

Rayat Shikshan Sanstha's
Karmaveer Bhaurao Patil College Vashi
[Autonomous College]

SR. NO.	HEADING	PARTICULARS
1	Title of Course	T.Y.B.Voc. Food Technology
2	Eligibility for Admission	S.Y.B.Voc. Food Technology
3	Passing Marks	40%
4	Ordinances/Regulations (if any)	-
5	No. of Years/Semesters	Three years/ Six semester
6	Level	U.G.
7	Pattern	Semester
8	Status	New Syllabus
9	To be implemented from Academic year	2020-2021

AC- 05/11/2019

Item no-5.7



Rayat Shikshan Sanstha's
KARMAVEER BHURAO PATIL COLLEGE VASHI
(AUTONOMOUS COLLEGE)

Sector-15- A, Vashi, Navi Mumbai - 400 703

2020-2021

Syllabus for T.Y.B. Voc.Course

Program: B.Voc. Food Technology

Course: T.Y.B.Voc. Food Technology

(Choice Based Credit, Grading and Semester System with effect from the academic year 2020-2021)

Preamble

Food Technology is a B.Voc. course and an under graduation programme at Karmaveer Bhaurao Patil College Vashi, Navi Mumbai [Autonomous College]

Food science is the study of the physical, biological, and chemical makeup of food; the causes of food deterioration; and the concepts underlying food processing. Food scientists and technologists apply scientific disciplines including chemistry, engineering, microbiology, and nutrition to the study of food to improve the safety, nutrition, wholesomeness and availability of food. Depending on their area of specialization, food scientists may develop ways to process, preserve, package, and/or store food according to industry and government specifications and regulations.

Food technology is the application of food science to the selection, preservation, processing, packaging, distribution, and use of safe food. Related fields include analytical chemistry, biotechnology, engineering, nutrition, quality control, and food safety management.

Food processing is the treatment of food substances by changing their properties to preserve it, improve its quality or make it functionally more useful. Food processors take raw animal, vegetable, or marine materials and transform them into edible products through the application of labor, machinery, energy, and scientific knowledge. Chemical, biological, and mechanical processes are used to convert relatively bulky, perishable, and typically inedible food materials into shelf-stable, convenient, and palatable foods and beverages.

The food processing sector is highly fragmented industry. It widely comprises of the following sub-segments: Fruits and vegetables, Milk and milk products, beer and alcoholic beverages, meat and poultry, marine products, grain processing, packaged or convenience food and packaged drinks. A huge number of entrepreneurs in this industry are small in terms of their production and operations, and are largely concentrated in the unorganized segment.

With potential of being the biggest in the world India next to China is the world's second largest producer of food and processed food products. India is having the biggest consumption category, with spending on food accounting for nearly 21% of India's GDP and with a market size of \$181 billion. The Indian domestic food market is expected to grow by

nearly 40% of the current market size to \$258 billion by 2015 and \$344 billion by 2025 (World of Food India, 2011; Merchant, 2008).

The content of a syllabus should be such that it maintains continuity with the course content of graduate course. The present curriculum is made keeping this in mind and is an effort to impart fundamental knowledge of the subject needed at this level. The curriculum is designed as per the guidelines for Choice Based Credit System and reflects the total credit, teaching hours and evaluation pattern.

Objectives of the Course:

- To prepare students as a qualified food technologists for Food industries, research organization and teaching.
- To provide students with a solid foundation in basic sciences related to food technology, food science and food technology & engineering.
- To enable the students with good scientific and engineering knowledge so as to comprehend, design, and create food products and device for food industry and provide solutions for the challenges in food industry as well as in agriculture.
- To train students in professional and ethical attitude, effective communication skills, teamwork skills and multidisciplinary approaches related to food technology and engineering.
- To provide student with an academic environment aware of excellence, leadership, written ethical codes and guidelines, and the life-long learning needed for a successful professional career.

Course Learning Outcomes:

1. Graduate will able to focus on the importance of safe processed nutritious food.
2. Graduates will demonstrate an ability to design or process food products as per the needs and specifications.
3. Graduates will demonstrate an ability to work in Food industries, research organization and teaching.
4. Graduate will demonstrate skills to use modern tools and equipment to analyze food prone infection and food spoilage.
5. Graduates will demonstrate knowledge of professional and ethical responsibilities.
6. Graduate will be able to understand economic importance of food products and food laws. 9. Graduate will show the understanding of impact of engineering solutions on the society and also will be aware of contemporary issues. 10. Graduate will develop confidence for self-education and ability for life-long learning.

Program Specific Outcome (Considered Third year)

- To understand the knowledge of technology of processing of Fruit and Vegetables, Physical properties of food, Food Processing and Equipment, Food Biotechnology and nutraceuticals , Unit operation in Food industry.
- To gain the knowledge of Sensory Evaluation of Food
- To get the practical knowledge of New product development.
- To develop the knowledge about Food Quality Assurance

Scheme of examination for Each Semester:

Continuous Internal Evaluation: 40 Marks (Common Test-20 Marks & 20 Marks for-

Assignment, Projects, Group discussion, Open book test, online test etc.) based on all units of each paper.

Semester End Examination: 60 Marks will be as follows -

I.	Theory: The Semester End Examination for theory course work will be conducted as per the following scheme.	
	Each theory paper shall be of two hours duration.	
	All questions are compulsory and will have internal options.	
	Q – I	Subject questions from Unit – I (having internal options.) 20 M
	Q – II	Subjective questions from Unit – II (having internal options.) 20 M
	Q – III	Objective type questions based on both the Units with equal weightage. 20 M
II.	Practical	The Semester End Examination for practical course work will be conducted as per the following scheme.

Sr. No.	Particulars of Semester End Practical Examination	Marks%
1	Laboratory Work	40
2	Journal	05
3	VIVA	05
	TOTAL	50

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Semester V

For the subject of food technology there shall be five papers and for each subject having 3.2 credits and 25 lectures.

SR. NO	PAPER NO.	PAPER NAME
1	UGFT 501	Processing of Fruit and Vegetables
2	UGFT 502	Analytical properties of food
3	UGFT 503	Sensory Evaluation of foods
4	UGFT 504	Food Processing and Equipment
5	UGFT 505	Food Biotechnology and Nutraceuticals

Semester IV

For the subject of food technology there shall be two papers and for each subject having 3.2 credits and 25 lectures.

SR. NO	PAPER NO.	PAPER NAME
1	UGFT 601	Unit Operations in Food Industry
2	UGFT 602	Food Quality Assurance

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SEMESTER V

Sr. no	Paper no.	Title	Theory/ Practical/Project	Marks (Total)	Distribution of Total Marks (100)	
					End Semester Theory	Internal Assessment
1	UGFT 501	Processing of Fruit and Vegetables	Theory	100	60	40
2	UGFT 502	Physical properties of food	Theory	100	60	40
3	UGFT 503	Sensory Evaluation of foods	Theory	100	60	40
4	UGFT 504	Food Processing and Equipment	Theory	100	60	40
5	UGFT 505	Food Biotechnology and Nutraceuticals	Theory	100	60	40
6	UGFTP 501	Processing of Fruit and Vegetables	Practical	50	-	-
7	UGFTP 502	Physical properties of food	Practical	50	-	-
8	UGFTP 503	Sensory Evaluation of foods	Practical	50	-	-
9	UGFTP 504	Food Processing and Equipment	Practical	50	-	-
10	UGFTP 505	Food Biotechnology and Nutraceuticals	Practical	50	-	-

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SEMESTER VI

Sr. No	Paper No	Title	Theory/ Practical/ Project	Marks (Total)	Distribution of Total Marks (100)	
					End Semester Theory	Internal Assessment
1	UGFT 601	Unit Operations in Food Industry	Theory	100	60	40
2	UGFT 602	Food Quality Assurance	Theory	100	60	40
3	UGFT 603	Internship/Training Project.	-	150	-	-
4	UGFT 604			150	-	-
5	UGFT 605			150	-	-
6	UGFTP 601	Unit Operations in Food Industry	Practical	50	-	-
7	UGFTP 602	Food Quality Assurance	Practical	50	-	-

Paper III, Paper IV and Paper V - Internship/Training Project.

After completion of Paper I & II, student has to complete internship equivalent to 60 lectures. The student has to produce relevant certificate and black book from the concerned industry. This internship will be of 10 credits.

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Credit Based Semester & Grading System

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SEMESTER V

Course code	Unit	Title	Credits	Lectures
UGFT 501		PROCESSING OF FRUIT AND VEGETABLES	3.3 Credits	25 Lectures
	Unit I	Introduction: Composition and nutritive value of fruits and vegetables; Factors effecting composition source and receiving at processing plants, primary processing: cleaning, washing, peeling, slicing and blanching. Types of grading and used machines- Hand Grader, Flat screen grader. Types of sorter- cylinder separator, roller sorter, spiral sorter		
	Unit I	Spoilage of fruits and vegetables: Different types of spoilages in fruits and vegetables. Spoilage during storage of fruits and vegetables and their prevention; General methods of preservation of whole fruits/vegetables and processed fruits and vegetables. spoilage of pickles - The methods of preparation, curing techniques, defects and remedies types of preservatives commonly used in fruits and vegetables processing industry, limits of usage of preservatives.		
	Unit III	Processing of fruits and vegetables: Dehydration of fruits and vegetables using various drying technologies like sun drying, solar drying (Natural and forced convection),osmotic, tunnel drying, fluidized bed drying, freeze drying, convectional and adiabatic drying; application to raisins, dried figs, vegetables, intermediate moisture fruits and vegetables. Fruits powder using spray drying .Technology of extraction of juices from different types of fruits		

	Unit IV	<p>Manufacture of fruits products: Manufacturing process of juice, soup, puree and paste; Jams, jellies and marmalade: selection, preparation, production. Differences between jam and jelly. Theory of jelly formation, failure and remedies in jam and jelly making. General Principles and manufacturing processes of preserves, candied fruits, glazed fruits, crystallized fruits. Criteria of Ready to Eat products</p>		
	Unit V	<p>Manufacture of vegetables product: Manufacturing process of sauce, ketchup, vegetable juices and concentrated products</p>		
UGFT 502		PHYSICAL PROPERTIES OF FOOD	3.3 Credits	25 Lectures
	Unit 1	<p>Physical properties of foods Methods of estimation of – Shape – round less, sphericity round less ratio, size, volume platform scale method, density, specific gravity- apparatus, porosity and surface area. Analysis of raw materials used as packaging material as per Appendix B</p>		
	Unit II	<p>Thermal properties of food Definitions – specific heat, enthalpy, conductivity and diffusivity, surface heat transfer coefficient. Measurement of thermal properties like specific heat, thermal conductivity and thermal diffusivity</p>		
	Unit III	<p>Aerodynamic properties and frictional properties of foods Aerodynamic property definition drag coefficient, terminal velocity application in handling and separation of food materials. Frictional property- coefficient of friction, angle of repose, angle of internal friction, application in food handling and storage Aerodynamic</p>		
	Unit IV	<p>Rheology and texture of food Rheology – rheological classification – viscoelasticity – viscometers. Hookean body, St Venant body and Newtonian body. Texture of foods – methods of textural evaluation – subjective and objective method – texture</p>		

		profile method.		
	Unit V	Electrical optical properties and mechanical damage Electrical and optical property – importance and its application. Mechanical damage-causes of mechanical damage – methods for detection and evaluation of mechanical damage		
UGFT 503		SENSORY EVALUATION OF FOODS	3.3 Credits	25 Lectures
	Unit I	Introduction Definition of sensory evaluation, basic tastes, human senses and sensory perception, threshold, psychophysics, Tongue surface		
	Unit II	Arrangements for Sensory Evaluation Test control Environment and taste room design; product control: sample preparation and presentation; Panelist controls; factors influencing measurements: psychological and physiological errors		
	Unit III	Statistical Methods for Sensory evaluation Classification of test methods; discrimination test: paired – comparison, duo-trio and triangle tests; affective test: qualitative (interview and focus group) and quantitative tests (paired preference and acceptance tests); Two sample test, ranking test, Two sample difference test, numeric scoring test, hedonic ranking test		
	Unit IV	Subjective and objective methods: Texture analyzer – mechanical characteristics – chewiness, brittleness, and geometric characteristics, sensory panel- types – criteria for panel selection		
	Unit V	Application of Sensory Analysis in the Food industry: Quality control; storage stability testing; product development and consumer acceptance testing. Texture		

UGFT 504		FOOD PROCESSING AND EQUIPMENT	3.3 Credits	25 Lectures
	Unit I	<p>Thermal Processing: Mechanism of heat generation – High Pressure Processing; Concept – Equipment for HPP Treatment – Mechanism of Microbial inactivation and its application in food, dielectric heating of food; Pulsed electric heat field – equipment – Mechanism of PEF – Advantages, Ohmic heating of foods – Mechanism – Principle - Advantages, Applications. Irradiation – Principles – Types of irradiation Advantage, Applications</p>		
	Unit II	<p>Non-Thermal Processing: Principle – Mechanism of Osmotic Dehydration – Effects 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; Role of antimicrobial agents in food – Plant and animal derived antimicrobials – Antimicrobial enzymes, Antimicrobial food packaging.HPP and gamma processing.</p>		
	Unit III	<p>Heat exchangers, dryers and evaporators Heat transfer equipments: Heat exchangers. Food evaporation equipments: food evaporators, evaporator components. Food dehydration equipments - Food dehydration principle, food dryers, hygiene and safety considerations. Types of dryers, Pumps, Types of Pumps and Boilers.</p>		
	Unit IV	<p>Food packaging equipments Introduction, preparation of food containers, filling equipment, closing equipment and group packaging</p>		
	Unit V	<p>Refrigeration: Refrigeration and freezing equipments. Refrigerants, freezers, chillers. Refrigeration cycle</p>		

UGFT 505		BIOTECHNOLOGY AND NUTRACEUTICALS	3.3 Credits	25 Lectures
	Unit I	Nutraceuticals: Nutraceuticals as a new dietary ingredient, Biological significance of nutraceuticals, World market for nutraceuticals, Regulatory issues, Health benefits, Antioxidants, Phytoestrogens, Isoflavonoids, Glucosinolates, Carotenoids, Omega-3 and omega-6 Fatty acids and Phytosteroids		
	Unit II	Probiotics, Prebiotics and Symbiotic: Definitions, Role and Usefulness in GIT health, Beneficial microbes, Prebiotics – Types – Effects on gut microbes; Resistant starch, FOS; Probiotics – Benefits; Symbiotic – Concept and role in management of GI diseases; Bioactive Compounds		
	Unit III	Use of Biotechnology for food processing: Genetically modified foods – Need of GM foods, Challenges, Potential benefits in agriculture, Nutritional improvements, Animal foods Issues of concern and safety of GM foods and Food Fortification		
	Unit IV	Product based on infant food formula: Hydrolysate, formula for lactose intolerant infant ,infant milk formula, Baby food based on cereals, weaning food, prebiotic and probiotic as infant food		
	Unit V	Nanotechnology: Introduction, Principle, Application of Nanotechnology in Food industry, Basic characterization techniques of nanomaterials		

References-

1. Girdharilal, Siddappaa, G.S and Tandon, G.L.1998. Preservation of fruits & Vegetables, ICAR, New Delhi.
2. W B Crusess.2004. Commercial Unit and Vegetable Products, W.V. Special Indian Edition, Pub: Agrobios India.
3. Rao E. S. (2013). Food Quality Evaluation. Variety Books.
4. Meilgard (1999). Sensory Evaluation Techniques, 3rd ed. CRC Press LLC, 1999.

5. Brannen and et al., Food Additives, Marcel Dekker, New York,1990
6. Manay NS and Shadaksharaswamy M,1987, Food-Facts and Principles, New Age International (P) Ltd. Publishers, New Delhi

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SEMESTER VI

Course Code	Unit	Title	Credits	Lectures
UGFT 601		UNIT OPERATIONS IN FOOD INDUSTRY	3.3 Credits	25 Lectures
	Unit I	Heat transfer in food processing: Modes of heat transfer – Conduction, Convection and Radiation – Heat exchanger – Plate heat exchanger – Tubular heat exchanger – Scraped surface heat exchanger		
	Unit II	Introduction to Mechanical equipments in food industry: Equipments: Types, planning, factors affecting selection and purchase; Transport equipments: Fluid food transport equipment, mechanical conveyors; Storage equipments: Solid and liquid food storage equipments; Processing equipments: Size reduction, homogenization, mixing and foaming equipments; Separation equipments: Grading and sorting equipment		
	Unit III	Distillation, Crystallization and Separation: Simple distillation, flash distillation, steam distillation, fractional distillation. Crystallization- theory, Tank crystallizer and scrap surface crystallizer. Membrane technology – Process – Micro-filtration, ultrafiltration, nanofiltration and reverse osmosis – advantages – Equipment.		
	Unit IV	Extraction and Extrusion: Solid liquid Extraction- Leaching, Liquid-liquid extraction, super critical fluid extraction, Single screw extruder, twin screw extruder.		

	Unit V	Mechanical separation and Material handling: Sedimentation, Centrifugal Separation and Mixing. Material Handling- Belt conveyor, Screw conveyor, Bucket elevator, Pneumatic conveyor.		
UGFT 602		FOOD QUALITY ASSURANCE	3.3 Credits	25 Lectures
	Unit I	Concept of Quality – Food Safety: Objectives, Importance and functions of quality control, Quality management systems in India, Sampling procedures and plans, Food Safety and Standards Act, 2006; Domestic regulations, Global Food safety Initiative, Various organizations dealing with Inspection, Traceability and Authentication, Certification and Quality Assurance-,BIS; Labeling Issues, International Food Standards, FSSAI 2011 Schedule 1, 2, 3 and 4, Adulteration of food.		
	Unit II	HACCP Systems: Hazard analysis critical control point, definitions, principles, guidelines for the application of HACCP system		
	Unit III	Food Quality Systems: Quality Assurance, total quality management, GMP/ GHP, GLP, GAP, Sanitary and hygienic practices, HACCP, Quality manuals, Documentation and audits.		
	Unit IV	Food Quality Laws and Regulations: Indian and International Quality Systems and Standards like ISO and Food CODEX, Export Import Policy, Export Documentation, Laboratory Quality procedure and Assessment of laboratory performance, applications in different Food Industries, FSSC 22000, GRMS, CODEX, BRC and ISO		
	Unit V	Intellectual Property Rights: PR – Introduction, history in India, Laws related to IPR, Copyrights, Patent, Trademark, designs, geographical indications of food, World Intellectual Property Organization (WIPO),		

		IPR – Introduction, history in India, Laws related to IPR, Copyrights, Patent, Trademark, designs, geographical indications of food, World Intellectual Property Organization (WIPO) commercialization of IPR, important websites.		
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UGFT 603, UGFT 604, UGFT605 - Internship/Training Project

After completion of Paper I & II, student has to complete internship equivalent to 60 lectures. The student has to produce relevant certificate from the concerned industry. This internship will be of 10 credits.

References:

1. R.P.Singh and D.R.Heldman, (2001), "Introduction to Food Engineering", 3rd ed., AcademicPress.
2. S.K.Sharma, S.J.Mulvaney and S.S.H.Rizvi, (2000), "Food Process Engineering: Theory and Laboratory Experiments", Wiley and SonsPublishers.
3. Earle RL (2013) "Unit Operations in Food Processing" Elsevier
4. Albert Ibarz and Gustavo V. Barbosa-Cánovas (2003) "Unit Operations in Food Engineering" CRC Press, Boca Raton, FL, USA.
5. Alli Inteaz, (2003), "Food Quality Assurance: Principles and Practices", CRC Press.
6. Vasconcellos J. Andres, (2003), "Quality Assurance for the Food Industry: A Practical Approach", CRC Press.

Credit Based Semester & Grading System

2020-21

SEMESTER V

Course code	Title	Total
UGFTP 501	PROCESSING OF FRUIT AND VEGETABLES	40 Lectures
	<ol style="list-style-type: none">1. Study of graders and sorters used in food processing.2. Preparation of lemon squash.3. Study and preparation of strawberry jam.4. Preparation of processing of making garlic depth.5. Study of making of Jelly.6. Preparation of tomato ketchup and tomato puree.	
UGFTP 503	SENSORY EVALUATION OF FOODS	40 Lectures
	<ol style="list-style-type: none">1. Sensory Evaluation Laboratory set up2. Sensory Evaluation of Food Products–Hedonic Rating Test3. Judging of Milk4. To plan a set of Sensory evaluation tests for a particular product.5. Sensory Evaluation of Food Products– Ranking Test6. Difference Tests<ol style="list-style-type: none">i) Simple paired comparison testii) Multiple paired comparison testiii) Duo Trio Testiv) Triangle Test	
UGFTP 504	FOOD PROCESSING AND ENGINEERING	40 Lectures
	<ol style="list-style-type: none">1. Comparison of conventional and microwave processing of food2. Preservation of food by the process of freezing3. Drying of food using Tray dryer4. Preservation of food by canning (Fruit/Vegetable/meat)5. Demonstration of preserving foods under cold vs. freezing process.6. Minimal Processing of raw food.	

<p style="text-align: center;">UGFTP 505</p>	<p style="text-align: center;">FOOD BIOTECHNOLOGY AND NUTRACEUTICALS</p> <ol style="list-style-type: none"> 1. Introduction to ELISA 2. Demonstration for detection of GMO foods 3. Study of fermentation technology of alcoholic beverages 4. Technology of indigenous and oriental fermented food 5. Identification of various nutraceuticals and functional foods available in the market 6. Preparation and evaluation of probiotic/prebiotic foods Determination of total pectin in plant material 	<p style="text-align: center;">40 Lectures</p>
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References: -

1. Maynard A. Amerine, Rose Marie Pangborn, Edward B. Roessler, (2013), "Principles of Sensory Evaluation of Food", Elsevier Publications.
2. Olga Martin-Belloso, Robert Soliva Fortuny, (2010), "Advances in Fresh-Cut Fruits and Vegetables Processing". CRCPress.
3. M. Anandha Rao, (2010), "Rheology of Fluid and Semisolid Foods: Principles and Applications: Principles and Applications", Springer Science & Business MediaPublishing.
4. Zeki Berk, (2008), "Food Process Engineering and Technology", Academic Press Publishers.

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2020-21

SEMESTER VI

Course code	Title	Total
UGFTP 601	UNIT OPERATIONS IN FOOD INDUSTRY	40 Lectures
	1. Study of Principle, working and demonstration of hammer mill and crushing roll. 2. Study of graders for grains. 3. Study of graders for fruits and vegetables. 4. Study of different material handling equipments. 5. Study of principle and working of spray dryer. 6. Study of centrifugal separation (centrifugal cream separation, centrifugal machine)	
UGFTP 602	FOOD QUALITY ASSURANCE	40 Lectures
	1. HACCP IN dairy PROCESSING. 2. Controlling Food Safety Hazards in Fruit and Vegetable Industry through HACCP. 3. FSMS plan development for bakery industry. 4. Food safety issues related to Ready to Eat food. 5. Quality control of packaged foods.	

References: -

1. Yong-Jin Cho, Sukwon Kang. (2011), "Emerging Technologies for Food Quality and Food Safety Evaluation", CRC Press.
2. Alli Inteaz, (2003), "Food Quality Assurance: Principles and Practices", CRC Press.
3. Sahay KM & Singh KK 1994. Unit Operation of Agricultural Processing. Vikash Publication House.
4. Fellos PJ 2005 Food Processing Technology: Principle & Practice 2nd Ed. CRC.
5. M.A.Rao, S.S.H.Rizvi and A.K.Dutta, (2005), "Engineering properties of Foods", 3rd ed., Marcel Dekker Publishers.
