



**Arts, Science and Commerce College CIDCO, Nashik-422 008**  
**Affiliated to Savitribai Phule Pune University, Pune**



**FOR**

**BACHELOR OF VOCATION (AGRICULTURE)**  
**IN**  
**FOOD PROCESSING TECHNOLOGY**

## Advanced Diploma in Food Processing Technology (Year II)

### Under Scheme of

### B. Voc. of UGC

**[Effective from 2019-20]**

### UGC Sponsored B. Voc Programme

Bachelor of Vocation (B. Voc.) is launched under the scheme of University Grants Commission on skill development based higher education leading to Bachelor of Vocation (B. Voc.) Degree with multiple exits as Diploma, Advanced Diploma and B. Voc. The B. Voc. Programme incorporate specific job roles and their National Occupational Standards along broad based general education. This course has been started in order to make education relevant and to create ‘**Industry Fit**’ skilled workforce. B. Voc. programme has been designed as per National Skill Qualification Framework emphasizing on skill based education.

### **Objectives**

- To provide judicious mix of skills relating to a profession and appropriate content of general education.
- To ensure that the students have adequate knowledge and skills, so that they are eligible to work at each exit point of the programme.
- To provide flexibility to students by means of pre-defined entry and multiple exit points.
- To integrate NSQF within the undergraduate level of higher education in order to enhance employability of the graduates and meet industry requirements. Such graduates apart from meeting the needs of local and national industry are also expected to be equipped to become part of the global workforce.
- To provide vertical mobility to students coming out with 10+2.

### **Preamble**

Arts, Science and Commerce College CIDCO, Nashik are offering a three year Bachelor Program in Vocational Education (B. Voc.) in Food Processing Technology from Academic year 2018-19. The curriculum design of this program is undertaken in the following framework (Preamble) as per the UGC guidelines for providing skill based education under National Skill Qualification framework.

In the age of globalization and increased unemployment there is huge demand for processed food and increased export of food and food products. This has opened a great avenue and career options for the students. Recent few years have proven to be a plethora of innovations in the field of food preservation and engineering therefore food industries are now voraciously absorbing food technologists at a very fast rate. A changing urban life style has been making processed food more dependable by the day. Besides this, quality assurance of food is a major concern which is opening up a quite a few opportunities in the Government and private sectors. Industries, Government agencies, educational and research institutions need the expertise of people holding advanced degree in food science and processing technology. In addition to food manufacturing companies, lot of other industries offer unlimited opportunities for food scientists in the areas of basic research, quality assurance, product development, regulatory affairs and the application of technology. It is estimated around 200000 jobs will be available in the food and allied sector in our country. Self-employment through establishing start up projects is an important area for the graduates of food technology. There are several government and development department schemes for establishing small and medium enterprises by food technologists. As a qualified food technologist one can find umpteen opportunities in Food Processing Technology multinational and national companies, research and development organizations, Government bodies and academic institutions in the world over.

## **Program Outcomes**

Vocational Education is education that prepares the students for specific job role in various sectors in Food Processing Technology industries and Professional organization. It trains the students from a trade, technician or professional position in Research and Development organizations for specific job roles.

The program outcomes are the skills and knowledge which the students acquire at each exit level and at the end of graduation. These outcomes are generic and are common to all exit levels mentioned in the program structure.

- Students with vocational training can find work in several state and central government organizations, non-profit groups, and academic institutions and in private sectors as well.
- This program prepares students for specific types of occupations and for direct entry into the market.
- After completion of this program students will have enough competences, to get benefit from market opportunities.
- This program would enable students to update their knowledge and professional skills for entering the work force, executing income generating activities or occupying better positions.
- At each exit level of this program, students will be able to
  - a) Apply knowledge of general education subjects and skill development subjects to the conceptualization of food processing technologies.
  - b) Designing and formulation of new food products, on the basis of consumer's demands, development of methodology/technologies of food processing, design that meet solutions needs with appropriate consideration for public health and safety, cultural, social and environmental considerations.
  - c) Conduct and undertake investigations of problems of including design of processing technology for various type food, food analysis, food quality and safety aspects and interpretation of data in order to provide valid conclusions.
  - d) Create, select and apply appropriate processing technology/techniques, resources, modern processing tools in order to improve the quality, safety and the shelf life of fresh and processed food.
  - e) Communicate effectively on minimal processing activity and value addition to the farmers/producers/grower at large, such as being able to comprehend and write effective reports, design documentation and make effective presentations.
  - f) Demonstrate understanding of the social, health, safety, legal, cultural issues and the consequent responsibilities relevant to Food processing.

- g) Understand and commit to professional ethics and responsibilities and norms/regulation for manufacturing of process food and its effects on health.
- h) Understand the impact of food processing technologies solutions in a social context and demonstrate technical know-how and understanding of food safety, quality for sustainable development.

#### **Levels of award**

The certification levels shall lead to Diploma/Advanced Diploma/B.Voc Degree (Agriculture) in Food processing.

<b>Award</b>	<b>Duration</b>	<b>Corresponding NSQF level</b>
Diploma in Food Processing Technology	1 Year	5
Advanced Diploma in Food Processing Technology	2 Year	6
B. Voc. Degree in Food Processing Technology	3 Year	7

Cumulative credits awarded to the students at the end of each year.

<b>Year</b>	<b>Skill Component Credits</b>	<b>General Education Credits</b>	<b>Total Credits for Award</b>	<b>Normal Duration</b>	<b>Exit Points/ Awards</b>
1	36	24	60	Two sem.	Diploma
2	72	48	120	Four sem.	Advanced Diploma
3	108	72	180	Six sem.	B. Voc. Degree

#### **Eligibility for admission in B. Voc.**

1. A candidate will be eligible to join 1<sup>st</sup> semester of B. Voc. Food Processing Technology course, if he/she has passed 10+2 examination, Diploma, 10+2 vocational stream (MCVC) from recognized Board/ university or any other examination recognized as equivalent to above mentioned.
2. Semester examination will be open to regular candidates who have been on the rolls of a college and meet the attendance and other requirements.
3. **Standard of Passing:** Student has to obtain 40% marks in the combined examination of In-Semester and End- Semester assessment with minimum passing of 30% passing in both assessments separately.

No. of Credits	Internal Marks Total	External Marks Total	Total Marks	Internal Passing Marks (30%)	External Passing Marks (30%)	Total Passing Marks (40%)
4	50	50	100	15	15	40
6	75	75	150	23	23	60

- **ATKT Rules:** A student cannot register for third semester if s/he fails to complete the 50% credits of the total credits expected to be ordinarily completed within two semesters.
- To qualify for admission to 5<sup>th</sup> semester (3<sup>rd</sup> year) of the course, the candidate must have passed 1<sup>st</sup> year and completed 50% credits of the 3<sup>rd</sup> and 4<sup>th</sup> semester (2<sup>nd</sup> year).
- **Attendance:** Students must have 75 % of attendance in each course for appearing examination otherwise he / she will not be allowed for appearing the examination of the course. However, students having 65 % attendance may request Principal for appearing the examination on medical ground.

### Evaluation Methods

The assessment will be based on Continuous Internal Assessment (CIA) and semester end examination (SEE). For each general course Continuous Internal Assessment (CIA) and semester end examination (SEE) will be of 50 marks each. For each skill based course Continuous Internal Assessment (CIA) and semester end examination (SEE) will be of 75 marks each. Marks obtained by the student in all heads viz. CIA and SEE will be added while declaring the final result.

**Continuous Internal Assessment (CIA):-** The internal marks shall be assigned on the basis of tutorials/home assignment/seminar presentation and weekly tests/class test/ preliminary examination, etc. to be conducted by the college. For practical courses continuous evaluation process will be on the basis of the following- Performance assessment of each experiment on the basis of attendance, punctuality, journal completion, practical skills, results, oral and analysis. Test on practical may be conducted before the end-semester examination. Assessment of each experiment shall be done for each practical weekly. If student misses internal assessment examination, she/he will have second chance with the permission of the concerned teacher. But it will not be right of the student. There shall be revaluation of answer script of end semester examination, but not of internal assessment papers. Internal assessment answer scripts may be shown to the concerned student but not end semester answer script.

**Semester End Examination (SEE):-** Semester end examination of the course would be held about two weeks after completion of teaching for the semester.

### Award of Class

Grades will be awarded from grade point average (GPA) of the credits.

Marks/Grade/Grade Point (10 Point Scale)

Marks	Grade	Grade point
80-100	O: Outstanding	10
70-79	A+: Excellent	9
60-69	A: Very Good	8
55-59	B+: Good	7
50-54	B: Above Average	6
45-49	C: Average	5
40-44	P: Pass	4
0-39	F: Fail	0
-	Ab: Absent	0

### Final Grade (10 Point Scale)

Grade Point Average	Grade
9.00 – 10.00	O
8.50 – 8.99	A+
7.50 – 8.49	A
6.50 – 7.49	B+
5.50 – 6.49	B
4.25 – 5.49	C
4.00 – 4.24	P
0.00 – 3.99	F

Remark- B+ is equivalent to 55% marks and B is equivalent to 50% marks.

### Computation of SGPA and CGPA

Credit Point (CP) = Credit (C) × Grade Point (G)

$$\text{SGPA } (S_i) = \sum (C_i \times G_i) / \sum C_i$$

SGPA = Semester Grade Point Average

$C_i$  = Number of Credit of the  $i^{\text{th}}$  course component

$G_i$  = Grade Points scored by the student in the  $i^{\text{th}}$  course component

### CGPA= Cumulative Grade Point Average

$$\text{CGPA} = \sum (C_i \times S_i) / \sum C_i$$

$S_i$  = SGPA of the  $i^{\text{th}}$  Semester

$C_i$  = Number of credits in that semester

$$\text{Grade Point Average} = \frac{\text{Total of Grade Point Earned} \times \text{Credit hrs for each Course}}{\text{Total Credit Hours}}$$

## **Course Code**

An eight character Course code is assigned to each course. The first two characters indicates the discipline, third and fourth character indicates the programme, fifth for year, sixth for semester, seventh characters for serial no of the course, eighth for general or skilled component.

### **Example: BVFP111G**

BV: Bachelor of vocation

FP: Food Processing Technology

1: First year

1: First semester

1: serial number of the course

G/S: General Component (G) / Skill Component (S)

**Course structure of B. Voc. Food Processing Technology****Diploma in Food Processing Technology****First year (Semester I & II)**

<b>Semester I</b>			
<b>Paper code</b>	<b>Title</b>	<b>No. of Credits</b>	<b>Marks</b>
<b>General education component</b>			
BVFP111G	Personality development and Computer Fundamentals	4	100
BVFP112G	Fundamentals of food and nutrition	4	100
BVFP113G	Introduction to food processing	4	100
<b>Skill Based Component</b>			
BVFP111S	Personality development	6	150
BVFP112S	Fundamentals of food and nutrition	6	150
BVFP113S	Introduction to food processing	6	150
	<b>Total</b>	<b>30</b>	<b>750</b>
<b>Semester II</b>			
<b>General education component</b>			
BVFP121G	Grape processing and preservation	4	100
BVFP122G	Principles of food preservation	4	100
BVFP123G	Fish, Meat and Egg Processing technology	4	100
<b>Skill Based Component</b>			
BVFP121S	Grape processing and preservation	6	150
BVFP122S	Principles of food preservation	6	150
BVFP123S	Fish, Meat and Egg Processing technology	6	150
	<b>Total</b>	<b>30</b>	<b>750</b>



**Course structure of B. Voc. Food Processing Technology**  
**Advanced Diploma in Food Processing Technology**  
**Second year (Semester III & IV)**

<b>Semester III</b>			
<b>Paper code</b>	<b>Title</b>	<b>No. of Credits</b>	<b>Hours/week</b>
<b>General education component</b>			
BVFP231G	Fundamental of Food Biochemistry	4	100
BVFP232G	Basics of Food Packaging	4	100
BVFP233G	Agro-Processing	4	100
<b>Skill Based Component</b>			
BVFP231S	Fundamental of Food Biochemistry	6	150
BVFP232S	Basics of Food Packaging	6	150
BVFP233S	Agro-Processing	6	150
	<b>Total</b>	<b>30</b>	<b>750</b>
<b>Semester IV</b>			
<b>General education component</b>			
BVFP241G	Bakery and confectionary	4	100
BVFP242G	Food quality assurance and control	4	100
BVFP243G	Milk and milk product processing	4	100
<b>Skill Based Component</b>			
BVFP241S	Bakery and confectionary	6	150
BVFP242S	Food quality assurance and control	6	150
BVFP243S	Milk and milk product processing	6	150
	<b>Total</b>	<b>30</b>	<b>750</b>

## Course structure of B. Voc. Food Processing Technology

### B. Voc. Food Processing Technology

#### Third year (Semester V & VI)

Semester V			
Paper code	Title	No. of Credits	Hours/week
<b>General education component</b>			
BVFP 351G	Marketing , retail management and Entrepreneurship Development	4	100
BVFP 352G	Food spoilage and control	4	100
BVFP 353G	Food industry waste management	4	100
<b>Skill Based Component</b>			
BVFP 351S	Marketing ,retail management and Entrepreneurship Development	6	150
BVFP 352S	Food spoilage and control	6	150
BVFP 353S	Food industry waste management	6	150
	<b>Total</b>	<b>30</b>	<b>750</b>
Semester VI			
<b>General education component</b>			
BVFP 361G	Technology of Beverages	4	100
BVFP 362G	Food processing plant designing and Documentation	4	100
BVFP 363G	Emerging Technologies in Food Industry	4	100
<b>Skill Based Component</b>			
BVFP364S	Industrial/ Institutional project	14	350
BVFP365S	Preparation of Food Processing plant Proposal	04	100
	<b>Total</b>	<b>30</b>	<b>750</b>

**Food Processing Technology**  
**Year 3: B. Voc. Food Processing Technology**  
**Semester V**

**BVFP351G: Marketing, Retail Management and Entrepreneurship Development (General)**

**Total credits: 4**

**Teaching hours -40(4 hours/week)**

**Aim of the course:** To know about the various types marketing strategy involved in generating sales for a new food products. To develop Entrepreneurial culture and encourage the students to become entrepreneurs.

**Outcome of the course:** Development of basic idea about different marketing skills, Knowledge of the different ways in which a food can be marketed to give optimum visibility. Understanding of the importance of packaging in improving sales and the latest marketing trends. Knowledge of the various procedures for starting a small scale unit of production. Information about various agencies that can provide assistance for starting a new project.

**Syllabus**

**Unit I: Marketing strategy in Food processing industry**

**5 Hours**

Strategic planning and the marketing process, the marketing environment, consumer markets. Rural marketing, industrial marketing, overview, advertising and promotion. Product and services strategy, pricing products, distribution and supply chain management channels. Direct and online marketing, competitive strategies.

**Unit II: Product and Brand Management**

**9 Hours**

Consumer buying behavior, sales management and sales promotion. Food product handling and transportation. Place of retailing in the marketing mix- Trends in retailing, communication and customer relations. Managing People at Work - recruitment and motivation, total quality management, product development, globalization in food industries.

**Unit III: Entrepreneurial Development Programme**

**10 Hours**

Introduction to Entrepreneurship- Meaning, definition and concepts, characteristics, functions, entrepreneurial traits and motivation, role of entrepreneur in economic development, factors affecting entrepreneurial growth. Types of entrepreneurs, Women entrepreneurship- significance, problems, solutions to the problems.

Steps of entrepreneurship development.

**Unit IV: Setting up of micro, small and medium enterprises****10 Hours**

Setting up of micro, small and medium enterprises, location significance, Green channel, Bridge capital, Seed capital assistance, Margin money scheme, Sickness, Causes-Remedies.

**Unit V: Role of institutions/schemes in entrepreneurial development****6 Hours**

MOFPI, NABARD, SIDCO, SIDBI, NIESBUD, EDII, SISI, NREG Scheme- SWARNA JAYANTHI, Rozgar Yojana Schemes, etc.

**References:**

- 1) Robert Reeder, Edward G, Industrial Marketing – Analysis, Planning and Control.
- 2) Krishna K. Havaldar, Industrial Marketing , Tata McGraw Hill
- 3) Jagdish Sheth & G shainesh, Customer Relationship Management,
- 4) Michael Levy, Retailing Management.
- 5) Swapna Pradhan, Retailing Management – Text & Cases.
- 6) Gibson Vedamani, Retail Management.
- 7) Walker and Larreche, Marketing Strategy – Boyd, McGraw Hill Irwin
- 8) David Aaker , Strategic Market management, John wiley & sons
- 9) George Belch, San Diego University Michael Belch, Advertising and Promotion: An Integrated Marketing Communications Perspective, San Diego University
- 10) Drucker, Peter “Innovation and Entrepreneurship”, Routledge Publishers.
- 11) Abraham M.M, “Entrepreneurship Development and Project Management”, Prakash Publications and Printers.
- 12) Desai, Vasant, “Dynamics of entrepreneurial development and management”. Himalaya Publishing House.

## **BVFP351S: Marketing and Retail Management (Skill based)**

**Total credits: 6**

### **List of Practicals:**

1. To collect different branded food items and their qualitative and quantitative comparison.
2. To conduct survey and prepare a report on consumer behavior with respect to a particular product.
3. To study parameters of customer satisfaction.
4. To plan for industrial unit set up for a product.
5. To study advantages & disadvantages of on line shopping.
6. Case studies regarding marketing management.
7. Survey of marketing in retail malls.
8. Study of information technology for merchandising techniques used by various retailers in an around Nasik.
9. Identification of best practices in buying.
10. Study of various methods of advertising.
11. Statistical analysis of consumer behavior of Nasik region.
12. Comparison of any three brands of food.
13. Analyze and compare two different franchisee food stores and identify their success factors.
14. Test to assess the Entrepreneurial spirit of learner through questionnaire (Entrepreneurial Self Assessment Tool).
15. A SWOT analysis of entrepreneurial opportunity in your locality with reference to the vocational course.
16. Video display of success story of entrepreneurs.
17. Seminar by successful entrepreneurs.

## **BVFP352G: Food Spoilage and Control (General)**

**Total credits: 4**

**Teaching hours -40(4 hours/week)**

**Aim of the course:** To study micro flora of processed foods under proper hygienic environment by implementing hazard analysis and to transform safe food around the globe.

**Outcome of the course:** Application of good manufacturing practices and good hygiene practices in food processing industries for safe food.

### **Syllabus**

#### **Unit I: Microscope and Microscopy**

**6 Hours**

Principles and types of different microscopes Control of micro-organisms, Control of enzymes & other factors.

#### **Unit- II: Sterilization**

**8 Hours**

Principles and Applications of (a) Physical Methods- Autoclave, Hot air oven, Laminar airflow, Seitz filter, Sintered glass filter, Membrane filter, (b) Chemical methods- Alcohol, Aldehydes, Phenols, Halogens, Gaseous agents and (c) radiation methods- UV rays, Gamma rays.

#### **Unit III: Food Preservation**

**8 Hours**

Principles and methods of food preservations (Physical; Drying, Freezing, Irradiation & Chemicals; Nitrites, Nitrates Sulphites, Sulphates and Antibiotics); Food adulteration, methods of evaluation of food adulterants.

#### **Unit IV: Food Contamination and Spoilage**

**12 Hours**

Major Causes of food spoilage (Physical, Chemical and Microbiological). Spoilage of fruits and vegetables, meat and meat products, fish, eggs, milk and milk products and canned foods.

#### **Unit V: Food Borne Diseases**

**6 Hours** Bacterial

food borne diseases (*Salmonella*, *Enterohemorrhagic E. coli*, *Listeria monocytogenes*, *Staphylococcus aureus*, *Clostridium botulinum*, *Clostridium perfringens*, *Bacillus cereus*), Non bacterial Food borne diseases (Mycotoxin, Aflatoxin, Patulin, Ochratoxin)

## References

- 1) James M Jay, "Modern Food Microbiology", CBS Publishers New Delhi
- 2) Pelczar, Chan & Krieg; "Microbiology", Tata-McGraw Hill Pub.
- 3) Stanier, R.Y. Adelberg, E.A. and Ingraham, J.L. (1984), "General Microbiology", IV edn Mac Millan Press.
- 4) Prescott. L.M. Harley J.P. and L. Kreig D.A. (1990). "Microbiology", WCB Publishers.
- 5) Banwart G. J. (1989). "Basic Food microbiology", 2nd Edn. Chapman and Hall. International Thompson Publishing.
- 6) William C. Frazier, Dennis C. Westhoff, N. M. Vanitha (2013). "Food Microbiology, 5thEdn.McGraw-Hill Education (India).
- 7) Thomos jay mont wille, "Food microbiology: An introduction" ASM press.
- 8) Bibek R.Ray, "Fundamental of food microbiology" CRC press.

## **BVFP353S: Food Spoilage and Control (Skill based)**

**Total credits: 6**

### **List of Practicals:**

1. Laboratory orientation and familiarization with Laminar air flow, analytical balance, oven, incubator, colony counter, autoclave, laboratory shaker.
2. Demonstration of compound microscope.
3. To perform streak plate techniques.
4. To perform spread plate techniques.
5. Isolation of microorganism from food samples.
6. To perform drying of given food material.
7. To perform Freezing of given food material.
8. To analyze adulterants in given food material.
9. Study of food preservation experiment.
10. Direct microscopic count for foods.
11. Sugar fermentation test.
12. Detection of pathogen in food (any 1).
13. Detection of coli forms in food.
14. To check efficiency of sterilization.
15. Visit to cold storage.



## **BVFP353G: Food Industry Waste Management (General)**

**Total credits: 4**

**Teaching hours -40(4 hours/week)**

**Aim of the course:** To understand ways for effective utilisation of the by products obtained after food processing and also to gain knowledge of characterisation of waste products and effluent treatment methods.

### **Outcome of the course**

Identification of types of wastes in food industry. Knowledge of different effluent treatment methods. Utilization of the by- product in the food industry.

### **Syllabus**

#### **Unit I: Introduction**

**10 Hours**

Classification and characterization of food industrial wastes from Fruit and Vegetable processing industry, Beverage industry, Fish, Meat & Poultry industry, Sugar industry and Dairy industry.

Waste disposal methods – Physical, Chemical & Biological.

Economical aspects of waste treatment and disposal.

#### **Unit II: Treatment Methods of Liquid Waste**

**12 Hours**

Treatment methods for liquid wastes from food process industries. Design of Activated Sludge Process, Rotating Biological Contactors, Trickling Filters, UASB, Biogas Plant.

#### **Unit III: Treatment Methods of Solid Wastes**

**8 Hours**

Biological composting, drying and incineration, Design of Solid Waste Management System: Landfill Digester, Vermicomposting Pit. Biofilters and Bioclarifiers, Ion exchange treatment of waste water, Drinking-Water treatment, Recovery of useful materials from effluents by different methods.

#### **Unit IV: Utilisation of waste**

**10 Hours**

Thermal and biotechnological uses of rice husk - pyrolysis and gasification of rice, utilisation of rice bran, and citric acid production from fruit waste, Coconut processing – by- product utilization – fuel briquette.

## References:

- 1) V. Oreopoulou, W. Russ, (ed), "Utilization of by-products and treatment of waste in the food industry" Vol, 3.,Springer.
- 2) K. Waldron, "Handbook of waste management and co-product recovery in food processing .CRC.
- 3) R. Smith, J. Klemes, J-K Kim "Handbook of water and energy management in food processing.", CRC.
- 4) C. Yapijakis , L.Wang, Yung Tse- Hung,. "Waste treatment in the food processing industry", H. LO, CRC,
- 5) Herzka A & Booth RG; Applied Science Pub Ltd, Food Industry Wastes: Disposal and Recovery
- 6) Fair GM, Geyer JC & Okun DA; "Water & Wastewater Engineering : Water supply and waste water Removal". John Wiley & Sons, Inc.
- 7) Bartlett RE, "Water & Wastewater Engineering"; Applied Science Pub Ltd.
- 8) Green JH & Kramer A; "Food Processing Waste Management"; AVI.
- 9) Rittmann B.E & McCarty PL; "Environmental Biotechnology: Principles and Applications", Mc-Grow-Hill International editions.
- 10) Bhattacharyya B C & Banerjee R; "Environmental Biotechnology", Oxford University Press.
- 11) P. N. Chereminnoff & A.C Morresi, "Energy from Solid Wastes".
- 12) A. Chakravarthy & De, "Agricultural Waste and By Product Utilisation".
- 13) Bor S. Luli (ed), "Rice Production and Utilisation".
- 14) E. Beagle, "Rice Husk Conversion to Energy".

## **BVFP353S: Food Industry Waste Management (Skill based)**

**Total credits: 6**

### **List of Practicals:**

1. Determination of BOD of water sample.
2. Determination of COD of waste sample.
3. Determination of total suspended solids (TSS).
4. Determination of the total dissolved solids (TDS).
5. Determination of the volatile and non-volatile components.
6. Flow process chart of food plant waste utilization processes.
7. Determination of the phenol content of water sample and evolution of parameters.
8. To operate the electrodialysis apparatus.
9. Uses of membrane filter separation techniques for salt brine and reverse osmosis process for sugar.
10. Recovery of proteins from food waste.
11. Extraction of fats from food waste.
12. Utilization of waste in animal feed.
13. Anaerobic treatment of food processing waste.
14. Production of earthworm protein from waste.
15. Visit to food waste treatment plant.

**Food Processing Technology**  
**Year 3: B. Voc. Food Processing Technology**  
**Semester VI**  
**BVFP 361G Technology of Beverages (General)**

**Total credits: 4**

**Teaching hours - 40(4 hours/week)**

**Aim of the course:** The aim of the course is to provide the students with general scientific knowledge about processing of alcoholic and non- alcoholic beverages.

**Outcome of the Course:** Knowledge of the various beverages and the products made out of them. Technical view of beverages and understanding of the manufacturing processes in the context of technology.

**Syllabus**

**Unit I: Introduction to beverages**

**6 Hours**

Types of beverages and their importance, status of beverage industry in India, Manufacturing technology for juice-based beverages, synthetic beverages, technology of still, carbonated, low-calorie and dry beverages, isotonic and sports drinks; role of various ingredients of soft drinks, carbonation of soft drinks.

**Unit II: Manufacturing process of beverages**

**7 Hours**

Beverages based on tea, coffee, cocoa, spices, plant extracts, herbs, nuts, Dairy-based beverages.

**Unit III: Types of coffee and tea**

**12 Hours**

Chemical composition and processing of tea and coffee and their quality assessment.

Types of tea- black tea, green tea, oolong tea.

Types of coffee- Vacuum coffee, drip coffee, iced coffee. Espresso coffee, instant coffee.

Decaffeination of Coffee- types of decaffeination (Roselius method, swiss water process, direct and indirect method, triglyceride method, carbon dioxide method).

**Unit IV: Alcoholic beverages**

**10 Hours**

Types, manufacture and quality evaluation; the role of yeast in beer and other alcoholic beverages, ale type beer, lager type beer, technology of brewing process, equipments used for brewing and distillation, wine and related beverages, distilled spirits.

**Unit V: Packaged drinking water****5 Hours**

Definition, types, manufacturing processes, quality evaluation and raw and processed water, methods of water treatment, BIS quality standards of bottled water; mineral water, natural spring water, flavoured water, carbonated water.

**References:**

1. Manay, N.S, Shandaksharaswamy, M., (2004), "Foods- Facts and Principles", New Age International Publishers, New Delhi,
2. Potter, N.N, Hotchkiss, J.H.( 2000), "Food Science". CBS Publishers, New Delhi.
3. Srilakshmi, B. Food Science (3<sup>rd</sup> Edition) (2003), New Age International (p) Limited Publishers, New Delhi,
4. Nicholas Dege. (2011), "Technology of Bottled water". Blackwell publishing Ltd.
5. Rashid Abafita Abawari, "Food and beverage fermentation technology." Auris Reference.
6. George Charalambous, "Handbook of food and beverage stability." Academic press.
7. Hui Y.H., "Handbook of food and beverage fermentation technology."CRC press.

## **BVFP 362G: Food Processing Plant Designing and Documentation (General)**

**Total credits: 4**

**Teaching hours - 40(4 hours/week)**

**Aim of the course:** To study design of plant and processing unit and to get a thorough knowledge about the importance of a good food plant design. To provide students with various documentation in food industry.

**Outcome of the Course:** Understanding of concepts of plant layout. Knowledge on building, utilities in the plant and importance of proper food plant design and safety. Knowledge of documents required for food industry. Familiarization with ERP and documentation of finished product.

### **Syllabus**

#### **Unit I: Introduction**

**8 Hours**

Definition, Basic concepts of plant layout and design with special reference to food process industries. Application of HACCP concept, ISO, FSSAI & MPO requirements in food plant layout and design.

Plant Location- Influence of location on plant layout, location factors, location theory and models, Economic plant size, types of manufacturing processes like continuous, repetitive and intermittent processes.

#### **Unit II: Plant Layout and Building**

**8 Hours**

Preparation of a Plant Layout, Plant Layout problem, importance, objectives, classical types of layouts. Evaluation of layout. Advantages of good layout. Considerations in building design, type of factory buildings, choice of building construction, material for floors, foundation, walls, doors, windows, drains etc, ventilation, fly control, mold prevention and illumination in food processing industries.

#### **Unit III: Introduction to documentation in food industry**

**8 Hours**

Documentation and inspection of raw material in food industry. Methods of documentation for raw material to finished product.

#### **Unit IV: Enterprise resource planning**

**8 Hours**

Introduction and implementation of ERP, application of ERP in food industry, Essential guidelines of ERP in food processing industries.

#### **Unit V: Documentation of finished product detail**

**8 Hours**

Name of the product, batch number, time of packing, date of manufacture, date of expiry, other label detail, primary, secondary and tertiary packing material for finished product, storage conditions.

**References:**

- 1) John Holah, H. L. M. Lelieveld, "Hygienic Design of Food Factories", Elsevier Publication.
- 2) J. Peter Clark, "Practical Design, Construction and Operation of Food Facilities", Academic Press Publishers.
- 3) Zacharias B. Maroulis, George D. Saravacos, "Food Plant Economics", CRC Press Publishers.
- 4) Antonio Lopez-Gomez, Gustavo V. Barbosa-Canovas, "Food Plant Design", CRC Press Publishers.
- 5) K. T. Patel and N.P Chotai, "Documentation and record: Harmonized GMP requirement".
- 6) P.J Lovett, A Ingram, C.N Bancrot, "Knowledge-based engineering for SMEs- a methodology"
- 7) Tufan Koc, "The impact of ISO 9000 quality management system on manufacturing"
- 8) Inka Heidi Vilpola, "A Method for improving ERP implementation success by the principle and process of user centred design".
- 9) A Rockley, "Proceedings of the 34th International Technical, Online documentation: from proposal to finished product".
- 10) Axel Röder, Bernd Tibken, "A methodology for modeling inter-company supply chains and for evaluating a method of integrated product and process documentation".

## **BVFP 363G: Emerging Technologies in Food Industry (General)**

**Total credits: 4**

**Teaching hours - 40(4 hours/week)**

**Aim of the course:** To understand new developments in food industry and to impart knowledge of the importance and applications of the recent technology.

**Outcome of the Course:** Enable the student to understand: Emerging / alternative technologies applied to food processing. Knowledge of relative advantages / disadvantages over existing technologies and economics and commercialization of newer technologies.

### **Syllabus**

#### **Unit I: Membrane separation process 4 Hours**

Membrane Technology-process- Micro-filtration, Ultra-filtration, Nano-filtration and Reverse Osmosis-advantages-equipments used.

#### **Unit II: High pressure processing and microwave heating 9 Hours**

Microwave heating of foods- Mechanism of Heat Generation-Working of microwave oven, High Pressure processing- Concept-Equipment for HPP Treatment-Mechanism of Microbial Inactivation and its Application in food, dielectric heating of foods.

#### **Unit III: Irradiation and PEF and ohmic heating 9 Hours**

Irradiation- principle, types of irradiation-advantages-applications.

Pulsed electric field – equipment, mechanism of PEF-advantages.

Ohmic heating of foods- mechanism- principle-advantages, applications.

#### **Unit IV: Osmotic dehydration of foods and minimal processing 9 Hours**

Osmotic dehydration- Principle, Mechanism, Effect of process parameters on mass transfer, Methods to increase the rate of mass transfer, Applications, Limitations of osmotic dehydration, Management of osmotic solutions.

Minimal processing- principle, methods, advantages.

#### **Unit V: Nanotechnology and antimicrobial technology 9 Hours**

Role of Antimicrobial agents in food –Plant and animal derived antimicrobials, Antimicrobial enzymes, antimicrobial food packaging, nanotechnology-application of nanotechnology in food industry



## References

1. Leistner L. and Gould G. "Hurdle Technologies – Combination treatments for food stability safety and quality", Kluwer Academics / Plenum Publishers, New York.
2. Gustavo V. Barbosa-Canovas, Maria S. Tapia, M. Soledad Tapia, M. Pilar Cano "Novel Food Processing Technologies" (Food Science and Technology Series) Publisher: CRC Press.
3. Da- Wen-Sun, "Emerging technologies for food processing" Academic press.
4. Fellows P. J., "Food processing technology principle and practice." CRC press.
5. Suwendu Bhattacharya, "Conventional and advance food processing technologies." John Wiley and sons.
6. Jatindra Kumar Sahu, "Introduction to advanced food process engineering." CRC press.
7. P Richardson , "Thermal Technologies in Food Processing", Campden and Chorleywood Food Research Association, UK, Woodhead Publishing Limited.

## **BVFP 364S: Industrial/ Institutional Project (Skill based)**

**Total credit: 14**

**Aim of the course:** To allow student to demonstrate the personal abilities and skill required to produce and present the extended piece of work.

**Outcome of the course:** Improve personal inquiry, action and reflection on specific topics and issues. Will enhance student's knowledge in food processing technology. Increase self confidence of the student and helps in finding their own proficiency. Cultivate student's leadership ability and responsibility to perform or execute the given task. Provide hands on practice within a real job situation. Student can become master in one specialized technology.

## **BVFP 365S: Preparation of Food Processing Plant Proposal (Skill based)**

### **Total credit: 4**

The project report to start new industry on food processing and agro based includes present market position and expected future demand, market size, statistics, trends, SWOT analysis and forecast.

This report gives access to decisive data such as

- Market growth drivers
- Factors limiting market growth
- Current market trends
- Market structure
- Key highlights.