Karmaveer Bhaurao Patil University, Satara

Syllabus for

B. Sc. I Food Technology

AEDP- Apprenticeship Embedded Degree Program

Under

Faculty of Science and Technology

(As per NEP 2020)

With effect from Academic Year 2026-2027

Syllabus for Bachelor of Science (B. Sc.) Part – I Food Technology

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 technology 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 the 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 Technology for becoming an entrepreneur a deniable students to get employed in Food, Nutraceuticals and Agriculture Industries.

General objectives

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

Program 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.

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 were food technology is involved. 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.
IV. 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.

V. At the time of completion of the programme the student will have developed extensive knowledge of food safety and regulation.

Program Specific Outcomes

I. At the end of the four-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.

Apprenticeship Embedded Degree Program.

Programme enabling a student admitted to an undergraduate programme of the Higher Educational Institution, recognized as per the UGC Act, 1956, to pursue apprenticeship training as an integrated component of the degree programme in compliance with these guidelines. Training in an industry or establishment under a contract of apprenticeship, which consists of a basic training component and on-the-job training (OJT)/practical training at the workplace. After completion of Apprenticeship for semester VII and semester VIII then only student will able to get AEDP degree. Further, as per the Apprentices Act of 1961, Apprenticeship training means a course of training in any industry or establishment undergone in pursuance of a contract of apprenticeship and under prescribed terms and conditions.

Objectives of AEDP:

I. To enhance the employability and career readiness of undergraduate students.

II. To promote outcome-based, skill-oriented, and industry-focused learning.

III. To promote active linkage between higher educational institutions and industry/establishment.

IV. To bridge the gap between academic knowledge and food industry requirements.

V. To provide hands-on industrial training through the BOAT- Board of Apprenticeship Training.

VI. To facilitate experimental learning and apprenticeship opportunities under the NATS National Apprenticeship training scheme.

VII. To develop competent, skilled, and industry-ready food technology professionals.

Outcomes of AEDP

I. Acquire practical experience through industrial apprenticeship and On-the-Job Training (OJT).

II. Apply food technology concepts in real industrial environments.

III. Develop technical skills in food processing, quality assurance, food safety, and packaging.

IV. Enhance problem-solving, communication, teamwork, and professional ethics.

V. Gain industry exposure through BOAT (WR) and NATS-supported apprenticeship opportunities.

VI. Become industry-ready professionals with improved employability and better career prospects.

1. **Title:** Food Technology
2. **Year of Implementation:** 2026-2027
3. **Duration:** 01 year
4. **Pattern:** Semester examination
5. **Medium of Instruction:** English
6. **Batch Size:** 20 students per batch
7. **Eligibility of Student:** As per guidelines obtained from university by following rules and regarding reservations by government of maharashtra
8. **Eligibility of core Faculty:** As per the rules and regulations of the university grants commission (UGC) and the government of maharashtra

STRUCTURE OF COURSE:

As per NEP-2020 (2.0)

Sem (Level)	Courses			OE	AEC/ VEC/ IKS	Total Credits	Degree/ Cum. Cr. MEME
	Course I	Course II	Course III				
SEM I (4.5)	DSC I (2) DSC II (2) DSC P I (2)	DSC I(2) DSC II(2) DSC P I (2)	DSC I (2) DSC II(2) DSC P I (2)	OE I (2)	IKS I (2) (Generic)	22	UG Certificate: 44
SEM II (4.5)	DSC III(2) DSC IV (2) DSC PII (2)	DSC III (2) DSC IV (2) DSC PII (2)	DSC III (2) DSC IV (2) DSC PII(2)	OE II (2)	VEC I (2) DEGG and IIC	22	
Total Credit	12	12	12	04	04	44	

B.Sc. (Food Technology)

Programme Structure as per NEP 2020 (2.0)
(As per Govt. of Maharashtra GR Dated 13th March 2024)
From Academic Year 2026-27

B.Sc. I Sem I					
Sr. No	**Sem**	**Com. / Vertical**	**Paper Code**	**Subject/Paper**	**Credit**
				Course I	
1	Sem-I	DSC I	BFTT111	Principles of Food Processing	02
2	Sem-I	DSC II	BFTT112	Technology of Food Packaging	02
3	Sem-I	DSC Lab I	BFTP113	Practical based on BFTT 111 and BFTT 112	02
				Course II	
4	Sem-I	DSC III	BFTT114	Food Microbiology – I	02
5	Sem-I	DSC IV	BFTT115	Food Preservation – I	02
6	Sem-I	DSC Lab II	BFTP116	Practical based on BFTT 114 and BFTT 115	02
				Course III	
7	Sem-I	DSC V	BFTT117	Human Nutrition	02
8	Sem-I	DSC VI	BFTT118	Biochemistry	02
9	Sem-I	DSC Lab III	BFTP119	Practical based on BFTT 117 and BFTT 118	02
10	Sem-I	OE I	BFTP OE I	National Cadet Corps	02
11	Sem-I	IKS-I	BFTT IKS I	Indian Knowledge System	02
				Total Credits	**22**
B.Sc. I Sem II					
Sr. No	**Sem**	**Com./Vertical**	**Paper Code**	**Subject/Paper**	**Credit**
				Course I	
1	Sem-II	DSC VII	BFTT121	Fruit and Vegetable Processing Technology	02
2	Sem-II	DSC VIII	BFTT122	Technology of Seafoods	02
3	Sem-II	DSC Lab IV	BFTP123	Practical based on BFTT 121 and BFTT 122	02
				Course II	
4	Sem-II	DSC IX	BFTT124	Food Microbiology – II	02
5	Sem-II	DSC X	BFTT125	Food Preservation – II	02
6	Sem-II	DSC Lab V	BFTP126	Practical based on BFTT 124 and BFTT 125	02
				Course III	
7	Sem-II	DSC XI	BFTT127	Food Laws and Standards	02
8	Sem-II	DSC XII	BFTT128	Food Additives and Toxicology	02
9	Sem-II	DSC Lab VI	BFTP129	Practical based on BFTT 127 and BFTT 128	02
10	Sem-II	OE II	BFTP OE II	Entrepreneurship Development	02
11	Sem-II	VEC I	BFTT VEC 1	Democracy, Election and Constitution	02
				Total Credits	**22**
B.Sc. II Sem III					
Sr.No.	**Sem**	**Course Category**	**Course Code**	**Name of the Course**	**Credits**

1	Sem-III	DSC XIII	BFTT 231	Processing of Milk and Milk Products	02
2	Sem-III	DSC XIV	BFTT 232	Processing of Meat, Fish and Poultry	02
3	Sem-III	DSC Lab VII	BFTP 233	Practical Based on BFTT 231 and BFTT 232	02
4	Sem-III	Minor I	BFTT 234	Fermentation Technology	02
5	Sem-III	Minor II	BFTT 235	Food Biotechnology	02
6	Sem-III	Minor Lab I	BFTP 236	Practical Based on BFTT 234 and BFTT 235	02
7	Sem-III	OE III (T+P)	BFTT OE III	Environmental Studies	01
			BFTP OE III	Environmental Studies	01
8	Sem-III	VSC I	BFTP VSC I	Analytical Techniques in Food Technology	02
9	Sem-III	SEC I (T+P)	BFTT SEC 1	Food Chemistry	01
			BFTP SEC 1	Food Chemistry	01
10	Sem-III	AEC I	BFTTAEC I	English P - I	02
11	Sem-III	IKS II	BFTT IKS 2	BFTT IKS 2 - Indian Traditional Foods	02
				Total Credits	**22**
B.Sc. II Sem IV					
Sr.No.	**Sem**	**Course Category**	**Course Code**	**Name of the Course**	**Credits**
1	Sem-IV	DSC XV	BFTT 241	Oil Seeds, Fats and Legumes Processing Technology	02
2	Sem-IV	DSC XVI	BFTT 242	Processing of Cereals and Pulses	02
3	Sem-IV	DSC Lab IX	BFTP 243	Practical Based on BFTT 241 and BFTT 242	02
4	Sem-IV	Minor III	BFTT 244	Food Safety and Plant Sanitation	02
5	Sem-IV	Minor IV	BFTT 245	Nutraceutical and Functional Food	02
6	Sem-IV	Minor Lab II	BFTP 246	Practical Based on BFTT 244 and BFTT 245	02
7	Sem-IV	OE IV	BFTT OE IV	Business Economics	02
8	Sem-IV	VSC II	BFTP VSC II	Human Physiology	02
9	Sem-IV	SEC II	BFTP SEC II	Plantation Crops and Spices	02
10	Sem-IV	AEC II	BFTT AEC II	English P - II	02
11	Sem-IV	VEC II	BFTT VEC 2	Quality Assurance and Certification	02
				Total Credits	**22**
B.Sc. II Sem V					
Sr.No.	**Sem**	**Course Category**	**Course Code**	**Name of the Course**	**Credits**
1	Sem-V	DSC XVII	BFTT 351	Processing Technology of Bakery Products	02
2	Sem-V	DSC XVIII	BFTT 352	Processing Technology of Confectionery Products	02

3	Sem-V	DSC XIX	BFTT 353	Food Process Engineering- I	02
4	Sem-V	DSC Lab IX	BFTP 354	Practical based on BFTT 351, 352, 353	02
5	Sem-V	DSE I (Elective I)	BFTT 355	Food Product Development and Computer Application	02
6	Sem-V	DSE I (Elective II)	BFTT 355	Food Plant Design and Layout	02
7	Sem-V	DSE Lab I	BFTP 356	Practical based on BFTT 355	02
8	Sem-V	VSC III	BFTP VSC III	Instrumental Techniques in Food Analysis	02
9	Sem-V	AEC III	BFTT AEC	English	02
10	Sem-V	RP	BFTP RP	Research Project	04
11	Sem-V	CEP	BFTP CEP	Community Engagement Programme	02
				Total Credits	**22**
B.Sc. III Sem VI					
Sr. No.	**Sem**	**Course Category**	**Course Code**	**Name of the Course**	**Credits**
1	Sem-VI	DSC XX	BFTT 361	Food Quality and Sensory Evaluation	2
2	Sem-VI	DSC XXI	BFTT 362	Processing Technology of Snack Foods.	2
3	Sem-VI	DSC XXII	BFTP 363	Food Process Engineering- II	2
4	Sem-VI	DSC Lab X	BFTP 364	Practical based on 361, 362, 363	2
5	Sem-VI	DSE II (Elective - I)	BFTT 365	Beverage Technology	2
6	Sem-VI	DSE II (Elective - II)	BFTT 365	Instrumentation Process Control and Computer Applications	
7	Sem-VI	DSE Lab II	BFTP 366	Practical based on BFTT 365	2
8	Sem-VI	VSC IV	BFTP VSC IV	Statistical Quality Control in Food Technology	2
9	Sem-VI	SEC III	BFTP SEC	Clinical Nutrition and Dietetics	2
10	Sem-VI	AEC IV	BFTT AEC	English	2
11	Sem-VI	FP	BFTP FP	Field Project	2
12	Sem-VI	CC	BFTP CC	Co-curricular course	2
				Total Credits	**22**
B.Sc. III Sem VII					
Sr. No.	**Sem**	**Course Category**	**Course Code**	**Name of the Course**	**Credits**
1	Sem-VII	Apprenticeship – OJT I	BFTPAP 471	Apprenticeship I	20
2	Sem-VII	Survey	BFTP 472	Applications of Digital Marketing in Food Technology	02
				Total Credits	**22**
B.Sc. III Sem VIII					
Sr. No.	**Sem**	**Course Category**	**Course Code**	**Name of the Course**	**Credits**

1	Sem-VIII	Apprenticeship - OJT II	BFTPAP 481	Apprenticeship II	20
2	Sem-VIII	Seminar	BFTP 482	Seminar	02
				Total Credits	**22**
Cumulative Credits					**176**

EVALUATION STRUCTURE:

- Semester I

Course	Course Category	Course Code	Internal Evaluation (Best of two CCE marks will be considered)			ESE	Total Marks	Credits
			CCE-I	CCE-II	CCE-III			
DSC I DSC II DSC Lab I	T	BFTT 111	10	10	10	30	50	02
	T	BFTT 112	10	10	10	30	50	02
	P	BFTP 113	--	--	--	50	50	02
DSC III DSC IV DSC Lab II	T	BFTT 114	10	10	10	30	50	02
	T	BFTT 115	10	10	10	30	50	02
	P	BFTP 116	--	--	--	50	50	02
DSC V DSC VI DSC Lab III	T	BFTT 117	10	10	10	30	50	01
	T	BFTT 118	10	10	10	30	50	01
	P	BFTP 119	--	--	--	50	50	02
OE	T	BFTT OE I	--	--	--	--	--	--
	P	BFTP OE I	--	--	--	50	50	02
IKS	T	BFTT IKS I	10	10	10	30	50	02
Total							**550**	**22**

*** Best of two CCE out of three CCE will be consider for final mark entry of internal examination.**

EVALUATION STRUCTURE:

- Semester II

Course	Course Category	Course Code	Internal Evaluation (Best of two CCE marks will be considered)			ESE	Total Marks	Credits
			CCE-I	CCE-II	CCE-III			
DSC VII DSC VIII DSC Lab IV	T	BFTT 121	10	10	10	30	50	02
	T	BFTT 122	10	10	10	30	50	02
	P	BFTP 123	--	--	--	50	50	02
DSC IX DSC X DSC Lab V	T	BFTT 124	10	10	10	30	50	02
	T	BFTT 125	10	10	10	30	50	02
	P	BFTP 126	--	--	--	50	50	02
DSC XI DSC XII DSC Lab VI	T	BFTT 127	10	10	10	30	50	02
	T	BFTT 128	10	10	10	30	50	02
	P	BFTP 129	--	--	--	50	50	02
OE	T	BFTT OE II	10	10	10	30	50	02
VEC	T	BFTT VEC I	10	10	10	30	50	02
Total							**550**	**22**

*** Best of two CCE out of three CCE will be consider for final mark entry of internal examination.**

Other Features:

A) Library:
Reference books, Textbooks, Journals and Periodicals are available in Institute and Departmental Library (Separate reference lists are attached along with the respective course syllabus)

B) Equipments:
Laboratory Equipment:
1. Analytical Balance
2. Autoclave
3. Microscope
4. Water Bath
5. Refrigerator
6. Baking Oven
7. pH Meter

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Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Food Technology

Programme: B. Sc.	**Semester: I**
Type: DSC I	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course: (BFTT 111) Principles of Food Processing

Course Objectives: Students should be able to…

1. understand the concept of food
2. know different methods of primary and secondary processing in food industry
3. illustrate various cooking methods
4. explain physicochemical changes of food after cooking

Course Outcomes: Student will be able to…

1. identify food spoilage
2. apply methods of primary and secondary processing in food industry
3. implement preservation and processing methods in food
4. analyze nutritional changes during processing

Module	Title and Contents	Hrs.
Module-1:	**Introduction to food** **1.1** Definition of food, scope of food processing industry. **1.2** Importance and future prospects, classification of food, constituents of foods. **1.3** Introduction of food preservation, food spoilage, causes of food spoilage **1.4** Factors affecting food spoilage, food poisoning, food-borne intoxication, food born infection.	7
Module-2:	**Primary processing and Secondary processing** **2.1** Primary processing- Introduction, classification. **2.2** Methods of cleaning, sorting, grading, cutting, chilling, and freezing. **2.3** Secondary processing- introduction, classification. **2.4** Methods of slicing pulping, paste, frying and milling.	8
Module-3:	**Common food processing** **3.1** Introduction, classification and methods of cooking. **3.2** Baking, frying, **3.3** Roasting, toasting, **3.4** Grilling, blanching, extrusion.	6
Module-4:	**Effect of processing on nutritional value of food** **4.1** Physicochemical changes during grilling, roasting, frying. **4.2** Effect of processing on vitamins. **4.3** Effect of processing on minerals. **4.4** Effect of processing on carbohydrate, effect of processing on lipids.	9

References:-

1) Acton, Eliza. Modern Cookery. Longmans Publications, 2020.
2) Earle, Richard L. Unit Operations in Food Processing. Amsterdam: Elsevier Publications, 2013.
3) Fellows, Peter John. Food Processing Technology: Principles and Practice. 5th ed. Duxford, UK: Woodhead Publishing, 2021.
4) Girdharilal, Siddapa G. S., and G. L. Tandon. Preservation of Fruits and Vegetables. 3rd ed. New Delhi: Indian Council of Agricultural Research, 2022.
5) Greer, Sandra C. Chemistry for Cooks: An Introduction to the Science of Cooking. Cambridge, MA: MIT Press, 2023.
6) Jafari, S. M., Sara Hedayati, and Vahid B. "Cooking Equipment for the Food Industry." In High-Temperature Processing of Food Products. Duxford, UK: Woodhead Publishing, 2023.
7) Jafari, Seid M. Engineering Principles of Unit Operations in Food Processing: Unit Operations and Processing

Equipment in the Food Industry. Duxford, UK: Woodhead Publishing, 2021.
8) Kerry, Mark J., Richard Coles, and Derek McDowell. Food Packaging Technology. Vol. 5. Boca Raton, FL: CRC Press, 2003.
9) Mercer, Donald G. Bridging the Gap in the Communication of Food Science Knowledge and Technology. Amsterdam: ScienceDirect, 2023.
10) Mishra, J. P., S. Mohapatra, M. Rastogi, S. Verma, and V. Singh. Textbook of Integrated Farming Systems for Sustainable Agriculture. B. P. International, 2023.
11) Porter, M. E. Mrs. Porter's New Southern Cookery Book. Kansas City, MO: Andrews McMeel Publishing, 2023.Mercer, Donald G. Bridging the Gap in the Communication of Food Science Knowledge and Technology. ScienceDirect, 2023.

Evaluation Pattern: 20:30

Total Marks: 50

Internal Continuous Evaluation: (20 Marks)	**End Semester Examination: 30 (Marks)**
• CCE-I : Home Assignment : 10 Marks • CCE –II : Short and long answer questions test/Seminar/ Open book test / Quiz / Case study / Book review / Field work / Industry visit: 10 Marks • CCE – III MCQ Test : 10 Marks (Best of two CCE Marks will be considered)	● Question -1 – Solve the following questions (five questions of 2 marks) 10 Marks ● Question -2 –Attempt any two questions (three question of 10 marks) 20 Marks ● Question -3 – Attempt any four questions (five questions of 5 marks) 20 Marks ● Note : Conversion of 50 marks of ESE to 30 marks

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Programme: B. Sc.	**Semester: I**
Type : DSC II	**Marks:** 50
Credits : 2	**From:** A. Y. 2026-27

Name of the Course: (BFTT 112) Technology of Food Packaging

Course Objectives: Students should be able to…

1. understand the importance, functions and types of food packaging
2. know the properties and functions of wood and paper
3. list the properties and functions of glass and metal packaging
4. explain the different packaging techniques

Course Outcomes: Student will be able to…

1. analyze the types of food packaging materials
2. determine the types and uses of paper, CFB boxes
3. describe the manufacturing process of glass and metal
4. make use of food labeling

Module	Title and Contents	Hrs.
Module-1:	**Introduction to Food Packaging** **1.1** History, define packaging. **1.2** Importance and functions of food packaging. properties of packaging. **1.3** Types of packaging, application of packaging, types of packaging material. **1.4** Materials used in packaging-rigid, semi rigid and flexible.	7
Module-2:	**Wood and Paper Packaging** **2.1** Packaging materials: wood structure, types, properties and wooden containers used in packaging. **2.2** Paper and paperboard- structure, making, properties. **2.3** Types and uses of paper and paperboard. **2.4** CFB boxes and their comparison with wooden containers.	8
Module-3:	**Glass, Metal and Plastic Packaging** **3.1** Packaging materials: glass–composition, properties. **3.2** Structure, types and manufacture of glass containers, their uses. **3.3** Metals-properties of metals, different metals used in food packaging, uses of metal packaging. **3.4** Plastic packaging materials: types of polymer**,** classification of polymers. **3.5** Functional and mechanical properties of thermo plastic polymers, thermosetting polymer and elastomer polymer.	9
Module-4:	**Safety Considerations in Food Packaging** **4.1** Labeling, Types of food safety problems associated with package, package labeling and nutritional labeling. **4.2** Food packaging and environment-recycling, composting, thermal treatment and land filling.	6

References:-

1) Ahvenainen, R. Novel Food Packaging Techniques. 1st ed. Woodhead Publishing Limited, 2003.
2) Crosby, N. T. Food Packaging Materials. Applied Science Publications, 2001.
3) Frank, A. P. A Handbook of Food Packaging. ARM Publications, Bangalore, 1983.
4) John, P. J. A. Handbook on Food Packaging. Narendra Publishing House, New Delhi, 2008.
5) Robertson, G. L. Food Packaging and Shelf Life: A Practical Guide. Narendra Publishing House, New Delhi, 2009.
6) Robertson, G. L. Food Packaging: Principles and Practice. 2nd ed. London and New York Press, 2005.
7) Robertson, G. L. Food Packaging: Principles and Practice. 3rd ed. Narendra Publishing House, New Delhi, 2012.
8) Robertson, G. L., and G. B. Taylor. Food Packaging: Principles and Practice. 3rd ed. London and New York Press, 2006.

9) Shri Lakshmi, B. Food Science. New Age International Publishers, New Delhi, 2003.
10) Singh, R. P., and Dennis R. Heldman. Introduction to Food Engineering. Academic Press, New Delhi, 2010.
11) Coles, Richard, Mark McDowell, and Mork J. Food Packaging Technology. CRC Press, New Delhi, 2003.

Evaluation Pattern: 20:30	
Total Marks: 50	
Internal Continuous Evaluation: (20 Marks) • CCE-I : Home Assignment : 10 Marks • CCE –II : Short and long answer questions test/Seminar/ Open book test / Quiz / Case study / Book review / Field work / Industry visit: 10 Marks • CCE – III MCQ Test : 10 Marks (Best of two CCE Marks will be considered)	**End Semester Examination: 30 (Marks)** ● Question -1 – Solve the following questions (five questions of 2 marks) 10 Marks ● Question -2 –Attempt any two questions (three question of 10 marks) 20 Marks ● Question -3 – Attempt any four questions (five questions of 5 marks) 20 Marks ● Note : Conversion of 50 marks of ESE to 30 marks

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Programme: B. Sc.	**Semester** – I
Type : DSC Lab I	**Marks:** 50
Credits : 2	**From:** A. Y. 2026-27

Name of the Course: (BFTP 113) Practical based on BFTT 111 and BFTT 112

Course Objectives: Students should be able to…

1. know the principle of various cooking methods
2. understand time temperature relationship during processing
3. explain the principle and working of vernier caliper to measure thickness of paper and paperboard
4. develop nutritional labeling of food products

Course Outcomes: Student will be able to…

1. understand different equipment's used in cooking
2. identify critical control point
3. measure compete strength of different food packaging material.
4. create labeling of food products.explain the basic theory and applications of mixing

Module No.	Content	Hrs.
1)	Study the principle and working of baking process.	60
2)	Study the principle and working of frying process.	
3)	Study the principle and working of roasting process.	
4)	Study the principle and working of grilling process.	
5)	Study the principle and working of blanching process.	
6)	Study the principle and working of extrusion process.	
7)	Study the principle and working of steaming method.	
8)	Study the product on the basis of preservation.	
9)	Identification of different types of packaging materials.	
10)	Determination of GSM (gram per square meter) of paper and paperboard.	
11)	Determination of thickness of paper & Paperboard	
12)	Determination of Cobb's value of a paperboard.	
13)	Determination of the thickness of plastic.	
14)	Identification of plastic packaging material.	
15)	Study the preparation of labels for different types of food products according to package labeling laws.	

References:-

1) Baker, Christopher G. J., M. D. Ranken, and R. C. Kill. Food Industries Manual. Bangalore: Springer Science & Business Media, 2012.
2) Fellows, P., and Peter J. Food Processing Technology: Principles and Practice. New Delhi: Woodhead Publishing, 2022.
3) George, W. Handbook of Odors in Plastic Materials. New Delhi: Elsevier Publications, 2023.
4) Heldman, Dennis R. Food Processing. New Delhi: Springer Science & Business Media, 2012.
5) Kadoya, Takashi. Food Packaging. New Delhi: Academic Press, 2012.
6) Proctor, Andrew. Alternatives to Conventional Food Processing. 2nd ed., Vol. 53. London: Royal Society of Chemistry, 2018.
7) Ramaswamy, Hosahalli S., and Michele M. Food Processing: Principles and Applications. New Delhi: CRC Press, 2005.
8) Robertson, Gordon L. Food Packaging: Principles and Practice. New Delhi: CRC Press, 2016.
9) Weaver, Connie M., and James R. D. The Food Chemistry Laboratory: A Manual for Experimental Foods, Dietetics, and Food Scientists. New Delhi: CRC Press, 2003.
10) Heldman, Dennis R., and Richard W. Hartel. Principles of Food Processing. New York: Springer, 1997.

Evaluation Pattern: 20:30	
Total Marks: 50	
Internal Evaluation: 20 Marks ● Journal : 10 Marks ● Students Performance : 05Marks ● Viva : 05 Marks	**End Semester Examination: 30 Marks** • Question I : 10 Marks • Question II : 10 Marks • Question III : 10 Marks

Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Food Technology

Programme: B. Sc.	**Semester: I**
Type : DSC III	**Marks:** 50
Credits : 2	**From:** A. Y. 2026-27

Name of the Course: (BFTT 114) Food Microbiology – I

Course Objectives: Students should be able to…

1. understand the important contributions of various scientists in microbiology and scope of microbiology
2. know the important genera of micro-organisms associated with food and their characteristics
3. illustrate the microbial nutrition and culture media
4. explain the control of microorganisms and mode of action of antiseptic and disinfectants

Course Outcomes: Student will be able to…

1. recall history of microbiology
2. classify the nutritional requirements of micro-organisms
3. apply the techniques required for control of microorganism
4. explain functions of cell organelles

Module	Title and Contents	Hrs.
Module-1:	**History and Scope of Microbiology** **1.1** Important contributions of various scientists. **1.2** Scope of microbiology. **1.3** Introduction to microorganisms-bacteria, algae, fungi, protozoa and viruses. **1.4** Importance of bacteria, yeast, and molds in foods.	7
Module-2:	**General Characteristics of Microorganisms** **2.1** Structure of Prokaryotic and Eukaryotic cell. **2.2** Morphology of bacteria: Size, Shape and Arrangements. **2.3** Cytology of bacteria-structure and functions of cell wall, cell membrane, Capsules and slime layer, flagella, Pilli, nuclear material, mesosome, ribosome and spores.	8
Module-3:	**Microbial Nutrition and Culture Media** **3.1** Microbial Nutrition-Nutritional requirements of microorganisms. **3.2** Nutritional types of microorganism based on carbon and energy sources. **3.3** Culture media: Common components of media and their functions. **3.4** Types of media.	8
Module-4:	**Control of Microorganisms** **4.1** Definitions Sterilization, Disinfection, Antiseptic, Germicide, Microbiostasis, Antisepsis, Sanitization. **4.2** Mode of action, application and advantages of: Physical agents, Chemical Agents, Gaseous Agent.	7

References:-

1) Ananthanarayan, R., and C. K. J. Paniker. Ananthanarayan and Paniker's Textbook of Microbiology. 7th ed. Hyderabad: Orient Blackswan, 2016.
2) Talaro, Kathleen Park. Foundations in Microbiology. 7th International ed. Bangalore: McGraw Hill Education, 2009.
3) Madigan, Michael T., and Thomas D. Brock. Brock Biology of Microorganisms. 12th ed. San Francisco, CA: Pearson Benjamin Cummings, 2008.
4) Purohit, S. S. Microbiology: Fundamentals and Applications. 6th ed. Jodhpur: Agrobios Publishers, 2003.
5) Frazier, W. C., and D. C. Westhoff. Food Microbiology. New Delhi: Tata McGraw-Hill, 2004.
6) Stanier, Roger Y., John L. Ingraham, Mark L. Wheelis, and Philip R. Painter. General Microbiology. 5th ed. London: Macmillan Education Ltd., 2001.
7) Pelczar, Michael J., E. C. S. Chan, and Noel R. Krieg. Microbiology. 5th ed. New York: McGraw-Hill, 1986.
8) Salle, A. J. Fundamental Principles of Bacteriology. 7th ed. New York and London: McGraw-Hill Book Company, 1973.

9) Frobisher, Martin. Fundamentals of Microbiology. 7th ed. Philadelphia: W. B. Saunders Company, 1962.
10) Adams, Martin R., and Maurice O. Moss. Food Microbiology. Cambridge: Royal Society of Chemistry, 2000.

Evaluation Pattern: 20:30

Total Marks: 50

Internal Continuous Evaluation: (20 Marks)	**End Semester Examination: 30 (Marks)**
• CCE-I : Home Assignment : 10 Marks • CCE –II : Short and long answer questions test/Seminar/ Open book test / Quiz / Case study / Book review / Field work / Industry visit: 10 Marks • CCE – III MCQ Test : 10 Marks (Best of two CCE Marks will be considered)	● Question -1 – Solve the following questions (five questions of 2 marks) 10 Marks ● Question -2 –Attempt any two questions (three question of 10 marks) 20 Marks ● Question -3 – Attempt any four questions (five questions of 5 marks) 20 Marks ● Note : Conversion of 50 marks of ESE to 30 marks

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Programme: B. Sc.	**Semester: I**
Type : DSC IV	**Marks:** 50
Credits : 2	**From:** A. Y. 2026-27

Name of the Course: (BFTT 115) Food Preservation – I

Course Objectives: Students should be able to…

1. understand the scope of food preservation
2. know the food preservation by high temperature and low temperature
3. illustrate the food preservation by drying and dehydration
4. explain the principles and types of preservation, shelf life of food products

Course Outcomes: Student will be able to…

1. explain the principle of preservation
2. compare the between sun drying and dehydration.
3. apply the processes of pasteurization and sterilization
4. explain principle and type of freezing

Module	Title and Contents	Hrs.
Module -1:	**Introduction of food preservation.** **1.1** Definition, scope, Need, Advantages & principles of Food preservation **1.2** Types of Food Preservatives – Class I Preservatives & Class II Preservatives, Mechanism of preservatives. **1.3** Food Spoilage – Types of food Spoilage ,Shelf life of the product – Intrinsic factors & Extrinsic Factors.	7
Module -2:	**Food Preservation by high temperature.** **2.1** Introduction high temperature methods and mechanism. **2.2** Sterilization-Physical & Chemical Methods. **2.3** Pasteurization- Types and Mechanism of Pasteurization. **2.4** Blanching- Methods of blanching: Steam blanching & Hot water blanching. **2.5** Canning: Methods of canning.	8
Module -3:	**Food Preservation by Drying and dehydration.** **3.1** Drying & Dehydration. **3.2** Difference between drying & dehydration **3.3** Types of Conventional and Non-Conventional drying – Principle, Mechanism. **3.4** Factors Affecting rate of drying, Normal drying curve	7
Module -4:	**Food Preservation by Low temperature.** **4.1** Chilling, Cryogenic chilling, chilling Storage. **4.2** Frozen food storage, Changes in food during Chilling. **4.3** Introduction and types of freezing-slow freezing, quick-freezing, freeze-drying changes in food during Freezing. **4.4** Introduction to thawing, changes during thawing and its effect on food.	8

References:-

1) Bawa, A. S., and O. P. Chauhan. Food Science. New Delhi: New India Publishing Agency, 2013.
2) Food Safety and Standards Authority of India. Manual of Methods of Analysis of Foods: Microbiological Testing. New Delhi: Ministry of Health and Family Welfare, Government of India, 2012.
3) Frazier, W. C., and D. C. Westhoff. Food Microbiology. New Delhi: Tata McGraw-Hill Publishing Company, 2004.
4) Man, C. M. D., John F. Hurst, and W. Jeffrey Hurst. Principles of Food Chemistry. 4th ed. New York: Springer International Publishing, 2018.
5) Manay, N. S., and M. Shadaksharaswamy. Food: Facts and Principles. New Delhi: New Age International Publishers, 1987.
6) Marion, L. F. Laboratory Manual in Food Preservation. 4th ed. New Delhi: AVI Publishing Company, 1983.

7) Meyer, Lillian Hoagland. Food Chemistry. New Delhi: New Age Publishers, 2004.
8) Rahman, M. Shafiur. Handbook of Food Preservation. Boca Raton, FL: CRC Press, 2007.
9) Ramaswamy, H. S., and Michel Marcotte. Food Processing: Principles and Applications. Boca Raton, FL: CRC Press, 2005.
10) Srilakshmi, B. Food Science. New Delhi: New Age International Publishers, 2002.

Evaluation Pattern: 20:30

Total Marks:50

Internal Continuous Evaluation: (20 Marks)	**End Semester Examination: 30 (Marks)**
• CCE-I : Home Assignment : 10 Marks • CCE –II : Short and long answer questions test/Seminar/ Open book test / Quiz / Case study / Book review / Field work / Industry visit: 10 Marks • CCE – III MCQ Test : 10 Marks (Best of two CCE Marks will be considered)	● Question -1 – Solve the following questions (five questions of 2 marks) 10 Marks ● Question -2 –Attempt any two questions (three question of 10 marks) 20 Marks ● Question -3 – Attempt any four questions (five questions of 5 marks) 20 Marks ● Note : Conversion of 50 marks of ESE to 30 marks

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Board of Studies in Food Technology

Programme: B. Sc.	**Semester: I**
Type : DSC Lab II	**Marks:** 50
Credits : 2	**From:** A. Y. 2026-27

Name of the Course: BFTT 116 Practical based on BFTT 114 and BFTT 115

Course Objectives: Students should be able to…

1. understand the principle and working of various laboratory instruments
2. know the handling techniques of laboratory equipment
3. explain the role of microbiology in food processing
4. apply the preservation techniques in food

Course Outcomes: Student will be able to…

1. recall basic microbiology laboratory practices
2. formulate media required for cultivation of different microorganism
3. apply techniques of cleaning and sterilization and preparation, sterilization of different media
4. elaborate the preservation of food by canning and osmotic dehydration

Module No.	Content	Hrs
1)	Study the Introduction to the Basic Microbiology Laboratory Practices.	60
2)	Study the use of instruments for microbiology (Incubator, oven, autoclave, water bath etc).	
3)	Study the Principle and working of analytical instrument such as colorimeter, weighing Balances, muffle furnace and centrifuge.	
4)	Study the functioning and use of compound microscope.	
5)	Cleaning and sterilization of glassware.	
6)	Prepare culture media(Nutrient broth, Nutrient agar, Macconkeys agar, Sabouraud's agar).Sterilization of media	
7)	Prepare slant, stab and plates using nutrient agar.	
8)	Study the preservation of food by the process of freezing.	
9)	Study the drying of food using Tray dryer/other dryers.	
10)	Study the preservation of food by canning (Fruit/Vegetable/meat).	
11)	Study the cut-out analysis of canned food.	
12)	Study the preservation of food by osmotic dehydration.	
13)	Identify the class I preservatives from different food Products.	
14)	Study the preservation of food by using chemical preservatives.	
15)	Study the preservation of food by using sugar as preservative.	

References:-

1) Baker, F. J. *Bacteriological Techniques*. New York: Butterworth & Co. Publishers Ltd., 1967.
2) David, T. P. An Introduction to Practical Biochemistry. 2nd ed. London: McGraw-Hill Book Company (U.K.) Ltd., 1978.
3) Dey, N. C., and T. K. Dey. Medical Bacteriology. 7th ed. Kolkata: Allied Agency, 1973.
4) Food Safety and Standards Authority of India. Manual of Methods of Analysis of Foods. New Delhi: Ministry of Health and Family Welfare, Government of India, 2012.
5) Frazier, W. C., and D. C. Westhoff. Food Microbiology. New Delhi: Tata McGraw-Hill Publishing Company, 2004.
6) Frobisher, Martin, R. D. Hinsdill, K. T. Crabtree, and C. R. Goodheart. Fundamentals of Microbiology. 9th ed. Philadelphia: W. B. Saunders Company, 1974.
7) Garcia, Emanuel, and Lorrence H. Green. Practical Handbook of Microbiology. Boca Raton, FL: Taylor & Francis, 2008.
8) Jayaraman, J. Laboratory Manual in Biochemistry. New Delhi: New Age International Publishers, 2011.
9) Patel, R. Experimental Microbiology. 5th ed. Vols. 1–2. New Delhi: Aditya Book Centre, 2009.
10) Rahman, M. Shafiur. Handbook of Food Preservation. Boca Raton, FL: CRC Press, 2007.
11) Ronald, A. Handbook of Media for Clinical and Public Health Microbiology. New Delhi: CRC Press, 2013.
12) Singh, R., and S. K. Sawhney. Introductory Practical Biochemistry. New Delhi: Narosa Publishing House, 2009.
13) Stanier, Roger Y., and M. Palgrave. General Microbiology. 5th rev. ed. New York: Palgrave Macmillan, 1987.
14) Wilson, Keith, and K. H. Goulding. Principles and Techniques of Practical Biochemistry. 3rd ed. London: Edward Arnold, 1986.
15) William, G. W. Laboratory Manual for Food Microbiology. 4th ed. New Delhi: I. K. Publishers, 2011.
16) Marion, L. F. Laboratory Manual in Food Preservation. 4th ed. New Delhi: AVI Publishing Company, 1983.

Evaluation Pattern: 20:30

Total Marks: 50

Internal Evaluation: 20 Marks	**End Semester Examination: 30 Marks**
● Journal : 10 Marks ● Students Performance : 05Marks ● Viva : 05 Marks	• Question I : 10 Marks • Question II : 10 Marks • Question III : 10 Marks

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Board of Studies in Food Technology

Programme: B. Sc.	**Semester: I**
Type : DSC V	**Marks:** 50
Credits : 2	**From:** A. Y. 2026-2027

Name of the Course: (BFTT 117) Human Nutrition

Course Objectives: Students should be able to…

1. understand the concept of nutrient.
2. know the relationship between food, Nutrition and health.
3. understand the concept of balanced diet, planning balanced meal and factors influencing meal planning.
4. know the nutrition and food requirements of pre-school children, school children adolescents and old age.

Course Outcomes: Student will be able to…

1. analyze relationship between food and health of people.
2. participate in nutrients and their functions.
3. create the concept of balanced diet, food groups, food pyramid and meal planning.
4. Develop the nutrition and food requirements for pre-school children, school children, Adolescents and during old age

Module	Title and Contents	Hrs
Module -1:	**Introduction of Food and Nutrition** **1.1** Introduction of nutrition, food as a source of nutrients, functions of food, types of nutrition **1.2** Food guide-Basic five food groups **1.3** Nutritional status **1.4** Recommended Dietary Allowances (RDA), Acceptable daily Intake(ADI) **1.5** Understanding relationship between food and health of people	7
Module -2:	**Nutrients and their functions** **2.1** Introduction, Energy value of food, Basal Metabolic Rate (BMR), Biological value of food. **2.2** Introduction, Classification, digestion, absorption metabolism, Dietary sources, RDA **2.3** Macronutrients and Micronutrients- Introduction , Classification and their functions , Deficiency.	8
Module -3:	**Balanced Diet and concept of meal planning** **3.1** Concept of balanced diet, Food groups, Food Pyramid **3.2** Meal planning- Introduction, planning, balanced meals, factors influencing meal planning	7
Module -4:	**Nutritional Care of Children's, Adolescents and During Old** **4.1** Pre-school children and school children- nutrition and food requirements, nutritional related problems of pre-schooler, packed lunches and school lunch programme **4.2** Adolescents and during old age- nutritional requirements, food requirements, nutritional related problems	8

References:-

1) Geissler, Catherine A., and Hilary J. Powers, eds. Human Nutrition. 12th ed. Edinburgh: Churchill Livingstone/Elsevier, 2011.
2) James, W. P. T., and A. Stewart Truswell, eds. Human Nutrition and Dietetics. 10th ed. Edinburgh: Churchill Livingstone, 2000.
3) Mann, Jim, and A. Stewart Truswell. Essentials of Human Nutrition. 2nd ed. Oxford: Oxford University Press, 2002.
4) Lean, Michael E. J., and Emilie Combet. Barasi's Human Nutrition: A Health Perspective. 3rd ed. Boca Raton, FL: CRC Press, 2017.
5) Gropper, Sareen S., Jack L. Smith, and Timothy P. Carr. Advanced Nutrition and Human Metabolism. 7th ed. Mason, OH: Cengage Learning, 2016.
6) Bender, David A. Introduction to Nutrition and Metabolism. 4th ed. Boca Raton, FL: CRC Press, 2008.
7) Bender, David A., and Alfred E. Bender. Nutrition: A Reference Handbook. Oxford: Oxford University

Press, 1997.
8) McDowell, Lee Russell. Minerals in Animal and Human Nutrition. 2nd ed. Amsterdam: Elsevier, 2003.
9) McDowell, Lee Russell. Vitamins in Animal and Human Nutrition. 2nd ed. Ames, IA: Iowa State University Press, 2000.
10) Bender, David A. "Human Nutrition." In The Encyclopaedia of Sports Medicine, edited by Ronald J. Maughan. Hoboken, NJ: Wiley-Blackwell, 2013

Evaluation Pattern: 20:30

Total Marks:50

Internal Continuous Evaluation: (20 Marks)	**End Semester Examination: 30 (Marks)**
• CCE-I : Home Assignment : 10 Marks • CCE –II : Short and long answer questions test/Seminar/ Open book test / Quiz / Case study / Book review / Field work / Industry visit: 10 Marks • CCE – III MCQ Test : 10 Marks (Best of two CCE Marks will be considered)	● Question -1 – Solve the following questions (five questions of 2 marks) 10 Marks ● Question -2 –Attempt any two questions (three question of 10 marks) 20 Marks ● Question -3 – Attempt any four questions (five questions of 5 marks) 20 Marks ● Note : Conversion of 50 marks of ESE to 30 marks

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Programme: B. Sc.	**Semester: I**
Type : DSC VI	**Marks:** 50
Credits : 2	**From:** A. Y. 2025-26

Name of the Course: (BFTT 118) Biochemistry

Course Objectives: Students should be able to…

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

Course Outcomes: Student will be able to…

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

Module	Title and Contents	Hrs
Module -1:	**Enzyme and Coenzyme** **1.1** Enzyme: Classification, nomenclature, activation energy, Michaelis - Menten equation, Lineweaver Burk Plot **1.2** Factors affecting on enzymes action, mechanism of enzyme action, Coenzymes: **1.3** Classifications [metabolite derived /vitamin derived] function of various types, structure of NAD+, NADP+, and FAD and FMN	8
Module -2:	**Utilization of Carbohydrates** **2.1** Glycolysis, Kreb cycle, Pentose phosphate pathway, glycogen metabolism, glycogen synthesis. **2.2** Disorders in carbohydrate metabolism, Essential metabolic pathways.	7
Module -3:	**Influence of Phenolic Substances on Health** **3.1** Free radicals in biological system, Oxidative stress and chronic diseases, antioxidant in fruits and vegetables, absorption and metabolism of polyphenolics **3.2** Efficiency of polyphenolics in Promoting human health.	8
Module -4:	**Utilization of Lipid and Lipid Oxidation** **4.1** Utilization of fats, Disorders related to lipid metabolism, clinical disorders associated with fats **4.2** Lipid oxidation -active oxygen species and free radical theory.	7

References:-

1) Hui, Y. H., Wai-Kit Nip, Leo M. L. Nollet, Gopinadhan Paliyath, and Benjamin K. Simpson, eds. Food Biochemistry and Food Processing. Ames, IA: Blackwell Publishing, 2006.
2) Simpson, Benjamin K., Leo M. L. Nollet, Fidel Toldrá, Soottawat Benjakul, Gopinadhan Paliyath, and Y. H. Hui, eds. Food Biochemistry and Food Processing. 2nd ed. Ames, IA: Wiley-Blackwell, 2012.
3) Eskin, N. A. M., and Fereidoon Shahidi, eds. Biochemistry of Foods. 3rd ed. San Diego, CA: Academic Press, 2013.
4) Yildiz, Fatih, ed. Advances in Food Biochemistry. Boca Raton, FL: CRC Press, 2009.
5) Whitehurst, Robert J., and Maarten van Oort, eds. Enzymes in Food Technology. 2nd ed. Oxford: Wiley-Blackwell, 2010.
6) Jeantet, Romain, Thomas Croguennec, Pierre Schuck, and Gérard Brulé, eds. Handbook of Food Science and Technology. Volume 3: Food Biochemistry and Technology. London: ISTE Press/Wiley, 2016.
7) Pérez-Castiñeira, José R. Chemistry and Biochemistry of Food. Berlin: De Gruyter, 2020.
8) Damodaran, Srinivasan, Kirk L. Parkin, and Owen R. Fennema. Fennema's Food Chemistry. 5th ed. Boca Raton, FL: CRC Press, 2017.
9) Belitz, Hans-Dieter, Werner Grosch, and Peter Schieberle. Food Chemistry. 4th ed. Berlin: Springer, 2009.
10) McGee, Harold. *On Food and Cooking*: The Science and Lore of the Kitchen. Rev. ed. New York: Scribner, 2004. and Human Metabolism. 7th ed. Mason, OH: Cengage Learning, 2016.

Evaluation Pattern: 20:30

Total Marks:50

Internal Continuous Evaluation: (20 Marks)	End Semester Examination: 30 (Marks)
• CCE-I : Home Assignment : 10 Marks • CCE –II : Short and long answer questions test/Seminar/ Open book test / Quiz / Case study / Book review / Field work / Industry visit: 10 Marks • CCE – III MCQ Test : 10 Marks (Best of two CCE Marks will be considered)	● Question -1 – Solve the following questions (five questions of 2 marks) 10 Marks ● Question -2 –Attempt any two questions (three question of 10 marks) 20 Marks ● Question -3 – Attempt any four questions (five questions of 5 marks) 20 Marks ● Note : Conversion of 50 marks of ESE to 30 marks

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Programme: B. Sc.	**Semester: I**
Type : DSC LAB III	**Marks:** 50
Credits : 2	**From:** A. Y. 2025-26

Name of the Course: (BFTP 119) Practical based on BFTT 117 and BFTT 118

Course Objectives: Students should be able to…

1. identify the foods sources for various nutrients using food composition table
2. Know the methods of planning diet chart for suffering from anemia
3. understand the enzyme and its activity.
4. estimate and analyze the vitamins, carbohydrates, lipids from food sample

Course Outcomes: Student will be able to…

1. understand the concept of how to identify the food sources for various nutrients using food composition table.
2. understand the concept of how to calculate BMI.
3. apply the principle and working of different chromatographic techniques
4. determine the quantity of carbohydrates, amino acids

Module No.	Content	Hrs
1)	Identification of food sources for various nutrients using food composition tables.	60
2)	Calculations of BMI of an individual and interpretation of result.	
3)	Record diet of self-using 24 hours dietary recall and its nutrition analysis.	
4)	Preparation of weaning foods for infants .	
5)	Planning and preparation of balanced diet for school children's .	
6)	Planning and preparation of balanced diet for an adolescent .	
7)	Nutritional labeling of food .	
8)	Planning nutritious snack for different age and income groups.	
9)	Estimate the quantity of ascorbic acid by titration(Volumetric) method in food. Sample	
10)	Estimate the quantity of Vitamin A in food sample.	
11)	Estimate the quantity of iron in food sample.	
12)	Analysis of lipids present in food sample.	
13)	Determination of total carbohydrates present in food sample.	
14)	Separation of carotenoids by thin layer chromatography.	
15)	Study the effect of temperature on enzyme activity.	

References:-

1) Dashman, Theodore, Deborah E. Blocker, and Nora Baker. Laboratory Manual for Human Nutrition. Chur, Switzerland: Harwood Academic Publishers, 1991.
2) Ismail, B. Pam, and S. Suzanne Nielsen, eds. Nielsens Food Analysis Laboratory Manual. 4th ed. Cham: Springer, 2024.
3) Sengar, R. S., and Reshu Chaudhary. Laboratory Manual of Biochemistry: Methods and Techniques. New Delhi: New India Publishing Agency, 2014.
4) Kaushik, G. G., Neha Sharma, Sabira Dabeer, and Ruchi Jindal. Practical Manual of Biochemistry. 2nd ed. New Delhi: CBS Publishers & Distributors, 2022.
5) Marimuthu, Charumathy, V. Magendira Mani, M. Gomathi, and R. Mahalakshmi. Practical Manual: Nutritional Biochemistry. Chennai: Marudhar Kesari Jain College for Women, 2023.

6) Nelson, David L., and Michael M. Cox. Lehninger Principles of Biochemistry. 8th ed. New York: W. H. Freeman, 2021.
7) Murray, Robert K., David A. Bender, Kathleen M. Botham, Peter J. Kennelly, Victor W. Rodwell, and P. Anthony Weil. Harpers Illustrated Biochemistry. 32nd ed. New York: McGraw-Hill Education, 2021.
8) Stipanuk, Martha H., and Marie A. Caudill. Biochemical, Physiological, and Molecular Aspects of Human Nutrition. 4th ed. St. Louis, MO: Elsevier, 2019.
9) Gibney, Michael J., Susan A. Lanham-New, Aedin Cassidy, and Hester H. Vorster. Introduction to Human Nutrition. 3rd ed. Oxford: Wiley-Blackwell, 2023.
10) Indira Gandhi National Open University. MFNL-002 Nutritional Biochemistry Practical Manual. New Delhi: IGNOU, 2020.

Evaluation Pattern: 20:30

Total Marks: 50

Internal Evaluation: 20 Marks	**End Semester Examination: 30 Marks**
● Journal : 10 Marks ● Students Performance : 05Marks ● Viva : 05 Marks	• Question I : 10 Marks • Question II : 10 Marks • Question III : 10 Marks

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Programme: B. Sc.	**Semester: II**
Type : DSC VII	**Marks: 50**
Credits : 2	**From:** A. Y. 2026-27

Name of the Course: (BFTT 121) Fruits and Vegetables Processing Technology

Course Objectives: Students should be able to…

1. know classification and composition of fruits and vegetables
2. explain physiology of fruits and vegetables and their role in pre and post-harvest changes in product quality
3. understand about preparation and evaluation of fruits and vegetables processed products
4. summarize methods of preservation of fruits and vegetables

Course Outcomes: Student will be able to…

1. describe the classification and composition of fruits and vegetables
2. understand biological, chemical and physical properties of fruits and vegetables
3. identify the technologies involved in the processing, preservation and value addition of fruit and vegetable
4. demonstrate effects of various methods used for preparing, preserving, packaging and evaluation of various fruit and vegetable products

Module	Title and Contents	Hrs
Module -1:	**Introduction of fruits and vegetables** **1.1** Classification and composition of fruits and vegetables climacteric and non-climacteric fruits **1.2** Indian scenario on production and processing of fruit and vegetables. **1.3** Post-harvest handling of fruits and vegetables: Respiration (RQ, climacteric and Non-climacteric fruits), Assessment of maturity indices; Biochemical changes during ripening	8
Module -2:	**Quality aspect of fruit and Vegetables** **2.1** Physical and chemical indices of fruit maturity and ripening, Biochemical changes during maturation, ripening, processing and storage. **2.2** Methods of storage: refrigerated, controlled atmosphere and hypobaric storage, Minimal, quality factors for processing, fruit product order (FPO).	7
Module -3:	**Costing of Fruit & Vegetable Production** **3.1** Cost & Nutrient Value of Fruits and Vegetable, Cost of Cultivation of Fruits & Vegetable, Cost estimation of fruits and vegetable Products. **3.2** Transportation cost of fruits and vegetables, development of low cost storage structure for fruits and vegetables.	8
Module -4:	**Fruit and Vegetable Products & Standards** **4.1** Ready to eat vegetable products, Jams/Marmalades, Squashes/cordials, Ketchup/sauces, Chutneys, Fruit Bar, Soup powders, Candied Fruits, Natural colors. **4.2** Fruit and Vegetable Fibres - specific processing, different packing including aseptic, Product specifications and standards; food regulations with respect to fruit and vegetable products	7

References:-

1) Srivastava, R. P., and S. Kumar. Fruit and Vegetable Preservation. Lucknow: International Book Distributing Co., 2005.
2) Lal, G., G. S. Siddhapa, and G. L. Tandon. Preservation of Fruits and Vegetables. New Delhi: Indian Council of Agricultural Research, 2009.
3) Khurdia, D. S. Preservation of Fruits and Vegetables. New Delhi: Indian Council of Agricultural Research, 1995.
4) Salunkhe, D. K., and S. S. Kadam. Handbook of Fruit Science and Technology: Production, Composition, Storage, and Processing. New York: Marcel Dekker, 2005.
5) Alzamora, Stella M., María S. Tapia, and Andrés López-Malo. Minimally Processed Fruits and Vegetables: Fundamental Aspects and Applications. New York: Springer, 2005.
6) Thompson, A. K. Fruit and Vegetables: Harvesting, Handling and Storage. 2nd ed. Oxford: Blackwell Publishing, 2003.

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<tr><td colspan="2">7) Verma, L. R., and V. K. Joshi. Post-Harvest Technology of Fruits and Vegetables. New Delhi: Indus Publishing Company, 2000.
8) Potter, Norman N., and Joseph H. Hotchkiss. Food Science. 5th ed. New Delhi: CBS Publishers & Distributors, 2006.
9) Hui, Y. H., and Evelyn Ö. Evranuz, eds. Handbook of Vegetable Preservation and Processing. 2nd ed. Boca Raton, FL: CRC Press, 2015.</td></tr>
<tr><td colspan="2">Evaluation Pattern: 20:30</td></tr>
<tr><td colspan="2">Total Marks: 50</td></tr>
<tr><td>Internal Continuous Evaluation: (20 Marks)
• CCE-I : Home Assignment : 10 Marks
• CCE –II : Short and long answer questions test/Seminar/ Open book test / Quiz / Case study / Book review / Field work / Industry visit: 10 Marks
• CCE – III MCQ Test : 10 Marks
(Best of two CCE Marks will be considered)</td><td>End Semester Examination: 30 (Marks)
● Question -1 – Solve the following questions (five questions of 2 marks) 10 Marks
● Question -2 –Attempt any two questions (three question of 10 marks) 20 Marks
● Question -3 – Attempt any four questions (five questions of 5 marks) 20 Marks
● Note : Conversion of 50 marks of ESE to 30 marks</td></tr>
</table>

Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Food Technology

Programme: B. Sc.	**Semester: II**
Type : DSC VIII	**Marks: 50**
Credits : 2	**From:** A. Y. 2026-27

Name of the Course: (BFTT 122) TECHNOLOGY OF SEAFOODS

Course Objectives: Students should be able to…

1. know the fish processes and factors affecting the quality of fresh fish
2. understand the principles of preservation of seafoods
3. summarize the principle of fish canning
4. illustrate economics of seafood and its by-products

Course Outcomes: Student will be able to…

1. identify Fishery resources, types of fish, water activity and shelf-life
2. demonstrate the chilling and freezing process of fish
3. to prepare various fish products using preservation techniques
4. make use of economics of seafood and its by-products

Module	Title and Contents	Hrs
Module -1:	**Basics of seafood** **1.1** Introduction to seafoods. Different types of seafoods Classification of fish, composition of fish, and characteristics of fresh fish**.** **1.2** Post mortem changes (rigor mortis and spoilage). Handling and sanitation. Precautions taken in handling of fish. **1.3** Packaging of seafoods	8
Module -2:	**Principles of preservation of seafoods** **2.1** Principles of seafood preservation- Cleaning and its techniques, lowering of temperature, increasing of temperature, denudation, use of salt and other preservatives, exposure to low radiation of gamma rays. **2.2** Principles of freeze drying- general aspects of freezing. Freezing systems (air blast freezing, plate or contact freezing, spray or immersion freezing). Relationship between chilling and storage life. Changes in quality in chilled and frozen storage, thawing. **2.3** Modern methods of preservation by irradiation and Modified Atmospheric Storage and Modified Atmospheric Packaging.	7
Module -3:	**Principles of Preservation Methods** **3.1** Principles of Preservation Methods- Preservation of fish by Drying. Preservation of fish by salting. Preservation of fish by smoking. **3.2** Salting methods (brining, pickling, kench curing, Gaspe curing) Canning: Introduction, Principles of canning. Pre- process operations and post process operations. **3.3** Storage of- Canned fish Cannery operations for specific canned products-Tuna, Mackerel, Sardine.	8
Module -4:	**Products and Its Quality Evaluation** **4.1** Status of value addition of fish and fish production in indian seafood sector. Advantages of value addition **4.2** Different types of value-added products- marinated and fermented products, fish paste, fish and prawn pickles, fish sauce, sausages, fish cake, fish ham. **4.3** By-products of the fish industry and their utilization- fish meal, fish body oil, fish liver oil, fish protein concentrate, fish hydrolysates, fish gelatin. Quality assurance and quality control of Seafoods.	7

References:-

1) Hall, George M., ed. Fish Processing Technology. 2nd ed. London: Blackie Academic & Professional, 1997.
2) Vidanarachchi, Janak K., Senaka Ranadheera, R. M. C. Wijerathne, S. M. C. Himali, Udayangani, and Jana Pickova. “Applications of Seafood By-products in Food Industry and Human Nutrition.” In Seafood Processing By-Products: Trends and Applications, edited by Se-Kwon Kim. New York: Springer, 2014.
3) Balachandran, K. K. Post-Harvest Technology of Fish and Fish Products. New Delhi: Daya Publishing House, 2016.
4) Sen, D. P. Advances in Fish Processing Technology. New Delhi: Allied Publishers, 2005.

5) Nguyen, Minh Van, Sigurjon Arason, and Trygve Magne Eikevik. “Drying of Fish.” In Seafood Processing: Technology, Quality and Safety, edited by Kashif A. Abbas. Chichester, UK: Wiley-Blackwell, 2013.
6) Kim, Se-Kwon, ed. Seafood Processing By-Products: Trends and Applications. New York: Springer, 2014.
7) Food Safety and Standards Authority of India (FSSAI). Manual of Methods of Analysis of Foods: Meat and Meat Products and Fish and Fish Products. New Delhi: Ministry of Health and Family Welfare, Government of India, 2016.
8) Abbas, Kashif A., ed. Seafood Processing: Technology, Quality and Safety. Chichester, UK: Wiley-Blackwell, 2013.
9) Bremner, H. Allan, ed. Safety and Quality Issues in Fish Processing. Cambridge, UK: Woodhead Publishing, 2002.
10) Gokoglu, Nalan, and Pinar Yerlikaya, eds. Seafood Processing and By-products: Properties, Safety Assurance and Sustainability. Cham, Switzerland: Springer, 2021.

Evaluation Pattern: 20:30

Total Marks: 50

Internal Continuous Evaluation: (20 Marks)	**End Semester Examination: 30 (Marks)**
• CCE-I : Home Assignment : 10 Marks • CCE –II : Short and long answer questions test/Seminar/ Open book test / Quiz / Case study / Book review / Field work / Industry visit: 10 Marks • CCE – III MCQ Test : 10 Marks (Best of two CCE Marks will be considered)	● Question -1 – Solve the following questions (five questions of 2 marks) 10 Marks ● Question -2 –Attempt any two questions (three question of 10 marks) 20 Marks ● Question -3 – Attempt any four questions (five questions of 5 marks) 20 Marks ● Note : Conversion of 50 marks of ESE to 30 marks

Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Food Technology

Programme: B. Sc.	**Semester: II**
Type : DSC LAB IV	**Marks:** 50
Credits : 2	**From:** A. Y. 2025-26

Name of the Course: (BFTP 123) Practical based on BFTT 121 and BFTT 122

Course Objectives: Students should be able to…

1. explain physiology of fruits and vegetables and their role in pre and post-harvest changes in product quality.
2. understand about preparation and evaluation of fruits and vegetables processed products.
3. summarize the principle of fish canning.
4. illustrate economics of seafood and its by-products.

Course Outcomes: Student will be able to…

1. understand biological, chemical and physical properties of fruits and vegetables.
2. identify the technologies involved in the processing, preservation and value addition of fruit and vegetable.
3. understand the pre and post process operations and storage of fish.
4. make use of economics of seafood and its by-products.

Module No.	Content	Hrs
1)	Study Enzymatic browning of fruits and vegetables.	60
2)	Estimation of titratable acidity, ascorbic acid, total and reducing sugars in fruit juice.	
3)	Preparation and sensory analysis of fruit products (juice concentrates, syrup, jam and jellies).	
4)	Quality evaluation of fruit juice concentrates, jams.	
5)	Qualitative determination of pectin content by alcohol test / jelmeter test in fruit extract.	
6)	Dehydration of fruits and vegetables.	
7)	Study morphological characteristics of fruits.	
8)	Study canning and cut out examination of canned fruits products.	
9)	Quality Evaluation of Fish/prawn.(Physical Parameters).	
10)	Formulation of Fish Products.	
11)	Study the anatomy of fish.	
12)	Perform Pre Canning operation of fish (selection, sorting, descaling).	
13)	Cutout Examination of Canned Fish.	
14)	Determination Acidity of Brine from Canned Fish Sample.	
15)	Determination of moisture content from the different fish samples.	

References:-

1) Lal, G., G. S. Siddhapa, and G. L. Tandon. Preservation of Fruits and Vegetables. New Delhi: Indian Council of Agricultural Research, 2009.
2) Khurdia, D. S. Preservation of Fruits and Vegetables. New Delhi: Indian Council of Agricultural Research, 1995.
3) Salunkhe, D. K., and S. S. Kadam. Handbook of Fruit Science and Technology: Production, Composition, Storage, and Processing. New York: Marcel Dekker, 2005.
4) Alzamora, Stella M., María S. Tapia, and Andrés López-Malo. Minimally Processed Fruits and Vegetables: Fundamental Aspects and Applications. New York: Springer, 2005.
5) Thompson, A. K. Fruit and Vegetables: Harvesting, Handling and Storage. 2nd ed. Oxford: Blackwell

Publishing, 2003.
6) Verma, L. R., and V. K. Joshi. Post-Harvest Technology of Fruits and Vegetables. New Delhi: Indus Publishing Company, 2000.
7) Potter, Norman N., and Joseph H. Hotchkiss. Food Science. 5th ed. New Delhi: CBS Publishers & Distributors, 2006.
8) Hall, George M., ed. Fish Processing Technology. 2nd ed. London: Blackie Academic & Professional, 1997.
9) Vidanarachchi, Janak K., Senaka Ranadheera, R. M. C. Wijerathne, S. M. C. Himali, Udayangani, and Jana Pickova. "Applications of Seafood By-products in Food Industry and Human Nutrition." In Seafood Processing By-Products: Trends and Applications, edited by Se-Kwon Kim. New York: Springer, 2014.
10) Balachandran, K. K. Post-Harvest Technology of Fish and Fish Products. New Delhi: Daya Publishing House, 2016.

Evaluation Pattern: 20:30

Total Marks: 50

Internal Evaluation: 20 Marks	**End Semester Examination: 30 Marks**
● Journal : 10 Marks ● Students Performance : 05Marks ● Viva : 05 Marks	• Question I : 10 Marks • Question II : 10 Marks • Question III : 10 Marks

Karmaveer Bhaurao Patil University, Satara

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Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Food Technology

Programme: B. Sc.	**Semester: II**
Type : DSC IX	**Marks: 50**
Credits : 2	**From:** A. Y. 2026-27

Name of the Course: (BFTT 124) Food Microbiology-II

Course Objectives: Students should be able to…

1. understand the role of microbes in contamination of food and spoilage of food
2. know the cultivation of micro-organisms
3. demonstrate the stains and staining techniques
4. illustrate identification of bacteria

Course Outcomes: Student will be able to…

1. find the microbial contamination of food and techniques for evaluation of contamination
2. examine microorganisms from food
3. explain the principle, mechanism, procedure and applications of different staining procedures
4. elaborate the biochemical characteristics for identification of microorganism

Module	Title and Contents	Hrs
Module -1:	**Microbial contamination of food and spoilage of food.** **1.1** Contamination from air, water, soil and sewage. **1.2** Techniques for evaluation of contamination. **1.3** Spoilage of Specific Food Products. **1.4** Food poisoning, Intoxication, Food borne illness.	8
Module -2:	**Cultivation of Micro-organisms** **2.1** Pure culture technique. **2.2** Methods of isolation . **2.3** Methods of cultivation. **2.4** Enumeration of Microorganisms- qualitative and Quantitative.	7
Module -3:	**Stains and staining techniques** **3.1** Classification of stains- acidic, basic and neutral, Principles, Procedures, mechanisms **3.2** Applications of staining procedures **3.3** Simple staining and Negative staining **3.4** Gram staining and Differential staining.	8
Module -4:	**Identification of bacteria** **4.1** Maintenance of stock cultures – (Agar slants and Agar stabs) Systematic study of pure cultures. **4.2** Morphological characteristics. **4.3** Cultural characteristics. **4.4** Biochemical Characteristics-Sugar fermentation, Production of metabolites -H2S gas, Production of enzymes - Amylase, Caseinase and Catalase Serological and genetic characteristic.	7

References:-

1) Adams, Martin R., and Maurice O. Moss. Food Microbiology. 2nd ed. Cambridge: Royal Society of Chemistry, 2000.
2) Ananthanarayan, R., and C. K. Jayaram Paniker. Ananthanarayan and Paniker's Textbook of Microbiology. 10th ed. Hyderabad: Orient Blackswan, 2016.
3) Frazier, W. C., and D. C. Westhoff. Food Microbiology. 4th ed. New Delhi: Tata McGraw-Hill, 2004.
4) Martin, F. Fundamentals of Microbiology. 7th ed. Philadelphia: W. B. Saunders, 1962.
5) Madigan, Michael T., John M. Martinko, and Thomas D. Brock. Brock Biology of Microorganisms. 12th ed. San Francisco: Pearson Benjamin Cummings, 2008.
6) Pelczar, Michael J., E. C. S. Chan, and Noel R. Krieg. Microbiology. 5th ed. New York: McGraw-Hill, 1986.
7) Purohit, S. S. Microbiology: Fundamentals and Applications. 6th ed. Jodhpur: Agrobios Publishers, 2003.
8) Salle, A. J. Fundamental Principles of Bacteriology. 7th ed. New York: McGraw-Hill Book Company, 1973.
9) Stanier, Roger Y., John L. Ingraham, Mark L. Wheelis, and Page R. Painter. General Microbiology. 5th ed. London: Macmillan Education, 2001.

<table>
<tr><td colspan="2">10) Talaro, Kathleen Park, and Barry Chess. Foundations in Microbiology. 7th International ed. New York: McGraw-Hill Education, 2009.</td></tr>
<tr><td colspan="2">Evaluation Pattern: 20:30</td></tr>
<tr><td colspan="2">Total Marks: 50</td></tr>
<tr><td>Internal Continuous Evaluation: (20 Marks)
• CCE-I : Home Assignment : 10 Marks
• CCE –II : Short and long answer questions test/Seminar/ Open book test / Quiz / Case study / Book review / Field work / Industry visit: 10 Marks
• CCE – III MCQ Test : 10 Marks
(Best of two CCE Marks will be considered)</td><td>End Semester Examination: 30 (Marks)
● Question -1 – Solve the following questions (five questions of 2 marks) 10 Marks
● Question -2 –Attempt any two questions (three question of 10 marks) 20 Marks
● Question -3 – Attempt any four questions (five questions of 5 marks) 20 Marks
● Note : Conversion of 50 marks of ESE to 30 marks</td></tr>
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Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Food Technology

Programme: B. Sc.	**Semester: II**
Type : DSC X	**Marks: 50**
Credits : 2	**From:** A. Y. 2026-27

Name of the Course: (BFTT 125) Food Preservation-II

Course Objectives: Students should be able to…

1. understand mechanism of action of radiation in food preservation
2. know effect of radiation on microorganisms
3. illustrate the non-thermal preservation of food
4. explain the plasma, bio-preservation and hurdle technology

Course Outcomes: Student will be able to…

1. choose the non-thermal preservation techniques for food preservation
2. apply non-thermal preservation techniques as dielectric heating and Microwave processing
3. explain thermal preservation techniques as high-pressure processing and ultrasound
4. elaborate the preservation techniques-plasma and bio-preservation

Module	Title and Contents	Hrs
Module -1:	**Food preservation by radiation** **1.1** Irradiation- Introduction, Types, Sources and Applications **1.2** Irradiation Advantages, Units **1.3** Effect of radiation on food **1.4** Effect of radiation on Microorganisms	8
Module -2:	**Non-thermal preservation of food** **2.1** Pulsed electric field processing- Principle working, advantages and disadvantages, application **2.2** Ohmic heating - Principle, advantages and disadvantages, application **2.3** Dielectric heating, Microwave processing -Principle, advantages and disadvantages application **2.4** Microwave processing – Mechanism of microwave heating, equipment design	7
Module -3:	**Other methods non-thermal food preservation** **3.1** Infrared heating – types, Mechanism, advantages and disadvantages **3.2** High pressure processing – history **3.3** effects of pressure of microorganisms, principle, application of HPP **3.4** Processing using ultrasound	8
Module -4:	**Recent methods of food preservation** **4.1** Plasma- Mechanism, advantages and Disadvantages **4.2** Bio-preservation- types, Mechanism, advantages and disadvantages **4.3** Hurdle technology- Principle **4.4** Types of Hurdles, advantages and disadvantages	7

References:-

1) Bawa, A. S., O. P. Chauhan, et al. Food Science. New Delhi: New India Publishing Agency, 2013.
2) Food Safety and Standards Authority of India (FSSAI). Manual of Methods of Analysis of Foods: Microbiological Testing. New Delhi: Ministry of Health and Family Welfare, Government of India, 2012.
3) Frazier, W. C., and D. C. Westhoff. Food Microbiology. 4th ed. New Delhi: Tata McGraw-Hill, 2004.
4) Manay, N. S., and M. Shadaksharaswamy. Food: Facts and Principles. New Delhi: New Age International Publishers, 1987.
5) Meyer, L. H. Food Chemistry. New Delhi: New Age Publishers, 2004.
6) Potter, Norman N., and Joseph H. Hotchkiss. Food Science. 5th ed. New Delhi: CBS Publishers & Distributors, 2006.
7) Rahman, M. Shafiur, ed. Handbook of Food Preservation. 2nd ed. Boca Raton, FL: CRC Press, 2007.
8) Ramaswamy, H. S., and Marcotte, M. Food Processing: Principles and Applications. Boca Raton, FL: CRC Press, 2005.
9) Srilakshmi, B. Food Science. 4th ed. New Delhi: New Age International Publishers, 2002.
10) Fellows, Peter J. Food Processing Technology: Principles and Practice. 4th ed. Duxford, UK: Woodhead Publishing, 2017.

Evaluation Pattern:	
Total Marks: 50	
Internal Continuous Evaluation: (20 Marks) • CCE-I : Home Assignment : 10 Marks • CCE –II : Short and long answer questions test/Seminar/ Open book test / Quiz / Case study / Book review / Field work / Industry visit: 10 Marks • CCE – III MCQ Test : 10 Marks (Best of two CCE Marks will be considered)	**End Semester Examination: 30 (Marks)** ● Question -1 – Solve the following questions (five questions of 2 marks) 10 Marks ● Question -2 –Attempt any two questions (three question of 10 marks) 20 Marks ● Question -3 – Attempt any four questions (five questions of 5 marks) 20 Marks ● Note : Conversion of 50 marks of ESE to 30 marks

	Faculty of Science and Technology
	Yashavantrao Chavan Institute of Science, Satara
	Board of Studies in Food Technology
Programme: B. Sc.	**Semester: II**
Type : DSC LAB V	**Marks:** 50
Credits : 2	**From:** A. Y. 2026-27
Name of the Course: (BFTP 126) Practical based on BFTT124 and BFTT 125	

Course Objectives: Students should be able to…

1) recall the isolation of bacteria by streak plate technique, isolation of molds from foods.
2) know detection ability of bacteria to produce caseine enzyme and sugar fermentation.
3) illustrate use of natural and chemical preservatives in food preservation.
4) 4)explain the effect of surface area of food on drying rate.

Course Outcomes: Student will be able to…

1) recall techniques of isolation of bacteria by streak plate, isolation of molds from foods.
2) apply the staining methods.
3) examine the detection the ability of bacteria to produce caseins enzyme and sugar fermentation.
4) choose the method of food preservation to preserve the different types of food.

Module No.	Content	Hrs
1)	Study the isolation of bacteria by streak plate technique.	60
2)	Study the staining methods- (Mono chrome staining, Gram staining, Negative staining)	
3)	Study the isolation of molds from foods.	
4)	Determine SPC of food sample.	
5)	Detect the ability of bacteria to produce casein as enzyme.	
6)	Detect the ability of bacteria to ferment sugar	
7)	Study the cultivation of anaerobic bacteria	
8)	Determine quality characteristics of foods preserved by drying/ dehydration and freezing	
9)	Study the pasteurization of fluids using different Methods	
10)	Study the effect of surface area of food on drying rate.	
11)	Study the preservation of food by using natural preservatives.	
12)	Study the preservation of food by using chemical Preservatives	
13)	Study the preservation of food using sugar as a Preservative	
14)	Study the preservation of food by using oil as a Preservative	
15)	Study the preservation of food by using salt as a Preservative	

References:-

1) Baker, F. J. Bacteriological Techniques. London: Butterworth & Co. (Publishers) Ltd., 1967.
2) David, T. Plummer. An Introduction to Practical Biochemistry. 2nd ed. London: McGraw-Hill Book Company (UK) Ltd., 1978.
3) Dey, N. C., and T. K. Dey. Medical Bacteriology. 7th ed. Kolkata: Allied Agency, 1973.
4) Goldman, Emanuel, and Lorrence H. Green. Practical Handbook of Microbiology. 2nd ed. Boca Raton, FL: CRC Press/Taylor & Francis, 2008.
5) Food Safety and Standards Authority of India (FSSAI). Food Safety and Standards Regulations. New Delhi: Ministry of Health and Family Welfare, Government of India, 2012.
6) Frazier, W. C., and D. C. Westhoff. Food Microbiology. 4th ed. New Delhi: Tata McGraw-Hill, 2004.
7) Frobisher, Martin, Robert D. Hinsdill, Kenneth T. Crabtree, and Charles R. Goodheart. Fundamentals of

Microbiology. 9th ed. Philadelphia: W. B. Saunders Company, 1974.
8) Jayaraman, J. Laboratory Manual in Biochemistry. New Delhi: New Age International Publishers, 2011.
9) Marion, L. F. Laboratory Manual in Food Preservation. 4th ed. Westport, CT: AVI Publishing Company, 1983.
10) Patel, R. Experimental Microbiology. 5th ed. Vols. 1–2. New Delhi: Aditya Book Centre, 2009.

Evaluation Pattern: 20:30

Total Marks: 50

Internal Evaluation: 20 Marks	**End Semester Examination: 30 Marks**
● Journal : 10 Marks ● Students Performance : 05Marks ● Viva : 05 Marks	• Question I : 10 Marks • Question II : 10 Marks • Question III : 10 Marks

Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Food Technology

Programme: B. Sc. I	**Semester: II**
Type : DSC XI	**Marks:** 50
Credits : 2	**From:** A. Y. 2026-2027

Name of the Course: (BFTT 127) Food Laws and Standards

Course Objectives: Students should be able to…

1. understand importance and concepts of food law
2. know the comprehension of food laws in food industries
3. apply basic research, methods, data analysis in field of food law
4. explain objectives and functions of food laws and regulation

Course Outcomes: Student will be able to…

1. explain scope of food laws and regulations
2. categorize food laws according to agencies
3. protect food laws and standards
4. understand food authorities

Module	Title and Contents	Hrs
Module -1:	**Food Safety and Standard Act, Rules and Regulations** **1.1** Food Safety and Standard Act 2006, Food Safety and Standards Rules and regulations Standards. **1.2** Food Safety and Standards Rules and regulations Procedures. **1.3** Inspection and Audits in Food Industries.	7
Module -2:	**Global Scenario** **2.1** Codex Alimentarius Commission (CAC)- Purpose, Standards Committees and Working Groups, Member Participation, Procedure and Processes, International Recognition, Guidance and Implementation. **2.2** World Trade Organization (WTO) implication-Purpose, Core Functions, Structure, Agreement and rules, Membership, Decision Making Process and Global Impact. **2.3** Other International Standard Setting Bodies.	8
Module -3:	**Export- Import Laws and Regulations** **3.1** Import Regulations, Export Regulations, Customs Procedure, Trade Agreements and Treaties, Compliance and Enforcement, Tariff Classification. **3.2** Import Export Documentation, Trade Facilitation. **3.3** Majors, Risk Management in Import Export Policies.	7
Module -4:	**Other Laws and Standards Related to Food** **4.1** International Regulatory Bodies- Food and Agricultural Organization (FAO), World Health Organization (WHO), World Trade Organization (WTO), International Organization for Standardization. **4.2** National Agencies For Implementation of International Food Laws and Standards.	8

References:-

1) Food Safety and Standards Authority of India (FSSAI). The Training Manual for Food Safety Regulators. Vol. 2, Food Safety Regulations and Food Safety Management. New Delhi: Food Safety and Standards Authority of India, 2011.
2) Surak, John G., and Steven Wilson. The Certified HACCP Auditor Handbook. 2nd ed. Milwaukee, WI: ASQ Quality Press, 2007.
3) Government of India, Ministry of Commerce and Industry, Department of Commerce. Foreign Trade Policy, 27 August 2009–31 March 2014. New Delhi: Government of India, 2009.
4) Government of India, Ministry of Commerce and Industry, Department of Commerce. Foreign Trade Policy, 27 August 2009–31 March 2014. New Delhi: Government of India, 2009.
5) Mortimore, Sara, and Carol Wallace. HACCP: A Practical Approach. 2nd ed. Gaithersburg, MD: Aspen Publishers, 2005.

Evaluation Pattern: 20:30

Total Marks: 50	
Internal Continuous Evaluation: (20 Marks) • CCE-I : Home Assignment : 10 Marks • CCE –II : Short and long answer questions test/Seminar/ Open book test / Quiz / Case study / Book review / Field work / Industry visit: 10 Marks • CCE – III MCQ Test : 10 Marks (Best of two CCE Marks will be considered)	**End Semester Examination: 30 (Marks)** ● Question -1 – Solve the following questions (five questions of 2 marks) 10 Marks ● Question -2 –Attempt any two questions (three question of 10 marks) 20 Marks ● Question -3 – Attempt any four questions (five questions of 5 marks) 20 Marks ● Note : Conversion of 50 marks of ESE to 30 marks

Karmaveer Bhaurao Patil University, Satara

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Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Food Technology

Programme: B. Sc.	**Semester: II**
Type : DSC XII	**Marks:** 50
Credits : 2	**From:** A. Y. 2026-27

Name of the Course: (BFTT 128) Food Additives and Toxicology

Course Objectives: Students should be able to…

1. know the functions and classification of food additives in food processing and preservation
2. know the types and functions of direct and indirect food additives
3. understand the safety and quality evaluation of food additives and contaminants
4. study methods for detection of Food Additives

Course Outcomes: Student will be able to…

1. apply the basics of enzyme, its classification, nomenclature and mechanism of action
2. implement the utilization of carbohydrate
3. identify the utilization of antioxidants and its effect on human body
4. identify the utilization of lipid and lipid oxidation

Module	Title and Contents	Hrs
Module -1:	**Basics of Food Additives** **1.1** Additives in food processing and preservation – classification and their functions, ADI, GRAS. **1.2** Nutritional and non-nutritional food additives. **1.3** International numbering system for food additives. **1.4** Introduction to direct and indirect food additives.	8
Module -2:	**Chemistry of Direct Food Additives- I** **2.1** Preservatives, Antioxidants, Acidulants, Chelating/ Sequesterants- Introduction, their chemistry, types and functions. **2.2** Sweeteners- Natural and low calorie/ Non –nutritive sweeteners, Their Chemistry, Types and Functions, Emulsifiers, Their Chemistry, Types and Function ,Stabilizers and Thickening agents- Their Chemistry, Types and Functions. **2.3** Anticaking agents, Humectants – Their Chemistry, Types and Function. **2.4** Flavor and flavor enhancers.	7
Module -3:	**Chemistry of Direct food additives –II** **3.1** Colors-Types and properties of food color. **3.2** Regulatory aspects, safety issues, Safety evaluation of food additives. **3.3** Natural food colors- heme pigments, chlorophylls, carotenoids, anthocynains and flavonoids, tannins, caramel and other artificial food colors.	8
Module -4:	**Methods for Detection of Food Additives** **4.1** Food Contaminants – Definition, Types, Food Toxicants – Definition, Types, Terminologies in Toxicology **4.2** Acute and Chronic studies. **4.3** Methods for Detection of Food Additives, LD50 Value	7

References:-

1) Fennema, Owen R., ed. Principles of Food Science: Part I—Food Chemistry. New York: Marcel Dekker, 1976.
2) Potter, Norman N. Food Science. 3rd ed. Westport, CT: AVI Publishing Company, 1978.
3) Furia, Thomas E. Handbook of Food Additives. Vols. I and II. Cleveland, OH: CRC Press, 1980.
4) Branen, A. Larry, and Paul M. Davidson. Antimicrobials in Foods. New York: Marcel Dekker, 1983.
5) Furia, Thomas E. Handbook of Food Additives. Vols. I and II. Cleveland, OH: CRC Press, 1980

Evaluation Pattern: 20:30

Total Marks: 50

Internal Continuous Evaluation: (20 Marks)	End Semester Examination: 30 (Marks)
• CCE-I : Home Assignment : 10 Marks • CCE –II : Short and long answer questions	• Question -1 – Solve the following questions (five questions of 2 marks) 10 Marks

test/Seminar/ Open book test / Quiz / Case study / Book review / Field work / Industry visit: 10 Marks • CCE – III MCQ Test : 10 Marks (Best of two CCE Marks will be considered)	● Question -2 –Attempt any two questions (three question of 10 marks) 20 Marks ● Question -3 – Attempt any four questions (five questions of 5 marks) 20 Marks ● Note : Conversion of 50 marks of ESE to 30 marks

	Faculty of Science and Technology
	Yashavantrao Chavan Institute of Science, Satara
	Board of Studies in Food Technology
Programme: B. Sc.	**Semester: II**
Type : DSC LAB VI	**Marks:** 50
Credits : 2	**From:** A. Y. 2025-26
Name of the Course: (BFTP 129) Practical based on BFTT 127 and BFTT 128	

Course Objectives: Students should be able to…

1. explain the classification, functions, and regulatory aspects of food additives used in food processing
2. understand food labeling requirements and legal provisions related to additives as per FSSAI regulations
3. apply standard laboratory techniques for identification and detection of food additives in various food products.
4. Analyze the compliance of food products with prescribed standards and specifications

Course Outcomes: Student will be able to…

1. Identify and classify different food additives and food standards used in the food industry
2. Perform laboratory tests for detection and estimation of additives such as colors, preservatives, emulsifiers, stabilizers, and thickeners.
3. Analyze food samples for compliance with FSSAI specifications and legal standards.
4. Evaluate the quality, authenticity, and safety of food products based on analytical results and regulatory requirements

Module No.	Content	Hrs
1)	To study licensing and registration process.	60
2)	To examine food labels for compliance with legal requirements.	
3)	To study FSSAI schedule 4.	
4)	Examination of cereals as per specifications.	
5)	Examination of milk and milk products as per specifications.	
6)	Examination of oil and oil products as per specifications.	
7)	Examination of fruit and vegetable products as per specifications.	
8)	Detection of Starch as a Thickening Agent.	
9)	Use of food additives in different food products.	
10)	Detection stabilizers from different food samples.	
11)	Detection of Gelatin in confectionery products.	
12)	Isolation and estimation of synthetic food colors.	
13)	Identification of Natural food colors.	
14)	Detection of Citric Acid in beverages.	
15)	Detection of emulsifiers from different food samples.	

1) References:-

2) Dashman, Theodore, Deborah E. Blocker, and Nora Baker. Laboratory Manual for Human Nutrition. Chur, Switzerland: Harwood Academic Publishers, 1991.
3) Ismail, B. Pam, and S. Suzanne Nielsen, eds. Nielsen's Food Analysis Laboratory Manual. 4th ed. Cham: Springer, 2024.
4) Sengar, R. S., and Reshu Chaudhary. Laboratory Manual of Biochemistry: Methods and Techniques. New Delhi: New India Publishing Agency, 2014.
5) Kaushik, G. G., Neha Sharma, Sabira Dabeer, and Ruchi Jindal. Practical Manual of Biochemistry. 2nd ed. New Delhi: CBS Publishers & Distributors, 2022.
6) Marimuthu, Charumathy, V. Magendira Mani, M. Gomathi, and R. Mahalakshmi. Practical Manual:

Nutritional Biochemistry. Chennai: Marudhar Kesari Jain College for Women, 2023.
7) Nelson, David L., and Michael M. Cox. Lehninger Principles of Biochemistry. 8th ed. New York: W. H. Freeman, 2021.
8) Murray, Robert K., David A. Bender, Kathleen M. Botham, Peter J. Kennelly, Victor W. Rodwell, and P. Anthony Weil. Harpers Illustrated Biochemistry. 32nd ed. New York: McGraw-Hill Education, 2021.
9) Stipanuk, Martha H., and Marie A. Caudill. Biochemical, Physiological, and Molecular Aspects of Human Nutrition. 4th ed. St. Louis, MO: Elsevier, 2019.
10) Gibney, Michael J., Susan A. Lanham-New, Aedin Cassidy, and Hester H. Vorster. Introduction to Human Nutrition. 3rd ed. Oxford: Wiley-Blackwell, 2023.
11) Indira Gandhi National Open University. MFNL-002 Nutritional Biochemistry Practical Manual. New Delhi: IGNOU, 2020.

Evaluation Pattern: 20:30

Total Marks: 50

Internal Evaluation: 20 Marks	**End Semester Examination: 30 Marks**
● Journal : 10 Marks ● Students Performance : 05Marks ● Viva : 05 Marks	• Question I : 10 Marks • Question II : 10 Marks • Question III : 10 Marks