Karmaveer Bhaurao Patil University, Satara

Syllabus for

B. Sc. III Food Technology

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 – III Food Technology

1. 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.

2. 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.

3. 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.

4. 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.

5. 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.

6. Title: Food Technology

7. Year of Implementation: 2026-2027

8. Duration: 01 year

9. Student Eligibility:

10. Faculty Eligibility:

11. Batch Size:

12. Pattern: Semester examination

13. Medium of Instruction: English

10. STRUCTURE OF COURSE:

Sem (Level)	Courses			OE	VSC/ SEC	AEC/ VEC/ IKS	OJT/ FP/ CEP/ CC/ RP	Total Credits
	Course I	**Course II**	**Course III**					
	Major Mandatory	**Major Elective**	**-**	**-**				
Sem V (5.5)	Major IX (2) Major X (2) Major XI (2) Major P V (2)	Major XII (Elect.) (2) Major P VI (Elect.) (2)	-	-	VSC III (2) (P) Major specific)	AEC III (2) (English)	OJT (4) CEP (2)	22
Sem VI (5.5)	Major XIII (2) Major XIV (2) Major XV (2) Major P VII (2)	Major XVI (Elect.) (2) Major P VIII (Elect.) (2)	-	-	VSC IV (2) (P) Major specific) SEC III (2) (P)	AEC III (2) (English)	FP (2) CC (2)	22
Credits	16	08	-	-	06	04	10	44

Note:

VSC:-Vocational Skill Courses, SEC:-Skill Enhancement Course, AEC:-Ability Enhancement Course, FP:-Field Project, CC:-Co-curricular Course, OJT:-On Job Training, CEP:-Community Engagement Programme

11. COURSE TITLES:

A) Semester V

Sr. No.	Course Category	Course Code	Name of the Course	Credits
1	Major IX	BFTT 351	Processing Technology of Bakery Products	2
2	Major X	BFTT 352	Processing Technology of Confectionary Products	2
3	Major XI	BFTT 353	Food Process Engineering I	2
4	Major P V	BFTP 354	Practical based on BFTT 351, BFTT 352, BFTT 353	2
5	Major Elective XII (E- 1)	BFTT 355	Food Product Development and Computer Application	2
	Major Elective XII (E- 2)		Food Plant Design and Layout	
6	Major Elective P VI	BFTP 356	Practical based on BFTT 355	2
7	VSC III	BFTP VSC III	Instrumental Techniques in Food Analysis	2
8	AEC	BFTP AEC	English	2
9	OJT	BFTP OJT	On Job Training	4
10	CEP	BFTP CEP	Community Engagement Programme	2
	Total Credits			**22**

Note:

VSC:-Vocational Skill Course, SEC:-Skill Enhancement Course, AEC:-Ability Enhancement Course, OJT:- On Job Training, CEP:-Community Engagement Programme

B) Semester VI

Sr. No.	Course Category	Course Code	Name of the Course	Credits
1	Major XIII	BFTT 361	Food Quality and Sensory Evaluation	2
2	Major XIV	BFTT 362	Processing Technology of Snack Foods.	2
3	Major XV	BFTT 363	Food Process Engineering II	2
4	Major P VII	BFTP 364	Practical based on BFTT 361, BFTT 362, BFTT 363	2
5	Major Elective XVI (E- 1)	BFTT 365	Beverage Technology	2
	Major Elective XVI (E- 2)		Instrumentation Process Control and Computer Applications	
6	Major Elective P VIII	BFTP 366	Practical based on BFTT 365	2
7	VSC IV	BFTP VSC IV	Numerical Skills - Statistical Quality Control	2
8	SEC	BFTP SEC	Clinical Nutrition and Dietetics	2
9	AEC	BFTP AEC	English	2
10	FP	BFTP FP	Field Project	2
11	CC	BFTP CC	Co-curricular course	2
	Total Credits			**22**

Note:

VSC:-Vocational Skill Courses, SEC:-Skill Enhancement Course, FP:-Field Project, CC:-Co-curricular Course, AEC:-Ability Enhancement Course

12. EVALUATION STRUCTURE:

Semester V

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 IX	T	BFTT 351	10	10	10	30	50	02
DSC X	T	BFTT 352	10	10	10	30	50	02
DSC XI	T	BFTT 353	10	10	10	30	50	02
DSC P	P	BFTP 354	--	--	--	50	50	02
DSC XII (E1)	T	BFTT 355	10	10	10	30	50	02
DSC XII (E2)	T	BFTT 355	10	10	10	30	50	
DSE P	T	BFTP 356	--	--	--	50	50	02
VSC III	P	BFTP VSC III	--	--	--	50	50	02
AEC III	T	BFTT AEC English	10	10	10	30	50	02
OJT I	P	BFTP OJT I	--	--	--	100	100	04
CEP I	P	BFTP CEP I	--	--	--	50	50	02
Total							**550**	**22**

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

Semester VI

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 XIII	T	BFTT 361	10	10	10	30	50	02
DSC XIV	T	BFTT 362	10	10	10	30	50	02
DSC XV	T	BFTT 363	10	10	10	30	50	02
DSC P	P	BFTP 364	--	--	--	50	50	02
DSC XVI (E1)	T	BFTT 365	10	10	10	30	50	02
DSC XVI (E2)	T	BFTT 365	10	10	10	30	50	
DSE P	T	BFTP 366	--	--	--	50	50	02
VSC	P	BFTP VSC IV	--	--	--	50	50	02
SEC	T	BFTP SEC III	--	--	--	50	50	02
AEC	P	BFTP AEC English	10	10	10	30	50	02
FP I	P	BFTP FP I	--	--	--	50	50	04
Total							**550**	**22**

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

SEMESTER V

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: V**
Type: Major IX	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course: BFTT 351, Processing Technology of Bakery Products

Course Objectives: Students should be able to…

1) to introduce students to the fundamentals and significance of bakery technology and its role in the food industry
2) to explain the scientific principles of baking, dough rheology, and ingredient functionality
3) to familiarize students with bakery equipment and their operational principles
4) to develop knowledge of processing techniques for various bakery products like bread, biscuits, cakes, and pizza base

Course Outcomes: Student will be able to…

1) explain the importance of bakery technology and principals involved in baking
2) apply appropriate equipment and time–temperature relationships in baking processes
3) develop or modify formulations for specialized bakery products
4) identify defects and evaluate quality control measures in bakery products

Module	Title and Contents	Hrs.
Module-1:	**Baking Technology** **1.1** Introduction and importance of bakery **1.2** Principles involved in baking **1.3** Dough rheology- farinograph, extensiograph, alveograph, mixograph, amylograph **1.4** Types of dough- soft dough, hard dough, fermented dough **1.5** Ingredients used in bakery	7
Module-2:	**Bakery Equipment's** **2.1** Sieving- purpose, importance and equipment used for sieving **2.2** Mixing- purpose, types of mixers **2.3** Molding- purpose, types of rotary system **2.4** Baking oven, types of oven, time temperature relationship in baking cooling and packaging machines	8
Module-3:	**Processing of Bakery Products** **3.1** Bread-raw material, manufacturing process, types **3.2** Biscuit- raw material, manufacturing process, types **3.3** Cookies-raw material, manufacturing process, types **3.4** Pizza base- raw material, manufacturing process **3.5** Cake- manufacturing process, types of cakes **3.6** Specialized bakery products	7
Module-4:	**Preservation, Quality and Hygiene of Bakery** **4.1** Preservation techniques used in bakery products **4.2** Defects in bakery products **4.3** Quality control and quality assurance in bakery products **4.4** Maintenance and safety in bakery **4.5** Cleaning and hygiene of bakery products	8

References:-

1) Hui, Y. H. Bakery Products Science and Technology. Chichester: Wiley-Blackwell, 2014.
2) Gisslen, Wayne. Professional Baking. 6th ed. Hoboken, NJ: Wiley, 2013.
3) Owens, Gavin. Cereal Processing Technology. Cambridge: Woodhead Publishing Ltd., 2000.
4) Pyler, E. J., and L. A. Gorton. Baking Science and Technology. Chicago: Siebel Publishing, 1952.

5) Figoni, Paula. How Baking Works: Exploring the Fundamentals of Baking Science. Hoboken: John Wiley & Sons, 2011.
6) Amendola, Joseph, and Nicole Rees. Understanding Baking: The Art and Science of Baking. Hoboken: John Wiley & Sons, 2003.
7) Labensky, Sarah R., Priscilla A. Martel, and Eddy Van Damme. On Baking: A Textbook of Baking and Pastry Fundamentals. Upper Saddle River: Pearson, 2016.
8) Corriher, Shirley O. BakeWise: The Hows and Whys of Successful Baking. New York: Scribner, 2008.
9) McGee, Harold. On Food and Cooking: The Science and Lore of the Kitchen. New York: Scribner, 2004.
10) Chlebana, R. Andrew. The Advanced Art of Baking and Pastry. Hoboken: Wiley, 2017.
11) Talbot, Geoff. Science and Technology of Enrobed and Filled Chocolate, Confectionery and Bakery Products. Cambridge: Woodhead Publishing, 2009.
12) Cauvain, Stanley P., and Linda S. Young. Technology of Bread making. New York: Springer, 2006.
13) Cauvain, Stanley P. Breadmaking: Improving Quality. Cambridge: Woodhead Publishing, 2012.
14) Myhrvold, Nathan, and Francisco Migoya. Modernist Bread. Bellevue: The Cooking Lab, 2017.
15) Food Safety and Standards Authority of India. Manuals of Analysis of Foods: Bakery Products. New Delhi: Ministry of Health and Family Welfare, Government of India, 2016.
16) American Bakers Association. Baking Technology. Chicago: American Bakers Association, 1926.

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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Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Food Technology

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

Name of the Course: BFTT 352, Processing Technology of Confectionary Products

Course Objectives: Students should be able to…

1) understand the basic principles of confectionery processing
2) study ingredients and their functional role in confectionery products
3) learn processing techniques for different confectionery items
4) gain knowledge about quality control, packaging, and storage of confectionery products

Course Outcomes: Student will be able to…

1) explain types and processing principles of confectionery products
2) identify ingredients and their role in product quality
3) prepare different confectionery products using standard methods
4) evaluate quality and apply packaging and storage techniques

Module	Title and Contents	Hrs.
Module-1:	**Introduction to Confectionery.** **1.1** Definition and classification of confectionery **1.2** Confectionery ingredients **1.3** Major ingredients and their functions. **1.4** Types of confectionery	7
Module-2:	**Processing of Sugar Confectionery**. **2.1** Sugar cooking principles (crystallization & non-crystallization). **2.2** Preparation and processing of: hard candies, toffees and caramels, fondant and fudge. **2.3** Alternative bulk sweeteners: corn syrup and glucose syrup, **2.4** Artificial bulk sweeteners orbitol, xylitol, maltitol, isomalt, lactitol, mannitol.	8
Module-3:	**Cocoa and Chocolate Processing.** **3.1** Cocoa harvesting, processing **3.2**. Cocoa beans processing **3.3** Chocolate manufacturing (mixing, refining, conching, tempering) **3.4** Types and quality of chocolate, storage and defects	7
Module-4:	**Quality Control, Packaging and Storage.** **4.1** Quality parameters **4.2** Hygiene and food safety **4.3** Shelf life study of confectionery products **4.4** Recent trends in confectionery	8

References:-

1) Beckett, Stephen T. Industrial Chocolate Manufacture and Use. 4th ed. Oxford: Wiley-Blackwell, 2009.
2) Beckett, Stephen T. The Science of Chocolate. 2nd ed. Cambridge: Royal Society of Chemistry, 2008.
3) Jackson, E. B. Sugar Confectionery Manufacture. 2nd ed. London: Blackie Academic & Professional, 1995.
4) Minifie, Bernard W. Chocolate, Cocoa and Confectionery: Science and Technology. 3rd ed. New York: Springer, 1989.
5) Edwards, W. P. The Science of Sugar Confectionery. Cambridge: Royal Society of Chemistry, 2000.

6) Manley, Duncan. Technology of Biscuits, Crackers and Cookies. 4th ed. Cambridge: Woodhead Publishing, 2011.
7) Fellows, P. J. Food Processing Technology: Principles and Practice. 3rd ed. Cambridge: Woodhead Publishing, 2009.
8) Potter, Norman N., and Joseph H. Hotchkiss. Food Science. 5th ed. New York: Springer, 1995.
9) Beckett, Stephen T. 2019. Industrial Chocolate Manufacture and Use. 5th ed. Oxford: Wiley-Blackwell.
10) Hartel, Richard W., Joachim H. von Elbe, and Randy Hofberger. 2018. *Confectionery Science and Technology*. Cham: Springer.

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 :** V
Type: Major XI	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course: BFTT 353, Food Process Engineering I

Course Objectives: Students should be able to…

1) know the principle of unit operation
2) acquaint with fundamentals of food engineering and its process
3) understand the theory and applications of filtration, centrifugation and distillation
4) imbibe the theory and applications of grinding and mixing

Course Outcomes: Student will be able to…

1) apply the principle of size reduction
2) understand the theory and applications of filtration
3) demonstrate the different equipment used for distillation process
4) explain the basic theory and applications of mixing

Module	Title and Contents	Hrs.
Module-1:	**Introduction and Size Reduction.** **1.1** Introduction: unit operations in food engineering **1.2** Units and dimensions, unit conversions **1.3** Mass and energy balance **1.4** Size reduction: particle size analysis, equipments, application to food industries	7
Module-2:	**Filtration and Centrifugation** **2.1** Filtration: theory of filtration **2.2** Industrial filters, equipments, and applications to food industries **2.3** Centrifugation: theory of centrifugation **2.4** Centrifugation equipments, applications to food industries	8
Module-3:	**Distillation and Absorption** **3.1** Introduction of Distillation ,Continues flash distillation, batch and continuous distillation, steam distillation **3.2** Theory of absorption, different equipment's of gas absorption. **3.3** Introduction of Scrubbers, Collection mechanism, types of Scrubbers, applications to food industries.	8
Module-4:	**Module-4: Grinding and Mixing** **4.1** Theory of solid-solid mixing. **4.2** Theory of liquid-liquid mixing, **4.3** Equipment's for mixing **4.4** Applications of grinding and mixing in food industries.	7

References:-

1) Christie J. Geankoplis. Transport Processes and Unit Operations. 3rd ed. Englewood Cliffs, NJ: Pearson College Division, 1993
2) R. Paul Singh, and Dennis R. Heldman. Introduction to Food Engineering. 4th ed. Burlington, MA: Academic Press, 2008.
3) Geankoplis. Transport Processes and Unit Operations. 3rd ed. Englewood Cliffs, NJ: Pearson College

Division,1993
4) C. G. Rao. Essentials of Food Process Engineering. Hyderabad: BS Publications, 2006.
5) P. J. Fellows. Food Processing Technology: Principles and Practice. 3rd ed. Oxford: Elsevier Science, 2009.
6) Heldman, Dennis R., and R. Paul Singh. Food Process Engineering. Dordrecht: Springer, 1981.
7) Leniger, H. A., and W. A. Beverloo. Food Process Engineering. Dordrecht: Springer, 1975.
8) Toledo, Romeo T. Fundamentals of Food Process Engineering. New York: Van Nostrand Reinhold, 1991.
9) Smith, P. G. Introduction to Food Process Engineering. New York: Springer, 2003.
10) Berk, Zeki. Food Process Engineering and Technology. 3rd ed. New York: Academic Press, 2018.
11) Singh, R. Paul, and Dennis R. Heldman. Introduction to Food Engineering. 5th ed. London: Academic Press, 2014.

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)	**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)

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Programme: B. Sc.	**Semester** – V
Type : Major P V	**Marks:** 50
Credits : 2	**From:** A. Y. 2026-27

Name of the Course: BFTP 354, Practical based on BFTT 351, BFTT 352, BFTT 353

Course Objectives: Students should be able to…

1) understand the principles and techniques involved in bakery and confectionery product preparation
2) learn sensory evaluation methods to assess quality attributes of baked and confectionery products
3) gain knowledge of basic food engineering operations such as size reduction, filtration, centrifugation, and mixing
4) acquaint with fundamentals of food engineering and its process

Course Outcomes: Student will be able to…

1) prepare bakery and confectionery products like bread, pizza base, cookies, and cakes and evaluate their sensory quality
2) analyse physicochemical properties of ingredients like sugar and assess different confectionery types
3) perform fundamental food processing operations such as particle size analysis, milling, filtration, centrifugation, and mixing
4) explain the basic theory and applications of mixing

Practical No.	Content	Hrs.
1)	Preparation of bread and its sensory evaluation.	30
2)	Preparation of pizza base and its sensory evaluation.	
3)	Preparation of butter cookies and its Sensory evaluation.	
4)	Preparation of sponge cake and its sensory evaluation.	
5)	Preparation of chocolate chip cookies and its sensory evaluation.	
6)	Study of physiochemical properties of sugar.	
7)	Preparation and assessment of flour based confectionary.	
8)	Preparation and assessment of chocolate based confectionary.	
9)	Preparation and assessment of milk based confectionary.	
10)	Preparation and assessment of sugar based confectionary.	
11)	Study of particle size analysis.	
12)	Study of size reduction- grain milling.	
13)	Study of filtrations- fibers extraction.	
14)	Study of centrifugation- starch, proteins, cream.	
15)	Study of mixing- dry solid.	

References:-

1. P. J. Fellows. Food Processing Technology: Principles and Practice. 5th ed. Cambridge: Woodhead Publishing, 2022.
2. Stanley P. Cauvain, and Linda S. Young. Baking Problems Solved. 2nd ed. Cambridge: Woodhead Publishing, 2021.
3. Y. H. Hui. Handbook of Food Science, Technology, and Engineering. 2nd ed. Boca Raton: CRC Press, 2020.
4. B. Srilakshmi. Food Science. 7th ed. New Delhi: New Age International, 2021.
5. S. Suzanne Nielsen. Food Analysis. 6th ed. Cham: Springer, 2022.
6. Harry T. Lawless, and Hildegarde Heymann. Sensory Evaluation of Food: Principles and Practices. 3rd ed. New York: Springer, 2022.
7. R. Paul Singh, and Dennis R. Heldman. Introduction to Food Engineering. 6th ed. Academic Press, 2021.
8. Samuel A. Matz. Bakery Technology and Engineering. New Delhi: CBS Publishers, 2019.
9. Richard W. Hartel, Joachim H. von Elbe, and Randy Hofberger. Confectionery Science and Technology. 2nd ed. Cham: Springer, 2018.
10. Edwards, W. P. The Science of Sugar Confectionery. Cambridge: Royal Society of Chemistry, 2000.
11. Manley, Duncan. Technology of Biscuits, Crackers and Cookies. 4th ed. Cambridge: Woodhead Publishing, 2011.

Evaluation Pattern:

Total Marks: 50

End Semester Practical Examination:

- Question -1
- Question -2
- Question -3
- Question -4

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Programme: B. Sc.	**Semester** :V
Type : Major Elective (E-I)	**Marks:** 50
Credits : 2	**From:** A. Y. 2026-27

Name of the Course: BFTT 355, E-I Food Product Development and Computer Application

Course Objectives: Students should be able to…

1) know define of new product, its classification, reasons, product development and npd team
2) learn product development process, proximate analysis, shelf-life study of new product
3) summarize the role of computers and basic software like MS Word, Excel, and PowerPoint for calculations, data analysis, and graphical representation related to food processing and quality
4) understand the application of software tools for food safety compliance, HACCP, and consumer data analysis

Course Outcomes: Student will be able to…

1) apply concept product life cycle and concept of market and marketing
2) interpret the shelf-life study of new product in accordance with fssai standards
3) prepare reports; maintain records, and present food technology projects using MS Office tools
4) analyze how computer vision and image processing help in defect detection, sorting, and microbial analysis of food products

Module	Title and Contents	Hrs.
Module-1:	**Basics of Food Product Development** **1.1** Definition, classification of new food product **1.2** Reason for new food product development **1.3** Product development-social concerns, health concerns **1.4** Product development-market place influences, technological influences, governmental influences	7
Module-2:	**Steps in Food Product Development** 2.1 Product life cycle 2.2 New product development team 2.3 Concept of market and marketing team 2.4 Idea generation, idea screening, concept testing, business analysis, product development, test marketing, commercialization	8
Module-3:	**New Product Development – From Concept to Final Report** **3.1** Market and literature survey to identify the concepts of new products **3.2** Development of prototype product and standardization of formulation process **3.3** Proximate analysis, shelf-life study of new product **3.4** Cost analysis and final project report	7
Module-4:	**Advanced Computer Applications in Food Technology** **4.1** Application of MS excel in food technology – calculation of shelf life, cost and formulation, preparation of charts and graphs, data analysis of temperature, moisture and microbial growth **4.2** Computer vision for food quality analysis – detection of defects in fruits, vegetables, grains, smart sorting & grading using image processing **4.3** Image-based microbial contamination detection, predicting product behavior before	8

	actual production **4.4** Digital food quality management systems - software for HACCP & food safety compliance, digital record keeping & audits	

References:-

1) Aramouni, Fadi, and Kathryn Deschenes. 2017. Methods for Developing the New Food Product. 2nd ed. Lancaster, PA: DEStech Publications.
2) Earle, M., R. Earle, and A. Anderson. 2001. Food Product Development. Cambridge: Woodhead Publishing. Saguy, Sam, and Tim Straus. 2009. Food Product Development. Boca Raton: CRC Press.
3) Fuller, Gordon W. 2011. New Food Product Development: From Concept to Marketplace. 3rd ed. Boca Raton: CRC Press.
4) Moskowitz, Howard R. An Integrated Approach to New Food Product Development.
5) Palm, William J. 2011. Introduction to MATLAB for Engineers. 3rd ed. New York: McGraw Hill.
6) Singh, R. Paul. 1996. Computer Applications in Food Technology: Use of Spreadsheets in Graphical, Statistical and Process Analysis. San Diego: Academic Press.
7) Snee, Ronald D., and Roger W. Hoerl. 2016. Strategies for Formulations Development: A Step by-Step Guide Using JMP. Revised ed. Cary, NC: SAS Institute.
8) Brosnan, Tadhg, and Da-Wen Sun. "Improving Quality Inspection of Food Products by Computer Vision—A Review." Journal of Food Engineering 61, no. 1 (2004): 3–16.
9) Lambert, Joan, and Joyce Cox. Microsoft Word 2019 Step by Step. Redmond, WA: Microsoft Press, 2019.
10) Mortimore, Sara, and Carol Wallace. HACCP: A Practical Approach. 3rd ed. New York: Springer, 2013.
11) Chen, Mo, and Robert A. J. M. van Delden. "Mobile Apps for Personalized Nutrition: A Review of Current Applications." Nutrients 12, no. 7 (2020): 2058.
12) Toledo, Romeo T., Rakesh K. Singh, and Fanbin Kong. Fundamentals of Food Process Engineering. 4th ed. New York: Springer, 2018.

Evaluation Pattern:	
Total Marks: 50	
Internal Continuous Evaluation: • Internal Work -1 • Internal Work -2 • Internal Work -3	**End Semester Examination:** • Question -1 • Question -2 • Question -3

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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** :V
Type : Major Elective (E-II)	**Marks:** 50
Credits : 2	**From:** A. Y. 2026-27

Name of the Course: BFTT 355, E-II Food Plant Design and Layout

Course Objectives: Students should be able to…

1. understand the food plant management
2. know the structure and operations of food plant
3. impart the classification of dairy and food plants
4. learn the preparation of a plant layout

Course Outcomes: Student will be able to…

1.apply the executive design making in a food plan
2. implement the productivity and quality in food plant operation
3. study the classification of dairy and food plants
4. solve plant layout problem

Module	Title and Contents	Hrs.
Module -1:	**Fundamentals of Food Plant Management and Operational Research** **1.1** Operations research: definition, scope, and applications in food industries **1.2** Techniques and tools used in operations research for decision-making **1.3** Key management factors influencing the location and layout of food processing plants **1.4** Study of regulatory and legal requirements governing food industries	7
Module -2:	**Organizational Structure and Functional Dynamics of Food Plants** **2.1** Organizational structure and working systems of food processing plants **2.2** Principles of executive decision-making in plant operations **2.3** Decision making protocols and strategies for effective management **2.4** Evolution and role of management functions: planning, organizing, and controlling	8
Module -3:	**Comprehensive Food Plant Design and Resource Planning** **3.1** Raw material procurement systems including farm-level collection and chilling centers **3.2** Estimation and planning of space requirements for plant operations **3.3** Integrated enterprise design: plant design principles and sales planning considerations **3.4** Selection and application of engineering materials in food industries **3.5** Study of material properties and strength: metals, plastics, glass, and other materials used in food processing.	7
Module -4:	**Advanced Plant Layout Planning and Optimization** **4.1** Classification and analysis of classical plant layout types **4.2** Techniques for evaluation and improvement of plant layouts **4.3** Advantages and impact of an efficient plant layout **4.4** Systematic approaches for organizing plant layout **4.5** Documentation methods and data forms used in layout planning **4.6** Principles of siting process sections within the plant	8

References:-

1. Singh, R. Paul, and Dennis R. Heldman. Introduction to Food Engineering. 5th ed. Burlington: Academic Press, 2014.

2. Toledo, Romeo T. Fundamentals of Food Process Engineering. 3rd ed. New York: Springer, 2007.
3. Fellows, P. J. Food Processing Technology: Principles and Practice. 4th ed. Cambridge: Woodhead Publishing, 2017.
4. Brennan, J. G., J. R. Butters, N. D. Cowell, and A. E. V. Lilley. Food Engineering Operations. 3rd ed. London: Elsevier, 1990.
5. Heldman, Dennis R., and Daryl B. Lund. Handbook of Food Engineering. 2nd ed. Boca Raton: CRC Press, 2007.
6. Peters, Max S., Klaus D. Timmerhaus, and Ronald E. West. Plant Design and Economics for Chemical Engineers. 5th ed. New York: McGraw-Hill, 2003.
7. Towler, Gavin, and Ray Sinnott. Chemical Engineering Design: Principles, Practice and Economics of Plant and Process Design. 2nd ed. Oxford: Elsevier, 2013.
8. Earle, R. L. Unit Operations in Food Processing. Oxford: Pergamon Press, 1983.
9. Geankoplis, Christie J. Transport Processes and Separation Process Principles. 4th ed. Upper Saddle River: Prentice Hall, 2003.
10. K. M. Sahay, and K. K. Singh. Unit Operations of Agricultural Processing. New Delhi: Vikas Publishing House, 2004.

Evaluation Pattern:

Total Marks:50

Internal Continuous Evaluation:	**End Semester Examination:**
• Internal Work -1 • Internal Work -2 • Internal Work -3	• Question -1 • Question -2 • Question -3

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Board of Studies in Food Technology

Programme: B. Sc.	**Semester** :V
Type : Major P VI	**Marks:** 50
Credits : 2	**From:** A. Y. 2026-27

Name of the Course: BFTP 356, E-I Food Product Development and Computer Application

Course Objectives: Students should be able to…

1) know analysis of new product
2) understand the problem solving using spreadsheet
3) application the use of word processing software for creating reports
4) analysis packaging and labeling of the new food product

Course Outcomes: Student will be able to…

1) evaluating standardization of formulation process
2) estimate of sensory and techno-economic feasibility
3) solve problem using spreadsheet
4) use word processing software for creating reports

Practical No.	Content	Hrs
1)	Identification of concepts of new products by using market and literature survey.	60
2)	Screening of product concept on the basis of techno-economic feasibility.	
3)	Optimization and standardization of ingredients in food product formulation.	
4)	Estimate moisture content of a developed food product.	
5)	Determination of fat content by so'xhlet method.	
6)	Estimation of protein content by kjeldahl method.	
7)	Determination of pH and acidity of the developed product.	
8)	Calculate calories and nutrients in developed product by using nutrition analysis app.	
9)	Study of packaging materials and techniques used for developed food product.	
10)	Design the label development as per FSSAI guidelines.	
11)	Demonstrate sorting of raw material based on color/size using an image processing tool.	
12)	Interpret vegetables drying rate by using temperature vs. time graphical data.	
13)	Calculate shelf life of a food product using critical moisture data.	
14)	Collect consumer feedback for a food product using google forms and analyze it.	
15)	Prepare a project report.	

References:-

1) Reinhard Renneberg, Biotechnology for Beginners, 4th ed. (Cambridge, MA: Academic Press, 2023).
2) Sandy B. Primrose and Richard Twyman, Principles of Gene Manipulation and Genomics, 7th ed. (Chichester, UK: Wiley-Blackwell, 2013).
3) Bernard R. Glick, Jack J. Pasternak, and Cheryl L. Patten, Molecular Biotechnology: Principles and Applications of Recombinant DNA, 5th ed. (Washington, DC: ASM Press, 2017).
4) David P. Clark and Nanette J. Pazdernik, Biotechnology: Applying the Genetic Revolution, 2nd ed. (Cambridge, MA: Academic Press, 2015).
5) Wim Soetaert and Erick J. Vandamme, eds., Industrial Biotechnology: Sustainable Production and Use of Biofuels and Biochemicals (Weinheim, Germany: Wiley-VCH, 2010)
6) Weixel, Suzanne. Microsoft Office 365: A Skills Approach. New York: McGraw-Hill Education, 2021.
7) Frye, Curtis D. Microsoft Excel 2019 Step by Step. Redmond, WA: Microsoft Press, 2019.
8) Singh, R. Paul, and Dennis R. Heldman. Introduction to Food Engineering. 5th ed. Amsterdam: Academic Press, 2014.
9) Toledo, Romeo T., Rakesh K. Singh, and Fanbin Kong. Fundamentals of Food Process Engineering. 4th ed. New York: Springer, 2018.
10) Mortimore, Sara, and Carol Wallace. HACCP: A Practical Approach. 3rd ed. New York: Springer, 2013.
11) Ferreira, Tânia, and Wanda M. Rasband. “ImageJ User Guide.” National Institutes of Health. Accessed April 12, 2026. https://imagej.net/ij/docs/guide/.
12) Sun, Da-Wen, ed. Computer Vision Technology in the Food and Beverage Industries. Cambridge: Woodhead Publishing, 2012.

Evaluation Pattern:

Total Marks: 50

End Semester Practical Examination:

- **Question -1**
- **Question -2**
- **Question -3**
- **Question -4**

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Programme: B. Sc.	**Semester:** V
Type : Major P VI	**Marks:** 50
Credits : 2	**From:** A. Y. 2026-27

Name of the Course: BFTP 356, E-II Food Plant Design and Layout

Course Objectives: Students should be able to…

1) understand different types of plant layouts used in food processing industries
2) learn preparation of process flow diagrams for various food products
3) study selection of equipment required for food processing units
4) learn the preparation of a plant layout

Course Outcomes: Student will be able to…

1) identify and differentiate various types of plant layouts (product, process, combination, fixed position)
2) prepare process flow diagrams for different food products
3) select appropriate equipment for different food processing operations
4) prepare food plant design and layout

Practical No.	Content	Hrs.
1)	Study of different types of food plant layouts.	30
2)	Preparation of process flow diagram for food products.	
3)	Selection of equipments for food processing unit.	
4)	Calculation of equipment capacity.	
5)	Study of line balancing in food processing operations.	
6)	Preparation of design and layout for raw material storage area.	
7)	Preparation of design and layout for finished goods storage area.	
8)	Preparation of plant layout using software tools.	
9)	Study of utilities required in food plant.	
10)	Study of waste disposal systems for food plant.	
11)	Preparation of design and layout for dairy processing plant.	
12)	Preparation of design and layout for drying and dehydration unit.	
13)	Preparation of design and layout for fruits and vegetable processing unit	
14)	Preparation of design and layout for oil processing unit	
15)	Preparation of design and layout for bakery processing unit	

References

1) M. R. Sahay, and K. K. Singh. Food Plant Design. New Delhi: CBS Publishers and Distributors, 2004.
2) James M. Apple. Plant Layout and Materials Handling. New York: John Wiley and Sons, 1977.
3) P. J. Fellows. Food Processing Technology: Principles and Practice. Cambridge: Woodhead Publishing, 2009.
4) R. Paul Singh, and Dennis R. Heldman. Introduction to Food Engineering. Burlington: Academic Press, 2014.
5) K. M. Sahay, and K. K. Singh. Unit Operations of Agricultural Processing. New Delhi: Vikas Publishing House,

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6) Singh, R. Paul, and Dennis R. Heldman. Introduction to Food Engineering. 5th ed. Burlington: Academic Press, 2014.
7) Toledo, Romeo T. Fundamentals of Food Process Engineering. 3rd ed. New York: Springer, 2007.
8) Fellows, P. J. Food Processing Technology: Principles and Practice. 4th ed. Cambridge: Woodhead Publishing, 2017.
9) Brennan, J. G., J. R. Butters, N. D. Cowell, and A. E. V. Lilley. Food Engineering Operations. 3rd ed. London: Elsevier, 1990.
10) Heldman, Dennis R., and Daryl B. Lund. Handbook of Food Engineering. 2nd ed. Boca Raton: CRC Press, 2007.
11) Peters, Max S., Klaus D. Timmerhaus, and Ronald E. West. Plant Design and Economics for Chemical Engineers. 5th ed. New York: McGraw-Hill, 2003.
12) Towler, Gavin, and Ray Sinnott. Chemical Engineering Design: Principles, Practice and Economics of Plant and Process Design. 2nd ed. Oxford: Elsevier, 2013.
13) Earle, R. L. Unit Operations in Food Processing. Oxford: Pergamon Press, 1983.
14) Geankoplis, Christie J. Transport Processes and Separation Process Principles. 4th ed. Upper Saddle River: Prentice Hall, 2003.

Evaluation Pattern:

Total Marks: 50

End Semester Practical Examination:

- Question -1
- Question -2
- Question -3
- Question -4

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Board of Studies in Food Technology

Programme: B. Sc.	**Semester** – V
Type : VSC III	**Marks:** 50
Credits : 2	**From:** A. Y. 2026-27

Name of the Course: BFTP VSC III - Instrumental Techniques in Food Analysis

Course Objectives: Students should be able to…

1) understand sampling, sample preparation, and basic analytical techniques used in food analysis
2) learn separation and identification methods like thin layer chromatography and paper chromatography for sugars and amino acids
3) apply instrumental methods (spectrophotometry) for estimation of compounds like chlorophyll and phytic acid and analysis of minor constituents
4) evaluate quality, sensory attributes, and shelf life of raw and processed food products

Course Outcomes: Student will be able to…

1) perform sampling, preparation, and basic analysis of food samples
2) identify and separate food components using chromatographic techniques
3) determine important constituents using instrumental methods
4) assess quality, sensory properties, and storage stability of food products.

Practical No.	Content	Hrs.
1)	Study of sampling techniques in food analysis.	30
2)	Preparation of food samples for laboratory analysis.	
3)	Quality evaluation of fruits.	
4)	Quality evaluation of packed products for color and taste.	
5)	Identification of sugars in fruit juice using TLC.	
6)	Separation of amino acids by two dimensional paper chromatography.	
7)	Estimation of chlorophyll content by using TLC.	
8)	Analysis of minor nutrients present in food sample.	
9)	Determination of specific gravity of liquid food samples.	
10)	Demonstration of food adulterants using spectrophotometer.	
11)	Identification of preservatives using TLC.	
12)	Estimation of total dissolved solids (TDS) in fruit juices.	
13)	Determine homogenization efficiency of milk by using centrifugation.	
14)	Assessment of shelf life of a food product by sensory analysis.	
15)	Demonstration of texture profile analyzer.	T

References:-

1) Otles, Semih. Handbook of Food Analysis Instruments. Boca Raton, FL: CRC Press, 2009.
2) Nielsen, S. Suzanne. Food Analysis. 3rd ed. New York: Kluwer Academic/Plenum Publishers, 2003.
3) AOAC International. Official Methods of Analysis of AOAC International. 17th ed. Gaithersburg, MD: AOAC International, 2003.
4) Macleod, A. J. Instrumental Methods of Food Analysis. New York: Marcel Dekker, 1973.
5) Pomrenz, Yeshajahu, and Clifton E. Meloan. Food Analysis: Theory and Practice. 3rd ed. New Delhi: CBS Publishers & Distributors, 1996.
6) Ranganna, S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. 2nd ed. New Delhi: Tata McGraw-Hill, 2001.
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8) Ewing, Galen W. Instrumental Methods of Chemical Analysis. 5th ed. New York: McGraw-Hill, 1985.
9) Meyers, Robert A., ed. Encyclopedia of Analytical Chemistry. Chichester: John Wiley & Sons, 2000.
10) Gunstone, Frank D. Food Analysis: A Practical Approach. Oxford: Oxford University Press, 1996.

Evaluation Pattern:

Total Marks: 50

End Semester Practical Examination:

- Question -1
- Question -2
- Question -3
- Question -4

AEC III- English

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Board of Studies in Food Technology

Programme: B. Sc.	**Semester-** V
Type : On Job Training	**Marks:** 50
Credits : 2	**From:** A.Y. 2026-27
Name of the Course: **BFTP OJT, On Job Training**	

Course Objectives: Student will able to…

1) explore themselves to become an entrepreneur
2) identify strengths and weaknesses of industry
3) know the practical knowledge about food processing and machine handling
4) understand industrial principles of various food safety and processing techniques

Course Outcomes: Students should able to…

1) get exposure to the industrial environment becoming competent professionals for the industry
2) apply to the current technological developments relevant to the subject area of training
3) determine the real time technical / managerial skills required at the job
4) analyze various practical skill

	Content	Duration
	• On job training is a crucial aspect of a student's educational journey, as it bridges the gap between theoretical knowledge and practical application. It provides students with real-world exposure and the opportunity to develop hands-on skills, enhancing their employability. • During a one month industrial training program at food industries students can gain several benefits: • Practical Experience: On job training students to the latest technologies and tools used in the industry. This practical experience is essential for students to understand how concepts learned in the classroom are implemented in real projects. • Skill Enhancement: The training program focuses on skill development. Students can learn the process and product develop, Research and Develpoment, Production process, man power handling, etc. • Exposure to Real Projects: Students get the opportunity to work on live projects, allowing them to apply their knowledge in a real-world setting. This experience helps in building confidence and competence. • Industry Insights: Interacting with professionals in industries provides students with insights into the food industry's working environment, culture, and best practices. They can learn from experienced mentors.	**One Month**

	• Networking: Building professional networks is essential for career growth. During the training, students can connect with professionals and peers, potentially opening doors to future job opportunities.	
Evaluation Pattern:		
Total Marks: 50		
End Semester Practical Examination: • Presentation • Industrial Evaluation • Report • Viva		

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Programme: B. Sc.	**Semester:** V
Type: Major XI	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course: BFTT CEP, Community Engagement Program

Course Objectives: Students should be able to…

1) promote a respect for rural culture, lifestyle, and wisdom among students
2) learn about the present status of agricultural and development initiatives
3) identify and address the root causes of distress and poverty among vulnerable households
4) improve learning outcomes by applying classroom knowledge to real-world situation

Course Outcomes: Student will be able to…

1) gain an understanding of rural life, Indian culture, and social realities
2) develop empathy and bonds of mutuality with the local community
3) appreciate the significant contributions of local communities to Indian society and economy
4) learn to Value local knowledge and wisdom
5) identify opportunities to contribute to the community's socioeconomic improvement

	Contents	Hrs.
	Importance of Community Engagement Program in Food Technology Education • Community engagement programs are an essential component of Food Technology education as they bridge the gap between theoretical knowledge and practical application. These programs provide students with opportunities to apply scientific principles of food processing, nutrition, and food safety in real-life community settings, thereby enhancing experiential learning. • They play a crucial role in developing a sense of social responsibility among students by exposing them to pressing issues such as malnutrition, food insecurity, poor hygiene practices, and lack of awareness about safe food handling. Through direct interaction with communities, students gain a deeper understanding of local food systems, cultural practices, and socio-economic challenges influencing dietary habits. • In addition, such programs help students build essential professional skills, including communication, teamwork, problem-solving, and leadership. They also encourage innovation by motivating students to develop low-cost, sustainable, and locally adaptable food solutions. • From a societal perspective, community engagement contributes to improving public health by promoting nutrition awareness, food safety, and sustainable food practices. It also supports livelihood development through training in small-scale food processing and entrepreneurship.	30

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation:	End Semester Examination

SEMESTER VI

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Programme: B. Sc.	**Semester:** VI
Type : Major XIII	**Marks:** 50
Credits : 2	**From:** A.Y. 2026-27

Name of the Course: BFTT 361, Food Quality and Sensory Evaluation

Course Objectives: Student will able to…

1) understand basic food taste
2) evaluate the relation between sensory attribute and food quality
3) learn the mechanism of perception: taste, olfaction, color, texture
4) study the role of food quality and sensory evaluation in the food industry

Course Outcomes: Students should be able to…

1) understand analytical sensory test
2) analyze the relationship between sensory attributes and food quality
3) describe taste measurement techniques and the electronic tongue, taste abnormalities
4) assess the importance of color

Module	Title and Contents	Hrs.
Module-1:	**Introduction to quality attributes of food** **1.1** Food quality and its role in the food industry need of quality control, Factors affecting quality control of food **1.2** Factors influencing food quality a) Soil b) field practices c) harvesting practice **1.3** Processing, condition, packaging, storage condition of finished product **1.4** Appearance, flavor, textural factors and additional quality factor	7
Module-2:	**Olfaction and Gustation** **2.1** Introduction, definition, and importance of odor and flavor, Mechanism of odor perception, Theories of odor classification, chemical specificity of odor, Odor Measurement Techniques, and Electronic Nose, Olfactory abnormalities **2.2** Introduction and importance of gestation, Structure and physiology of taste organs-tongue, papillae, taste buds, salivary glands, Mechanism of taste perception **2.3** Chemical dimensions of basic tastes- sweet, salt, sour, bitter, and umami, Factors affecting taste, reaction time, taste modification, absolute and recognition Threshold, Taste measurement **2.4** Techniques and Electronic Tongue, Taste abnormalities	8
Module-3:	**Color and Texture** **3.1** Introduction and importance of color, Dimensions of color and attributes of color; gloss, etc., physiology of the eye, Perception of color, Color Measurement: Munsell color system, CIE color system, Hunter color system **3.2** Color abnormalities Introduction, definition and importance of texture, Phases of oral processing, Texture perception, receptors involved in texture perception **3.3** Rheology of foods, Texture classification, Texture measurement-basic rheological models, forces involved in texture measurement **3.4** Recent advances in texture evaluation	7

Module-4:	**Methods of Food Analysis** **4.1** Affective tests, Specific test methods– paired preference test, ranking for preference, rating for preference, sensory evaluation in consumer testing, hedonic test **4.2** Analytical sensory test-difference testing, simple difference testing, triangle test, duo-trio test, two out of five test **4.3** directional difference tests- paired comparison test, ranking test, rating test **4.4** Statistics for sensory-descriptive testing, difference testing	8

Reference Books:-

1. Lawless, Harry T., and Hildegarde Heymann. Sensory Evaluation of Food: Principles and Practices. 2nd ed. New York: Springer, 2010.
2. Lawless, Harry T., and Hildegarde Heymann. Sensory Evaluation of Food: Principles and Practices. New York: Springer, 2016.
3. Amerine, Maynard A., Rose Marie Pangborn, and Edward B. Roessler. Principles of Sensory Evaluation of Food. New York: Academic Press, 1965.
4. Muñoz, Alejandra M., Gail Vance Civille, and B. Thomas Carr. Sensory Evaluation in Quality Control. Boston: Springer, 1992.
5. Chambers, Edgar IV, ed. Analysis of Sensory Properties in Foods. Basel: MDPI, 2019.
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7. Sirangelo, Tiziana Maria. "Sensory Descriptive Evaluation of Food Products: A Review." Journal of Food Science and Nutrition Research 2, no. 4 (2019): 354–363.

Evaluation Pattern:	
Total Marks: 50	
Internal Continuous Evaluation: • Internal Work -1 • Internal Work -2 • Internal Work -3	**End Semester Examination:** • Question -1 • Question -2 • Question -3

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Programme: B. Sc.	**Semester:** VI
Type : Major XIV	**Marks:** 50
Credits : 2	**From:** A. Y. 2026-27

Name of the Course: BFTT 362, Processing Technology of Snack Foods

Course Objectives: Students should be able to…

1) learn about the importance and scope of snack food
2) study and formulate the ingredients and current practices for preparation of snacks
3) understand extrusion & processing of snacks through extruders
4) know packaging material required for snack foods &their quality control

Course Outcomes: Student will be able to…

1) analyze application of seasonings and Indian savory snacks
2) describe the type of packaging material required for snack foods
3) standardize quality control & quality assessment for snack foods & shelflife study
4) formulate the ingredients and current practices for preparation of snacks

Module	Title and Contents	Hrs
Module-1:	**Basics of Snack Food Processing** **1.1** Importance and scope of snack food technology **1.2** Ingredients & additives commonly used in snack foods **1.3** Snack food classification first gen: traditional fried and baked, second gen: processed and extruded and third gen: healthy and functional **1.4** Processing methods involved in snack food processing **1.5** Technology of frying, baking and drying	7
Module-2:	**Products and Processing** **2.1** Cereal-based snacks- flaked snacks (corn flakes, rice flakes), popcorn and bakery products (biscuits, cakes, pastries), etc. **2.2** Dairy based snacks- jamun, rasgulla, rasmalai, etc. **2.3** Roots and tuber based snacks- potato chips, cassava chips, etc. **2.4** Fruits and vegetable based snacks- banana chips, onion rings, candied fruits, etc. **2.5** Meat based snacks- kebab, ready to eat cutlet etc.	8
Module-3:	**Extrusion & Extrusion methods of Snack Foods** **3.1** Food extrusion: definition, chemical and nutritional changes during food extrusion. **3.2** Extruder: definition, types of extruders-single screw, twin screw, ram etc. **3.3** Extruded product manufacturing-puffs, expanded products, pasta, vermicelli etc. **3.4** Advantages and disadvantages of extrusion cooking method	7
Module-4:	**Packaging & Quality Control of Snack Foods** **4.1** Packaging of snack foods: product protection and properties of packaging materials **4.2** packaging materials and equipment required for snack foods **4.3** Quality control and quality assurance of snack foods: quality control measures in-process checks, finished product testing. **4.4** Quality assurance systems : HACCP, GMP, ISO standards	8

References:-

1) S. M. Kamran, S. Z. Makkia, H. R. Sharif, and R. S. Hafiz, "Enrichment and fortification of traditional foods with plant protein isolates." In Plant protein foods, Cham: Springer International Publishing, pp. 131-169 2022.
2) N. R. Mian, Extruders in food applications. CRC press, 2000.
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5) L. W. Edmund and L. W. Rooney, Snack foods processing. CRC Press, 2001.
6) Frame, N. D. Textbook of Technology of Extrusion Cooking. New York: Springer Science and Business Media, 1993
7) Harper, Judson M. Extrusion of Foods. 1st ed. Boca Raton: CRC Press, 2019.

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9) Cable, Mike. 2005. Calibration: A Technician's Guide. Research Triangle Park, NC: ISA.
10) Hughes, Thomas A. Measurement and Control Basics. 5th ed. Research Triangle Park, NC: ISA. 2015.

Evaluation Pattern:	
Total Marks: 50	
Internal Continuous Evaluation: • Internal Work -1 • Internal Work -2 • Internal Work -3	**End Semester Examination:** 1) Question -1 2) Question -2 3) Question -3

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Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Food Technology

Programme: B. Sc.	**Semester** - V
Type : Major XV	**Marks:** 50
Credits : 2	**From:** A. Y. 2026-27

Name of the Course: BFTT 363, Food Process Engineering II

Course Objectives: Students should be able to…

1) learn the principle of evaporation, crystallization and extraction

2) understand the principles of blanching, pasteurization and sterilization

3) understand the properties of dry-air, water-vapor and air-vapor mixtures

4) imbibe the principles of drying, drying rate kinetics

Course Outcomes: Student will be able to…

1) explain the theory of extraction and evaporation

2) demonstrate the microbial survivor curves and thermal death time

3) learn the properties of air-vapor mixtures

4) learn the concept and selection of a refrigerant food processing

Module	Title and Contents	Hrs
Module-1:	**Evaporation and Crystallization** **1.1** Principles of evaporation **1.2** Types and selection of evaporators **1.3** Theory and principles of crystallization **1.4** Nucleation, crystal growth **1.5** Crystallization equipment, application of crystallization in food processing	8
Module-2:	**Thermal Processing and Leaching** **2.1** Principles of blanching **2.2** Principles of pasteurization **2.3** Principles of sterilization **2.4** Theory of leaching **2.5** Solvent extraction, equipment used in food industry	7
Module-3:	**Psychrometrics** **3.1** Properties of dry-air: composition of air **3.2** Specific volume of air **3.3** Specific heat of dry air **3.4** Enthalpy of dry air, dry bulb temperature **3.5** The psychrometric chart: Use of psychrometric chart to evaluate complex air conditioning processes	7
Module-4:	**Drying, Freezing and Refrigeration** **4.1** Principles of drying **4.2** Different types of dryers and components- roller, spray, tray, fluidized bed etc. **4.3** Vapour compression refrigeration system, Types and selection of a refrigerant **4.4** effect of low temperature on quality, equipments and freeze drying	8

References:-

1) R. Paul Singh, and Dennis R. Heldman. Introduction to Food Engineering. 4th ed. San Diego: Academic Press, 2009.

2) Stanley E. Charm. The Fundamentals of Food Engineering. Westport, CT: AVI Publishing, 1963.

3) R. T. Toledo. Fundamentals of Food Process Engineering. 2nd ed. New Delhi: CBS Publishers, 2000.

4) Warren L. McCabe, Julian C. Smith, and Peter Harriott. Unit Operations of Chemical Engineering. 6th ed. New

York: McGraw-Hill, 2000.
5) Heldman, Dennis R., and R. Paul Singh. Food Process Engineering. Dordrecht: Springer, 1981.
6) Singh, R. Paul, and Dennis R. Heldman. Introduction to Food Engineering. 5th ed. London: Academic Press, 2014.
7) Toledo, Romeo T. Fundamentals of Food Process Engineering. New York: Van Nostrand Reinhold, 1991.
8) Ibarz, Albert, and Gustavo V. Barbosa-Cánovas. Introduction to Food Process Engineering. Boca Raton: CRC Press, 2014.
9) Smith, P. G. Introduction to Food Process Engineering. New York: Springer, 2011.
10) Berk, Zeki. Food Process Engineering and Technology. 3rd ed. London: Academic Press, 2018

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation:	**End Semester Examination:**
• Internal Work -1 • Internal Work -2 • Internal Work -3	1) Question -1 2) Question -2 3) Question -3

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** :VI
Type : Major P VIII	**Marks:** 50
Credits : 2	**From:** A. Y. 2026-27

Name of the Course: BFTT 364, Practical based on BFTT 361, BFTT 362, BFTT 363

Course Objectives: Students should be able to…

1) understand the principles of snack food processing, extrusion technology, and basic processing of meat and milk products
2) learn various sensory evaluation techniques for assessing food quality and consumer acceptability
3) imbibe the principles of drying, drying rate kinetics
4) gain practical knowledge of food processing equipment and preservation methods such as drying, freezing, and evaporation

Course Outcomes: Student will be able to…

1) perform sensory evaluation of food using standard methods like hedonic scale, triangle test, and ranking tests
2) prepare and evaluate different snack food products such as potato chips, mathari, popcorn, and coated nuts
3) learn the properties of air-vapor mixtures
4) analyse basic food processing equipment and interpret results like air properties using a psychrometric chart

Practical No.	Content	Hrs.
1)	Training for Sensory Panel.	30
2)	Sensory evaluation of food by 9-point hedonic scale.	
3)	Sensory evaluation of food by Triangle test.	
4)	Sensory evaluation of food by Duo-Trio test.	
5)	Sensory evaluation of food by ranking and rating test.	
6)	Preparation of potato chips and its quality evaluation.	
7)	Preparation of mathari and its quality evaluation.	
8)	Preparation of extruded snack and its quality evaluation.	
9)	Preparation of coated grains or nuts and its quality evaluation.	
10)	Preparation of popcorn and its quality evaluation.	
11)	Study of types of dryer.	
12)	Study of types of evaporator.	
13)	Study of types of freezing methods.	
14)	Study of types of crystallizer.	
15)	Determination of air properties using psychometric chart.	

References

1) Bowers, A. R., and M. A. Civille, and C. M. Carr. Sensory Evaluation Techniques. 5th ed. Boca Raton: CRC Press, 2016.
2) Fellows, P. J. Food Processing Technology: Principles and Practice. 4th ed. Cambridge: Woodhead Publishing (Elsevier), 2017.
3) Singh, R. Paul, and Dennis R. Heldman. Introduction to Food Engineering. 5th ed. San Diego: Academic Press, 2014.

4) L. W. Edmund and L. W. Rooney, Snack foods processing. CRC Press, 2001.
5) Frame, N. D. Textbook of Technology of Extrusion Cooking. New York: Springer Science and Business Media, 1993
6) Harper, Judson M. Extrusion of Foods. 1st ed. Boca Raton: CRC Press, 2019.
7) Rahman, M. Shafiur. Handbook of Food Process Engineering. 2nd ed. Boca Raton: CRC Press, **2012**.
8) R. T. Toledo. Fundamentals of Food Process Engineering. 2nd ed. New Delhi: CBS Publishers, 2000.
9) Warren L. McCabe, Julian C. Smith, and Peter Harriott. Unit Operations of Chemical Engineering. 6th ed. NewYork: McGraw-Hill, 2000.
10) Heldman, Dennis R., and R. Paul Singh. Food Process Engineering. Dordrecht: Springer, 1981.
11) Singh, R. Paul, and Dennis R. Heldman. Introduction to Food Engineering. 5th ed. London: Academic Press, 2014.

Evaluation Pattern:

Total Marks: 50

End Semester Practical Examination:

- Question -1
- Question -2
- Question -3
- Question -4

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:** VI
Type : Major Elective XVI(E-I)	**Marks:** 50
Credits : 2	**From:** A. Y. 2026-27

Name of the Course: BFTT 365, E-I Beverage Technology

Course Objectives: Students should be able to…

1) understand the various beverages and the products made out of them
2) learn technical view of beverages and the manufacturing processes in beverages
3) to understand various principles involved in beverage technology
4) evaluate the laws related to beverages

Course Outcomes: Student will be able to…

1) understand the fundamentals of beverage technology
2) understand manufacturing technologies for various beverages
3) evaluate water quality requirements for the beverage industry
4) assess the quality of beverages using sensory and chemical analysis techniques

Module	Title and Contents	Hrs.
Module-1:	**Fundamentals of Beverage Technology** **1.1** History, importance of beverages and status of beverage industry **1.2** Ingredients, manufacturing and equipment used for different beverages **1.3** Classification of beverages- alcoholic: fermented and distilled beverages and non-alcoholic beverages: refreshing, nourishing and stimulating beverages. **1.4** FSSAI specifications and PFA standards for food beverages.	7
Module-2:	**Water Treatment in Beverage Industry** **2.1** National and global standards for drinking water **2.2** Specific requirements for beverage industry **2.3** Water Analysis- PH, alkalinity, turbidity, total dissolved solids and hardness **2.4** Treatment methods used in beverages: filtration, reverse osmosis (RO), u.v treatment , chlorination/ozonation	8
Module-3:	**Manufacturing Technology for Beverages** **3.1** Methods for juice extraction **3.2** Manufacturing technology for juice-based beverages: RTS, nectar, squash and cordial **3.3** Technology of synthetic beverage **3.4** Technology of still, carbonated, low-calorie and dry beverages, isotonic and sports drinks **3.5** Role of various ingredients in beverages. **3.6** History and types of soft drink, carbonation of soft drink ,packaging aspects in soft drinks	7
Module-4:	**Quality and Packaging Technology Beverages** **4.1** Sensory evaluation: and chemical analysis **4.2** Various packaging technology for beverages: glass bottles, plastic bottles (PET), metal cans (aluminum/tin), tetra packs (aseptic packaging) and active and intelligent packaging **4.3** Food laws and safety standards for beverages **4.4** Modern trends in beverages: Smart packaging (QR codes, sensors)	8

References:-

1) Briggs, Denis E., Paul A. Brookes, and Roger Stevens. Brewing: Science and Practice. 2nd ed. Cambridge: Woodhead Publishing, 2004.
2) European Food Safety Authority (EFSA). Scientific and Technical Guidance on Beverage Safety Regulations. Parma, Italy: EFSA, 2020.
3) Food and Drug Administration (FDA). Code of Federal Regulations Title 21: Food and Drugs. Washington, DC: U.S. Government Publishing Office, 2019.
4) Hui, Y. H., ed. Handbook of Food Products Manufacturing: Principles, Bakery, Beverages, Cereals, Cheese, Confectionary, Fats, Fruits, and Functional Foods. Hoboken, NJ: John Wiley & Sons, Inc., 2007.
5) Jayaram, V. R., and V. K. Joshi. Beverage Technology: Principles and Applications. New Delhi: New India Publishing Agency, 2016.
6) Joshi, V. K., and R. K. Roy. Food Processing: Principles and Applications. 2nd ed. New Delhi: CRC Press, 2017.
7) Krammer, Günther, and Frank J. Sindelar. Beverage Processing and Quality Control. New York: Wiley, 2013.
8) Schoeman, Timothy, and M. C. Smith. Food Safety and Quality Systems in Developing Countries: Volume II – Beverage Industry. Boca Raton, FL: CRC Press, 2015.
9) Sofos, John N., and Kim L. Kochevar, eds. Food Safety Assurance and Veterinary Public Health. New York: CRC Press, 2015.
10) Vanderzant, Carl, and David F. Splittstoesser. Compendium of Methods for the Microbiological Examination of Foods. 3rd ed. Washington, DC: American Public Health Association, 1992.

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation:	**End Semester Examination:**
• Internal Work -1 • Internal Work -2 • Internal Work -3	1) Question -1 2) Question -2 3) Question -3

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:** VI
Type : Major Elective XVI (E-II)	**Marks:** 50
Credits : 2	**From:** A. Y. 2026-27

Name of the Course: BFTT 365, E-II Instrumentation Process Control and Computer Applications

Course Objectives: Students should be able to…

1) understand instrumentation principles
2) learn process control techniques
3) apply computer-based control systems
4) develop practical and analytical skills

Course Outcomes: Student will be able to…

1) explanation of instrumentation systems
2) analysis of process control systems
3) utilization of computer applications in control
4) design and troubleshooting of control systems

Module	Title and Contents	Hrs.
Module-1:	**Fundamentals of Industrial Instrumentation and Measurement Systems** 1.1 Basic concepts of measurement: accuracy, precision, sensitivity, calibration 1.2 Classification of instruments: mechanical, electrical, and electronic instruments 1.3 Measurement of process variables in food industry: temperature, pressure, flow, and level 1.4 Sensors and transducers: types, working principles, and applications 1.5 Signal conditioning and data acquisition systems 1.6 Instrumentation used in food processing plants	7
Module-2:	**Principles of Process Control in Food Processing Systems** 2.1 Process control: need and importance in food industries 2.2 Open-loop and closed-loop control systems 2.3 Components of control systems: controller, actuator, sensor, and feedback 2.4 Types of controllers: P, PI, PID controllers and their applications 2.5 Control strategies for food processes (temperature control, flow control, etc.) 2.6 Stability and response of control systems	8
Module-3:	**Automation and Control Systems in Food Industry** 3.1 Introduction to automation in food processing industries 3.2 Programmable Logic Controllers (PLC): basics, architecture, and applications 3.3Supervisory Control and Data Acquisition (SCADA) systems 3.4 Industrial automation tools and their role in improving efficiency and quality 3.5 Application of automation in food processing operations (pasteurization, drying, packaging, etc	7
Module-4:	**Computer Applications and Data Management in Food Industry** 4.1 Role of computers in food processing and quality control 4.2 Basics of computer hardware and software relevant to food industry 4.3 Data acquisition, storage, and analysis	8

	4.4 Introduction to software used in food industry (e.g., process simulation, quality control Tools.	

References:-

1. Johnson, Curtis D. Process Control Instrumentation Technology. New York: Wiley, 1982.
2. Bolton, William. Instrumentation and Control Systems. 2nd ed. Oxford: Elsevier, 2015.
3. Seborg, Dale E., Thomas F. Edgar, Duncan A. Mellichamp, and Francis J. Doyle III. Process Dynamics and Control. 4th ed. Hoboken: John Wiley & Sons, 2016.
4. Stephanopoulos, George. Chemical Process Control: An Introduction to Theory and Practice. Englewood Cliffs: Prentice Hall, 1984.
5. McMillan, Gregory K., and Douglas M. Considine. Process/Industrial Instruments and Controls Handbook. 5th ed. New York: McGraw-Hill, 1999.
6. Patranabis, D. Principles of Industrial Instrumentation. New Delhi: Tata McGraw-Hill, 2003.
7. Doebelin, Ernest O., and Dhanesh N. Manik. Measurement Systems: Application and Design. 6th ed. New York: McGraw-Hill, 2011.
8. Singh, S. K. Industrial Instrumentation and Control. New Delhi: Tata McGraw-Hill, 2009.
9. Krishna Kant. Computer-Based Industrial Control. New Delhi: Prentice Hall of India, 2010.
10. Nagrath, I. J., and M. Gopal. Control Systems Engineering. 5th ed. New Delhi: New Age International, 2007.

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation:	**End Semester Examination:**
• Internal Work -1 • Internal Work -2 • Internal Work -3	1) Question -1 2) Question -2 3) Question -3

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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:** VI
Type : Major P VIII	**Marks:** 50
Credits : 2	**From:** A. Y. 2026-27

Name of the Course: BFTP 366, Beverage Technology

Course Objectives: Students should be able to…

1) understand the principles of preparation of different types of beverages
2) develop skills in preparing non-carbonated and carbonated beverages
3) learn formulation of sports drinks, synthetic beverages, and whey-based beverages
4) understand preparation of traditional beverages like rts, squash, and artificial lemon juice

Course Outcomes: Student will be able to…

1) understand and apply formulation techniques for beverage development
2) measure and analyze ph, acidity, and specific gravity of beverages
3) evaluate water quality for beverage processing
4) detect adulteration and preservatives in beverages

Practical No.	Content	Hrs.
1)	Quality analysis of raw water.	30
2)	Determination of colors in soft drinks by wool technique.	
3)	Preparation of synthetic beverage.	
4)	Preparation of non-carbonated beverage.	
5)	Preparation of whey-based beverage.	
6)	Preparation of carbonated beverage.	
7)	Preparation of RTS beverage.	
8)	Preparation of artificial lemon juice.	
9)	Preparation of fruit squash.	
10)	Determination of pH in beverage.	
11)	Study of adulteration detection in beverage.	
12)	Determination of caffeine in beverage.	
13)	Determination of specific gravity of beverage.	
14)	Detection of sodium benzoate in beverage.	
15)	Determination of acidity in beverage.	

Reference

1. shurst, Philip R. Chemistry and Technology of Soft Drinks and Fruit Juices. 2nd ed. Oxford: Blackwell Publishing, 2005.
2. Bamforth, Charles W. Food, Fermentation, and Micro-organisms. Oxford: Blackwell Science, 2005.
3. Belitz, H.-D., Werner Grosch, and Peter Schieberle. *Food Chemistry*. 4th ed. Berlin: Springer, 2009.
4. Branen, A. Larry, P. Michael Davidson, Seppo Salminen, and John H. Thorngate III, eds. *Food Additives*. 2nd ed. 5. New York: Marcel Dekker, 2001.

5. Fellows, P. J. Food Processing Technology: Principles and Practice. 3rd ed. Cambridge: Woodhead Publishing, 2009.
6. Hui, Y. H., ed. Handbook of Food and Beverage Fermentation Technology. New York: Marcel Dekker, 2004.
7. Lawless, Harry T., and Hildegarde Heymann. Sensory Evaluation of Food: Principles and Practices. 2nd ed. New York: Springer, 2010.
8. Ranganna, S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. 2nd ed. New Delhi: Tata McGraw-Hill, 2000.
9. Sharma, H. K., and S. J. Kumar. Food Processing Engineering: Theory and Laboratory Experiments. New Delhi: CBS Publishers, 2012.
10. Steele, R. Understanding and Measuring the Shelf-Life of Food. Cambridge: Woodhead Publishing, 2004.

Evaluation Pattern:

Total Marks: 50

End Semester Practical Examination:

- Question -1
- Question -2
- Question -3
- Question -4

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:** VI
Type : Major P VIII	**Marks:** 50
Credits : 2	**From:** A. Y. 2026-27

Name of the Course: BFTP 366 Instrumentation Process Control and Computer Application

Course Objectives: Students should be able to…

1) understand the principles of process measurement, control systems, and industrial instrumentation
2) study sensors, controllers, PLC, SCADA, and their applications in automation
3) develop skills for monitoring, analyzing, and controlling industrial process variables effectively
4) develop practical and analytical skills

Course Outcomes: Student will be able to…

1) use process measurement instruments and control systems
2) analyze and control process variables using plc, scada, and controllers
3) capability to apply instrumentation and automation concepts in industrial processes
4) design and troubleshooting of control systems

Practical No.	Content	Hrs.
1)	Study of temperature measuring devices.	
2)	Study of calibration of thermometer.	
3)	Study of pressure measuring instruments.	
4)	Study of measurement of flow rate.	
5)	Study of open loop and closed loop system.	

6)	Demonstration of ON-OFF Control System.	60
7)	Study of PID Controller (Simulation/Chart).	
8)	Control of temperature using water bath.	
9)	Study of process variables in food industry.	
10)	Determination of pH of food sample by using pH meter.	
11)	Study of SCADA System (Virtual/Demo).	
12)	Study of PLC System.	
13)	Preparation of Process Flow Diagram (PFD) using computer.	
14)	Study of digital technologies in food industry (IoT & Traceability).	
15)	Study of food product data analysis using MS Excel.	

Reference

1) Béla G. Lipták. Instrument Engineers' Handbook: Process Control and Optimization. Boca Raton: CRC Press, 2019**.**

2) Seborg, Dale E., Thomas F. Edgar, and Duncan A. Mellichamp. Process Dynamics and Control. *Hoboken:* Wiley, 2010**.**

3) Johnson, Curtis D. Process Control Instrumentation Technology. New York: Pearson, 2016.

4) Stephanopoulos, George. Chemical Process Control: An Introduction to Theory and Practice. Englewood Cliffs: Prentice Hall, 1984.

5) McMillan, Gregory K., and Douglas M. Considine. Process/Industrial Instruments and Controls Handbook. 5th ed. New York: McGraw-Hill, 1999.

6) Patranabis, D. Principles of Industrial Instrumentation. New Delhi: Tata McGraw-Hill, 2003.

7) Doebelin, Ernest O., and Dhanesh N. Manik. Measurement Systems: Application and Design. 6th ed. New York: McGraw-Hill, 2011.

8) Singh, S. K. Industrial Instrumentation and Control. New Delhi: Tata McGraw-Hill, 2009.

9) Krishna Kant. Computer-Based Industrial Control. New Delhi: Prentice Hall of India, 2010.

10) Nagrath, I. J., and M. Gopal. Control Systems Engineering. 5th ed. New Delhi: New Age International, 2007

Evaluation Pattern:

Total Marks: 50

End Semester Practical Examination:

- Question -1
- Question -2
- Question -3
- Question -4

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:** VI
Type : VSC IV	**Marks:** 50
Credits : 2	**From:** A.Y. 2026-27

Name of the Course: BFTPVSC IV, Numerical Skills - Statistical Quality Control

Course Objectives: Student will able to…

1) understand common measures of central tendency–mean, mode, median
2) learn common measures of dispersion, mean deviation, standard deviation
3) analyze dispersion- coefficient of variation
4) analyzing the simple random sampling and stratified sampling

Course Outcomes: Students should able to…

1) apply common measures of central tendency-mean, mode, median
2) understand common measures of dispersion- Mean deviation, standard deviation
3) create measure of dispersion- coefficient of variation
4) learn the simple random sampling and stratified sampling

Practical No.	Content	Hrs.
1	Determination of central tendency– arithmetic mean.	30
2	Determination of central tendency– median.	
3	Determination of central tendency– mode.	
4	Determination of relationship among mean, median and mode.	
5	Determination of measure of dispersion– range.	
6	Determination of measure of dispersion– coefficient of range.	
7	Determination of measure of dispersion– mean deviation.	
8	Determination of measure of dispersion– coefficient of mean deviation.	
9	Determination of measure of dispersion– standard deviation.	
10	Determination of measure of dispersion– coefficient of variation.	
11	Determination of measure of dispersion–variance (mean square deviation).	
12	Determination of measure of dispersion– quartile deviation.	
13	Determination of measure of dispersion– coefficient of quartile deviation.	
14	Determination of measure of dispersion– Karl Pearson's coefficient of skewness.	
15	Study of simple random sampling and stratified sampling.	
16	Study of methods of sampling or techniques of sampling.	
18	Study of fractions, decimals, and percentages	
19	Study of number sense and operations	

20	Study of geometry and spatial understanding	

Reference Books:-

1) Bhaskarrao, T. Methods of Biostatistics. 2nd ed. Hyderabad: Paras Medical Publisher, 2004.
2) Dixit, J.V. Principles and Practicals of Biostatistics. 7th ed. New Delhi: Bhanot, 2017.
3) Heldman, Dennis R., and Daryl B. Lund. Handbook of Food Engineering. 3rd ed. Boca Raton, FL: CRC Press, 2013.
4) Myers, Raymond H., Douglas C. Montgomery, and Christine M. Anderson-Cook. Response Surface Methodology: Process and Product Optimization Using Designed Experiments. 4th ed. Hoboken, NJ: Wiley, 2016.
5) Nielsen, Suzanne S. Food Analysis. 5th ed. New York: Springer, 2017.
6) Potter, Norman N., and Joseph H. Hotchkiss. Food Science. 5th ed. New York: Springer, 1995.
7) Saha, T.K. Biostatistics in Theory and Practicals. New Delhi: Emkkay Publication, 1997.
8) Stanier, Roger Y. General Microbiology. 5th ed. London: Palgrave Macmillan, 1999.

Evaluation Pattern:

Total Marks: 50

End Semester Practical Examination:

- Question -1
- Question -2
- Question -3
- Question -4

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:** VI
Type : SEC III	**Marks:** 50
Credits : 2	**From:** A. Y. 2026-27

Name of the Course: BFTP SEC III, Clinical Nutrition and Dietetics

Course Objectives: Students should be able to…

1) understand the role of nutrition in health and disease
2) learn principles of nutritional assessment
3) apply nutrition science in medical care
4) study nutrient requirements in various disease conditions

Course Outcomes: Student will be able to…

1) implement the principles of nutrition and dietetics
2) assess the nutritional status of individuals
3) know dietary modifications and healthy eating practices
4) develop personalized nutrition plans

Practical No.	Content	Hrs
1)	Preparation of diet plan for weight gaining.	
2)	Preparation of diet for obesity and leaners.	
3)	Nutritional requirements and diet planning for infant.	

4)	Nutritional requirements and diet planning for school aged children.	60
5)	Planning of ketogenic diet.	
6)	Preparation of diet plan for diabetic person.	
7)	Formulation of a diet for cardiovascular disorders.	
8)	Assessment of pediatric nutrition.	
9)	Development of geriatrics foods.	
10)	Preparation and planning of questionnaire for patients.	
11)	Menu planning for a hospitalized patient.	
12)	Development of diet for hypothyroidism.	
13)	Study of nutritional requirement of cancer patient.	
14)	Preparation of low sodium diet for hypertension.	
15)	Preparation of low fiber diet for diarrhea.	
16)	Preparation of high fiber diet for constipation.	
17)	Formulation of products for seed cycling.	
18)	Preparation of carbohydrate loading product for athletes.	
19)	Study of BMI comparison according to WHO.	
20)	Case study: Identification of nutritional problem and formulation of individualized diet plans.	

References:-

1. Mahan, L. Kathleen, Janice L. Raymond, and Sylvia Escott-Stump. Krauses Food and the Nutrition Care Process.* 15th ed. St. Louis, MO: Elsevier, 2021.
2. Whitney, Eleanor Noss, and Sharon Rady Rolfes. Understanding Nutrition. 16th ed. Boston, MA: Cengage Learning, 2022.
3. Gropper, Sareen S., Jack L. Smith, and Timothy P. Carr. Advanced Nutrition and Human Metabolism. 8th ed. Boston, MA: Cengage Learning, 2022.
4. Gibney, Michael J., Susan A. Lanham-New, Aedin Cassidy, and Hester H. Vorster, eds. *Introduction to Human Nutrition. 3rd ed. Hoboken, NJ: Wiley-Blackwell, 2013.
5. Escott-Stump, Sylvia. *Nutrition and Diagnosis-Related Care. 9th ed. Burlington, MA: Jones & Bartlett Learning, 2020.
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7. Smolin, Lori A., and Mary B. Grosvenor. *Nutrition: Science and Applications.* 5th ed. Hoboken, NJ: Wiley, 2020.
8. Shills, M. E. Olsan, J. A. Shike, M. and Roos, A. C , Modern Nutrition in health and disease, 9th edition , Williams and Wilkins (1999).
9. Garrow, J. S. James, W. P. T. and Ralph, A., Human Nutrition and Dietetics, 10 Edition, Churchill Livingstone (2000).
10. Walker, W. A. and Watkins, J. B., Nutrition in pediatrics, Boston, Little, Brown and Co. (1985).
11. Davis, J. and Sherer, K. Applied Nutrition and Diet Therapy for Nurses, 2nd Edition, W. B. Saunders Co. (1994).

Evaluation Pattern:

Total Marks: 50

End Semester Practical Examination:

- Question -1
- Question -2
- Question -3
- Question -4

AEC III- English

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Programme: B. Sc.	**Semester:** VI
Type: Major XI	**Marks:** 50
Credits: 2	**From:** A. Y. 2026-27

Name of the Course: BFTT FP, comparison**Field Project**

Course Objectives: Students should be able to…

1) provide hands-on experience in applying principles of **Food Technology** in real community settings
2) develop an understanding of community food habits, nutritional status, and local food systems
3) enhance students' skills in communication, teamwork, leadership, and problem-solving
4) encourage innovation in developing low-cost, sustainable, and nutritionally improved food solutions

Course Outcomes: Student will be able to…

1) apply theoretical knowledge of **Food Technology** to address real-world food and nutrition problems
2) assess community needs related to food, nutrition, and hygiene through surveys and field observations
3) demonstrate safe food handling and hygienic practices in community settings
4) perform basic food processing and preservation techniques suitable for small-scale or household use

	Contents	**Hrs.**
	Importance of Field Project in Food Technology • Field projects are a vital component of Food Technology education, as they provide a platform for students to connect classroom learning with real-world applications. They enhance experiential learning by allowing students to work directly with communities, food industries, or local systems, making their knowledge more practical and outcome-oriented • One of the key importance of field projects is the development of technical competence. Students get hands-on experience in areas such as food processing, preservation, quality control, and hygiene practices. This practical exposure strengthens their understanding of concepts that are often difficult to grasp through theory alone • Field projects also help students understand community-level challenges such as malnutrition, food safety issues, and post-harvest losses. By engaging with real situations, students learn to design feasible, low-cost, and sustainable solutions tailored to local needs, which is essential in a diverse country like India • In addition, these projects play a significant role in building professional skills. Students develop communication, teamwork, leadership, and problem-solving abilities while interacting with different groups such as farmers, vendors, and consumers. They also learn how to present data, prepare reports, and evaluate outcomes • Another important aspect is the promotion of social responsibility and ethical awareness. Field projects encourage students to contribute to society by spreading awareness about nutrition, safe food practices, and sustainable food systems • From a career perspective, field experience enhances employability by preparing students for roles in food industries, public health sectors, research, and entrepreneurship. It also fosters innovation by motivating students to create value-added products and explore small-scale business opportunities	30

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation:	**End Semester Examination:**
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Co-curricular courses