



Rayat Shikshan Sanstha's
YASHAVANTRAO CHAVAN INSTITUTE OF SCIENCE, SATARA
(Lead College of Karmaveer Bhaurao Patil University, Satara)

Reaccredited by NAAC with 'A⁺' Grade

Syllabus for

Bachelor of Science

Part - II

B.Sc. Food Technology

Syllabus

to be implemented from June, 2024 onwards

(As Per NEP-2020 Guidelines)

Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara

Lead college of Karmaveer Bhaurao Patil University, Satara

Syllabus for Bachelor of Science Part II

- 1. Title:** B.Sc. Food Technology
- 2. Year of Implementation:**2024-25
- 3. Preamble:**

B.Sc. Food Technology course under autonomy has been prepared keeping in view the unique requirements of B.Sc. Food Technology students. The emphasis of the contents is to provide students the latest information along with due weightage to the concepts of classical trends in Processing and Packaging in food so that they are able to understand the all subjects.

The course content also lists new practical exercises so the students get hands on experience of the latest techniques that are currently used in Food industries. Project curriculum spanning over the one year of the course is designed in a way to understand he basics of food technology Along with students are also provided with an opportunity to peruse the practical knowledge about subject. The course will also inspire students to pursue higher studies and research in Food Processing and Packaging, for becoming an entrepreneur a deniable students to get employed in Food, Nutraceutical and Agriculture Industries.

4. General Objectives:

- To construct and designing of the courses to suite industrial needs.
- To more emphasis on applied aspects of Food Technology.
- To develop aptitude of students in the field of research.
- To enrichment of basic knowledge in areas of Food Technology.
- To shape good and informed citizens from the students entering into the programme.

5. Programme Outcomes:

- i] The students will graduate with proficiency in the Food technology
- ii] The students will be eligible to continue higher studies in Food technology
- iii] The students will be eligible to pursue higher studies abroad.
- iv] The students will be eligible to appear for the examinations for jobs in government organizations.
- v] The students will be eligible to apply for jobs with a minimum requirement of B.Sc. programme

6. PROGRAM SPECIFIC OBJECTIVES

- i. The broad goal of the teaching of under graduate students in Food technology is to provide an understanding of various basic concepts in wide ranging contexts which involve the use of knowledge and skills of Food Technology.
- ii. Their understanding, knowledge and skills in food technology needs to be developed through a thorough teaching learning processes in the class, practical skills through the laboratory work, their presentation and articulation skills, exposure to industry and interaction with industry experts, write short research-based projects where they are guided and mentored by the academic and other experts of the subject.
- iii. The graduate students of Food Technology should have knowledge of the diverse places where food technology is involved. The graduate students of food technology should have understood of diverse food technology processes.
- iv. The graduate students of food technology should have basic skills such as food analysis, food processing, shelf-life testing, sensory analysis, food preservation techniques, etc.
- v. The main objective of the course is to provide students with the basis to face the study of the major fundamentals of food chemistry, food processing, food microbiology, food preservations, food packaging, food engineering etc.
- vi. At the time of completion of the programme the student will have developed extensive knowledge of food safety and regulation.

7. PROGRAM SPECIFIC OUTCOMES

At the end of the three-year programme the student will understand and be able to explain different branches of food technology.

- ii] The student will be able to explain about various applications of food technology such as food processing, food packaging, food preservation, food analysis etc.
- iii] The students will be able to design and execute experiments related to Basic of food chemistry, food analysis, food processing, etc.
- iv] The students will be able to execute a short research project incorporating techniques of Basic and Advanced food technology under supervision

8. Duration: Three/Four Year

9. Exam Pattern: Semester

10. Medium of Instruction: English

11. Structure of B. Sc. II:

Credit Distribution for Second Year of Four Year UG Honors Degree

Class	Level	Sem	Subject-1 Major		Subject-2 Minor		VSC	SEC	AEC	VEC	CC	Total
			T	P	T	P						
B.Sc. II	5.0	III	4 (2 Theory Papers)	4 (2 Theory Papers)	2	2	2	2	4	2	-	22
		IV	4 (2 Theory Papers)	4 (2 Theory Papers)	2	2	2	2	4	-	2	22

Note: VSC- Vocational skill courses, SEC- Skill Enhancement Course, VEC- Value Educational Course, CC- Co-curricular courses

B. Sc. II SEMESTER III COURSE STRUCTURE

Sr. No.	Course Category	Course Code	Name of the Course
1	Major I	BFTT 211	Processing of Fruits and Vegetables
2	Major II	BFTT 212	Processing of Meat, Fish and Poultry
3	Lab I	BFTP 213	Major Lab
4	Minor I	BFTP 214	Fermentation Technology
5	Lab II	BFTT 215	Minor Lab
6	VSC	BFTTVSC	Processing of Plantation Crops and Spices
7	SEC	BFTTSEC	Food Biochemistry

Note : VSC- Vocational skill courses, SEC- Skill Enhancement Course, VEC- Value Educational Course, CC- Co-curricular courses

B. Sc. II SEMESTER IV COURSE STRUCTURE

Sr. No.	Course Category	Course Code	Name of the Course
1	Major I	BFTT 221	Processing of Milk and Milk Products
2	Major II	BFTT 222	Processing of Cereals, Pulses and Oilseeds
3	Lab I	BFTP 223	Major Lab
4	Minor I	BFTT 224	Food Safety and Plant Sanitation
5	Lab II	BFTT 225	Minor Lab
6	SEC	BFTTSEC	Processing of Bakery and Confectionary Products
7	CC	BFTTCC 2	Yoga and Diet

Note ; VSC- Vocational skill courses, SEC- Skill Enhancement Course, VEC- Value Educational Course, CC- Co-curricular courses

SEMESTER III
MAJOR –I

COURSE BFTT 211: - PROCESSING OF FRUITS AND VEGETABLES

Course Objectives: Students should be able to...

1.	classify and know composition of fruits and vegetables.
2.	illustrate the process and defects of jam, jelly, and marmalade
3.	know the process and preservation methods of different types of fruits and vegetables juices.
4.	explain the process of tomato products.

Credits (Total 02 Credits)	BFTT 211 PROCESSING OF FRUITS AND VEGETABLES	No. of hours (30 hrs.)
UNIT – I	Introduction of Fruits and Vegetables	7
	A) Classification and composition of fruits and vegetables Climacteric and no-climacteric fruits B) Postharvest handling, precooking, methods, post-harvest treatments, Storage of Fruits and Vegetables–Ambient, Refrigerated, Modified atmosphere, evaporative Cold storage	
UNIT – II	Jams, Jellies and Marmalades	8
	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.	
UNIT III	Fruits Beverage	8
	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.	
UNIT IV	Tomato Products and Potato Products	7
	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 will be able to...

1.	list and classify the composition of fruits and vegetables.
2.	apply methods of the processing of jam, jellies and ketchup processing.
3.	identify the processing of RTS, squashes, cordials, nectars, concentrates and powder.
4.	explain the important consideration in potato processing

REFERENCE BOOKS:

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)
5.	R.P. Shrivastav and Sanjeev Kumar "Fruits and Vegetable Preservation" 3 rd edition 2019.

SEMESTER III
MAJOR –II

COURSE BFPT 212: - PROCESSING OF MEAT, FISH & POULTRY

Course Objectives: Students should be able to...

1.	know the importance of meat production, chemical composition in India
2.	understand the structure, composition and nutritive value, quality evaluation of eggs.
3.	illustrate the fish processes and factors affecting the quality of fresh fish.
4.	summarize the principle of fish canning.

Credits (Total 02 Credits)	BFPT 212 PROCESSING OF MEAT, FISH & POULTRY	No. of hours (30 hrs)
UNIT-I	Introduction to Meat & Meat Products	07
	<ul style="list-style-type: none"> • Introduction and Importance of meat products in India. • Ante-mortem examination of meat animals, Pre – slaughtering operation, Scientific techniques of slaughtering, Post- mortem inspection, Storage, Preservation 	
UNIT-II	Egg & Poultry processing.	08
	<ul style="list-style-type: none"> • Egg: Structure, composition and nutritive value, Storage and shelf-life problems, Quality evaluation of eggs, Egg products: egg powder, value added egg products, Preservation. • 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 	
UNIT-III	Introduction of Sea Foods	07
	<ul style="list-style-type: none"> • 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 concentrates and fishmeal, By-products of the fish industry and their utilization. 	
UNIT-IV	Chilling, Freezing & Canning	08

	<ul style="list-style-type: none"> • Relationship between chilling and storage life, MAP, general aspects of freezing, Freezing systems (air blast freezing, plate or contact freezing, sprayer immersion freezing), Changes in quality in chilled and frozen storage, thawing. • 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. 	
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Course Outcomes: Student will be able to...

1.	determine the chemical composition and structure of meat.
2.	describe the pre and post inspection, storage and preservation of meat and poultry products.
3.	identify fishery resources, types of fish, water activity and shelf-life.
4.	analyze the general aspects of freezing, chilling and canning of fish.

REFERENCE BOOKS:

1.	Meat, Poultry & Fish Products Technology, Syed Imran Hashmi, VNMAU Parbhani
2.	Principles of Meat Science Aberle E. D. Kendall Hunt Publication, Fifth edition, 2012
3.	Meat Processing Improving Quality, Joseph Kerry.
4.	Meat Science, Lawrie R A, Lawrie' Wood head Publisher England, 5 th Ed, 2017
5.	Processed Meats, A.M. Pearson, Second Edition 2011
6.	Fish Processing Technology, George. M. Hall published by Back i.e academic and professional, 2 nd edition
7.	Post-harvest technology of fish and fish products, K. K. Bala Chandran published DAYA publishing house, 2016
8.	Advances in Fish Processing Technology, D. P. Sen, published, Allied Publishers, Feb 2005
9.	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 Pick ova published Springer New York, Editors: Se-Kwon Kim

Major Lab

BFTP 213- Major Lab
BFTP 213- PROCESSING OF FRUITS AND VEGETABLES AND PROCESSING OF MEAT, FISH AND POULTRY

Course Objectives: Students should be able to...

1.	know the principle and working of tray dryer, brixo meter.
2.	compare the process of different fruit and vegetable product.
3	understand the process of pulp.
4	demonstrate the method of slaughtering and dressing of meat animals
5	summarize the quality analysis of meat, egg etc.
6	evaluate Quality of fish/prawn.

Credits (Total Credit 04)	Major Lab I - PROCESSING OF FRUITS AND VEGETABLES AND PROCESSING OF MEAT, FISH AND POULTRY	No. of hours per unit/credits (120 hrs)
Part I	PROCESSING OF FRUITS AND VEGETABLES	
1	Identification of equipment required for fruit and vegetable processing.	
2	Preparation of instant fruit juice.	
3	Preparation of pulp	
4	Preparation of Syrup	
5	Preparation of RTS	
6	Preparation of squash.	
7	Preparation of Nectar.	
8	Preparation of Jam.	
9	Preparation of Jelly.	
10	Preparation of Marmalade.	
11	Preparation of Tomato Ketchup and Sauce	
12	Preparation of Preserve and Candied Fruit	
13	Preparation of Preserve and Candied Fruit	

14	Preparation of food product by drying: Leafy vegetable	
15	Preparation of Pickle	
Part II	PROCESSING OF MEAT, FISH AND POULTRY	
1	Slaughtering and dressing of meat animals.	
2	Analysis of frozen meat/meat emulsion products (Chemical and Microbial)	
3	Evaluation of eggs for quality parameters market eggs	
4	Formulation of fish products	
5	Meat/Egg product formulation	
6	Quality Evaluation of Fish/prawn. (Physical Parameters)	
7	Pre-Canning operation of fish (selection, sorting, descaling, washing, nobbing, brining)	
8	Formulation of Fish Products.	
9	To study shelf life of eggs by different methods of preservation	
10	To study the anatomy of Fish	
11	Determination of moisture content from the different fish samples	
12	Estimation of moisture content of meat	
13	Preservation of meat by different method	
14	Determination of acidity of brine from canned fish.	
15	To perform freezing of yolk/albumen	

Course Outcomes: Student will be able to...

1.	Operate tray dryer, refractometer.
2.	Prepare different types of fruit and vegetable products.
3.	develope different pulp
4.	formulate the products of meat/egg.
5	study the shelf life of eggs.
6	determination of fishery resource, water activity and shelf life.

PRACTICAL REFERENCE:

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,Rah
4	Advances in Fish Processing Technology, D. P. Sen, published, Allied Publishers, Feb 2005
5	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)
6	Meat, Poultry and Fish Products Technology, Syed Imran Hasmi, DAYA Publishing house, 2 nd Edition, 2015
7	Manuals of Methods of Analysis of Foods Meat and Meat Products, Food Safety Standards, Authority of India Ministry of Health and Family Welfare Government of India New Delhi, 2016
8	Advances in Fish Processing Technology, D.P. Sen, Published, Allied Publishers, Feb 2005.
9	Fish Processing Technology, K.K. Balachandran Published academic and professional, 3 rd Edition, 2014
10	Meat and Meat Products Technology Including Poultry Products Technology, BD Sharma, 2 nd Edition, Jan 2019

SEMESTER III

MINOR

COURSE BFTT 214: - FOOD FERMENTATION TECHNOLOGY

Course Objectives: Students should be able to...

1.	know basics of fermentation.
2.	understand the microbial products.
3.	summarize the traditional fermented products.
4.	illustrate the enzyme in food industry and fermentation economics.

Credits (Total 02 Credits)	BFTT 214 FERMENTATION TECHNOLOGY	No. of hours (30 hrs)
UNIT-I	Basics of Food Fermentation	8
	<ul style="list-style-type: none"> ● Fermenter design, operation, measurement and control in fermentation, Media for Industrial Fermentation, Sterilization of air and media, inoculum Preparation, Scale up in fermentation ● Batch and continuous process, Solid substrates fermentation, down stream processing and Product recovery. 	
UNIT-II	Microbial Product	7
	<ul style="list-style-type: none"> ● Primary, secondary metabolites – Organic acids (Citric Acid, Lactic acid), alcohol, Penicillin and Vitamin B12. ● Microbial biomass production- baker's yeast, single cell protein and mushroom. 	
UNIT-III	Traditional fermented Foods and Beverage.	7
	<ul style="list-style-type: none"> ● Traditional fermented foods like idli, dosa, Soya-sauce, Miso, Sauerkraut. Beverage – vinegar, beer, wine, whisky, rum, vodka. 	
UNIT-IV	Enzyme Technology in Food Industry and Fermentation Economic	8
	<ul style="list-style-type: none"> ● Enzyme technology in food industry- Industrial enzymes (with respect to food processing industry) Enzyme Immobilization. ● Fermentation economics- Market Potential, Fermentation 	

and Product Recovery Costs, Process Appraisal.

Course Outcomes: Student will be able to...

1.	learn fermenter design, operation, measurement and controlling in fermentation technology.
2.	know primary, secondary metabolites and learn microbial biomass production.
3.	develop traditional fermented foods and know beverage production.
4.	extend enzyme technology in food industry and learn fermentation economics.

REFERENCE BOOKS:

1.	Peter F Stanbury and Whitaker A. ,Elsevier, 2008 Principles of Fermentation Technology
2.	L. E. J. R. Casida , New age international publishers, 2007 Industrial Microbiology
3.	Peppler, Perimam Volume II, 2 nd edition, 2007 Microbial Technology Fermentation Technology
4.	Ramesh C Ray and Montet Didier Published August 21, 2014 Microorganisms and Fermentation of Traditional Foods (Food Biology Series)
5.	<u>P.-L. Yu</u> (Editor) 31 August 1990 Fermentation Technologies: Industrial applications Hardcover
6.	Fermentation Technologies: Industrial applications Hardcover – Illustrated, 31 August 1990

Minor Lab I

BFTTP 215- Minor Lab I
BFTTP 215- FERMENTATION TECHNOLOGY

Course Objectives: Students should be able to...

1.	understand the growth of curve bacteria.
2.	analyze effect of temperature & pH on bacterial growth.
3.	demonstrate microbial examination of food.
4.	learn to develop fermented food.

Credits (Total Credits 02)	BFTP 215 - FERMENTATION TECHNOLOGY	No. of hours (60 hrs)
1.	Determination of Growth curve of bacteria.	
2.	Effect of temperature on bacterial growth.	
3.	Effect of pH on bacterial growth.	
4.	Microbial examination of food.	
5.	Development of a fermented Kimchi.	
6.	Detection of food borne pathogens.	
7.	Primary screening of antibiotic producers by crowded plate technique.	
8.	Immobilization of yeast cell by Sodium – alginate entrapment method & determination of viability of immobilized cells by invertase activity.	
9.	Fermentative production of Amylase.	
10.	Development of a fermented drink utilizing plant products/ animal products or byproducts as substrate.	
11.	Development of a fermented food.	
12.	Identification of Molds by lactophenol blue staining.	
13.	Development of a Traditional fermented .	
14.	Development of a Vinegar by using different fruits.	
15.	Development of a fermented Jalebi.	

Course Outcomes: Student will be able to...

1.	learn basics of fermentation
2.	understand the microbial fermentation products
3.	develop the traditional fermentation production
4.	Determine microbial analysis of food.

REFERENCE BOOKS:

1.	Food Quality Evaluation, Rao E. S., Variety Books, 2013
2.	Principles of Sensory Evaluation of food, Amerine, Pang born and Roessler, Academic Press, London,1965
3.	Michael M. Cramer, CRC Press, 3 rd edition, 2013 Food Plant Sanitation: Design, Maintenance and Good Manufacturing Practices.
4.	Sensory Evaluation Techniques, Meilgard, 3 rd ed. CRC Press LLC, 1999.
5.	Principles of Food Chemistry, de Man J. 3 rd ed., Springer.62, 2007.

SEMESTER III

VSC

COURSE BFTT VSC: - PROCESSING OF PLANTATION CROPS AND SPICES

Course Objectives: Students should be able to...

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

Credits (Total 02 Credits)	BFTTVSC PROCESSING OF PLANTATION CROPS AND SPICES	No. of hours (30 hrs.)
UNIT-I	Plantation Crops	15
	<ul style="list-style-type: none"> Importance of plantation crops and spices, Processing of Tea leaves: Black tea, Green tea and Oolong tea. Processing of coffee, Processing of coconut and cashew nut. 	
UNIT-II	Spices	15
	Definition, Classification, Spice oil and oleoresins, Adulteration of spices. Production and processing of Major Spices –Pepper, Cardamom, Ginger, Chilies, Turmeric, onion. Production and processing of Minor spices– ajwain, coriander, cumin, cinnamon, fenugreek, garlic, mustard, saffron, tamarind, cloves, mint, vanilla, asafoetida.	

Course Outcomes: Student will be able to...

1.	understand the chemical composition of plantation crops.
2.	elaborate the definition, classification, and properties of spices.
3.	summarize the production of major spices on commercial scale.
4.	construct the production of minor spices on commercial scale.

REFERENCE BOOKS:

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 ungo.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 Trus, 1996 (Unit IV)
6.	Processing of coffee, U.S. Specialty coffee consumption report 2014
7.	Processing technologies for virgin coconut oil and coconut based confectionaries and beverages, May 2007
8.	Black pepper, Food and Agriculture Organization of the United Nations http://www.fao.org/3/a-au145e.pdf .
9.	Turmeric, Food and Agriculture Organization of the United Nations http://www.fao.org/fileadmin/user_upload/inpho/docs/Post_Harvest_Compensium_-_Turmeric.pdf . (Unit IV)
10.	K. V. Peter, Handbook of herbs and spices, Wood head Publishing, 2012 (Unit III)

SEMESTER III

SEC

COURSE BFTPSEC: - FOOD BIOCHEMISTRY

Course Objectives: Students should be able to...

1.	know the principle and working of different chromatographic techniques
2.	understand the enzyme and its activity.
3.	estimate and analyze the vitamins, carbohydrates, lipids from food sample.
4.	know the principle and working evaporator and dryers etc.

Credits (Total Credits 2)	BFTPSEC FOOD BIOCHEMISTRY	No.of hours per unit/credits (60 hrs)
1	Estimate the quantity of ascorbic acid by titration(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	Qualitative detection of antioxidants by thin layer chromatography.	
5	Analysis of lipids present in food sample.	
6	Determination of carbohydrates present in food sample	
7	Separation of carotenoids by thin layer chromatography	
8	Separation of amino acids by column chromatography.	
9	Detection of enzymes in food sample. (Urease)	
10	Detection of enzymes in food sample. (Amylase)	
11	Detection of enzymes in food sample. (Lipase)	
12	To estimate the quantity of enzyme activity.	
13	To study the effect of temperature on enzyme activity.	
14	To study the effect of substrate concentration on enzyme activity.	
15	Assay of Amylase by DNSA Method. (Graphical estimation)	

Course Outcomes: Student will be able to...

1.	understand 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.	know the types of dryers.
4.	analyze the methods of extraction.

REFERENCE BOOKS:

1.	Handbook of Analysis and Quality control for fruits and vegetable products S. Ranganna, McGraw Hill Education (India) PVT.LTD, Chennai, 2 nd edition, 2007.
2.	Food Engineering Laboratory Manual, Gustavo V.Barbosa- Canovas, LiMa, Blas J.Barletta, 1 st Edition. 2019
3.	chemical food analysis – A Practical Manual, Bruce R. D’ Arcy, Geoff Hawes, 2003
4.	An introduction to practical biochemistry, Plummer, Tata Mc Graw Hill Publishing Co. New Delhi. 3 rd edition, 2004.
5.	Modern experimental biochemistry, Rodney Boyer, Dorling Kindersley (India) Pvt Ltd 3 rd Edition, 2000.

SEMESTER IV

SEMESTER IV
MAJOR –I

SEMESTER IV

BFTT 221 PROCESSING OF MILK AND MILK PRODUCTS

Course Objectives: Students should be able to...

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

Credits (Total 02 Credits)	BFTT 221 PROCESSING OF MILK AND MILK PRODUCTS	No. of hours (30 hrs.)
UNIT-I	Introduction to food	7
	<ul style="list-style-type: none"> • Development of milk processing industry in India- present status and scope • Dairy layout for small scale industry, sanitation layout, dairy equipment and sanitation. 	
UNIT-II	Primary processing.	8
	<ul style="list-style-type: none"> • Food value and Composition of milk. • 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. 	
UNIT-III	Secondary processing.	8
	<ul style="list-style-type: none"> • Milk product Processing – Cream, Butter, Khoa, Paneer, Ice-cream Condensed milk and evaporated milk. • Judging and grading of milk and its products • Manufacturing of Cheddar cheese–Introduction, Manufacturing process, packaging, storage, defects and their prevention • Dried milk products–Buttermilk powder, Whey Powder, Ice Cream mix Powder, Infant milk food, WMP and SMP. 	
UNIT-IV	Common food processing	7
	<ul style="list-style-type: none"> • Introduction, Classification and Composition of byproducts. • Principles and methods of Utilization Whey utilization and whey-based beverages like lassi and buttermilk. 	

Course Outcomes: Student will be able to...

1.	utilize the processing of different milk products- cream, , butter khoa, paneer, ice-
2.	apply the process to evaporate milk and know the process of cheddar cheese, dried milk products.
3.	know the buying, receiving, collection, transportation, storage and distributionof milk
4.	identify the composition of byproducts

REFERENCE BOOKS:

1.	Outlines of Dairy Technology, Sukumar De, Oxford University Press, 1 st edition, 2001.(Unit-I)
2.	Dairy Engineering Advanced Technologies and Their Applications, Rupesh S Chavan, Netra R Goyal, Murlidhar Meghwal, TaylorandFancis, 1stedition, 2017..(Unit-II)
3.	Dairy Technology, Shivashraya Singh, illustrated, New India Publishing Agency-Nipa, 2013. .(Unit-III)
4.	Structure of Dairy Products, A.Y.Tamime, Wiley-Blackwell, 1stedition, 2007. (Unit-IV)
5.	Indian Dairy Products, Rangappa K.S., AsiaPub.House, 2 nd edition, 1975. .(Unit-Iand UnitII)

Semester IV

MAJOR –II

COURSE BFTT 222: - PROCESSING OF CEREALS, PULSES AND OIL SEEDS

Course Objectives: Students should be able to...

1.	know the structure and composition of cereals and pulses.
2.	illustrate the different types of milling processes and different by products.
3.	illustrate various cooking methods.
4.	understand different types of improved milling methods of pulses.

Credits (Total 02 Credits)	BFTT 222 PROCESSING OF CEREALS, PULSES AND OIL SEEDS	No. of hours (30 hrs)
UNIT-I	Wheat and Rice Processing	
	<ul style="list-style-type: none"> • 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. • Structure and chemical composition of rice grain, milling of rice– types of rice mill; Sheller-cum-cone polisher mill, Modern rice milling, Factors affecting rice yield during milling, rice bran as rice milling by products, Rice parboiling technology. 	8
UNIT-II	Corn Processing	
	<ul style="list-style-type: none"> • 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 	7
UNIT-III	Pulses Processing	
	<ul style="list-style-type: none"> • 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 	7

	methods.	
UNIT-IV	Extraction and Refining of Oil.	
	<ul style="list-style-type: none"> Extraction of oil by mechanical expelling and solvent extraction and obtaining de oiled cakes suitable for edible purposes. Processing of other plant sources of edible oils and fats like coconut, cottonseed, rice bran, maze germ, etc. 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. 	8

Course Outcomes: Student will be able to...

1.	explain the structure and chemical composition, types and milling of rice.
2.	understand the structure and chemical composition, toxic constituents of pulses.
3.	examine the different types of milling methods of pulses.
4.	understand extraction methods for oil seeds and fats as mechanical and solvent extraction methods.

REFERENCE BOOKS:

1.	Post harvest technology of cereals, pulses and oil seeds, A. Chakraverty, Oxford and IBH Publishing Company, 2014. (Unit I, II)
2.	Cereal Processing Technology Gavin Ovens, Wood Head Publishing LTD, 2000.
3.	Food Science, B. Srilakshmi, New Age International Pvt Ltd Publisher 7th Edition, 2018. (Unit-I, II, III)
4.	David Firestone, Physical and chemical characteristics of oils, fats and waxes, Amer oil chemists society, 3 rd Edition, 2006
5.	John Wiley and Sons, Bailey's Industrial Oil and Fat Products, , 4 th edition, 2004
6.	Frank D. Gunstone, Vegetables and oils in food technology. 2002
7.	Dimitrios Boskou, Olive oil chemistry, , 2 edi .1996.

Major Lab

BFTP 223- Major Lab

BFTP 223 - PROCESSING OF MILK AND MILK PRODUCTS AND PROCESSING OF CEREALS, PULSES AND OIL SEEDS

Course Objectives: Students should be able to...

1.	know the principle and working of hydrometer
2.	explain the composition, food value and processing of milk.
3.	understand the processing of different milk products such as cream, butter, cheese.
4.	know the structure and composition of cereals and pulses.
5.	to carryout qualitative estimation of different fats and oils.
6.	find out adulteration in fats and oil samples.

Credits (Total Credit 04)	BFTP 223- Major Lab III PROCESSING OF MILK AND MILK PRODUCTS AND PROCESSING OF CEREALS, PULSES AND OIL SEEDS	No. of hours per unit/credits (120 hrs.)
Part - I	PROCESSING OF MILK AND MILK PRODUCT LAB	
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	Preparation of Kunda	
13	Preparation of Gulabjamun	
14	Preparation of Rasmalai	
15	MBRT and Phosphatase test for milk.	
PART - II	PROCESSING OF CEREALS, PULSES AND OIL SEEDS	
1	Determination of gluten content in wheat flour	

2	Preparation of malt	
3	To study the cooking quality of rice using water uptake 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	Preparation of instant dhokla mix	
10	To prepare test samples and determine moisture content of fats and oils.	
11	Determination of Peroxide value of oil.	
12	To determine adulteration in fats and oils.	
13	Determination of animal fat in vegetable fat	
14	Detection of presence of rancidity	
15	Determination of Melting point of fats and oils.	

Course Outcomes: Student will be able to...

1.	perform plate form test of milk.
2.	prepare different types of dairy products like ice-cream paneer, khoa and condensed milk etc.
3.	study the composition and byproducts of Milk
4.	learn physico-chemical properties of cereal and pulses.
5.	develop different types of malt.
6.	choose test samples and determine melting point of fats and oils.

REFERENCE BOOKS:

1.	Outlines of Dairy Technology, Sukumar De, Oxford University Press, 1 st edition, 2001.(Unit-I)
2.	Airy Engineering Advanced Technologies and Their Applications, Rupesh S Chavan, Netra R Goyal, Murlidhar Meghwal, Taylor and Francis, 1 st edition, 2017.
3.	Indian Dairy Products, Rangappa K.S., Asia Pub. House, 2 nd edition, 1975.
4.	Structure of Dairy Products, A.Y. Tamime, Wiley-Blackwell, 1 st edition, 2007.
5.	Indian Dairy Products, Rangappa K.S., Asia Pub. House, 2 nd edition, 1975. (Unit-I and Unit II)
6.	Packaged Fluid Milk Sales in Federal Milk Order

	Markets by Size and Type of Containers, and Distribution Method during November 1975, AMS-553, July 1977.
7	Post harvest technology of cereals,pulses and oil seeds, A.Chakraverty,Oxfordand IBH PublishingCompany,2014.(Unit I,II)
8	Cereal Processing Technology Gavin Ovens,Wood Head Publishing LTD,2000.
9	Food Science, B.Srilakshmi, New Age International Pvt Ltd Publisher7th Edition,2018.(Unit-I,II,III)
10	David Firestone, Physical and chemical characteristics of oils, fats and waxes, Amer oil chemists society, 3rd Edition, 2006
11	John Wiley and Sons, Bailey's Industrial Oil and Fat Products, , 4th edition, 2004
12	Frank D.Gunstone, Vegetables and oils in food technology.2002
13	Dimitrios Boskou, Olive oil chemistry, , 2 edi .1996.

SEMESTER IV

MINOR I

BFTT 224 – Minor
FOOD SAFETY AND PLANT SANITATION

Course Objectives: Students should be able to...

1.	demonstrate food safety and food related hazards and risks
2.	summarize the food safety management tools.
3.	Know the food laws and food safety standards.
4.	analyze the food hygiene and sanitation of plant.

Credits (Total 02 Credits)	BFTT 224 - FOOD SAFETY AND PLANT SANITATION	No. of hours (30 hrs)
UNIT-I	Introduction to Food Safety and Food related hazards	8
	<ul style="list-style-type: none"> • Definition of food safety, Importance of food safety, Hazards-Types of hazards, biological, chemical, physical hazards, Importance of Safe Food, microbiological considerations in food safety. • Acute toxicity, Mutagenicity and carcinogenicity, reproductive and developmental toxicity, neurotoxicity and behavioral effect, immunotoxicity. 	
UNIT-II	Food Safety Management Tools	7
	<ul style="list-style-type: none"> • Basic concept of food safety, Prerequisites- GHPs, GMPs, HACCP, ISO series, • TQM - concept and need for quality, components of TQM, Kaizen, Risk Analysis-Risk assessment and risk benefit Indices of human exposure, Accreditation and Auditing. 	
UNIT-III	Food Laws and Standards	7
	<ul style="list-style-type: none"> • AGMARK and Bureau of Indian standards, Additional food laws – Federal Poultry products Inspection Act of 1957. • Federal Trade Commission act, Infant formula Act of 1986, Nutrition labeling and education act of 1990. • Consumer protection Act, Food Safety and Standards 2006, Other laws and standards related to food. 	
UNIT-IV	Food Plant Hygiene and Sanitation	8

	<ul style="list-style-type: none"> • Waste disposal, control methods using physical and chemical agents, pest and rodent control. • ETP design and layout, food storage sanitation, transport sanitation and water sanitation, by-products utilization obtained from dairy plant, egg and poultry processing industry and meat industry. • Wastewater and solid waste treatment: - Waste-types-solid and liquid waste characterization, physical, chemical, biological, aerobic, anaerobic, primary, Secondary and tertiary (advanced) treatments. 	
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Course Outcomes: Student will be able to...

1.	extend the importance of food safety and to know food related hazards and risks.
2.	learn food safety management tools and to understand risk analysis and risk assessment.
3.	understand food laws and to learn food safety standards.
4.	summarize waste management system and to learn food hygiene and sanitation of plant.

REFERENCE BOOKS:

1.	Training manual for Food Safety Regulators, Vol II 2010 Food Safety Regulations and Food Safety Management
2.	Food Quality and Safety Systems-A training manual on Food Hygiene and the Hazard Analysis and Critical Control Point(HACCP) system, 1998 Food and Agriculture Organization of the United Nations, Rome, Publishing Management Group, FAO Information Division
3.	Michael M. Cramer, CRC Press, 3rd edition, 2013 Food Plant Sanitation: Design, Maintenance and Good Manufacturing Practices.
4.	Keith W Waldron, ELSEVIER, 2007 Handbook of waste management and co- product recovery in food processing, Vol I
5.	Sunetra Roday, McGraw Hill Education (India) Private Limited, 2nd edition, 2017 Food Hygiene and Sanitation

Minor Lab

BFTP 225– Minor Lab
BFTP 225- FOOD SAFETY AND PLANT SANITATION

Course Objectives: Students should be able to...

1.	Understand BOD and COD determination in industrial effluent.
2.	Know the testing of sanitizers and disinfectants
3.	classify physico-chemical estimation from sewage and industrial effluent.
4.	interpret bacteriological analysis of water by qualitative and quantitative method.

Credits 2 (Total Credits)	BFTP 225 - FOOD SAFETY AND PLANT SANITATION	No. of hours (60 hrs)
1	Determination of BOD (Biological oxygen demand) of industrial effluent.	
2	Determination of COD (Chemical oxygen demand) of industrial effluent.	
3	Identification of Enteric Bacilli by IMViC test.	
4	To determine acidity of waste water.	
5	Estimation of TS, TSS, TDS from sewage and industrial effluent.	
6	Bacteriological analysis of water by presumptive test, confirmed and completed test.	
7	Determination of oil from industrial waste.	
8	Assessment of surface sanitation by swab method.	
9	To determine alkalinity of waste water.	
10	Evaluation for effectiveness of disinfectants (Detection of phenol coefficient of disinfectant).	
11	Testing of carcinogenicity of a substance by Ame's test.	
12	Determination of grease from industrial waste.	

13	Bacteriological Analysis of Water by MPN method.	
14	Enumeration of aerial micro flora using PDA, NAD.	
15	Assessment of surface sanitation by rinse method.	

Course Outcomes: Student will be able to...

1.	determine BOD and COD in industrial effluent.
2.	interpret physico-chemical estimation from sewage and industrial effluent
3.	analyze testing of sanitizers and disinfectants
4.	examine bacteriological analysis of water by qualitative and quantitative method.
5.	determine acidity and alkalinity of water.

REFERENCE BOOKS:

1.	Rao E. S., Variety Books, 2013, Food Quality Evaluation
2.	Pang born and Roessler, Academic Press, London,1965 Principles of Sensory Evaluation of food, Amerine
3.	Michael M. Cramer, CRC Press, 3rd edition, 2013 Food Plant Sanitation: Design, Maintenance and Good Manufacturing Practices.
4.	Meilgard, 3rd ed. CRC Press LLC, 1999Sensory Evaluation Techniques.
5.	De Man J. 3rd ed., Springer.62, 2007, Principles of Food Chemistry.

Semester IV

SEC

COURSE BFTTSEC: - PROCESSING OF BAKERY AND CONFECTIONARY

Course Objectives: Students should be able to...

1.	understand the importance and principles involved in baking.
2.	learn the processing technology of various bakery products.
3.	describe the basics of confectionary technology.
4.	know the chocolate manufacturing process.

Credits (Total 02 Credits)	BFTTSEC PROCESSING OF BAKERY AND CONFECTIONARY	No. of hours (30 hrs)
UNIT-I	Bakery Technology .	15
	<ul style="list-style-type: none"> • Introduction, Importance and principles involved in Baking. Equipments used in bakery. Ingredients used in bakery products. Time temperature relationship in baking. • Processing technology of bakery products- bread, pizza base, crackers, biscuit, cookies. Cooling and packaging, 	
UNIT-II	Introduction to confectionary Technology	15
	<ul style="list-style-type: none"> • Introduction, Importance, types, Classification and principles involved in confectionary. Ingredients used in confectionary. • Sugar confectionary: Types of sugar- production, storage, alternative bulk sweeteners, corn syrup and glucose syrup, sorbitol, xylitol, maltitol, isomalt, lactitol, mannitol, polydextrose. 	

Course Outcomes: Student will be able to...

1.	know the various machineries used in bakery industries.
2.	prepare various bakery products.
3.	apply the basics of confectionary in industries.
4.	develop the various products of chocolate.

REFERENCE BOOKS:

1.	Khetarpaul. N.,Grewal. B. R. 2022. Bakery science and cereal technology, Daya Publication House, Delhi.
2.	Davidson. I. 2022. Biscuit, Cookie and Cracker Production. Academic Press. Elsevier, London.
3.	Wayne Gisslen, 2021. Professional Baking, 8 th edition Wiley Blackwell Publication, New Jersey, UK.
4.	Rashmi. S. Sharma, 2020. Handbook of Baking and Bakery products, Wood Head Publishing Ltd, New Delhi.
5.	Ducan Manley, 2019. Manual 1 Ingredients. Wood Head Publishing Ltd, Cambridge.
6.	Ducan Manley, 2019. Manual 2 Biscuit Doughs. Wood Head Publishing Ltd, Cambridge.
7.	Ducan Manley, 2019. Manual 3 Biscuit Dough Piece Forming. Wood Head Publishing Ltd, Cambridge.
8.	Ducan Manley, 2019. Manual 4 Baking and Cooling of Biscuits. Wood Head Publishing Ltd, Cambridge.
9.	Ducan Manley, 2019. Manual 5 Secondary Processing in Biscuit Manufacturing. Wood Head Publishing Ltd, Cambridge.
10.	Ducan Manley, 2019. Manual 6 Biscuit Packaging and Storage. Wood Head Publishing Ltd, Cambridge.
11.	Bakery and Confectionery, Acharya NG Ranga Agricultural University
12.	William P Edwards, 2018. The Science of Sugar confectionery, Royal Society of Chemistry, 2nd edition, Wood Head Publishing Ltd, New Delhi.
13.	Hui. Y. H. 2014, Bakery Products Science and Technology, Wiley Blackwell Publication, New Jersey, UK.
14.	Gavin Owens, 2012. Cereal Processing Technology, Wood Head Publishing Ltd, New Delhi.
15.	Peter P. Greweling, 2012. Chocolate and Confections; Formula, Theory and Technique for the Artisan Confectioner, 2nd edition, Wiley-Blackwell New Jersey, UK.
16.	Yogambal Ashok kumar, 2012. Textbook of Bakery and Confectionery , Prentice Hall India Learning Private Limited, Wood Head Publishing Ltd, New Delhi.
17.	Ferenc A. Mohos, 2010. Confectionery and Chocolate Engineering: Principles and Applications, Wiley-Blackwell Publication, New Jersey, UK.

Semester IV

CC

BFTTCC 2: Yoga and Diet

Structure of the Course:

Duration	Theory Periods	Total Periods	Credits	No. of Students in batch
1 Year	30	30	2	

Course objectives:

Students should be able to ...

1. understand the basic principles of yoga
2. learn about basic knowledge of various yogic texts
3. explain the basic concept of yogic diet.
4. classify different diet therapy for treatment of diseases according to ayurveda

Credit(1)	Name of the Unit	No of Hrs. (30)
Unit I	Basic Principles of Yoga	8
	<ul style="list-style-type: none"> • Concept of Yoga: Its Definition, Aim, Objectives and Misconception. • Significance of Hatha Yoga Practices- Shatkriyas, • Yogasana – Pranayama – Mudra – Bandha - Dhyana. • Roles and Responsibilities of Yoga. • Knowledge of use props: ropes/belt/cushions/special aids. • Importance of pre-procedural preparedness for performing Yoga 	
Unit II	Yoga in Traditional Yoga Text	7
	<ul style="list-style-type: none"> • Basic Knowledge of various yogic texts such as Patanjala Yogsutra, Hathapradipika, Gheranda Samhita . • Knowledge of schools of Yoga: Karma Yoga, Bhakti Yoga, Jnana Yoga and Dhyana Yoga. • Concept of klesha, Concept of chitta vritti , • Ashtanga Yoga and its therapeutic importance. • Principles of Hathayoga , Hatha yogic practices in view of therapy. 	
Unit III	Concept of Yogic Diet.	

	<ul style="list-style-type: none"> • Meaning and definition of Mithahara Indicated and contra indicated food • Yogic diet for practice of Pranayama • Sattvik, Rajasic and Tamic foods as per Bhagavad Gita 	8
Unit IV	Diet Therapy For Treatment of Diseases According To Ayurveda	7
	<ul style="list-style-type: none"> • Diet according to Shadrasas and Doshas • Diet therapy for digestive disorders • Diet therapy for Diabetes • Diet therapy for Circulatory disorders 	

Course outcomes:

Students will be able to...

1. explore the different schools of Yoga
2. aware about significance of Hatha Yoga Practices
3. develop and implement different yogic diet
4. apply diet according to disease.

Reference Books:

1. Hathayoga_Radha, Sivananda_ jaico Publishing House, Delhi, 2004.
2. Asana, Pranayama, Bandha, Mudra_Saraswati, Swami Satyanand_Bihar School of Yoga, Munger.
3. History of Yoga_Singh, S.P.& Chattopadhyaya, D.P._ MLBD, New Delhi, 2010Hollebeek, L. D., Glynn, M. S. and Brodie, R. J., 2014.
4. Swami Mukhtibodhananda , Hatha Yoga Pradeepika, Bihar School of Yoga,Munger,Bihar; 1998
5. Swami Diagambarji, DrM.L Gharote, Gheranda Samhitha, S.M.Y.M Samithi Kaivalyadhama, Lonavla Maharashtra; 1997.
6. Dr.B Athavale, Basic principles of Ayurveda, Sanathan Samstha, 206 Sion Main Road, Mumbai 1980
7. Alladi Mahadeva Shasthri, The Bhagavath Geetha;With the Comentry of Shankaracharya, Samatha Books, 10 Kamaraj Bhavan, Mount Road Madras; 1997