaging materials.
20. To determine Bursting strength of different packaging materials
21. To determine Tensile strength of different packaging materials.
22. To study the Finishes and Closures in Glass containers.

Learning outcomes

1. The student should able to learn the principle & working of different chromatographic techniques, estimate vitamins (vit. C & vit. A), minerals (iron, lead, arsenic)from food sample.
2. The student should able to estimate the quantity of carbohydrates, amino acids
3. The student should able to determine quality of packaging material.
4. The student should able to prepare Labels for different types of food products

Recommended Books:

1. Handbook of Analysis and Quality control for fruits and vegetable products(2nd edition) by S.Ranganna published by McGraw Hill Education(India) PVT.LTD, Chennai.(Practical 13, 14, 15, 17, 18,22)
2. Robertson, G.L.(2006). Food Packaging: Principles and Practice published by CRC, Taylor and Francis Group Boca raton, London New York press (3rd ed.) (Practical 19,20,21)
3. Food Science by B. Shrilakshmi published by New Age International,2003(Practical 16)
4. An introduction to practical biochemistry-Plummer (Practical 1, 2, 6, 11, 12.)
5. Modern experimental biochemistry-Rodney Boyer.(Practical l9.)