

GANPAT UNIVERSITY

FACULTY OF SCIENCE

TEACHING AND EXAMINATION SCHEME

Program		B.Sc. – Food Technology	Branch	Food Technology	Semester	III	Version	1.0.0.0										
Effective from		2019-20	Effective for batches admitted onwards		2018-19													
S. N	Subject Code	Subject Name	Theory / Practical	Teaching Scheme								Examination Scheme						
				Credit				Hours Per Week				Theory Marks			Practical Marks			Total Marks
				Th	Tu	Pr	Total	Th	Tu	Pr	Total	CE	SE	ES	CE	SE	ES	
1	BFT301	Unit Operations in Food processing	Theory / Practical	3	1	2	6	3	1	4	8	20	20	60	20	20	60	200
2	BFT302	Principles of Food preservation	Theory / Practical	3	1	2	6	3	1	4	8	20	20	60	20	20	60	200
3	BFT303	Technology of fruits, vegetables and crops	Theory / Practical	3	1	2	6	3	1	4	8	20	20	60	20	20	60	200
4	BFT304	Food Packaging and Storage Technology	Theory / Practical	3	1	2	6	3	1	4	8	20	20	60	20	20	60	200
		Total		12	4	8	24	12	4	16	32	80	80	240	80	80	240	800

-GANPAT UNIVERSITY												
FACULTY OF SCIENCE												
Program	B.Sc. – Food Technology				Branch/Spec.	Food Technology						
Semester	III				Version	1.0.0.0						
Effective from Academic Year				2019-20	Effective for the batches Admitted onwards						July 2018	
Subject code	BFT302			Subject Name	Principles of Food Preservation							
Teaching scheme				Examination scheme								
	Th	Tu	Pr	Total	Marks	CE	SE	ES	Total	Duration	SE	ES
Hours	3	1	4	8	Theory	20	20	60	100	Theory	1 hr.	3 hr.
Credit	3	1	2	6	Practical	20	20	60	100	Practical	4 hr.	4 hr.
Pre-requisites												
Nil												
Scope and Objectives:												
	To study the importance microorganisms in food preservation.											
	To introduce the basics of various food processing and preservation technologies.											
	To teach different preservation methods.											
	To teach about thermal food processing.											
Learning Outcome:												
	Know about basic principles of food preservation, food spoilage and methods to determine hazards in preserve foods											
	Understand the processing and preservation techniques of food product.											
	Apply various food preservation methods to enhance the shelf life of food											
	Analyse the various preservation foods for the study of quality characteristics											
	Compare the potential of preservation techniques for the quality characteristics of various food											
	Develop the skills of optimizing and applying the various preservation methods.											
Syllabus- Theory												
Unit	Content											Hrs
1	Introduction Introduction to food processing: basic principles, importance of food processing and preservation; classification of foods based on pH, types of food spoilage, viz. microbiological, enzymatic, chemical, physical and their effects on food quality.											5
2	Food Preservation by Low temperature Freezing and Refrigeration :Introduction to refrigeration, cool storage and freezing, definition, principle of freezing, freezing curve, changes occurring during freezing, types of freezing i.e. slow freezing, quick freezing, introduction to thawing, changes during thawing and its effect on food.											6
3	Food Preservation by high temperature Thermal Processing- Commercial heat preservation methods: Sterilization, commercial sterilization, Pasteurization, and blanching.											5
4	Food Preservation by Moisture control Drying and Dehydration - Definition, drying as a means of preservation, differences between sun drying and dehydration (i.e. mechanical drying), heat and mass transfer, factors affecting rate of drying, normal drying curve, names of types of driers used in the food industry.											7
	Evaporation Definition and principle of evaporation, factors affecting evaporation, names of evaporators											5

	used in food industry.	
5	Food Preservation by Irradiation Introduction, units of radiation, kinds of ionizing radiations used in food irradiation, mechanism of action, uses of radiation processing in food industry, concept of cold sterilization.	6
6	Fermentation Principles of fermentation, Types of fermentation, curing and pickling; Hurdle technology, Advantages.	6
	Chemical Preservatives Natural Preservatives-Mode of action, Chemical preservatives- Sulphur dioxide, Benzoic acid, Sorbic acid, Antioxidants.	5

Syllabus Practical

1	To study the method of sampling.
2	Identification of lab equipment.
3	To study the concept of Asepsis and sterilization.
4	To study the drying curve.
5	To Study quality characteristics of foods preserved by drying/dehydration/ freezing.
6	To perform pasteurization of fluids using different methods.
7	To perform blanching of different plant foods
8	To perform the Pasteurization of the milk.
9	To study the concept of shelf life of different foods.
10	To perform blanching of different plant foods.
11	To study the storage of banana.
12	Preparation of product by using Oil as preservative
13	Identification of class I & class II Preservatives.
14	Preparation of product by using Salt as preservative.
15	Preparation of product by using Sugar as a preservative

Text books

1	Srilakshmi, B. Food science, New Age Publishers, 2002
2	Meyer, Food Chemistry, New Age, 2004
3	Bawa, A.S, Chauhan O.P. Food Science. New India Publishing agency, 2013
4	Frazier WC and Westhoff DC, Food Microbiology, TMH Publication, New Delhi, 2004
5	Krishna Prasad Nooralabettu, Downstream processing-A new horizon in biotechnology, PHI publication, New Delhi, 2010.
6	Robertson, G. L., Food Packaging: Principles and Practice, 3rd edition, 2013.

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Semester	III				Version	1.0.0.0						
Effective from Academic Year				2019-20	Effective for the batches Admitted onwards						July 2018	
Subject code	BFT301			Subject Name	Unit Operations in Food Processing							
Teaching scheme					Examination scheme							
	Th	Tu	Pr	Total	Marks	CE	SE	ES	Total	Duration	SE	ES
Hours	3	1	4	8	Theory	20	20	60	100	Theory	1 hr.	3 hr.
Credit	3	1	2	6	Practical	20	20	60	100	Practical	4 hr.	4 hr.
Pre-requisites												
Nil												
Scope and Objectives:												
	To provide basic understanding of the various unit operations involved in food processing.											
	To familiarize the students with the size reduction, and mixing operations of different types of foods necessary in the processing of foods.											
	To familiarize the students with the various equipment used for filtration and evaporation.											
	To explain the dehydration, drying curve, freeze drying and equipments required for carrying out these operations.											
Learning Outcome:												
	Know various unit operation and material handling in food processing.											
	Apply his computational skills in calculating the mass and energy balance in unit operation of food processing											
	Apply theoretical concepts in order to develop lucid ideas about the use of various unit operation relevant to food processing.											
	Compare various unit operations by means of in hand practice like size reduction, grading and mixing											
	Analyze various unit operation in food processign using lab equipments.											
	Create skill of using various parameters in solving food engnerring problems.											
Syllabus- Theory												
Unit	Content											Hrs
1	Material handling Theory, classification of various material handling equipments – conveyors (gravity and powered conveyors), elevators (bucket and screw type elevators), pneumatic conveyors; Cleaning – types of contaminants, methods of cleaning- dry cleaning methods: screening, aspiration, magnetic cleaning and abrasive cleaning, wet cleaning methods: soaking, spray washing, flotation washing and ultrasonic washing, combination methods.											10
2	Sorting and grading Advantages, methods; Size reduction- benefits, forces, criteria, energy requirement by Rittinger law, Kick’s law, Bond’s law, mode of operation of size reduction equipment – open circuit and closed circuit grinding, free crushing, choke feeding and wet milling; Size reduction of solid foods, fibrous foods and liquid foods; Effects of size reduction on solid and liquid foods; Sieving terminology, effectiveness of screen, particle size analysis, fineness modulus, equipments.											12

3	Mixing Terminology, equipments – mixers for liquids of low or moderate viscosity (Paddle agitators, turbine agitators and propeller agitators), mixers for high viscosity pastes (pan mixer, horizontal mixer and dough mixer), mixers for dry solids (tumbler mixer & vertical screw mixer), effects of mixing on foods; Filtration- terminology (feed slurry, filtrate, filter medium, filter cake and filter), Methods/equipments: pressure filtration, vacuum filtration and centrifugal filtration; Expression factors affecting efficiency, methods of expressing the liquid from solid-liquid food system – hydraulic pressing, roller pressing and screw pressing.	11
4	Evaporation and Dehydration Functions, factors affecting the rate of heat transfer, factors influencing the economics of evaporation, equipments – open pans, horizontal tube, vertical tube and plate evaporator, single and multiple effect evaporators; Dehydration- objectives, terminology, basic theory, drying curves. Dehydration systems- Tray drier, tunnel drier; Drying time calculations; Freeze drying- conventional drying vs. freeze drying, equipments used.	12

Syllabus Practical

1	Plant layout design
2	Determination of drying characteristics.
3	Determination of viscosity of Newtonian and non-Newtonian fluids.
4	Study of effect of temperature on viscosity.
5	Screen analysis of food sample.
6	Study of evaporation process.
7	Freezing time calculation.
8	Study of sorting and grading.
9	Determination of size and sphericity of agricultural materials given.
10	Determination of the rate of drying for given food product.
11	Study of different conveying equipments used in food material handling.
12	To study the working principle of hot air oven.
13	Study of fluid flow properties.
14	Study of heat exchangers.
15	Calculation for fruits and vegetables dehydration.

Text books

1	Earle R. L. (1983) Unit Operations in Food Processing, 2nd Edition, Pergamon Press.
2	Singh R. P. & Heldman D. R. (1984) Introduction to Food Engineering, Academic Press.
3	Toledo R. T. (1980) Fundamentals of Food Process Engineering, AVI Publication.
4	Saravacos G. D. and Maroulis Z. B. (2011) Food process engineering operations: contemporary food engineering series, CRC Press, Boca Raton.
5	Das H. (2005) Food processing operations analysis, Asian Books Publications, New Delhi.
6	Berk Z. (2013) Food process engineering and technology, 2nd edition, Academic press, New Delhi.

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Subject code	BFT303			Subject Name	Technology of Fruits, Vegetables and crops							
Teaching scheme					Examination scheme							
	Th	Tu	Pr	Total	Marks	CE	SE	ES	Total	Duration	SE	ES
Hours	3	1	4	8	Theory	20	20	60	100	Theory	1 hr.	3 hr.
Credit	3	1	2	6	Practical	20	20	60	100	Practical	4 hr.	4 hr.
Pre-requisites												
Nil												
Scope and Objectives:												
	To train the students in the field of Fruit and Vegetable Processing and											
	To make aware a student with knowledge of the basic postharvest biological, chemical, physiological and metabolic processes and changes in fruits and vegetables.											
	To enable the students learn different preservation techniques to curb post-harvest losses in the field of agriculture.											
	To explain processing technology of jam, jelly and marmalades											
Learning Outcome:												
	Apprehend different operations like cleaning, grading, peeling and different aroma recovery systems etc. involved in processing fruits and vegetables											
	Understand the structure and composition of fruits and vegetables and their role in nutrition											
	Grasp the concept of quality in relation to fruit and vegetable based products.											
	Apply various preservation techniques to enhance storage stability of fruits and vegetables.											
	Analyze the various fruit and vegetable products for their quality characteristics											
	Develop the skill of processing and equipments handling relative to fruit and vegetable											
Syllabus- Theory												
Unit	Content											Hrs
1	Introduction Importance of fruits and vegetable, history and need of preservation, reasons of spoilage, method of preservation (short & long term).											3
2	Canning and Bottling of Fruits and Vegetables Selection of fruits and vegetables, process of canning, factors affecting the process- time and temperature, containers of packing, lacquering, syrups and brines for canning, spoilage in canned foods.											6
3	Fruits Beverages Introduction, Processing of fruit juices (selection, juice extraction, deaeration, straining, filtration and clarification), preservation of fruit juices (pasteurization, chemically preserved with sugars, freezing, drying, tetra-packing, carbonation), processing of squashes, cordials, nectars, concentrates and powder.											7
4	Jams, Jellies and Marmalades Introduction, Jam: Constituents, selection of fruits, processing & technology, Jelly: Essential constituents (Role of pectin, ratio), Theory of jelly formation, Processing & technology,											6

	defects in jelly, Marmalade: Types, processing & technology, defects.	
5	Pickles, Chutneys And Sauces Processing , Types, Causes of spoilage in pickling.	4
6	Tomato Products Selection of tomatoes, pulping& processing of tomato juice, tomato puree, paste, ketchup, sauce and soup.	4
7	Dehydration of Fruits and Vegetables Sun drying & mechanical dehydration, process variation for fruits and vegetables, packing and storage.	4
8	Spices Processing and properties of major and minor spices, essential oils & oleoresins, adulteration.	6
9	Tea, Coffee and Cocoa Processing, Variety and Products.	5
Syllabus Practical		
1	Estimation of total soluble solids (TSS).	
2	Estimation of pH and acidity of products.	
3	Estimation of ascorbic acid and effect of heat treatment on it.	
4	To study the steps of can making process.	
5	Preparation and evaluation of pectin products.	
6	To study the Adulteration of spices.	
7	To study the Dehydration of fruits and vegetables.	
8	To study Rehydration of fruits and vegetables.	
9	Effects of pre-treatment and process variables on quality of preserve and candied fruits.	
10	Preparation of chutney.	
11	Preparation of sauerkraut	
12	Preparation of jam.	
13	Preparation of fruit nectar.	
14	Extraction of juice by different methods.	
15	Study of common food processing equipment such as pulper, sealers, juice extracting machines, autoclaves, corking machines etc.	
Text books		
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	Manay, S. & Shadaksharaswami, M.2004. Foods: Facts and Principles, New Age Publishers	
4	Ranganna S.1986. Handbook of analysis and quality control for fruits and vegetable products, Tata McGraw-Hill publishing company limited, Second edition.	
5	Srivastava, R.P. and Kumar, S. 2006 . Fruits and Vegetables Preservation- Principles and Practices. 3rd Ed. International Book Distributing Co.	

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Subject code	BFT304			Subject Name	Food Packaging and Storage Technology							
Teaching scheme					Examination scheme							
	Th	Tu	Pr	Total	Marks	CE	SE	ES	Total	Duration	SE	ES
Hours	3	1	4	8	Theory	20	20	60	100	Theory	1 hr.	3 hr.
Credit	3	1	2	6	Practical	20	20	60	100	Practical	4 hr.	4 hr.
Pre-requisites												
Nil												
Scope and Objectives:												
To impart comprehensive overview of the scientific and technical aspects of food packaging.												
To instill knowledge on packaging machinery, systems, testing and regulations of packaging.												
Learning Outcome:												
Know about the different types of packaging materials used in the food industry.												
Understand the role of packaging material and packaging techniques in storage of food.												
Analyse the physical and mechanical properties of food packaging materials												
Developed the skill to understand testing and regulatory aspect of food packaging												
Solve different problems to develop better controlled storage technology												
Create skills to co-relate between packaging and storage condition for food.												
Syllabus- Theory												
Unit	Content											Hrs
1	Introduction Packaging Functions and Requirements,, Printing of packages .Barcodes & other marking, Labeling Laws.											5
	Packaging material Paper and paper-based materials, corrugated fiber board (CFB). Plastics, formation- Injection molding, Blow molding, Types of plastics, Lamination, Biodegradable plastics, Edible packaging and Bio-composites. Environmental Concerns recycling and disposal of plastic waste Metal packaging- Metals: Tinplate, tinning process, components of tinplate, tin free can (TFC) types of can, metallic films, lacquers. Glass: Composition, Properties, Methods of bottle making, Types of closures.											15
2	Package Designing for Foods Package design for fresh horticultural produce and animal foods, dry and moisture sensitive foods, frozen foods, fats and oils, thermally processed foods and beverages.											12
3	Testing and Regulatory Aspects of Food Packaging Testing Procedures for Packaging Materials- thickness, tensile strength, puncture resistance, Bursting strength, seal strength, water vapor permeability, CO2 permeability, oxygen											5

	permeability, grease resistance. Testing Procedures for Packaged Foods - Compatibility and shelf life studies, evaluation of transport worthiness of filled packages. Food Packaging Laws and Regulations.	
4	Packaging Machinery and System Bottling machines, Cartooning systems, Seal and Shrink packaging machine; Form, Fill and Sealing machine (FFS). Vacuum, Controlled and Modified atmosphere packaging systems; Aseptic packaging systems; Retort packaging, Active and Intelligent packaging systems	8
Syllabus Practical		
1	Testing of physical/mechanical properties of food packaging material .	
2	Testing of thermal shock resistance of glass .	
3	Gas/Vacuum packaging of foods and shelf life studies.	
4	Determination of Water Vapor Transmission rate of Packaging Material.	
5	Edible packaging of Food Samples.	
6	Study of Sorption Isotherm for Food Package Design	
7	Packaged food cut-out analysis.	
8	To study the operation of FFS machine.	
9	Studies on strength properties of packaging materials.	
10	Determination of chemical resistance of plastics.	
11	Determination of shelf life of packaged foodstuff.	
12	Preparation of food product label.	
13	Ink adhesion test for milk pouches.	
14	Determination of paper alkalinity.	
15	Thermal shock resistance test for glass bottles.	
Text books		
1	Robertson GL, Food Packaging – Principles and Practice, CRC Press Taylor and Francis Group, 2012.	
2	Paine FA and Paine HY, A Handbook of Food Packaging, Blackie Academic and Professional, 1992.	
3	Coles R, McDowell D, Kirwan MJ Food Packaging Technology. Blackwell, 2003.	