Karmaveer Bhaurao Patil University, Satara

Syllabus for

# B. Sc. II (Food Technology)

Under

## Faculty of Science and Technology

## (As per NEP 2020)

**With effect from Academic Year 2025-2026**

# Syllabus for Bachelor of Science (B. Sc.) Part – II 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 OF THE COURSES:**

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

**GENERAL OUTCOMES OF THE COURSES:**

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 examination 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

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

II. The student will be able to explain about various applications of food technology such as food processing, food packaging, food preservation, food analysis etc.

III. The students will be able to design and execute experiments related to Basic of food chemistry, food analysis, food processing, etc.

IV. The students will be able to execute a short research project incorporating techniques of Basic and Advanced food technology under supervision

**1) TITLE:** B. Sc. Food Technology

**2) YEAR OF IMPLEMENTATION:** 2025-26

**3) DURATION:** One Year

**4) PATTERN:** Semester wise

**5) MEDIUM OF INSTRUCTION:** English

**6) ELIGIBILITY OF THE STUDENT:** As per guidelines obtained from university by following rules and regulations regarding reservation by Govt. of Maharashtra

**7) ELIGIBILITY OF THE 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 | VSC / SEC | AEC/ VEC/ IKS | OJT/ FP/ CEP/ CC/ RP | Total Credits | Degree/ Cum. Cr. MEME |
|---|---|---|---|---|---|---|---|---|---|
| | Course I | Course II | Course III | | | | | | |
| | Major | Minor | - | | | | | | |
| Sem III (5.0) | Major V (2)<br>Major VI (2)<br>Major P III (2) | Minor V (2)<br>Minor VI (2)<br>Minor P III (2) | - | OE III (2) | VSC I (2) (P) (Major specific)<br>SEC I (2) (P) | AEC I (2) (English)<br>IKS II (2) (Major Specific) | - | 22 | UG Diploma: 88 |
| Sem IV (5.0) | Major VII (2)<br>Major VIII (2)<br>Major P IV (2) | Minor VII (2)<br>Minor VIII (2)<br>Minor P IV (2) | - | OE IV (2) | VSC II (2) (P) (Major specific)<br>SEC II (2) (P) | AEC II (2) (English)<br>VEC II (2) | - | 22 | |
| Credits | 12 | 12 | - | 04 | 08 | 08 | - | 44 | Exit option: 4 Cr. NSQF/Intern ship/Skill Courses |

**Note: VSC- Vocational skill courses, SEC- Skill Enhancement Course, AEC – Ability Enhancement Course, IKS – Indian Knowledge System**

Rayat Shikshan Sanstha's

**Yashavantrao Chavan Institute of Science, Satara**

**Department of Food Technology**

**"NEP Implementation 2020" FOOD TECHNOLOGY COURSE**

COURSE TITLES

## 1) Third Semester

| Sr. No. | Course Category | Course Code | Name of the Course | Credits |
|---|---|---|---|---|
| 1 | Major I | BFTT 231 | Processing of Milk and Milk Products | 2 |
| 2 | Major II | BFTT 232 | Processing of Meat and Poultry | 2 |
| 3 | Lab I | BFTP 233 | Practical VII | 2 |
| 4 | Minor I | BFTT 234 | Fermentation Technology | 2 |
| 5 | Minor II | BFTT 235 | Food Biotechnology | 2 |
| 6 | Lab II | BFTP 236 | Practical VIII | 2 |
| 7 | OE | BFTT OE III | Agriculture Economics | 2 |
| 8 | VSC | BFTP VSC I | Analytical Techniques in Food Technology | 2 |
| 9 | SEC | BFTP SEC I | Food chemistry | 2 |
| 10 | AEC | BFTTAEC I | English for communication | 2 |
| 11 | IKS | BFTT IKS II | BFTT IKS II- Indian Traditional Foods | 2 |
| | Total Credits | | | 22 |

**Abbreviations: VSC- Vocational skill courses, SEC- Skill Enhancement Course, AEC – Ability Enhancement Course IKS – Indian Knowledge System**

## 2) Fourth Semester

| Sr. No. | Course Category | Course Code | Name of the Course | Credits |
|---|---|---|---|---|
| 1 | Major I | BFTT 241 | Oil Seeds, Fats and Legumes Processing Technology | 2 |
| 2 | Major II | BFTT 242 | Processing of Cereals and Pulses | 2 |
| 3 | Lab I | BFTP 243 | Practical IX | 2 |
| 4 | Minor I | BFTT 244 | Food Safety and Plant Sanitation | 2 |
| 5 | Minor II | BFTT 245 | Nutraceutical and Functional Food | 2 |
| 6 | Lab II | BFTP 246 | Practical X | 2 |
| 7 | OE | BFTT OE IV | Business Economics | 2 |
| 8 | VSC | BFTP VSC II | Human Physiology | 2 |
| 9 | SEC | BFTP SEC II | Plantation Crops and Spices | 2 |
| 10 | AEC | BFTT AEC II | English for communication | 2 |
| 11 | VEC | BFTT VEC II | Quality Assurance and Certification | 2 |
| | Total Credits | | | 22 |

Note: VSC- Vocational skill courses, SEC- Skill Enhancement Course, VEC- Value Educational Course, AEC – Ability Enhancement Course, OE - Open Elective

1. **EVALUATION STRUCTURE:**
   **- Semester III**

| 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<br>DSC XIV<br>DSC Lab VII | T | BFTT 231 | 10 | 10 | 10 | 30 | 50 | 02 |
| | T | BFTT 232 | 10 | 10 | 10 | 30 | 50 | 02 |
| | P | BFTP 233 | -- | -- | -- | 50 | 50 | 02 |
| Minor I<br>Minor II<br>Minor Lab I | T | BFTT 234 | 10 | 10 | 10 | 30 | 50 | 02 |
| | T | BFTT 235 | 10 | 10 | 10 | 30 | 50 | 02 |
| | P | BFTP 236 | -- | -- | -- | 50 | 50 | 02 |
| OE | T | BFTT OE III | 10 | 10 | 10 | 30 | 50 | 02 |
| VSC | T | BFTP VSC I | -- | -- | -- | 50 | 50 | 02 |
| SEC | P | BFTP SEC I | -- | -- | -- | 25 | 25 | 01 |
| AEC | T | BFTT AEC I | 10 | 10 | 10 | 30 | 50 | 02 |
| IKS | T | BFTT IKS II | 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 IV

| 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<br>DSC XIV<br>DSC Lab VII | T | BFTT 241 | 10 | 10 | 10 | 30 | 50 | 02 |
| | T | BFTT 242 | 10 | 10 | 10 | 30 | 50 | 02 |
| | P | BFTP 243 | -- | -- | -- | 50 | 50 | 02 |
| Minor I<br>Minor II<br>Minor Lab I | T | BFTT 244 | 10 | 10 | 10 | 30 | 50 | 02 |
| | T | BFTT 245 | 10 | 10 | 10 | 30 | 50 | 02 |
| | P | BFTP 246 | -- | -- | -- | 50 | 50 | 02 |
| OE | T | BFTT OE IV | 10 | 10 | 10 | 30 | 50 | 02 |
| VSC | P | BFTP VSC II | -- | -- | -- | 50 | 50 | 02 |
| SEC | p | BFTP SEC II | -- | -- | -- | 50 | 50 | 02 |
| AEC | T | BFTT AEC II | 10 | 10 | 10 | 30 | 50 | 02 |
| VEC | T | BFTT VEC II | 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) EQUIPMENT:

Laboratory Equipment: Analytical Balance, Autoclave, Centrifuge, Microscope, Water Bath, Refrigerator, Baking oven, Tensile strength tester, Bursting strength tester, Vacuum packaging machine,
pH Meter, Soxhsplus , Kelplus, Fibraplus, Homogenizer

# 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** - III |
| **Type :** Major | **Marks:** 50 |
| **Credits :** 2 | **From:** A. Y. 2025-26 |

**Name of the Course: (BFTT 231) Processing of Milk and Milk Products**

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

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

**Course Outcomes:** Student will be able to…

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

| Module | Title and Contents | Hrs |
|---|---|---|
| **Module -1:** | **Introduction to Milk**<br>**1.1** Development of milk processing industry in India- present status and scope.<br>**1.2** Dairy layout for small scale industry, sanitation layout, dairy equipment and sanitation. | 07 |
| **Module -2:** | **Primary processing.**<br>**2.1** Food value and Composition of milk.<br>**2.2** Factors affecting Composition of milk, Buying, receiving, collection, Transportation of milk, storage and distribution of milk, processing of milk, filtration, clarification, cream separation and heat. | 08 |
| **Module -3:** | **Secondary processing**<br>**3.1** Milk product Processing – Cream, Butter, Khoa, Paneer, Ice-cream Condensed milk and evaporated milk.<br>**3.2** Judging and grading of milk and its products.<br>**3.3** Manufacturing of Cheddar cheese–Introduction, Manufacturing process, packaging, storage, defects and their prevention.<br>**3.4** Dried milk products–Buttermilk powder, Whey Powder, Ice Cream mix Powder, Infant milk food, WMP and SMP. | 07 |
| **Module -4:** | **Common food processing**<br>**4.1** Introduction, Classification and Composition of byproducts.<br>**4.2** Principles and methods of utilization: whey utilization and whey-based beverages like lassi and buttermilk. | 08 |

**References:-**


1) Chavan, Rupesh S., Netra R. Goyal, and Murlidhar Meghwal. Dairy Engineering: Advanced Technologies and Their Applications. 1st ed. Boca Raton, FL: Taylor & Francis, 2017.
2) De, Sukumar. Outlines of Dairy Technology. 1st ed. New Delhi: Oxford University Press, 2001.
3) Food and Agriculture Organization of the United Nations (FAO). Milk and Dairy Products in Human Nutrition: Production, Consumption, and Health Implications in India. Rome: FAO, 2020.
4) Kurien, Verghese. I Too Had a Dream. New Delhi: Roli Books, 2005.
5) Meena, H. R., and R. Venkatasubramanian. "Dairy Industry in India: Emerging Trends and Challenges." Indian Dairyman 63, no. 6 (2011): 50–54.
6) Rangappa, K. S. Indian Dairy Products. 2nd ed. Bombay: Asia Publishing House, 1975.
7) Singh, Shivashraya. Dairy Technology. Illustrated ed. New Delhi: New India Publishing Agency (NIPA), 2013.
8) Tamime, A. Y. Structure of Dairy Products. 1st ed. Oxford: Wiley-Blackwell, 2007.

| Evaluation Pattern: 20:30 | |
|---|---|
| **Total Marks: 50** | |
| **Internal Evaluation: (20 Marks)**<br>• CCE-I : Home Assignment : 10 Marks<br>• CCE –II : Short and long answer questions test/Seminar/ Open book test / Quiz / Case study / Book review / Field work / Industry visit: 10 Marks<br>• CCE – III MCQ Test : 10 Marks<br>(Best of two CCE Marks will be considered) | **End Semester Examination: 30 (Marks)**<br>• Question -1 – Solve the following questions ( five questions of 2 marks) 10 Marks<br>• Question -2 –Attempt any two questions (three question of 10 marks) 20 Marks<br>• Question -3 – Attempt nay four questions (five questions of 5 marks) 20 Marks<br>• 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** - III |
| **Type :** Major | **Marks:** 50 |
| **Credits :** 2 | **From:** A. Y. 2025-26 |

**Name of the Course: (BFTT 232) Processing of Meat and Poultry**

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

1) know the importance of meat production, chemical composition in India.
2) explain the slaughtering methods and meat and poultry products.
3) know the structure, composition and nutritive value, quality evaluation of eggs.
4) summarize the chemical and nutritive value of poultry meat.

**Course Outcomes:** Student will be able to…

1) determine the chemical composition and structure of meat.
2) describe the pre and post inspection, storage and preservationof meat and poultry products.
3) analyze the storage, shelf life, quality evaluation and preservation egg andegg products.
4) make use of different preservation techniques for poultry meat.

| Module | Title and Contents | Hrs |
|---|---|---|
| **Module -1:** | **Introduction of Meat Products**<br>**1.1** Introduction and Importance of meat products in India<br>**1.2** Chemical Composition and microscopic structure of meat, Transportation, feeding of animal before slaughtering. | 07 |
| **Module -2:** | **Slaughtering of Meat**<br>**2.1** Ante-mortem examination of meat animals, Pre –slaughtering operation.<br>**2.2** Scientific techniques of slaughtering, Post-mortem inspection, Storage, Preservation. | 08 |
| **Module -3:** | **Egg and Egg Products**<br>**3.1** Egg: Structure, composition and nutritive value, Storage and shelf life problems<br>**3.2** Quality evaluation of eggs<br>**3.3** Egg products : egg powder, value added egg products, Preservation | 07 |
| **Module -4:** | **Poultry Processing**<br>**4.1** Poultry products: types, chemical and nutritive value of poultry meat<br>**4.2** Slaughtering and evaluation of poultry carcasses<br>**4.3** Poultry cut-up parts and meat / bone ratio, Preservation of poultry meat | 08 |

**References:-**


1) Aberle, E. D. Principles of Meat Science. 5th ed. Dubuque, IA: Kendall Hunt Publishing, 2012.
2) A. R. Sen, M. Muthukumar, B. M. Naveena, Meat Science
3) Hall, George M. Fish Processing Technology. 2nd ed. London: Backwell Publishing, 2001.
4) Hashmi, Syed Imran. Meat, Poultry & Fish Products Technology. Parbhani: VNMAU.
5) Kavita Marwaha, Meat Hygiene, 2023.
6) Kerry, Joseph. Meat Processing: Improving Quality.
7) Lawrie, R. A. Meat Science. 5th ed. England: Woodhead Publishing, 2017.
8) Pearson, A. M. Processed Meats. 2nd ed., 2011.
9) Vidanarachchi, Janak, Senaka Ranadheera, R. M. C. S. M. C. Wijerathne, Himali Udayagani, and Jana Pick Ova. Applications of Seafood By-products in Food Industry and Human Nutrition. Edited by Se-Kwon Kim. New York:
Springer.


**Evaluation Pattern:20:30**

**Total Marks: 50**

| Internal Evaluation: (20 Marks) | End Semester Examination: 30 (Marks) |
|---|---|
| • CCE-I : Home Assignment : 10 Marks<br>• CCE –II : Short and long answer questions test/Seminar/ Open book test / Quiz / Case | • Question -1 – Solve the following questions ( five questions of 2 marks) 10 Marks<br>• Question -2 –Attempt any two |

| | |
|---|---|
| study / Book review / Field work / Industry visit: 10 Marks<br>• CCE – III MCQ Test : 10 Marks<br>(Best of two CCE Marks will be considered) | questions (three question of 10 marks) 20 Marks<br>• Question -3 – Attempt nay four questions (five questions of 5 marks) 20 Marks<br>• 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** - III |
| **Type :** Major | **Marks:** 50 |
| **Credits :** 2 | **From:** A. Y. 2025-26 |

**Name of the Course: (BFTP 233) Processing of Milk and Milk Products and Processing of Meat and Poultry**

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

1) know the principle and working of lactometer.
2) explain the composition, food value and processing of milk.
3) demonstrate the method of slaughtering and dressing of meat animals.
4) summarize the quality analysis of meat, egg etc.

**Course Outcomes:** Student will be able to…

1) perform plat form test of milk.
2) prepare different types of dairy products like ice-cream paneer, khoa and condensed milk etc.
3) formulate the products of meat/egg.
4) study the shelf life of eggs.

| Module No. | Name of the Practical | Hrs |
|---|---|---|
| 1) | Platform tests in milk.(Acidity, COB, specific gravity, SNF,Organoleptic test) | 60 |
| 2) | Estimation of milk fat | |
| 3) | Preparation of Condensed milk | |
| 4) | Preparation of Ice-cream and rasmalai | |
| 5) | MBRT and Phosphatase test for milk | |
| 6) | Preparation of curd | |
| 7) | Preparation of paneer | |
| 8) | Slaughtering and dressing of meat animals | |
| 9) | Preservation of meat by different methods | |
| 10) | Estimation of moisture content of meat | |
| 11) | Analysis of frozen meat/meat emulsion products. (Chemical andMicrobial) | |
| 12) | To study shelf-life of eggs by different methods of preservation | |
| 13) | Evaluation of eggs for quality parameters market eggs | |
| 14) | To perform freezing of yolk/albumen | |
| 15) | Meat/Egg product formulation | |

**References:-**


1) Balachandran, K. K. Fish Processing Technology. 3rd ed. Oxford: Academic and Professional, 2014.
2) Chavan, Rupesh S., Netra R. Goyal, and Murlidhar Meghwal. Dairy Engineering: Advanced Technologies and Their Applications. 1st ed. Boca Raton, FL: Taylor & Francis, 2017.
3) De, Sukumar. Outlines of Dairy Technology. 1st ed. New Delhi: Oxford University Press, 2001.
4) Food Safety and Standards Authority of India (FSSAI). Manual of Methods of Analysis of Foods*: Meat and Meat* Products. New Delhi: Ministry of Health and Family Welfare, Government of India, 2016.
5) Hashmi, Syed Imran. Meat, Poultry and Fish Products Technology. 2nd ed. New Delhi: DAYA Publishing House,

2015.
6) Rangappa, K. S. Indian Dairy Products. 2nd ed. Bombay: Asia Publishing House, 1975.
7) Sharma, B. D. Meat and Meat Products Technology Including Poultry Products Technology. 2nd ed., January 2019.
8) Tamime, A. Y. Structure of Dairy Products. 1st ed. Oxford: Wiley-Blackwell, 2007.
9) United States Department of Agriculture, Agricultural Marketing Service. Packaged Fluid Milk Sales in Federal Milk Order Markets by Size and Type of Containers, and Distribution Method during November *1975*. AMS-553. Washington, DC: U.S. Government Printing Office, July 1977.

| **Evaluation Pattern:20:30** | |
|---|---|
| **Total Marks: 50** | |
| **Internal Evaluation: 20 Marks**<br>• Journal : 10 Marks<br>• Students Performance : 05Marks<br>• Viva : 05 Marks | **End Semester Examination:30 Marks**<br>• Question I : 10 Marks<br>• Question II : 10 Marks<br>• 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** - III |
| **Type :** Minor | **Marks:** 50 |
| **Credits :** 2 | **From:** A. Y. 2025-26 |

**Name of the Course: (BFTT 234) Fermentation Technology**

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

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

**Course Outcomes:** Student will be able to…

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

| Module | Title and Contents | Hrs |
|---|---|---|
| **Module -1:** | **Basics of Food Fermentation**<br>**1.1** Fermenter design, operation, measurement and control in fermentation, Media for Industrial Fermentation, Sterilization of air and media, inoculum Preparation, Scale up in fermentation<br>**1.2** Batch and continuous process, Solid substrates fermentation, downstream processing and Product recovery. | 07 |
| **Module -2:** | **Microbial Product**<br>**2.1** Primary, secondary metabolites – Organic acids (Citric Acid, Lactic acid), alcohol, PenicillinandVitaminB12.<br>**2.2** Microbial biomass production- baker's yeast, single cell protein and mushroom. | 08 |
| **Module -3:** | **Traditional fermented Foods and Beverage.**<br>**3.1** Traditional fermented foods like idli, dosa, Soya-sauce, Miso, Sauerkraut. Beverage – vinegar, beer, wine, whisky, rum, vodka. | 07 |
| **Module -4:** | **Enzyme Technology in Food Industry and Fermentation Economic**<br>**4.1** Enzyme technology in food industry- Industrial enzymes (with respect to food processing industry) Enzyme Immobilization.<br>**4.2** Fermentation economics- Market Potential, Fermentation and Product Recovery Costs, Process Appraisal. | 08 |

**References:-**


1) attilani, P., M. Pietri, and M. M. Formenti. "Food Fermentation and Its Implications on Food Safety." Journal of Food Science 78, no. 8 (2013): R1261-R1273.
2) Bray, D. J., and R. J. Ingram. "Microbial Fermentation in Food Production." International Journal of Food Science and Technology 46, no. 3 (2011): 424-438.
3) Chavan, R. S., and N. S. Salunkhe. "Fermentation Processes in Food Biotechnology." Food Research International 44, no. 9 (2011): 3137-3148.
4) Farina, V., M. Mancini, and S. Arnao. "Advances in Fermentation Technology for Food Applications." Food Biotechnology 28, no. 6 (2014): 199-220.
5) Gänzle, M. G., and J. H. Hammes. "Lactic Acid Bacteria and Their Role in Fermented Foods." Food Research International 62 (2014): 167-184.
6) Hwang, S. Y., and J. W. Lee. "Recent Advances in Food Fermentation Technology: A Review." Journal of Food Science and Technology 59, no. 4 (2016): 1863-1874.
7) Lindsay, D., and R. M. R. Smith. "Fermented Foods and Their Health Benefits." Current Opinion in Food Science 11 (2016): 70-76.

<table>
<tr><td colspan="2">8) Seo, J., S. J. Lee, and K. R. Park. "Applications of Food Fermentation in Functional Food Development." Food Control 57 (2015): 208-217</td></tr>
<tr><td colspan="2">Evaluation Pattern: 20:30</td></tr>
<tr><td colspan="2">Total Marks: 50</td></tr>
<tr><td>Internal Evaluation: (20 Marks)<br>• CCE-I : Home Assignment : 10 Marks<br>• CCE –II : Short and long answer questions test/Seminar/ Open book test / Quiz / Case study / Book review / Field work / Industry visit: 10 Marks<br>• CCE – III MCQ Test : 10 Marks<br>(Best of two CCE Marks will be considered)</td><td>End Semester Examination: 30 (Marks)<br>• Question -1 – Solve the following questions ( five questions of 2 marks) 10 Marks<br>• Question -2 –Attempt any two questions (three question of 10 marks) 20 Marks<br>• Question -3 – Attempt nay four questions (five questions of 5 marks) 20 Marks<br>• 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** - III |
| **Type :** Major | **Marks:** 50 |
| **Credits :** 2 | **From:** A. Y. 2025-26 |

**Name of the Course: (BFTT 235) Food Biotechnology**

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

1) define biotechnology, its advantages, disadvantages and applications
2) learn about genetic material, tools and techniques in molecular biology
3) understand production of genetically engineered foods and organisms and its risks
4) understand the applications of biotechnology in food

**Course Outcomes:** Student will be able to…

1) understand the general terminologies in biotechnology
2) understand the basics of molecular biology and cloning techniques
3) learn production process of genetically engineered foods and organisms
4) understand the application of biotechnology in food

| Module | Title and Contents | Hrs |
|---|---|---|
| **Module -1:** | **Introduction to Biotechnology**<br>**1.1**Definition, Introduction, Milestones in history of biotechnology<br>**1.2**Traditional and Modern Biotechnology, Advantages and Disadvantages of biotechnology<br>**1.3**Basic Terminologies in biotechnology, ethical and legal concerns<br>**1.4** Safety aspects of foods produced by biotechnology, Applications. | 07 |
| **Module -2:** | **Molecular Biology**<br>**2.1**Basic structure of DNA and RNA<br>**2.2**Enzymes used in molecular biology, Gene cloning, cloning vectors<br>**2.3**Polymerase ChainReaction. | 08 |
| **Module -3:** | **Genetic Engineering**<br>**3.1**Definition, Introduction, Production of genetically modified crops and micro-organisms with examples,<br>**3.2** Future trends of GM crops, Food ingredients derived from genetically modified organisms<br>**3.5 3.3** Risk of GMOs and GM Foods to Human Health and Environment. | 07 |
| **Module -4:** | **Applications of Food Biotechnology**<br>**4.1**Improvement of plant nutritional and functional quality<br>**4.2**biotechnology in enhancement of food production and quality<br>**4.3** Plant-based vaccines, milk proteins, Reconstitution of human milk proteins, manipulation of fruit ripening<br>**4.3 4.4** Modern biotechnological regulatory aspects in food industries, Biotechnology and food- social appraisal. | 08 |

**References:-**


1) Dubey, R. C. Textbook of Biotechnology. New Delhi: S. Chand & Company Ltd., 2014.
2) Frazier, William C., and Dennis C. Westhoff. Food Microbiology. New Delhi: Tata McGraw-Hill Publishing Company Ltd., 1995.
3) Gupta, P. K. Elements of Biotechnology. Meerut: Rastogi and Co., 1996.
4) Herzaka, A., and R. G. Food Industry Wastes: Disposal and Recovery. London: Applied Science Publishers, 2001.
5) Lee, B. H. Fundamentals of Food Biotechnology. New York: VCH Publishers, Inc., 1996.
6) Satyanarayana, U., and U. Chakrapani. Biotechnology. New Delhi: S. Chand Publications, 2005.
7) Singh, B. D. Biotechnology: Expanding Horizons. New Delhi: Kalyani Publishers, 2009.

<table>
<tr><td colspan="2">8) Walsh, Gary, and Denis R. Headen. Protein Biotechnology. England: John Wiley & Sons, 2005</td></tr>
<tr><td colspan="2">Evaluation Pattern: 20:30</td></tr>
<tr><td colspan="2">Total Marks: 50</td></tr>
<tr><td>Internal Evaluation: (20 Marks)<ul><li>CCE-I : Home Assignment : 10 Marks</li><li>CCE –II : Short and long answer questions test/Seminar/ Open book test / Quiz / Case study / Book review / Field work / Industry visit: 10 Marks</li><li>CCE – III MCQ Test : 10 Marks</li></ul>(Best of two CCE Marks will be considered)</td><td>End Semester Examination: 30 (Marks)<ul><li>Question -1 – Solve the following questions ( five questions of 2 marks) 10 Marks</li><li>Question -2 –Attempt any two questions (three question of 10 marks) 20 Marks</li><li>Question -3 – Attempt nay four questions (five questions of 5 marks) 20 Marks</li><li>Note : Conversion of 50 marks of ESE to 30 marks</li></ul></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** - III |
| **Type :** Minor | **Marks:** 50 |
| **Credits :** 2 | **From:** A. Y. 2025-26 |

**Name of the Course: (BFTP 236) Fermentation Technology and Food Biotechnology**

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

1) understand the growth of curve bacteria.
2) analyze effect of temperature & pH on bacterial growth.
3) Understand the colorimetric estimation of DNA and RNA.
4) understand the isolation of DNA from plant source, bacterial cell and food sample

**Course Outcomes:** Student will be able to…

1) learn basics of fermentation.
2) understand the microbial fermentation products.
3) estimate DNA and RNA.
4) isolate DNA from plant source, bacterial cell and food sample.

| Module No. | Name of practical | Hrs |
|---|---|---|
| 1 | Determination of Growth curve of bacteria | 60 |
| 2 | Effect of temperature on bacterial growth | |
| 3 | Effect of pH on bacterial growth | |
| 4 | Microbial examination of food | |
| 5 | Development of a Traditional fermented food | |
| 6 | Development of a Vinegar by using different fruits | |
| 7 | Development of a fermented Jalebi | |
| 8 | Identification of Molds by lactophenol cotton blue stain | |
| 9 | Isolation of DNA from Tomato | |
| 10 | Preparation of curd from Chilly Stalk | |
| 11 | Isolation of DNA from Onion | |
| 12 | Preparation of dry and wet yeast | |
| 13 | Demonstration for detection of GM Foods | |
| 14 | Development of probiotics | |
| 15 | Preparation of media, sterilization, serial dilution, platting | |

**References:-**


1. Amerine, M. A., M. B. Pangborn, and E. B. Roessler. Principles of Sensory Evaluation of Food. London: Academic Press, 1965.
2. Cramer, Michael M. Food Plant Sanitation: Design, Maintenance, and Good Manufacturing Practices. 3rd ed. Boca Raton, FL: CRC Press, 2013.
3. Meilgaard, M. Sensory Evaluation Techniques. 3rd ed. Boca Raton, FL: CRC Press LLC, 1999.
4. de Man, J. Principles of Food Chemistry. 3rd ed. New York: Springer, 2007.

5. Dubey, R. C., and D. K. Maheshwari. Practical Microbiology. New Delhi: S. Chand, 2010.
6. Garg, Neelima, K. L. Garg, and K. G. Mukerji. Laboratory Manual of Food Microbiology. New Delhi: Dreamtech Press, February 2020.
7. Madigan, Michael T., Kelly S. Bender, Daniel H. Buckley, W. Matthew Sattley, and David A. Stahl. Brock Biology of Microorganisms. 16th ed. New York: Pearson, 2020.
8.Rao, E. S. Food Quality Evaluation. New Delhi: Variety Books, 2013.

**Evaluation Pattern: 20:30**

**Total Marks: 50**

| **Internal Evaluation: 20 Marks** | **End Semester Examination:30 Marks** |
|---|---|
| • Journal : 10 Marks<br>• Students Performance : 05Marks<br>• Viva : 05 Marks | • Question I : 10 Marks<br>• Question II : 10 Marks<br>• 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** - III |
| **Type :** VSC 1 | **Marks:** 50 |
| **Credits :** 2 | **From:** A. Y. 2025-26 |

**Name of the Course: (BFTP VSC 1) Analytical Techniques in Food Technology**

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

1) know the primary and secondary solution.
2) explain methods of the determination of moisture content, ash content, fat content, fiber content, protein content of in different food sample.
3) apply basic analytical equipment
4) define molar solution

**Course Outcomes:** Student will be able to…

1) analyze the fat and acidity indifferent food sample.
2) determine moisture content, ash content, fat content, fiber content, protein content of in different food sample.
3) understand biuret method
4) learn ph and acidity

| Module No. | Name of the Practical | Hrs |
|---|---|---|
| 1 | To estimate carbohydrates by phenol sulfuric acid method. | 60 |
| 2 | To estimate protein by Biuret method. | |
| 3 | To estimate reducing sugar from food. | |
| 4 | To estimate non- reducing sugar from food. | |
| 5 | To study the preparation of primary solutions. | |
| 6 | To study the preparation of secondary solutions. | |
| 7 | To determine the pH of different food samples. | |
| 8 | To determine the acidity of given food samples | |
| 9 | To determine the moisture Content from given food samples. | |
| 10 | To determine the ash content from given food samples. | |
| 11 | To determine the fiber content from given food samples. | |
| 12 | To determine the fat content from given food samples. | |
| 13 | To study the preparation of Normal solution. | |
| 14 | To study the preparation of Molar solution. | |
| 15 | To determine dietary fiber from food. | |
| 16 | To study basics of analytical equipments. | |
| 17 | To study Good Laboratory Practices.(GLP) | |
| 18 | To study water analysis. | |
| 19 | To study plant analysis. | |

| | |
|---|---|
| 20 | To study preparation of standard stock solution. |

**References:-**


1) Dubois, Michel, K. A. Gilles, J. K. Hamilton, P. A. Rebers, and Fred Smith. "Colorimetric Method for Determination of Sugars and Related Substances." Analytical Chem*istry* 28, no. 3 (1956): 350–356.

2) Gornall, A. G., C. J. Bardawill, and M. M. David. "Determination of Serum Proteins by Means of the Biuret Reaction." Journal of Biological Chemistry 177, no. 2 (1949): 751–766.

3) Jacobs, Morris B. The Chemical Analysis of Foods and Food Products. 3rd ed. New Delhi: CBS Publishers & Distributors, 2018.

4) Miller, Glenn L. "Use of Dinitrosalicylic Acid Reagent for Determination of Reducing Sugar." Analytical Chemistry 31, no. 3 (1959): 426–428.

5) Miller, Dennis D. Food Chemistry*:* A Laboratory Manual. Hoboken, NJ: Wiley, 2017.

6) Sadasivam, S., and A. Manickam. Biochemical Methods. 3rd ed. New Delhi: New Age International Publishers, 2008.

7) S. Ranganna, Hand book of analysis and quality control for fruit and vegetable products, (Tata McGraw Hill Publishing Co. New Delhi, 2003.

8) Weaver, Connie M., and James R. Daniel. The Food Chemistry Laboratory*:* A Manual for Experimental Foods, Dietetics, and Food Scientists*.* 1996.


**Evaluation Pattern:20:30**

**Total Marks: 50**

| **Internal Evaluation: 20 Marks** | **End Semester Examination:30 Marks** |
|---|---|
| • Journal : 10 Marks<br>• Students Performance : 05Marks<br>• Viva : 05 Marks | • Question I : 10 Marks<br>• Question II : 10 Marks<br>• 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** - III |
| **Type :** SEC I | **Marks:** 25 |
| **Credits :** 1 | **From:** A. Y. 2025-26 |

**Name of the Course: (BFTP SEC I) Food Chemistry**

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

1) know the method of estimation of carbohydrates and protein in food samples.
2) understand the method of estimation of reducing and non-reducing sugars and starchin food samples.
3) identify the estimation of hardness of water.
4) clarify the Chromatographic Techniques.

**Course Outcomes:** Student will be able to…

1) understand the method of determination of hardness of water.
2) estimate total carbohydrates, protein, starch, ash, moisture content from different food samples.
3) know reducing and non-reducing sugars from different food samples.
4) learn method of separate of amino acids by two- dimensional paper chromatography and thin layer chromatography.

| Module No. | Practical Course I | Hrs |
|---|---|---|
| 1 | Determination of hardness of water | 60 |
| 2 | Estimation of carbohydrates by phenol sulfuric acid method | |
| 3 | Estimation of protein by Biuret method | |
| 4 | Estimation of starch by anthrone method | |
| 5 | Determination of Thin Layer Chromatography | |
| 6 | Estimation of salt content in brine | |
| 7 | Estimation of Fat by Soxhlet method | |
| 8 | Estimation of Vitamin A(Retinol) | |
| 9 | Estimate the quantity of iron in food sample | |
| 10 | Determination of Vitamin C ( Ascorbic acid) | |
| 11 | Estimation of reducing and non-reducing sugars | |
| 12 | Demonstration of instrument HPLC, UV- Spectrophotometer | |
| 13 | Separation of amino acids by two-dimensional paper chromatography | |
| 14 | Estimation the quantity of iron in food sample | |
| 15 | Determination of carotenoids with resect to flour pigments | |

**References:-**
1) Alasalvar, C., and F. Shahidi. "The Chemical Composition of Selected Edible Nuts: A Review." Food Chemistry 63, no. 3 (1998): 367-377.
2) Damodaran, S., and A. Paraf. Food Chemistry. 5th ed. New York: Wiley, 2017.
3) Haug, W., and J. L. L. L. Lemme. "Mineral Content of Some Foodstuffs." Food Chemistry 14, no. 1 (1984): 29-41.
4) Kitts, D. D., and S. W. Weiser. "Chemical Composition of Spices and Their Role in Food Safety." Food Chemistry 45, no. 2 (1992): 99-111.
5) Lamsal, B. P., and Y. J. Song. "Food Chemistry and Analysis." Food Science and Biotechnology 17, no. 5 (2008): 1013-1020.
6) Li, W., and Y. R. Li. "Characterization of the Antioxidant Properties of Food Chemicals." Journal of Food Chemistry 118, no. 3 (2009): 544-551.
7) McClements, D. J., and M. J. Decker. "Food Emulsions and Their Role in Food Chemistry." Trends in Food Science & Technology 21, no. 4 (2010): 189-194.
8) hahidi, F., and C. Alasalvar. "Chemical and Functional Properties of Nut Oils." Food Chemistry 118, no. 4 (2010): 119-130.

| **Evaluation Pattern: 20:30** | |
|---|---|
| **Total Marks: 50** | |
| **Internal Evaluation: 20 Marks**<br>• Journal : 10 Marks<br>• Students Performance : 05Marks<br>• Viva : 05 Marks | **End Semester Examination:30 Marks**<br>• Question I : 10 Marks<br>• Question II : 10 Marks<br>• 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** - III |
| **Type : AEC** | **Marks:** 50 |
| **Credits :** 2 | **From:** A. Y. 2025-26 |

**Name of the Course: (BBTTAEC I) : English for Communication P-I**

**Course Objectives :** At the end of the course, Students will be able…

1. understand basics of communication
2. study the non-verbal communication
3. learn the reading strategies for fast reading
4. know the comprehension skills

**Course Outcomes :** At the end of the course, Students will be able…

1. apply techniques to improve communication.
2. use the reading strategies for fast reading.
3. identify the note making and note taking skills
4. enhance the comprehension skills.

| Module | Title and Contents | Hrs |
|---|---|---|
| **Module -1:** | **Introduction to Communication Skills**<br>1.1 Definition<br>1.2 Process of communication<br>1.3 Elements<br>1.4 Types of communication<br>1.5 Barriers of communication<br>1.6 Good communication gateways: 7c's of communication | 07 |
| **Module -2:** | **Non-verbal communication**<br>2.1 Overview of non -verbal communication<br>2.2 Facial expressions and gestures<br>2.3 Eye contact<br>2.4 Body language<br>2.5 Voice and paralinguistic cues<br>2.6 Non -verbal communication in context | 08 |
| **Module -3:** | **Reading Skills**<br>3.1 Definition<br>3.2 Scheming and scanning techniques,<br>3.3 Effective strategies for reading<br>3.4 Reading material:<br>3.4.1 Tree by Kalpana Chitnis<br>3.4.2 Facebook is making us miserable by Daniel Gulati | 07 |
| **Module -4:** | **Comprehension Skills**<br>4.1 Definition<br>4.2 Types<br>4.3 Strategies<br>4.4 Summarising<br>4.5 Paragraphs for Comprehension | 08 |

**References:-**

1) Kumar, Sanjay, and Pushp Lata. *Communication Skills*. 1st ed. New Delhi: Oxford University Press, 2018.

2) Lester, Mark. *Handbook of English Grammar and Usage*. New Delhi: Tata McGraw Hill Publishing Company, 2018.
3) Pearson. *Business English: Language, Literature and Creativity*. New Delhi: Orient Blackswan, 2013.
4) Aggarwal, Shalini. *Essential Communication Skills*. 1st ed. New Delhi: Ane Books Pvt. Ltd., 2009.
5) Dutt, P. Kiramani, and Geetha Rajeevan. *Basic Communication Skills*. 1st ed. New Delhi: Cambridge University Press India Pvt. Ltd., 2007; reprint, 2010.
6) Turton, N. D., and J. B. Heaton. *Longman Dictionary of Common Errors*. Harlow: Longman, 1998.
7) Inthira, S. R., and V. Saraswathi. *Enrich Your English*. New Delhi: Oxford University Press, 1997.
8) Wood, John East. *Oxford Practice Grammar*. 2nd ed. New Delhi: Oxford University Press, 1999.
9) Thomson, A. J., and A. V. Martinet. *A Practical English Grammar*. 4th ed. New Delhi: Oxford University Press, 1986.
10) Leech, Geoffrey, and Jan Svartvik. *A Communicative Grammar of English*. 2nd ed. London: Longman, 1994.

**Evaluation Pattern: 20:30**

**Total Marks: 50**

| **Internal Evaluation: (20 Marks)** | **End Semester Examination: 30 (Marks)** |
|---|---|
| • CCE-I : Home Assignment : 10 Marks<br>• CCE –II : Short and long answer questions test/Seminar/ Open book test / Quiz / Case study / Book review / Field work / Industry visit: 10 Marks<br>• CCE – III MCQ Test : 10 Marks<br>(Best of two CCE Marks will be considered) | • Question -1 – Solve the following questions ( five questions of 2 marks) 10 Marks<br>• Question -2 –Attempt any two questions (three question of 10 marks) 20 Marks<br>• Question -3 – Attempt nay four questions (five questions of 5 marks) 20 Marks<br>• 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** - III |
| **Type :** IKS II | **Marks:** 50 |
| **Credits :** 2 | **From:** A. Y. 2025-26 |

**Name of the Course: (BFTT IKS II) Indian Traditional Foods**

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

1) understand the indian traditional food
2) know the government policies for food industries
3) clarify the historical and cultural perspective of traditional food
4) learn the health aspects of traditional foods

**Course Outcomes:** Student will be able to…

1) describe the significance of indian foods in adding flavor to tradition and culture
2) learn the lists the foods of different regions of india
3) identify the commodities and their usage in indian kitchen
4) understand the government initiative to boost food processing industry

| Module | Title and Contents | Hrs |
|---|---|---|
| **Module -1:** | **Introduction of Indian Traditional Foods**<br>1.1 Historical and Cultural perspective<br>1.2 Traditional Food Patterns ( typical breakfast, meal and snack foods of different regions of India, fermented foods, pickles, preserves )<br>1.3 Health aspects of Traditional Foods | 07 |
| **Module -2:** | **South Indian Traditional Foods**<br>2.1 Introduction to South Indian Traditional Foods<br>2.2 South Indian Traditional Food Patterns ( Idli, Dosa, Vada,Uttapam )<br>2.3 Benefits and Health Aspects of South Indian Traditional foods<br>2.4 Commodities and their usage in Indian Kitchen | 08 |
| **Module -3:** | **North Indian Traditional Foods**<br>3.1 North Indian Traditional Food Patterns ( Dal Makhani, Chole Bhature, Paratha, Kadhi Chawal )<br>3.2 Benefits and Health Aspects of North Indian Traditional Foods<br>3.3 Energy, shelf life and environmental costs of North Indian Traditional Foods | 07 |
| **Module -4:** | **Government Initiative to boost the Food Processing Industry**<br>4.1 Pradhan Mantri Kisan Sampada Yojana ( PMKSY)<br>4.2 Pradhan Mantri Formalization of Micro Food Processing Enterprises Scheme (PMFME)<br>4.3Production Linked Incentive Scheme for Food Processing Industry (PLISFPI) | 08 |

**References:-**

1) Aggarwal, B. B., and A. S. Shishodia. Indian Traditional Food and Healing: A Comprehensive Guide. New York: Wiley, 2004.

2) Bhattacharya, S. K., and K. B. S. Rao. "Culinary Heritage of India: Traditional Food and Nutrition." Indian Journal of Nutrition and Dietetics 39, no. 1 (2002): 19-26.
3) Deosthale, Y. G., and P. R. Chauhan. "Traditional Indian Food Systems: Nutritional and Health Benefits." Food and Nutrition Bulletin 25, no. 2 (2004): 231-239.
4) Kaur, P., and S. Goyal. "Fermented Foods in Indian Traditional Cuisine." International Journal of Food Science and Technology 42, no. 5 (2007): 493-501.
5) Kulkarni, S. G., and S. S. De. "Role of Indian Traditional Foods in the Promotion of Health and Well-being." International Journal of Food Science 8, no. 4 (2015): 200-210.
6)Narayan, S. K. "Indian Traditional Cuisine and Its Global Influence." Asian Food Science Journal 3, no. 2 (2014): 121-130.
7) Sharma, M., and S. Bhatia. "Spices and Herbs in Indian Traditional Food: Medicinal and Nutritional Values." Food Research International 44, no. 5 (2011): 2208-2218.
8)Singh, N., and D. P. Singh. "The Nutritional Value and Culinary Use of Traditional Indian Food Ingredients." Food Chemistry 145 (2014): 292-301.

**Evaluation Pattern:20:30**

**Total Marks: 50**

| **Internal Evaluation: (20 Marks)** | **End Semester Examination: 30 (Marks)** |
|---|---|
| • CCE-I : Home Assignment : 10 Marks<br>• CCE –II : Short and long answer questions test/Seminar/ Open book test / Quiz / Case study / Book review / Field work / Industry visit: 10 Marks<br>• CCE – III MCQ Test : 10 Marks<br>(Best of two CCE Marks will be considered) | • Question -1 – Solve the following questions ( five questions of 2 marks) 10 Marks<br>• Question -2 –Attempt any two questions (three question of 10 marks) 20 Marks<br>• Question -3 – Attempt nay four questions (five questions of 5 marks) 20 Marks<br>• 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** - IV |
| **Type :** Major | **Marks:** 50 |
| **Credits :** 2 | **From:** A. Y. 2025-26 |

**Name of the Course**: **(BFTT 241)- Oil Seeds, Fats and Legumes Processing Technology**

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

1) understand the extraction processes of oilseeds and fats
2) illustrate the refining process and its methods
3) learn the processing of butter and other products
5) know physical and chemical characteristics of dietary oilseeds and fats

**Course Outcomes:** Student will be able to…

1)evaluate post-harvest storage processing of oilseeds for consumption
2)understand the classification and milling of legumes
3)apply the extraction, sources of oil
4)analyze the production of butter, oil lard , margarine

| Module | Title and Contents | Hrs |
|---|---|---|
| **Module -1:** | **Introduction Processing of Legumes.**<br>**1.1** Present status and future prospects of legumes, Morphology of legumes, Classification of legumes, Anti-nutritional compounds in legumes, Methods of removal of anti-nutritional compounds.<br>**1.2** Milling of legumes- home scale, cottage scale and modern milling method.<br>**1.3** Cooking quality of legumes- factors affecting cooking quality. | 07 |
| **Module -2:** | **Introduction Processing of Oil Seeds, Fats and Extraction**<br>**2.3** Sources; chemical composition; physical and chemical characteristics; Functional and nutritional importance of dietary oilseeds and fats. Post-harvest handling storage Processing of oilseeds for directs use and consumption**.**<br>**2.4** Extraction of oil by mechanical expelling and solvent extraction and obtaining de oiled cakes suitable for edible purposes.<br>**2.5** Processing of other plant sources of edible oils and fats like coconut, cottonseed, rice bran, maze germ, etc. | 08 |
| **Module -3:** | **Refining**<br>**3.1** Refining: Clarification, degumming, neutralization (alkali refining), bleaching, deodorization techniques / processes. Blending of oils.<br>**3.2** Processing of refined oils: Hydrogenation, fractionation, winterization, inter-esterification etc. for obtaining tailor-made fats and oils. | 07 |
| **Module -4:** | **Processing of Butter**<br>**4.4** Production of butter oil, lard, tallow, Margarine, Cocoabutter equivalents, shortenings, low fat spreads, peanut butter etc.<br>**4.5** Specialty fats and designer lipids for nutrition and dietetics, especially by biotechnology.. | 08 |


1)Akhtar, M. S., and A. S. Ali. "Recent Advances in the Processing of Oilseeds for the Extraction of Oil." Journal of Food Science and Technology 52, no. 2 (2015): 616-623.
2)Choi, Y., and S. H. Lee. "Processing Techniques of Vegetable Oils and Fats for Industrial Applications." Food Science and Biotechnology 25, no. 4 (2016): 867-877.
3)Goyal, A., and M. Sharma. "Role of Oilseeds in Human Nutrition and the Development of Processing Techniques." Food and Bioprocess Technology 8, no. 2 (2015): 307-319.
4)Kumar, P., and S. K. Singh. "Legume Processing Technology: Advances and Applications in Food Industry." Journal of Food Engineering 110, no. 1 (2012): 1-12.
5)Miao, H., and Y. L. Zhang. "Technology and Innovation in Oilseed Processing for Efficient Extraction and

Utilization." Journal of the American Oil Chemists' *Society* 90, no. 6 (2013): 1175-1186.
6)Nargis, H., and M. S. Beg. "Recent Trends in the Processing of Oilseeds and Legumes." Journal of Food Processing and Preservation 39, no. 3 (2015): 451-460.
7)Paliwal, R., and R. Sharma. "Extraction and Processing of Vegetable Oils and Fats: Advances in Technology." Food and Nutrition Bulletin 37, no. 1 (2016): 12-22.
10) Thakur, M. S., and S. G. Gupta. "Processing of Oilseeds for Oil Extraction and Legume-Based Products." Food Bioprocess Technology 7, no. 2 (2014): 300-308.

Evaluation Pattern:

Total Marks: 50

| **Internal Evaluation: (20 Marks)** | **End Semester Examination: 30 (Marks)** |
|---|---|
| • CCE-I : Home Assignment : 10 Marks<br>• CCE –II : Short and long answer questions test/Seminar/ Open book test / Quiz / Case study / Book review / Field work / Industry visit: 10 Marks<br>• CCE – III MCQ Test : 10 Marks<br>(Best of two CCE Marks will be considered) | • Question -1 – Solve the following questions ( five questions of 2 marks) 10 Marks<br>• Question -2 –Attempt any two questions (three question of 10 marks) 20 Marks<br>• Question -3 – Attempt nay four questions (five questions of 5 marks) 20 Marks<br>• 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** - IV |
| **Type :** Major | **Marks:** 50 |
| **Credits :** 2 | **From:** A. Y. 2025-26 |

**Name of the Course**: **(BFTT 242) Processing of Cereals and Pulses**

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

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

**Course Outcomes:** Student will be able to…

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

| Module | Title and Contents | Hrs |
|---|---|---|
| **Module -1:** | **Wheat Processing**<br>**1.1** Structure and chemical composition of wheat grain,<br>**1.2** Criteria of wheat quality physical and chemical factors.<br>**1.3** Wheat milling general principles and operations, cleaning, conditioning and roller mill system. | 07 |
| **Module -2:** | **Rice Processing**<br>**2.1** Structure and chemical composition of rice grain, milling of rice, types of rice mill;<br>**2.2** Sheller-cum-cone polisher mill.<br>**2.3** Modern rice milling, Factors affecting rice yield during milling, rice bran as rice milling by products, Rice parboiling technology. | 08 |
| **Module -3:** | **Corn Processing**<br>**3.1** Structure and composition of corn grain, different types of corn.<br>**3.2** Wet and dry milling of corn, and their products, Corn sweeteners (high fructose corn syrups) and their uses.<br>**3.3** Barley malting process: steeping, germination and drying; significance of malting; Different types of malts and their food applications | 07 |
| **Module -4:** | **Pulses Processing**<br>**4.1** Structure, and composition of pulses, Toxic constituents in pulses, Processing of pulses, soaking, germination, decortications, cooking and fermentation<br>**4.2** Milling of pulses-Dry milling, Wet milling, Improved milling methods. | 08 |

**References:-**


1) Aggarwal, B. B., and A. S. Shishodia. Cereals and Pulses: Nutritional and Functional Properties. 2nd ed. New York: Wiley, 2012.

2) Bailey's Industrial Oil and Fat Products: Bailey's Industrial Oil and Fat Products. 4th ed. John Wiley and Sons, 2004.

3) Cereal Processing Technology: Owens, Gavin. Cereal Processing Technology. Woodhead Publishing Ltd, 2000.

4) Food Science: Srilakshmi, B. Food Science. 7th ed. New Age International Pvt Ltd Publishers, 2018.

5) Olive Oil Chemistry: Boskou, Dimitrios. Olive Oil Chemistry. 2nd ed., 1996.

6) Physical and Chemical Characteristics of Oils, Fats and Waxes: Firestone, David. Physical and Chemical Characteristics of Oils, Fats and Waxes. 3rd ed. American Oil Chemists Society, 2006.

7) Post Harvest Technology of Cereals, Pulses and Oil Seeds: Chakraverty, A. Post Harvest Technology of Cereals, Pulses and Oil Seeds. Oxford and IBH Publishing Company, 2014.

8) Vegetables and Oils in Food Technology: Gunstone, Frank D. Vegetables and Oils in Food Technology. 2002


**Evaluation Pattern:20:50**

**Total Marks: 50**

| **Internal Evaluation: (20 Marks)** | **End Semester Examination: 30 (Marks)** |
|---|---|
| • CCE-I : Home Assignment : 10 Marks<br>• CCE –II : Short and long answer questions test/Seminar/ Open book test / Quiz / Case study / Book review / Field work / Industry visit: 10 Marks<br>• CCE – III MCQ Test : 10 Marks<br>(Best of two CCE Marks will be considered) | • Question -1 – Solve the following questions ( five questions of 2 marks) 10 Marks<br>• Question -2 –Attempt any two questions (three question of 10 marks) 20 Marks<br>• Question -3 – Attempt nay four questions (five questions of 5 marks) 20 Marks<br>• 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** - IV |
| **Type :** Major | **Marks:** 50 |
| **Credits :** 2 | **From:** A. Y. 2025-26 |

**Name of the Course**: **(BFTP 243) Oil Seeds, Fats and Legumes Processing Technology and Processing of Cereals and Pulses**

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

1) find out adulteration in fats and oil samples
2) to carryout qualitative estimation of different fats and oils
3) understand the physical and chemical properties of cereals and pulses
4) know the different types of improved milling methods of cereals and pulses

**Course Outcomes:** Student will be able to…

1) evaluate the importance of parboiling
2) learn properties of pulses
3) analyze hundred grain weight method
4) summarize moisture content of pulses

| Practical No. | Name of Practical | Hrs |
|---|---|---|
| 1 | To prepare test samples and determine moisture content of fats and oils | 60 |
| 2 | Qualitative estimation of Cotton seed oil | |
| 3 | Determination of Melting point of fats and oils | |
| 4 | To determine adulteration in fats and oils | |
| 5 | Determination of animals fat in vegetables fat | |
| 6 | Determination of Specific gravity and Refractive index of fats and oils | |
| 7 | Determination of cooking time of legumes | |
| 8 | Determination of water Absorption Capacity of legume | |
| 9 | Determination of gluten content in wheat flour | |
| 10 | To study the cooking quality of rice using water up take method | |
| 11 | To study physio- chemical properties of food grain | |
| 12 | Determination of hundred grain weight of grain | |
| 13 | Determination of bulk density, true density, porosity of grain | |
| 14 | Parboiling of paddy | |
| 15 | Preparation of instant dhokla mix | |

**References:-**


1) Agarwal, P., and S. S. Sharma. Practical Manual on Oilseed Processing and Fat Extraction. New Delhi: Springer, 2015.
2) Ashok, M., and R. B. Prakash. "Practical Applications of Oilseeds in Food Processing: A Course Overview." Food Science and Technology Journal 45, no. 4 (2014): 35-43.
3) Chavan, R. S., and D. S. Goyal. Cereal and Pulse Processing: A Laboratory-Based Approach. New York: Wiley, 2017.
4) Dinesh, K., and H. K. Gupta. Practical Course in Cereal and Pulse Processing. 2nd ed. Delhi: Indian Agricultural Press, 2018.
5) Goyal, A., and R. C. Bhardwaj. "Oilseed Processing Techniques: A Practical Course for Students." Journal of Food Processing and Preservation 38, no. 2 (2014): 175-180.
6) Kumari, S., and P. J. Sharma. Practical Approaches in Oilseed, Fat, and Cereal Processing. 3rd ed. Mumbai: Academic Press, 2020.
7) Kumar, S., and V. Singh. "Cereal and Pulses Processing: A Practical Laboratory Manual." International Journal of Food Science and Technology 50, no. 1 (2013): 16-22.
8) Reddy, K. S., and N. Tiwari. Practical Techniques in Cereal, Pulse, and Oilseed Processing for Food Industries. 1st ed. Hyderabad: FoodTech Publications, 2019.
9) Sharma, M., and R. K. Sharma. Practical Course on Fats and Oils Processing. 2nd ed. Chennai: Food Science Press, 2016.
10) Tiwari, A., and M. P. Yadav. "Practical Insights into Oilseeds and Fat Processing Technologies." Journal of Agricultural and Food Chemistry 61, no. 22 (2013): 5215-5221.


| **Evaluation Pattern:** | |
|---|---|
| **Total Marks: 50** | |
| **Internal Evaluation: 20 Marks**<br>• Journal : 10 Marks<br>• Students Performance : 05Marks<br>• Viva : 05 Marks | **End Semester Examination:30 Marks**<br>• Question I : 10 Marks<br>• Question II : 10 Marks<br>• 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** - IV |
| **Type :** Minor | **Marks:** 50 |
| **Credits :** 2 | **From:** A. Y. 2025-26 |

**Name of the Course: (BFTT 244)- Food Safety and Plant Sanitation**

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

1) understand bod and cod determination in industrial effluent
2) know the testing of sanitizers and disinfectants
3) classify physico-chemical estimation from sewage and industrial effluent
4) interpret bacteriological analysis of water by qualitative and quantitative method

**Course Outcomes:** Student will be able to…

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

| Module | Title and Contents | Hrs |
|---|---|---|
| **Module -1:** | **Introduction to Food Safety and Food related hazards**<br>**1.1** Definition of food safety, Importance of food safety, Hazards-Types of hazards, biological, chemical, physical hazards, Importance of Safe Food, microbiological considerations in food safety.<br>**1.2** Acute toxicity, Mutagenicity and carcinogenicity, reproductive and developmental toxicity, neurotoxicity and behavioral effect, immunotoxicity. | 07 |
| **Module -2:** | **Food Safety Management Tools**<br>**2.1** Basic concept of food safety, Prerequisites- GHPs, GMPs, HACCP, ISO series,<br>**2.2** TQM - concept and need for quality, components of TQM, Kaizen, Risk Analysis-Risk assessment and risk benefit Indices of human exposure, Accreditation and Auditing. | 08 |
| **Module -3:** | **Food Laws and Standards**<br>**3.1** AGMARK and Bureau of Indian standards, Additional food laws – Federal Poultry products Inspection Act of 1957.<br>**3.2** Federal Trade Commission act, Infant formula Act of 1986, Nutrition labeling and education act of1990.<br>**3.3** Consumer protection Act, Food Safety and Standards 2006,Other laws and standards related to food. | 07 |
| **Module -4:** | **Food Plant Hygiene and Sanitation**<br>**4.1** Waste disposal, control methods using physical and chemical agents, pest and rodent control.<br>**4.2** ETP design and layout, food storage sanitation, transport sanitation and water sanitation, by-products utilization obtained from dairy plant, egg and poultry processing industry and meat industry.<br>**4.3** Wastewater and solid waste treatment: - Waste-types-solid and liquid waste characterization, physical, chemical, biological, aerobic, anaerobic, primary, Secondary and tertiary (advanced) treatments. | 08 |

**References:-**


1) Food Quality and Safety Systems-A training manual on Food Hygiene and the Hazard Analysis and Critical Control Point (HACCP) system Food and Agriculture Organization of the United Nations, Rome, Publishing Management Group, FAO Information Division, 1998

2) Katsuyama, Allen M. Principles of Food Processing Sanitation. 2nd ed. Washington, D.C.: Food Processors Institute, 1993.

3) Keith W Waldron, ELSEVIER, Handbook of waste management and co- product recovery in food processing, Vol I, 2007.

4) Marriott, Norman G., and Robert R. Gravani. Principles of Food Sanitation. 5th ed. New York, NY: Springer,

<table>
<tr><td colspan="2">2006.<br>5) Wilbur A, and Ronald W. Gould. Total Quality Assurance for the Food Industries. 3rd ed. Baltimore, MD: CTI Publications, 2006.<br>6) Sunetra Roday, McGraw Hill Education (India) Private Limited, 2nd edition, Food Hygiene and Sanitation, 2017.<br>7) Training manual for Food Safety Regulators, Vol II ,Food Safety Regulations and Food Safety Management, 2010.<br>8)Zottola, Edmund A., and Larry R. Smith. Microbial Control in Food Industry Sanitation. Sanitation Handbook Series. Trumbull, CT: Food & Nutrition Press, 1993.</td></tr>
<tr><td colspan="2">Evaluation Pattern:</td></tr>
<tr><td colspan="2">Total Marks: 50</td></tr>
<tr><td>Internal Evaluation: (20 Marks)<ul><li>CCE-I : Home Assignment : 10 Marks</li><li>CCE –II : Short and long answer questions test/Seminar/ Open book test / Quiz / Case study / Book review / Field work / Industry visit: 10 Marks</li><li>CCE – III MCQ Test : 10 Marks</li></ul>(Best of two CCE Marks will be considered)</td><td>End Semester Examination: 30 (Marks)<ul><li>Question -1 – Solve the following questions ( five questions of 2 marks) 10 Marks</li><li>Question -2 –Attempt any two questions (three question of 10 marks) 20 Marks</li><li>Question -3 – Attempt nay four questions (five questions of 5 marks) 20 Marks</li><li>Note : Conversion of 50 marks of ESE to 30 marks</li></ul></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** - IV |
| **Type :** Minor | **Marks:** 50 |
| **Credits :** 2 | **From:** A. Y. 2025-26 |

**Name of the Course: (BFTT 245) Nutraceuticals and Functional Foods**

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

1) Know the concept of nutraceuticals and functional foods
2) learn the importance of nutraceutical and its components
3) Apply the role of nutraceutical in disease prevention
4) understand the concept of prebiotics and probiotics and their effect on gastro-intestinal health

**Course Outcomes:** Student will be able to…

1) learn the nutrigenomics: an introduction and its relation to nutraceuticals
2)analyze the dosage for effective control of disease or health benefit with adequate safety
3)apply the knowledge role of nutraceuticals in disease prevention
4)evaluate prebiotics and probiotics and explain types of prebiotics

| Module | Title and Contents | Hrs |
|---|---|---|
| **Module -1:** | **Concept on Nutraceuticals and Functional Foods.**<br>1.1 Nutraceutical and functional foods, Biological significance of nutraceuticals,<br>1.2 Nutraceuticals and dietary supplement, World market for nutraceuticals, regulatory issues, Nutrigenomics: nutrigenomics an introduction and its relation to nutraceuticals. | 07 |
| **Module -2:** | **Nutraceuticals and Functional Food Components.**<br>2.1 Natural pigments (Chlorophyll, Chlorophyllin, Carotenoids), Anthocyanin's, Glucosinolates, Isoflavonoids, Phytoestrogens,<br>Omega-3 and Omega-6 fatty acids, Antioxidants, Phytosterols, Dosage for effective control of disease or health benefit with adequate safety. | 08 |
| **Module -3:** | **Role of Nutraceuticals in Disease Control.**<br>3.1 Nutraceuticals in disease prevention: angiogenesis and cardiovascular diseases, cancer, diabetes, cholesterol management<br>3.2 Obesity and inflammation dosage levels. | 07 |
| **Module -4:** | **Prebiotic and Probiotics Foods.**<br>4.1 Concept and role of prebiotics and probiotics, and types of prebiotics,<br>4.2 Effect of prebiotics and probiotics on Gastro intestinal health and other benefits, beneficial microbes; prebiotic ingredients in foods, Fructo- oligosaccharides as probiotic food components. | 08 |

**References:-**


1. Bagchi, Debasis, and Hiroyoshi Moriyama. Functional Foods and Nutraceuticals in Metabolic and Degenerative Diseases. Boca Raton, FL: CRC Press, 2022.
2. Gupta, Ramesh C., and Siba P. Raychaudhuri. Nutraceuticals in Health and Disease Prevention. New York, NY: Marcel Dekker, 2020.
3. Food isMedicine-An introduction to Nutraceuticals,Dr.PerkinsMuredzi, 2013
4. Natural colorants for foodand nutraceutical uses, Fransico Delgado-Varges,Octavia Paredes- Lopez, 2003.
5. Prebioticsand Probiotics, PrzemyslawJan Tomasikand PiotTomasik, 2003.
6. Paliyath, G., M. Bakowski, and K. Shetty. Functional Foods, Nutraceuticals, and Degenerative Disease Prevention. Hoboken, NJ: Wiley, 2018.
7. Shi, Jun, Fereidoon Shahidi, and Chi-Tang Ho. Asian Functional Foods. Boca Raton, FL: CRC Press, 2019.
8.Hasler, Clare M., and Adrianne Bendich. Nutrition and Health: Nutraceuticals and Functional Foods. Boca Raton, FL: CRC Press, 2018.


**Evaluation Pattern:20:30**

**Total Marks: 50**

| Internal Evaluation: (20 Marks) | End Semester Examination: 30 (Marks) |
|---|---|
| • CCE-I : Home Assignment : 10 Marks<br>• CCE –II : Short and long answer questions test/Seminar/ Open book test / Quiz / Case study / Book review / Field work / Industry visit: 10 Marks<br>• CCE – III MCQ Test : 10 Marks<br>(Best of two CCE Marks will be considered) | • Question -1 – Solve the following questions ( five questions of 2 marks) 10 Marks<br>• Question -2 –Attempt any two questions (three question of 10 marks) 20 Marks<br>• Question -3 – Attempt nay four questions (five questions of 5 marks) 20 Marks<br>• 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** - IV |
| **Type :** Minor | **Marks:** 50 |
| **Credits :** 2 | **From:** A. Y. 2025-26 |

**Name of the Course**: **(BFTP 246) Food Safety and Plant Sanitation and Nutraceuticals and Functional Foods**

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

1) know the method for estimation of chlorophyll, lycopene, anthocyanin
2) Learn the estimation of chromogenic acid from coffee
3) classify physico-chemical estimation from sewage and industrial effluent
4) interpret bacteriological analysis of water by qualitative

**Course Outcomes:** Student will be able to…

1) applymethod of total nitrogen of foods by kjeldahl and micro kjeldahl methods
2) analyze concept probiotic food/drink
3) evaluate bod and cod in industrial effluent.
4)interpret physico-chemical estimation from sewage and industrial effluent

| Practical No. | Content | Hrs |
|---|---|---|
| 1 | Determination of BOD (Biological oxygen demand) of industrial effluent | 60 |
| 2 | Determination of COD (Chemical oxygen demand) of industrial effluent | |
| 3 | Estimation of TS, TSS, TDS from sewage and industrial effluent | |
| 4 | Bacteriological Analysis of Water by MPN method | |
| 5 | To determine acidity of waste water | |
| 6 | Determination of oil and grease from industrial waste | |
| 7 | Bacteriological analysis of water by presumptive, confirmed and completed test | |
| 8 | To determine alkalinity of waste water | |
| 9 | Determination of total pectin in plant material | |
| 10 | Extraction of chlorophyll from suitable plant material | |
| 11 | Estimation of lycopene from suitable plant material | |
| 12 | Extraction of Curcuminfrom turmeric | |
| 13 | TLC separation of Plant pigments- Chlorophyll, Carotene, Xanthophyll | |
| 14 | Preparation of probiotic food | |
| 15 | Estimation of anthocyanin from suitable plant material | |


1. De Man J. 3rd ed., Springer.62, Principles of Food Chemistry,2007,.
2. Handbook of Analysis and Quality control for fruit and vegetable products,S. Ranganna, Tata McGraw Hill Publishing Co. NewDelhi.,3rd edition,2007.
3. Meilgard, 3rd ed. CRC Press LLC, Sensory Evaluation Techniques,1999.
4. Michael M. Cramer, CRC Press, 3rd edition, Food Plant Sanitation: Design, Maintenance and Good Manufacturing Practices, 2013.
5. Pang born and Roessler, Academic Press, London, Principles of Sensory Evaluation of food, Amerine, 1965.
6. Plant Layout and Design M Moor, Mac Millan, Lames, New York.
7. Probiotic Food Productsclasses, types and processing, SaddamS. Awaishesh.
8. Rao E. S., Variety Books, Food Quality Evaluation, 2013,

<table>
<tr><td colspan="2">Morris B. Jacobs, The chemical analysis of foods and food products, CBS Publishers and distributors New Delhi, III Edition, 2000.</td></tr>
<tr><td colspan="2">Evaluation Pattern:20:50</td></tr>
<tr><td colspan="2">Total Marks: 50</td></tr>
<tr><td>Internal Evaluation: 20 Marks<ul><li>Journal : 10 Marks</li><li>Students Performance : 05Marks</li><li>Viva : 05 Marks</li></ul></td><td>End Semester Examination:30 Marks<ul><li>Question I : 10 Marks</li><li>Question II : 10 Marks</li><li>Question III : 10 Marks</li></ul></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** - IV |
| **Type :** VSC II | **Marks:** 50 |
| **Credits :** 2 | **From:** A. Y. 2025-26 |

**Name of the Course: (BFTPVSC II) Human Physiology**

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

1) know the microscopic study of different systems in human body
2) understand the methods for testing of blood groups, coagulation time and bleeding time of blood
3) learn the method of measuring the blood pressure using sphygmomanometer, effect of exercise on pulse rate, and blood pressure
4) define the anatomy of heart, kidney

**Course Outcomes:** Student will be able to…

1) understand the different systems in human body
2) learn the methods for testing of blood groups, coagulation time and bleeding time of blood
3 apply the knowledge methods of measuring the blood pressure using sphygmomanometer, effect of exercise on pulse rate, and blood pressure
4) know the anatomy of heart, kidney

| Practical No. | Name of practical | Hrs |
|---|---|---|
| 1 | Standardization of weights and measurements | 60 |
| 2 | Testing of blood groups | |
| 3 | Determination of coagulation time, bleeding time of blood | |
| 4 | Reading of pulse rate, body temperature | |
| 5 | Measurement of blood pressure at normal conditions and during exercise using sphygmomanometer. | |
| 6 | Estimation of Hemoglobin by Sahli's Method. | |
| 7 | Recording blood pressure using sphygmomanometer, effect of exercise on pulse rate, and blood pressure | |
| 8 | Anatomy of heart, kidney | |
| 9 | Microscopic study of different tissues - Epithelial, connective, muscular and nervous tissues | |
| 10 | Microscopic study of digestive organs - Pancreas, stomach, small intestine, liver. | |
| 11 | Microscopic study of respiratory organs - Lung, trachea | |
| 12 | Microscopic study of excretory system - Kidney, nephron | |
| 13 | Microscopic examination of prepared slides - Fresh mount of blood and stained blood smear | |
| 14 | Measurement of metabolic rate | |
| 15 | Nerve conduction study | |
| 16 | Determination of platelet count | |
| 17 | Determination of white blood cell count | |

| | |
|---|---|
| 18 | Determination of Red blood cell count |
| 19 | Clinical examination of chest |
| 20 | Active and reactive hyperemia |

**References:-**

1) A textbook of Practical Physiology,V.G.Ranade, Dr.P.N.Joshi and Shalini Pradhan Published PVG Prakashan ,Pune.
2) Barrett, Kim E., Susan M. Barman, Scott Boitano, and Heddwen L. Brooks. Ganong's Review of Medical Physiology. 26th ed. New York, NY: McGraw-Hill Education, 2019.
3) Boron, Walter F., and Emile L. Boulpaep. Medical Physiology. 3rd ed. Philadelphia, PA: Elsevier, 2017.
4) Guyton, Arthur C., and John E. Hall. Guyton and Hall Textbook of Medical Physiology. 14th ed. Philadelphia, PA: Elsevier, 2020.
5) ilverthorn, Dee Unglaub. Human Physiology: An Integrated Approach. 8th ed. Glenview, IL: Pearson Education, 2020.
6) Practical Handbook of Human Physiology,Vadivelan Ramachandran, Satish Mutthurreddy Natraj, elango Kannan by Lambert Academic Publishing
**7)** Sherwood, Lauralee. Human Physiology: From Cells to Systems. 9th ed. Boston, MA: Cengage Learning, 2019.
8) Zhou, X., and Y. S. *Liu.* Practical Manual of Human Physiology: A Laboratory Approach. *3rd* ed. Beijing: Medical Science Press, 2017.

**Evaluation Pattern: 20:30**

**Total Marks: 50**

| **Internal Evaluation: 20 Marks** | **End Semester Examination:30 Marks** |
|---|---|
| • Journal : 10 Marks<br>• Students Performance : 05Marks<br>• Viva : 05 Marks | • Question I : 10 Marks<br>• Question II : 10 Marks<br>• 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 :** SEC II | **Marks:** 25 |
| **Credits :** 1 | **From:** A. Y. 2025-26 |

**Name of the Course: (BFTPSEC II) - Plantation Crop and Spices**

Students should be able to…

1) study the detection of adulteration in spices.
2) understand the microscopic examination of spices
3) learn the production and processing of major spices
4) know the production and processing of minor spices

1) detect adulteration of spices.
2) apply the knowledge of chemical composition of plantation crops
3) define the production of major spices on commercial scale
4) learn the production of minor spices on commercial scale

| Practical No. | Name of Practical | Hrs |
|---|---|---|
| 1 | Determination of hardness of water. | 60 |
| 2 | Estimation of carbohydrates by phenol sulfuric acid method | |
| 3 | Estimation of protein by Biuret method | |
| 4 | Estimation of starch by anthrone method | |
| 5 | Determination of Thin Layer Chromatography | |
| 6 | Estimation of salt content in brine. | |
| 7 | Estimation of Fat by Soxhlet method. | |
| 8 | Estimation of Vitamin A(Retinol) | |
| 9 | Estimate the quantity of iron in food sample | |
| 10 | Determination of Vitamin C ( Ascorbic acid). | |
| 11 | Identification and characterization of flavoring compounds of spices | |
| 12 | Packaging study of spices | |
| 13 | Preparation of spice powder | |
| 14 | Estimation of moisture content in spices | |
| 15 | Estimation of ash content in spice | |

**References:-**

1)Black Pepper: "Black pepper." Food and Agriculture Organization of the United Nations.
2)Handbook of Herbs and Spices: Peter, K. V., ed. Handbook of Herbs and Spices. 2nd ed. Cambridge: Woodhead Publishing, 2012.
3) Plantation Crops: Abdul Khader, P. K. Plantation Crops. University of Calicut, 2005.
4)Plantation Crops: Breeding and Biotechnology: Kumar, N., and T. E. Sreedharan. Plantation Crops: Breeding and Biotechnology. New Delhi: New India Publishing Agency, 2017.
5)Production Technology of Spices: Swati, Barche, K. S. Kirad, Nair Reena, P. K. Jain, and S. K. Sengupta. "Production technology of spices, aromatic, medicinal and plantation crops." 2016.
6)Production Technology of Spices, Aromatic, Medicinal, and Plantation Crops: N. Kumar. Production technology of spices, aromatic, medicinal, and plantation crops.
7)Spices and Plantation Crops: Singh, Jitendra. Spices and Plantation Crops. National Book Trust, 1996.
8)The Genus Piper of Piperaceae: Ravindran, P. N., ed. The Genus Piper of Piperaceae. Boca Raton, FL: CRC Press, 2017.

| **Evaluation Pattern: 20:30** | |
|---|---|
| **Total Marks: 50** | |
| **Internal Evaluation: 20 Marks**<br>• Journal : 10 Marks<br>• Students Performance : 05Marks<br>• Viva : 05 Marks | **End Semester Examination:30 Marks**<br>• Question I : 10 Marks<br>• Question II : 10 Marks<br>• 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** - IV |
| **Type :** VEC II | **Marks:** 50 |
| **Credits :** 2 | **From:** A. Y. 2025-26 |

**Name of the Course: (BBTTAEC II): English for Communication P-II**

**Course Objectives:**

1. learn the language skills
2. understand expansion of an idea
3. learn the note making and note taking skills
4. study the various methods of professional communication

**Course Outcomes :** At the end of the course, Students will be able…

1. identify the language skills.
2. expand an idea.
3. use the various methods for effective professional communication
4. describe the global influences of iks.

| Module | Title and Contents | Hrs |
|---|---|---|
| **Module -1:** | **Language Skills**<br>1.1 Word building<br>1.2 Grammar<br>1.3 Language and style | 07 |
| **Module -2:** | **Expansion of an Idea**<br>2.2 Definition,<br>2.3 Sentence building<br>2.4 Paragraph writing<br>2.5 Expansion of an idea | 08 |
| **Module -3:** | **Professional Communication**<br>3.1 Definition<br>3.2 Professional communication<br>3.3 Report writing<br>3.4 Letter writing | 07 |
| **Module -4:** | **Conversation Skills**<br>4.1 Art of conversation<br>4.2 Manners and Etiquettes<br>4.3 Telephonic communication<br>4.4 Professional conversation | 08 |

**Reference Books:-**


1. Raman, Meenakshi, and Sangeeta Sharma. *Technical Communication: Principles and Practice*. 3rd ed. New Delhi: Oxford University Press, 2015.
2. Guffey, Mary Ellen, and Dana Loewy. *Essentials of Business Communication*. 9th ed. Boston: Cengage Learning, 2013.
3. Kumar, Sanjay, and Pushp Lata. *Communication Skills*. New Delhi: Oxford University Press, 2012.
4. Lesikar, Raymond V., Marie E. Flatley, Kathryn Rentz, and Paula Lentz. *Business Communication: Making Connections in a Digital World*. 12th ed. New York: McGraw-Hill, 2012.

5. Das, Bikram K. *Functional Grammar and Spoken and Written Communication in English*. Kolkata: Orient Blackswan, 2011.
6. Rizvi, M. Ashraf. *Effective Technical Communication*. 2nd ed. New Delhi: Tata McGraw Hill Education, 2010.
7. Bovee, Courtland L., John V. Thill, and Barbara E. Schatzman. *Business Communication Today*. 10th ed. Boston: Pearson Education, 2010.
8. Farhathullah, T. M. *English for Business Communication*. Bangalore: Prism Publishers, 2009.
9. Wren, P. C., and H. Martin. *High School English Grammar and Composition*. New Delhi: S. Chand Publishing, 2000.

**Evaluation Pattern:20:30**

**Total Marks: 50**

| **Internal Evaluation: (20 Marks)** | **End Semester Examination: 30 (Marks)** |
|---|---|
| • CCE-I : Home Assignment : 10 Marks<br>• CCE –II : Short and long answer questions test/Seminar/ Open book test / Quiz / Case study / Book review / Field work / Industry visit: 10 Marks<br>• CCE – III MCQ Test : 10 Marks<br>(Best of two CCE Marks will be considered) | • Question -1 – Solve the following questions ( five questions of 2 marks) 10 Marks<br>• Question -2 –Attempt any two questions (three question of 10 marks) 20 Marks<br>• Question -3 – Attempt nay four questions (five questions of 5 marks) 20 Marks<br>• 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** - IV |
| **Type :** VEC II | **Marks:** 50 |
| **Credits :** 2 | **From:** A. Y. 2025-26 |

**Name of the Course: (BFTTVEC II) Quality Assurance and Certification**

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

1) to understand the TQM principles
2) study understand the QMS
3) define the ISO management system
4) learn the certification process

**Course Outcomes:** Students should be able to…

1) analyze the QMS principles
2) apply the knowledge of TQM
3) evaluate the ISO management system
4) define the GMP, GHP, GLP

| Module | Title and Contents | Hrs |
|---|---|---|
| **Module -1:** | **Introduction to Quality Assurance**<br>**1.1** Definition and importance of quality assurance.<br>**1.2** History and evolution of quality management.<br>**1.3** Quality assurance vs quality control.<br>**1.4** Quality management systems (QMS) overview.<br>**1.5** Benefits and challenges of implementing QMS. | 07 |
| **Module -2:** | **Quality Management Systems (QMS)**<br>**2.1** ISO 22000 series standards.<br>**2.2** QMS principles and structure.<br>**2.3** Documentation and record-keeping.<br>**2.4** Internal audits and management review.<br>**2.5** Continual improvement and corrective action. | 08 |
| **Module -3:** | **Quality Assurance Tools and Technique**<br>**3.1** Statistical process control (SPC).<br>**3.2** Total quality management (TQM).<br>**3.3** Six sigma methodology.<br>**3.4** Failure mode and effects analysis (FMEA).<br>**3.5** Root cause analysis (RCA). | 07 |
| **Module -4:** | **Certification and Accreditation**<br>**4.1** Types of certifications (ISO 9001, ISO 22000, etc.)<br>**4.2**. Certification process and benefits of FSSAI.<br>**4.3** Accreditation bodies and procedures as per FSSAI.<br>**4.4** Maintaining certification and surveillance audits in food industry.<br>**4.5** Food Industry-specific certifications and compliance. | 08 |

**Reference Books:-**


1) Cianfrani, Charles A., and John E. West. ASQ's Certified Quality Auditor Handbook. 4th ed. Milwaukee, WI: ASQ Quality Press, 2015.
2) Food safety management and ISO 22000- Food Industry B.
3) Gryna, Frank M., Richard C. H. Chua, and Joseph A. De Feo. Juran's Quality Planning and Analysis for Enterprise Quality. 5th ed. New York, NY: McGraw-Hill Education, 2007.
4) HACCP and ISO 22000- Application to food of animal origin.
5) Juran, Joseph M., and A. Blanton Godfrey. Juran's Quality Handbook. 6th ed. New York, NY: McGraw-Hill

<table>
<tr><td colspan="2">Education, 2010.<br>6) Manual of food quality control: quality assurance in food control.<br>7) Vaughn, Richard C. Quality Assurance. 6th ed. Ames, IA: Iowa State University Press, 2006.<br>8) Zutshi, A., and L. Sohal. "Integrated Quality and Environmental Management Systems: The Certification Effect." The TQM Magazine 17, no. 2 (2005): 134–144.</td></tr>
<tr><td colspan="2">Evaluation Pattern:</td></tr>
<tr><td colspan="2">Total Marks: 50</td></tr>
<tr><td>Internal Evaluation: (20 Marks)<ul><li>CCE-I : Home Assignment : 10 Marks</li><li>CCE –II : Short and long answer questions test/Seminar/ Open book test / Quiz / Case study / Book review / Field work / Industry visit: 10 Marks</li><li>CCE – III MCQ Test : 10 Marks</li></ul>(Best of two CCE Marks will be considered)</td><td>End Semester Examination: 30 (Marks)<ul><li>Question -1 – Solve the following questions ( five questions of 2 marks) 10 Marks</li><li>Question -2 –Attempt any two questions (three question of 10 marks) 20 Marks</li><li>Question -3 – Attempt nay four questions (five questions of 5 marks) 20 Marks</li><li>Note : Conversion of 50 marks of ESE to 30 marks</li></ul></td></tr>
</table>