Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Department of Food Processing Technology

Curriculum
For the Academic Year 2020-21

Three Year Degree Programme in B. Voc Food Processing Technology

(Six Semester Pattern)

UG Third Year
Semester V and VI

Syllabus Approved by Board of Studies in Biotechnology with effect from June, 2020

Rajarshi Shahu Mahavidyalaya, Latur
(Autonomous)
B. Voc. Food Processing Technology

Introduction: Food processing is the branch of Food Science, where a set of techniques and methods are used to change the raw ingredients into prepared food. It is a procedure in which food is prepared for consumption purposes by humans and animals. Food processing is the transformation of agricultural products into food, or of one form of food into other forms. Food processing includes many forms of processing foods, from grinding grain to make raw flour to home cooking to complex industrial methods used to make convenience foods.

Food processing is a broad term, in itself, which includes processing, preservation, manufacturing, packaging, and canning various food items. In India, Food Processing industry is gaining momentum as the consumer food industry. The modern food processing techniques have prompted the feasibility of the development of the present-day stores.

Food processing industries lead to the highest employment in all industry. So, giving employment indirectly to the almost lakhs of people. Food processing industry in India provides numbers of direct and indirect employment opportunities because it somehow connects the Agriculture to the Manufacturing. In the upcoming years, there will be good demand for healthy, modern food products. India is the second largest producer of food next to China.

It is expected that in upcoming of few years the total food production in India is maybe double and there is an opportunity for the graduates of food processing technicians. The most common areas of employment are Canning, Dairy and Food Processing. Packaging. Frozen Food Refrigeration and Thermo Processing. Some of the sub-sectors of the food processing industry are Fruits & Vegetables Processing. Fisheries, Milk & Milk Products, Meat & Poultry, Alcoholic Beverages & Soft Drinks and Grain processing. You can also employ in the consumer product groups like confectionery, chocolates and cocoa products, Soya-based products, mineral water, high protein foods, soft beverages, alcoholic and non-alcoholic fruit beverages, etc. Taking into consideration of the importance of food processing technology Rajarshi Shahu Mahavidyalaya, Latur (Autonomous), have taken an initiative to introduce a new emerging field as a under graduate Programme in Food technology under the faculty of science. B. Voc Food Processing Technology is a Three-year degree program which is started in the academic year 2018-19.

B. Voc Food processing has been designed on Accordance with the changing scenario in the field of food sciences, its demand and necessary needs. to uplift betterment of society and environment. The designed syllabus of food technology is effectively implemented from 2018. The committee members of BoS in food technology also took the local need and employability of graduate students while framing the syllabus, keeping in view of the guidelines given in the UGC curriculum. The number of objectives is taken into consideration while reforming the syllabus.

Local, Regional and Global relevance of Syllabus:

Curriculum developed and implemented have relevance to the local, regional and global developmental needs which is give back in Programme Specific Outcomes/ Programme Outcomes and Course Outcomes of the Programmes extend by the College.

Global and local focus has slowly shifted to using knowledge of Food Science for innovative technology development that is being used for betterment of human life. Many fundamental and modern research field comes under the Food Processing Technology e.g., Sugar Processing Technology, Food Industry Waste Management, Food Hygiene and sanitation, Human Resource Development, Entrepreneurship Development, Bakery & Confectionary Etc.

Title of programme: B. Voc. Food Processing Technology

Learning Objectives of the programme:

The main objective is to create technologically skilled minds for the understanding theoretical and practical knowledge essential for implementation from LAB to LAND further it will useful in processing of food. It helps effectively to inculcate scientific temper and social attitude to solve various problems related to wastage of food material.

The member of Board of Studies from various organizations has a strong recommendation for Job oriented syllabus is to be included. Accordingly. The necessary changes have been effectively implemented in Curriculum.

Programme Specific outcomes/ Programme Outcomes:

At the end of the program the student will be able to:

1. Apply knowledge of food science or food processing technology to the society.
2. Processing of raw material to edible food products by using technical knowledge.
3. Apply research-based knowledge and food technological methods to development of new product
4. Entrepreneurship development

B. Voc. Programme:

The B. Voc. Programme has been designed as per National Skill Qualification Framework (NSQF) emphasizing on skill-based education

Duration of Program:

The duration of Program is 3 years with 3 exit points.

Sr. No.	Award	Duration	Core level/ responding/ NSQF
1	Diploma	1 Year	5
2	Advanced Diploma	2 Year	6
3	B. Voc Degree	3 Year	7

Note:

1. After successful completion of second semester (1st Year) a **Diploma** will be awarded to the candidate.
2. After successful completion of fourth semester (2nd Year) an **Advance Diploma** will be awarded to the candidate.
3. After successful completion of six semesters (3rd Year) B. Voc. **Degree** will be awarded to the candidate

Eligibility criteria for admission:

12th class or equivalent from any stream.

Total number of seats:

B. Voc. (Food processing & Technology): 50

Fees for Course: As per University/College rules.

Admission / Selection procedure: Admission by merit through Registration

Teacher's qualifications: As per UGC/University/College rules

Standard of Passing: As per UGC/University/College rules

Nature of question paper with scheme of marking:
As per UGC/University/College rules

List of books recommended: Included in syllabus

Laboratory Equipment's, Instruments, and Measurements etc.:

The department of Food processing and Technology has well equipped laboratories with all necessary and advance instrumentation facility.

Rules and regulations and ordinance if any:

As per UGC/University/College rules

Course Duration: Each theory Course is of 60 contact hours
Medium of the language: English

Rajarshi Shahu Mahavidyalaya, Latur
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Department of Food Processing Technology
Course Structure of B.Voc. Food Processing Technology Third Year

B. Voc. III [Food Processing Technology] Semester V

		Course Code	Course Title	Credits	Hrs / Week	CIA	Ext. Exam	Marks
Semester -V	FPT.GE1	U-ALR-649	Aptitude and Logical Reasoning-II (General Education)	4	4	40	60	100
	FPT.GE2	U-PHM-650	Post-Harvest Management (General Education)	4	4	40	60	100
	FPT.GE3	U-END-651	Entrepreneurship Development (General Education)	4	4	40	60	100
			Total Credit (A)	**12**				
	FPT.SCT1	U-SPT-652	Sugar Processing Technology	4	4	40	60	100
	FPT.SCT2	U-FWM-653	Food Industry Waste Management	4	4	40	60	100
	FPT.SCT3	U-FBP-654	Food and Beverages Processing	4	4	40	60	100
	FPT.SCP1	U-LAC-655	Lab Course - XIII	2	3	20	30	50
	FPT.SCP2	U-LAC-656	Lab Course - XIV	2	3	20	30	50
	FPT.SCP3	U-LAC-657	Lab Course - XV	2	3	50	30	50
			Total Credit (B)	**18**		**Total Marks (B)**		**450**
			Total Credit (Sem-V) (A + B)	**30**		**Total Marks (A+B)**		**750**

B.Voc. III [Food Processing Technology] Semester VI

		Course Code	Course Title	Credits	Hrs / Week	CIA	Ext. Exam	Marks
Semester - VI	FPT.GE1	U-HRD- 751	Human Resource Development (General Education)	4	4	40	60	100
	FPT.GE2	U-FOS-752	Free and Open Source Softwares (FOSS) (General Education)	4	4	40	60	100
	FPT.GE3	U-IDB-753	Introductory Biotechnology (General Education)	4	4	40	60	100
			Total Credit (A)	**12**				
	FPT.SCT1	U-FHS-754	Food Hygiene and sanitation	4	4	40	60	100
	FPT.SCT2	U-BEC-756	Bakery & Confectionary	4	4	40	60	100
	Industrial Project Work	U-IIP-758	Industrial Institutional Project	4	4	40	60	100
	FPT.SCP1	U-LAC-755	Lab Course - XVI	2	3	20	30	50
	FPT.SCP2	U-LAC-757	Lab Course -XVII	2	3	20	30	50
	FPT. Seminar	U-SEM-759	Seminar-I	2	3	50	-	50
			Total Credit (B)	**18**		**Total Marks (B)**		**450**
			Total Credit (Sem-VI) (A + B)	**30**		**Total Marks (A+B)**		**750**
			Total Credit (Sem-V + Sem VI)	**60**				**1500**
	Note: GE- General Elective, SCT- Selective course theory and SCP- Selective course practical.							

Rajarshi Shahu Mahavidyalaya, Latur
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B. Voc. Food Processing Technology
V Semester

Course Title: Aptitude and Logical Reasoning-II **Course Code:** U-ALR-649

Marks: 100 **Hours: 60** **Credit: 04**

Learning Objectives:

- To enhance students' numerical ability Which further be used to qualify national level tests including UPSC, SSC, etc.
- To build up students Logical Reasoning
- To impart detailed understanding of Calendar Problem.
- To provide the information on numerical aptitude and implementation in day-to-day life.

Course Outcomes:

On the successful completion of the course, student will be able to-

- understand the problems on numerical abilities in day-to-day life
- acquaint the knowledge about Development of logical skills
- gain knowledge about Tricks and Shortcuts for calculations on calendar.
- understand the Clock Problem

Unit I: **(15L)**

Numerical Ability:

Important Sequences: Arithmetic Sequences, Geometric Sequence. Probability: Approach of probability, The use of conjunction AND, The use of conjunction OR, Combination of AND, OR. Another approach of Probability (General), Important facts abouts probabilities. Permutations & Combinations. Mean. Median & Mode: Theory, Examples., Standard Deviation, Variance.

Unit II: **(15L)**

Logical Reasoning:

Data Interpretation: Theory, Table, Bar Chart, Line graph, Histograms, Pie Charts. Observational Ability: Theory, to draw a Venn Diagram, Logical Puzzles: Theory, Problems. Observational Ability; Theory, draw a Venn diagram

Unit III: **(15L)**

Typical Problems:

Calendar Problem: The History, Theory: Odd Days, Leap Year, Ordinary Year, Counting of Odd Days, Tricks and Shortcuts for calculations, working rule for finding the day of a given date,

Conditions for calendars of two different years to be same.

Unit IV: **(15L)**

Clock Problem:

Theory, Important facts and shortcuts for quick calculation, some important types of clock problems. Moving Locomotive Problem, Series Formation: Theory, Number Sequence, Letter Sequence, Symbol Sequence.

Recommended Textbooks and References:

1. General Aptitude- A New Outlook by Christy Varghese.
2. Verbal and Non-verbal reasoning by Dr. R.S. Aggarwal
3. Quantitative aptitude by Dr. R.S. Aggarwal
4. Quantitative Aptitude and Reasoning by R. V. Praveen, (2016).

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B. Voc. Food Processing Technology

V Semester

Course Title: Post Harvest Management **Course Code:** U-PHM-650

Marks: 100 **Hours: 60** **Credit:04**

Learning Objectives:

- To create awareness about Importance of post-harvest management.
- To provide the information on factors affecting post-harvest losses.
- To inculcate the new approaches to Commodity pretreatments of fruits
- To know the knowhow about Physiological post-harvest disorders and their management.

Course Outcomes:

On the successful completion of the course, student will be able to-

- acquaint the knowledge about General principles and method of preservation.
- gain knowledge about the Standards and specifications for fruits and vegetables.
- understand losses due to poor management of fruits and vegetables after harvesting.
- recognize the possible remedies and technology for post-harvest management.

Unit I: **(17L)**

Introduction to Post-harvest technology

Post-harvest technology: Importance of post-harvest management of food; Causes of post-harvest losses; Maturity, ripening and biochemical changes after harvesting; post-harvest loss reduction technology including aspects of packaging, storage, post-harvest treatment; General principles and method of preservation; Principles and applications of modern techniques in food processing.

Morphology, structure and composition of fruits and vegetables; maturity indices and standards for selected fruits and vegetables; methods of maturity determinations.

Unit II: **(15L)**

Post-harvest losses and processing

Harvesting and handling of important fruits and vegetables, Field heat of fruits and vegetables and primary processing for sorting and grading; factors affecting post-harvest losses; Standards and specifications for fresh fruits and vegetable.

Unit III: **(15L)**

Post-harvest physiological and biochemical changes in fruits and vegetables; ripening of climacteric and non-climacteric fruits; Storage practices: CA and MA, hypobaric storage, pre-cooling and cold storage; Commodity pretreatments - chemicals, wax coating, prepackaging and irradiation.

Unit IV **(13L)**

Storage of Post harvest Processed Food

Physiological post-harvest disorders - chilling injury, freeze injury and disease. Prevention of post-harvest diseases and infestation; Handling and packaging of fruits and vegetables.

Recommended Textbooks and References:

1. Salunkhe DK, Bolia HR & Reddy NR. 1991. Storage, Processing and Nutritional Quality of Fruits and Vegetables. Vol. I. Fruits and Vegetables. CRC.
2. Thompson AK. 1995. Post -Harvest Technology of Fruits and Vegetables. Blackwell Sci.
3. Verma LR. & Joshi VK. 2000. Post- Harvest Technology of Fruits and Vegetables. Indus Publication

Rajarshi Shahu Mahavidyalaya, Latur
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B. Voc. Food Processing Technology
V Semester

Course Title: Entrepreneurship development **Course Code:** U-END-651
Marks: 100 **Hours: 60** **Credit:04**

Learning Objectives:

- To explain the role of Entrepreneurship in Economic Growth
- To understand the knowledge of Major Motives Influencing an entrepreneur.
- To develop and strengthen entrepreneurial quality and motivation in students and to impart basic entrepreneurial skills and understanding to run a business efficiently and effectively.
- To Know the government schemes and incentives for promotion of entrepreneurship

Course Outcomes:

On the successful completion of the course, student will be able to-

- get knowledge about the Problems and factors Affecting Entrepreneurial Growth.
- acquaint the knowledge about objectives of Entrepreneurship Development
- understand the knowledge and skills needed to run a business successfully.
- understand the government policy on small and medium enterprises.

Unit I: **(15L)**

Entrepreneurship:

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth; Women entrepreneurship: Role and importance, problems

Unit II: **(15L)**

Motivation:

Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self-Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives. incubation and commercialization of ideas and innovations

Unit III: **(15L)**

Business:

Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment

Unit IV: **(15L)**

Indian Food Industry:

Creativity, Government schemes and incentives for promotion of entrepreneurship; Government policy on small and medium enterprises (SMEs)/SSIs; Export and import policies relevant to food processing sector; Venture capital; Contract farming and joint ventures, public-private partnerships; Overview of food industry inputs; Characteristics of Indian food processing industries and export; Social responsibility of business. Business Proposals: Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

Recommended Textbooks and References:

1. Khanka. S.S., "Entrepreneurial Development" S.Chand & Co. Ltd.,Ram Nagar, New Delhi, 2013.
2. Donald F Kuratko, " Entreprenuership – Theory, Process and Practice", 9th Edition, Cengage Learning 2014.
3. Entrepreneurship Development, C.B. Gupta and N.P. SrinivasanS. Chand & Sons, New Delhi. 2012
4. Entrepreneurship Development, Anil Kumar, S., Poornima, S.C., Mini, K., Abraham and Jayashree, KNew Age International Publishers, New Delhi. 2003
5. Management:Theory and Practice, Gupta, C.B.Sultan Chand & Sons, New Delhi. 2001
6. Dynamics of Entrepreneurial Development and Management, Vasant Desai, Himalaya Publishing House, New Delhi 2000

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B. Voc. Food Processing Technology
V Semester

Course Title: Sugar processing technology **Course Code:** U-SPT-652

Mark: 100 **Hours: 60** **Credit: 04**

Learning Objectives:

- To create awareness about biological properties of Granulated sucrose, invert sugars and Liquid Sugars.
- To provide the information on manufacturing Process of sugar.
- To understand the major Equipment for Sugar Production.
- To provide information for the manufacturing process of Caramel, Toffee and fudge-Licorice.

Course Outcomes:

On the successful completion of the course, student will be able to-

- acquaint the knowledge of importance of sugar and major sugar producing countries in the world.
- understand the Milling Operation of sugar from sugarcane.
- acquaint the knowledge of Equipment used for Sugar processing.
- understand the process of manufacturing of different sugar products such as coffee, fudge, chewing gum etc.

Unit I: **(18L)**

Introduction to Sugar Processing

Major sugar producing countries in the world. Area under sugarcane in different states of India. Sugarcane and sugar beet as sugar raw materials. Flow charts for manufacture of Granulated sugar and Liquid sugars. Properties of Granulated sucrose and Liquid Sugars. Invert sugar and their characteristics. Byproducts - molasses, bagasse and filter mud, Sugar Production Processes, Raw sugar from sugarcane.

Unit II: **(15L)**

Sugarcane to sugar

Milling Operation, Clarification/ Purification, Carbonation process, Suphitation process, Filtration, Concentration/ Saturation, Crystallization, Centrifuging, Drying and Bagging Refining

of sugar Beet sugar manufacturing

Unit III: (12L)

Equipments for sugar processing

Equipment for Sugar Production Major Equipment for Sugar Production: Crushers, Pressure mills, Shredders, Filter Press, Evaporators, Crystallizers, Centrifuge, Vacuum pump

Unit IV: (15L)

Byproducts of sugar

Technology of Chocolate manufacturing and Miscellaneous Products: Chocolate manufacturing ingredients and their role as food additives. Machineries involved in the process of manufacturing chocolates. Caramel, Toffee and fudge-Licorice paste and aerated confectionary, Lozenges, sugar panning and chewing gum.

Recommended Textbooks and References:

1. E.B. Jackson, 1999, Sugar Confectionery Manufacture, Second edition, Aspen publishers Inc., Great Britain
2. Guilford L Spencer and George P. Made, 1993, Cane Sugar Hand Book, John Wiley and sons Inc. London
3. P. Manohara Rao: Industrial Utilization of Sugar Cane and its co-products P. J. International Consultants, New Delhi
4. Maurice Shachman, Soft Drinks Companion: (2005). A Technical Handbook for the Beverage Industry, CRC press, Florida, USA.
5. W. Ray, Junk & Harry M. Pancost: (1973), Hand Book of Sugars – for Processors, Chemists and Technologists: AVI Puvblishing, West port.

Rajarshi Shahu Mahavidyalaya, Latur
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B. Voc. Food Processing Technology
V Semester

Course Title: LAB- Lab Course - XIII **Course Code:** U-LAC-655

Marks 50 **Credit: 02**

Learning Objectives:

- To provide the solution for determination of sugar content in juice.
- To Understand the working of tools and techniques in sugar processing.
- To inculcate and augment the hands-on expertise on determination of reducing and non-reducing sugars in sugar product.
- To understand the techniques and instruments involved in preparation of different confectionary products.

Course Outcomes:

On the successful completion of the course, student will be able to-

- get the knowledge about the quantitative and qualitative estimation of sugar from different food products.
- understand the process of manufacturing of different sugar products such as coffee, fudge, chewing gum etc.
- conduct routine experiments carried out in sugar processing industries like acidity, ash content, and moisture content of sugar products.

Practicals:

1. Determination of sugar content in juice.
2. Determination of reducing and non-reducing sugars in sugar product.
3. To prepare chocolate
4. To prepare candy and jelly from fruit sources.
5. To study the equipments related to sugar manufacturing.
6. To determine ash content of sugar product.
7. To determine moisture content of sugar product.
8. To estimate acidity and TSS of sugar products.

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B. Voc. Food Processing Technology
V Semester

Course Title: Food Industry Waste Management **Course Code:** U-FWM-653

Marks 100 **Hours: 60** **Credit: 04**

Learning Objectives:

- To provide comprehensive background of waste management in various food industry.
- To impart detailed understanding of Liquid Waste management in food industry.
- To provide adequate knowledge about classification & characterization of food industrial waste from dairy, fruit & vegetable processing etc.
- To gain information about waste disposal method, economical aspects of waste treatment etc.

Course Outcomes:

On the successful completion of the course, student will be able to-

- understand the Classification of food industrial wastes from Fruit and Vegetable processing industry
- acquaint knowledge about Activated Sludge Process and Trickling Filters.
- get the knowledge about Ion exchange treatment of waste water.
- acquaint knowledge about environment management systems.

Unit I: **(18L)**

Introduction to food industrial wastes

Introduction: Classification and characterization of food industrial wastes from Fruit and Vegetable processing industry, Beverage industry; Fish, Meat & Poultry industry, Sugar industry and Dairy industry; Types of waste generated: non-degradable & biodegradable wastes - Methods of utilizing wastes to make value added products

Waste storage and Waste disposal methods – Physical, Chemical &Biological; Economical spects of waste treatment and disposal.

Unit II: **(10L)**

Liquid Waste and Management

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

Unit III: **(17L)**

Solid Waste Treatment

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

Unit IV: **(15L)**

Storage and disposal of liquid and gaseous waste

Storage and disposal of liquid and gaseous waste - Environment management systems (ISO 14000) and its application in food industry. Methods of utilizing wastes to make value added products.

Recommended Textbooks and References:

1. V. Oreopoulou, W. Russ, (ed), 2007, "Utilization ofby-products and treatment of waste in the food industry" Vol, 3., Springer.
2. K. Waldron, 2007, "Handbook of waste management and co-product recovery in food processing". CRC.
3. R. Smith, J. K. lemes, J-K Kim 2008, "Handbook of water and energy management in food processing.", CRC.
4. C. Yapijakis, L. Wang, Yung Tse- Hung,2005, . Waste treatment in the food processing industry, H. LO, CRC,
5. Herzka A & Booth RG; 1981, Applied Science Pub Ltd, Food Industry Wastes: Disposal and Recovery
6. Fair GM, Geyer JC &Okun DA; 1986, John Wiley & Sons, Inc.
7. Bartlett RE;. Water & Wastewater Engineering; Applied Science Pub Ltd.
8. Green JH & Kramer A; 1979, Food Processing Waste Management; AVI.

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B. Voc. Food Processing Technology
V Semester

Course Title: Lab Course - XIV **Course Code: U-LAC-656**

Marks 50 **Credit: 02**

Learning Objectives:

- To provide Hands-on electrodialysis apparatus.
- To provide Hands-on Qualitative analysis of phenol content of water sample.
- To evaluate different treatment methods for liquid waste.
- To provide solutions in membrane separation techniques.

Course Outcomes:

On the successful completion of the course, student will be able to-

- get hands on approach to conduct experiments to find the TDS and TSS.
- get hands on approach to conduct experiments to determine BOD and COD of water sample.
- prepare flow process chart of food plant waste utilization processes

Practicals:

1. To find BOD of water sample.
2. To find COD of waste sample.
3. To find the total dissolved solids (TDS) and its volatile and non-volatile components.
4. To find the total suspended solids (TSS) and its volatile and non-volatile components.
5. Flow process chart of food plant Waste utilization processes
6. To find the phenol content of water sample and evolution of parameters.
7. To operate the electrodialysis apparatus.
8. To find the biodegradation constant (K) and the effect of timing on it.
9. To use the membrane separation techniques for salt brine and reverse osmosis process for sugar.

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B. Voc. Food Processing Technology
V Semester

Course Title: Food and Beverage Technology **Course Code:** U-FBP-654
Marks: 100 **Hours:** 60 **Credit: 04**

Learning Objectives:

- To understand the types of beverages and their importance.
- To distinguish between alcoholic and non-alcoholic beverages.
- To impart knowledge of manufacturing process of alcoholic beverages.
- To explain the role of carbonated water and natural spring water.

Course Outcomes:

On the successful completion of the course, student will be able to-

- understand the manufacturing technology for juice-based beverages
- acquaint the knowledge about manufacturing process of espresso coffee, instant coffee.
- gain knowledge about the role of yeast in beer and other alcoholic beverages.
- understand the BIS quality standards of bottled water.

Unit I: **(15L)**

Introduction to beverages

Introduction to beverages 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 **(15L)**

Manufacturing process of beverages

Manufacturing process of beverages based on tea, coffee, cocoa, spices, plant extracts, herbs, nuts, Dairy-based beverages.

Types of coffee and tea Chemical composition and processing of tea and coffee and their quality assessment. Types of tea: black tea, green tea, oolong tea. Types of coffee: Vaccum 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 III **(15L)**

Alcoholic beverages:

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 IV **(15L)**

Packaged drinking water

Packaged drinking water 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**.**

Recommended Textbooks and 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 (3rd Edition) (2003), New Age International (p) Limited Publishers, New Delhi,
4. Nicholas Dege. (2011), "Technology of Bottled water". Blackwell publishing Ltd, UK.

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B. Voc. Food Processing Technology
V Semester

Course Title: Lab Course - XV **Course Code:** U-LAC-657
Marks 50 **Credit: 02**

Learning Objectives:

- To provide Hands-on qualitative analysis of raw water.
- To provide Hands-on microbiological analysis of raw water quality
- To Provide Hands-on preparation of crush, nectar, blended juice.
- To Provide Hands-on preparation of soy milk, fruit milkshakes herbal beverages.

Course Outcomes:

On the successful completion of the course, student will be able to-

- understand to prepare different beverages.
- understand chemistry behind important beverages
- get hands on approach in capacity to develop new beverages as per needs of industry.
- understand various methods for qualitative analysis of experiments of Beverage industry

Practical:

1. Chemical analysis of raw water quality;
2. Preparation of regional fruit juices;
3. Preparation of whey-based beverages;
4. preparation of crush, nectar, blended juice
5. Preparation of soy milk, fruit milkshakes herbal beverages;
6. Preparation of herbal beverages;
7. Microbiological analysis of raw water quality
8. Visit to relevant processing units.

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B. Voc. Food Processing Technology
VI Semester

Course Title: Human Resource Development **Course Code:** U-HRD-751
Marks: 100 **Hours: 60** **Credit: 04**

Learning Objectives:

- To provide the information on introduction of human resource management.
- To impart detailed understanding of Job Analysis process.
- To develop comprehensive understanding regarding Techniques of Recruitment.
- To provide adequate knowledge about Steps in Training.

Course Outcomes:

On the successful completion of the course, student will be able to-

- get knowledge about the Problems and Challenges of Human Resource Management.
- understand the Guidelines of Job Enrichment.
- understand the Sources of Internal and External Recruitment.
- acquaint knowledge about concept of Job Design, Job Analysis and Job Description etc.

Unit I: **(15L)**

Introduction Human Resource Management

Introduction Human Resource Management: Meaning, Objectives & Scope, Importance and Functions, Types of Organization, Problems and Challenges of Human Resource Management, Qualities of Good Human Resource Manager

Unit II: **(15L)**

Job Design, Job Analysis and Job Description

Job Design, Job Analysis and Job Description: Job Design, Job Rotation, Job Enlargement & Job Enrichment; Stages and Guidelines of Job Enrichment, Job Analysis – Meaning & Process, Tools & Techniques of Job Analysis, Job Description: Features & Stages

Unit III: **(15L)**

Recruitment and Selection:

Meaning and Objectives of Recruitment, Techniques of Recruitment, Employee Selection – Meaning & Process, Sources of Internal and External Recruitment, Decision of Selection & Factor affecting it.

Unit IV: **(15L)**

Training and Development:

Training - Concept and Importance, Steps in Training, Types and Methods of Training, Development – Concept and Need, Techniques of Management Development, Performance Appraisal, Job Evaluation and Employee Turnover - Concept and Purposes

Recommended Textbooks and References:

1. C.B.Gupta – Human Resource Management, Sultan Chand & Sons, New Delhi.
2. Teresa Gomes Dcruze – Human Resource Management – Dominant, New Delhi.
3. L.M.Prasad – Human Resource management, Sultan Chand & Sons, New Delhi.
4. Tripathi – Personnel Management, Sultan Chand & Sons, New Delhi.
5. C.B.Memoria – Personnel Management, Himalaya Publishers, New Delhi.
6. P. SubbaRao – Human Resource Management

Rajarshi Shahu Mahavidyalaya, Latur
(Autonomous)
B. Voc. Food Processing Technology
VI Semester

Course Title: Free Open-Source Software **Course Code:** U-FOS-752
Marks: 100 **Hours:** 60 **Credit:04**

Learning Objectives:

- To provide the information on Components of Computer System.
- To know the technical knowhow about R Software.
- To provide adequate knowledge about Data Management.
- To develop comprehensive understanding regarding Graphical Representation.

Course Outcomes:

On the successful completion of the course, student will be able to-

- get knowledge about the Input devices & Output Devices.
- understand the information of data editing and use of R as a calculator.
- acquaint the knowledge in the data management with sequences.
- apply the knowledge of statistical functions for central tendency.

Unit I: **(18L)**

Components of Computer System:

Central Processing Unit, Keyboard, mouse, Other Input devices & Output Devices, Computer Memory, connecting keyboard, mouse, monitor and printer to CPU, Word Processing Basics, Opening and closing Documents, Text Creation and manipulation, Formatting the Text, Table Manipulation, Creation of Presentation, Preparation of Slides, Presentation of Slides, Slide Show. Connectivity using the Web: Web Browsing Software, Search Engines, Basics of E-mail

Unit II: **(15L)**

R Software

Basic fundamentals, installation and use of software, data editing, use of R as a calculator, functions and assignments. Use of R as a calculator, functions and matrix operations, missing data and logical operators.

Unit III: **(10L)**

Data Management

Conditional executions and loops, data management with sequences. Data management with repeats, sorting, ordering, and lists.

Unit IV: **(17L)**

Graphical Representation

Graphics and plots, statistical functions for central tendency, variation, skewness and kurtosis, handling of bivariate data through graphics, correlations, programming and illustration with examples.

Recommended Textbooks and References:

1. Introduction to Statistics and Data Analysis - With Exercises, Solutions and Applications in R By Christian Heumann, Michael Schomaker and Shalabh, Springer, 2016.
2. The R Software-Fundamentals of Programming and Statistical Analysis -Pierre Lafaye de Micheaux, Rémy Drouilhet, Benoit Liquet, Springer 2013.
3. A Beginner's Guide to R (Use R) By Alain F. Zuur, Elena N. Ieno, Erik H.W.G. Meesters, Springer 2009.
4. R software for Beginners- Mr. Mahesh S. Wavare, Mr. Akash J. Waghmare

Rajarshi Shahu Mahavidyalaya, Latur (Autonomous)
B. Voc. Food Processing Technology
(Semester Pattern)
VI Semester

Course Title: Introductory Biotechnology **Course Code:** U-IDB-753
Marks: 100 **Hours:** 60 **Credit: 04**

Learning Objectives:

- To understand fundamentals of biology and technology especially in reference with plant and animal.
- To understand the design experiments related with structural and functional biology.
- To inculcate the new approaches to Basics of plant science.
- To provide the information on Life processes in animals.

Course Outcomes:

On the successful completion of the course, student will be able to-

- acquaint the knowledge in the introduction to recombinant DNA technology.
- understand the Whittaker's five kingdom system of classification.
- apply the knowledge of Diffusion, Osmosis and Facilitated Diffusion.
- to provide the information on Animal Nutrition and Transport system in humans.

Unit I: **(15L)**

Introduction to Biotechnology

Introduction to Biotechnology: Definition, History, Scope of biotechnology, food biotechnology, introduction to recombinant DNA technology, tools and techniques, application with examples.

Unit II: **(15L)**

Studying life:

Whittaker's five kingdom system of classification, Classification of plants and animals with a suitable example, prokaryotic cell –bacteria, eukaryotic cell-plant cell and animal cell, a brief idea about Levels of organization in plants and animal, Origin of life.

Unit III: **(15L)**

Basics of plant science

Biophysical Process: Diffusion, Osmosis, Facilitated Diffusion, Surface Tension, Cohesion, Adhesion, Osmotic Pressure, Brief introduction to Plant nutrition, Photosynthesis Reproduction in Plant: Structure of Flower A Sexual reproduction in plant.

Unit IV: **(15L)**

Life processes in animals:

Animal Nutrition, Transport in humans- Circulatory system, structure and functions, Respiration, types, Excretion in animals, Co-ordination and response, Sexual reproduction in humans.

Recommended Textbooks and References:

1. Biology by Campbell, Reece (seventh edition) 2009 Pearson education
2. Life the science of biology by Sadava, Hillis, Heller, Berenbaum(eighth edition)2011 W H Freeman
3. Botany: An Introduction to Plant Biologyby James D. Mauseth (Fourth edition) 2009 Jones and Bartlett
4. An Introduction to Zoology -Investigating the Animal World by Joseph springer,Dennis
5. Human Body Systems, Structure, function and environment by Daniel D.Chiras(second Edition) 2012 Jones and Bartlett
6. Reproductive biology by Gayatri Prakash (2007) alpha science international limited
7. NCERT XI and NCERT XII (Biology) 2012

Rajarshi Shahu Mahavidyalaya, Latur
(Autonomous)
B. Voc. Food Processing Technology
VI Semester

Course Title: Food Hygiene and Sanitation **Course Code: U-FHS-754**
Marks: 100 **Hours:** 60 **Credit: 04**

Learning Objectives

- To provide the information on Introduction to Food Hygiene.
- To know the knowhow about Sanitization and it's type.
- To provide the information on Methods of Sanitization.
- To impart detailed understanding of Sanitation control and regulations.

Course Outcomes:

On the successful completion of the course, student will be able to-

- get knowledge about the hygiene in urban and rural areas with respect to food preparations.
- understand the types of Soil and its properties.
- acquaint the knowledge in the facilities and procedures in food plant operations.
- apply the knowledge of requirements for ease in maintenance of hygiene and sanitation.

Unit I: **(15L)**

Introduction to Food Hygiene

Principles of Food Hygiene, hygiene in urban and rural areas with respect to food preparations. Food handling habits and personal hygiene Sources of water and impurities in water, hardness of water. Water supply systems and water purification, chlorination.

Unit II: **(15L)**

Sanitization and it's type

Types of Soil (Food residues on equipment surfaces) and its properties. Cleaning procedures, types of cleaning agents and their properties. Acid and alkaline cleaners.

Types of sanitizing agents and their properties

Unit III: **(15L)**

Methods of Sanitization

Chlorine, iodine and their compounds as a sanitizer, Quaternaly ammonium compounds, phonolic compounds as sanitizers. Advantages and disadvantages of these sanitizers.

Physical sanitizing agents' example Hot water, Steam and UV light. Sanitation facilities and procedures in food plant operations. CIP system.

Unit IV: **(15L)**

Sanitation control and regulations

Cleaning premises and surroundings. Common Pests in food services rodents, insects, birds, house flies, cockroaches, ants and their control. Sanitation regulations, phytosanitary requirements. Hygiene and sanitation of preparation, storage and retail shops. Plant and equipments design, requirements for ease in maintenance of hygiene and sanitation

Recommended Textbooks and References:

1. Guide to improving Food Hygiene - Ed Gaston & Tiffney
2. Practical Food Microbiology and - Harry H.Weiser, J.mountney and W.W.Gord
   Technology (2nd edition)
3. Principles of Food Sanitatin - Marriott. Norman G.
4. Hygiene in food manufacturing and Handling - Barry Graham- Rack and Raymond
   Bmsted

Rajarshi Shahu Mahavidyalaya, Latur
(Autonomous)
B. Voc. Food Processing Technology
VI Semester

Course Title: Lab Course - XVI **Course Code:** U-LAC-755
Marks 50 **Credit: 02**

Learning Objectives

- To provide Hands-on Isolation and Characterization of microbes.
- To provide Hands-on Qualitative and quantitative analysis of food sample.
- To Provide Hands-on microbial quality of eating utensils.
- To provide Hands-on testing of sanitizers, disinfectants for antimicrobial activity.

Course Outcomes:

On the successful completion of the course, student will be able to-

- isolate the microbes from different food material.
- perform and analyze the determination of micro-organisms as sanitary indicator ropiness.
- perform methods of pest control in food industries rodents.
- prevent the food poisoning and to introduce the requirements of safety in the workplace.

Practicals

1. Microbial quality of air
2. Microbial load of palm/ fingers, nose secretions
3. Microbial quality of eating utensils
4. Visit to water purification plant
5. Determination of micro-organisms as sanitary indicator ropiness/ moldiness of bread
6. Testing of sanitizers, disinfectants for antimicrobial activity
7. Visit to District public health laboratory and preparation of visit report
8. Visit to restaurents/ local food industries and preparatin of visit report on prevailing conditions of hygiene
9. Methods of pest control in food industries rodents / cockroaches

Rajarshi Shahu Mahavidyalaya, Latur
(Autonomous)
B. Voc. Food Processing Technology
VI Semester

Course Title: Bakery & Confectionary **Course Code:** U-BEC-756

Marks 100 **Hours: 60** **Credit: 04**

Learning Objectives

- The course involves a basic understanding of introduction to bakery and confectionery.
- To provide adequate knowledge about Flour types and its by-products.
- To develop comprehensive understanding regarding principle involved in cake and cookies production.
- To impart detailed understanding about confectionary products.

Course Outcomes:

On the successful completion of the course, student will be able to-

- get knowledge about the Important cereals used in bakery and confectionery.
- understand the methods and machinery in bakery product production.
- understand the processing and mechanism needed for Bakery and confectionary industry.
- understand the manufacturing process of cake and biscuits.

Unit I: **(15L)**

Introduction to bakery and confectionery

Importance of bakery and confectionery in food industry, Important cereals used in bakery and confectionery, Flour Mill, mixer, moulding machine, balance, packing machines, measuring glass, moulds, knifes, extruder, oven

Unit II: **(15L)**

Flour types and By-products

Types of flours, Qualities of flour for the production of bakery items, Availability of starch in different grains, Principle involved in bread production, Different types of breads and their uses, Ingredients used in bread production

Unit III: **(15L)**

Cake:

Principle involved in cake production, Different types of cakes and their uses, Ingredients used in cake production.

Biscuits and Cookies:

Principle involved in biscuits and cookies production, Different types of biscuits and cookies and their uses Ingredients used in biscuits and cookies production.

Unit IV: **(15L)**

Confectionary products

Characteristics of confectionary products, Types of confectionary products, Ingredients used in confectionary products, Making of any 02 confectionary products.

Recommended Textbooks and References:

1. W.P. Edwards: Science of Bakery Products.
2. Emmanueal Obene: Chocolate science and Technology
3. John Kingslee: A professional text to bakery and confectionary, New Age International Publication.
4. NIIR Board: The complete technology book on bakery products

Rajarshi Shahu Mahavidyalaya, Latur
(Autonomous)
B. Voc. Food Processing Technology
VI Semester

Course Title: Lab Course -XVII **Course Code:** U-LAC-757

Marks: 50 **Credit: 02**

Learning Objectives

- To provide Hands-on approach for the production of different types of bread.
- To provide Hands-on qualitative evaluation of bread.
- To provide Hands-on Examination of different types of starch
- To provide Hands-on estimation of gluten.

Course Outcomes:

On the successful completion of the course, student will be able to-

- perform Quantitative and Qualitative analysis of bread.
- gain Hands-on experience and training on manufacturing process of protein Rich bread.
- understand the equipments related to bakery and confectionery production.

Practicals

1. Introduction to Bakery Equipments and Confectionery Equipments
2. Gluten Estimation
3. Preparation of different types of bread
    a. Plain bread
    b. Fermented bread
    c. Protein Rich bread / Milk bread
    d. Special bread
4. Quality evaluation of bread
5. Examination of different types of starch
6. Visit to Bakery
7. Preparation of cake
8. Preparation of biscuits
9. Preparation of cookies
10. Preparation of chocolate

Summary of cross cutting issues:

Food Processing Technology includes a set of physical, chemical, or microbiological methods and techniques used to transmute/transform raw ingredients into food and its transformation into other food processing firms. As such, it ranges in complexity and Food processing includes traditional like heat treatment, fermentation, pickling, smoking, drying, curing and modern methods like pasteurization, ultra-heat treatment, high pressure processing, or modified atmosphere packaging. Food Processing Technology covers various topics such as Food Processing, Food Technology, Food Safety, Food Industry, Food Allergy, Food Microbiology, Food Biotechnology, Food Allergy, Food Addiction, Food Fortification, Food Nanotechnology, etc. It is expected to cover some critical issues in the designed curriculum for the development of Students. In our syllabus we tried to include following cross cutting issues.

Cross-cutting issues relevant to Professional Ethics, Gender, Environment and Sustainability, and Human Values into the curriculum:

Sr. No.	Course Name	Code	Relevant to Professional Ethics	Description
1.	Post-Harvest Management	U-PHM-650	Professional Ethics	Expertise in Post harvest processing techniques will create employability in food industries.
2.	Sugar Processing Technology	U-SPT-652	Professional Ethics	Expertise in sugar processing will create employability in food industries.
3.	Food and Beverages Processing	U-FBP-654	Professional Ethics	Students can get jobs in beverage industry.
4.	Free and Open-Source Software	U-HRD-751	Professional Ethics	Student understands the Proper use of software, which is essential in Research and Industry job.
5.	Food Hygiene and sanitations	U-FHS-754	Professional Ethics	help in getting absorb in various quality control lab.
6.	Bakery & Confectionary	U-BEC-756	Professional Ethics	Students will get job in different bakery

Sr. No	Course Name	Code	Relevant to	Description
1.	Food Industry Waste Management	U-FWM-653	Environment and Sustainability	Students will be able to fulfill food security issues
2.	Post-Harvest Management	U-PHM-650	Environment and Sustainability	Students will be able to develop post-harvest Management techniques.

Curricula developed and implemented have relevance to the local, national, regional and global developmental needs:

Sr. No.	Course name	Course code	Linkage with Local/National/Regional/Global development
1.	Entrepreneurship Developments	U-END-651	Technical skills to develop good entrepreneur
2.	Post-Harvest Managements	U-PHM-650	Research in food processing
3.	Sugar Processing Technology	U-SPT-652	Skills in sugar processing
4.	Food Industry Waste Management	U-FWM-653	QC and QA
5.	Food and Beverages Processing	U-FBP-654	Skills in production of alcoholic and non-alcoholic beverages
6.	Human Resource Development	U-HRD-751	Technical skills in food sector.
7.	Free and Open-Source Software	U-FOS-752	Data Base Generation, Analysis of Data in research
8.	Food Hygiene and sanitation	U-FHS-754	QC and QA
9.	Bakery & Confectionery	U-BEC-756	Skills in production of bakery products.

Courses having focus on employability/ entrepreneurship/ skill development

Sr. No.	Name of the Course	Course Code	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development			Year of introduction
			Employability	Entrepreneurship	Skill development	
1.	Aptitude and Logical Reasoning-II	U-ALR-649			Students will able to solve logical reasoning.	2020-21

2.	Post-Harvest Management	U-PHM-650	Expertise in Post harvest processing techniques will create employability in food industries.		Students will get idea about techniques to store fruits and cereal grains after harvesting.	2020-21
3.	Entrepreneurship Developments	U-END-651	Students can get the knowledge about skill required to become entrepreneur.		Students will get idea about various scheme for entrepreneur.	2020-21
4.	Sugar Processing Technology	U-SPT-652	Expertise in sugar processing will create employability in food industries.		Students will get idea about role of sugar in different food material.	2020-21
5.	Food Industry Waste Management	U-FWM-653	Expertise in waste management will create employability in quality control lab.		Students will get idea about technique for industrial waste management.	2020-21
6.	Food and Beverages Processing	U-FBP-654	Students can get jobs in beverage industry.	Entrepreneurship in Beverage industry.	Students will get idea about production of beverages.	2020-21
7.	Human Resource Development	U-HRD-751			Students will get idea about skill require to develop food industry.	2020-21
8.	Free and Open-Source Software	U-FOS-752	Student understands the Proper use of software, which is		Students will get idea about various softwares used in research.	2020-21

			essential in Research and Industry job.			
9.	Food Hygiene and sanitations'	U-FHS-754	help in getting absorb in various quality control lab.		Students will get thorough knowledge and understanding of technique of sanitization.	2020-21
10.	Bakery & Confectionary	U-BEC-756	Students will get job in different bakery	Entrepreneurship in bakery.	Students will get idea about production of cake, breads and pastries.	2020-21
11.	Industrial / Institutional Project	U-IIP-758	Students will get job in different food industries.		Student develop the skill of instrument handling in industry.	2020-21