

**DEPARTMENT OF FOOD PROCESSING TECHNOLOGY
SRI GURU GRANTH SAHIB WORLD UNIVERSITY**

OUTLINES OF TESTS, SYLLABI AND COURSES

FOR

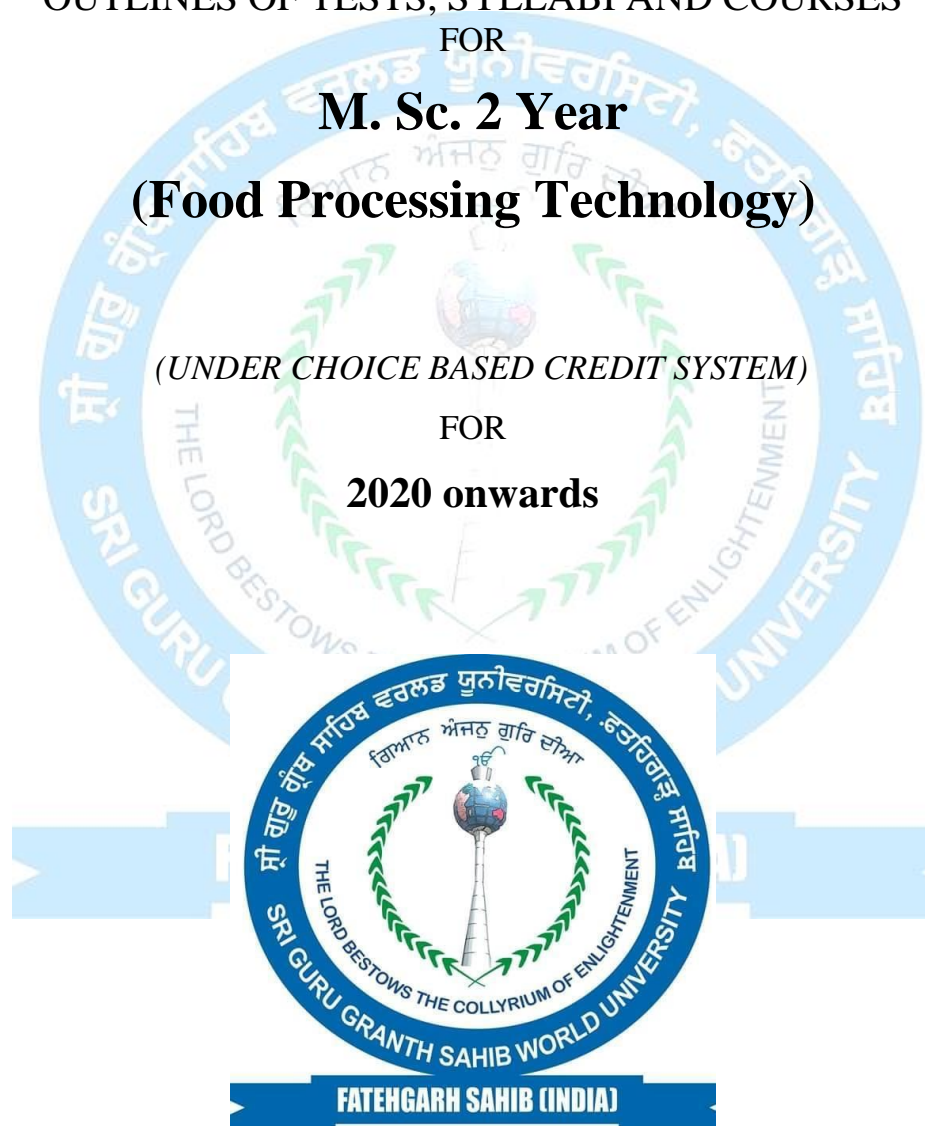
M. Sc. 2 Year

(Food Processing Technology)

(UNDER CHOICE BASED CREDIT SYSTEM)

FOR

2020 onwards



**SRI GURU GRANTH SAHIB WORLD UNIVERSITY
FATEHGARH SAHIB**

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SCHEME OF TEACHING & EXAMINATION
NAME OF THE DEPARTMENT: FOOD PROCESSING TECHNOLOGY
NAME OF THE COURSE: M. Sc. Food Processing Technology

SEMESTER-I

COURSE CODE	TITLE	CONTACT HOURS			CREDIT	MAX. MARKS	
		L	T	P		INT.	EXT.
MFP 101	Principles of Food Processing and Preservation	3	1	0	4	25	75
MFP 102	Food Microbiology	3	1	0	4	25	75
MFP 103	Food Chemistry	3	1	0	4	25	75
MFP 104	Enzymes in Food Processing	3	1	0	4	25	75
MFP 105	Elective Paper [#]	3	1	0	4	25	75
MFP 106 L	Practical paper pertaining to MFP 101 & MFP 102	0	0	4	2	25	75
MFP 107 L	Practical paper pertaining to MFP 103 & MFP 104	0	0	4	2	25	75
MFP 108	Seminar	0	2	0	2	50	00
		15	7	8	26	225	525
TOTAL						750	
#Elective (Select any one)							
(i)	Thermal Processing of Foods*						
(ii)	Nutraceutical and Functional Foods						

*Swayam MOOC Course

SEMESTER-II

COURSE CODE	TITLE	CONTACT HOURS			CREDIT	MAX. MARKS	
		L	T	P		INT.	EXT.
MFP 201	Technology of Fruits and Vegetables	3	1	0	4	25	75
MFP 202	Snack and Beverage Technology	3	1	0	4	25	75
MFP 203	Meat, Poultry and Fish Technology	3	1	0	4	25	75
MFP 204	Dairy Technology	3	1	0	4	25	75
MFP 205	Elective Paper [#]	3	1	0	4	25	75
MFP 206 L	Practical paper pertaining to MFP 201 & MFP 202	0	0	4	2	25	75
MFP 207 L	Practical paper pertaining to MFP 203 & MFP 204	0	0	4	2	25	75
MFP 208	Industrial Visit Seminar	0	2	0	2	50	00
		15	7	8	26	225	525
TOTAL						750	
#Elective (Select any one)							
(i)	Food Laws and Standards*						
(ii)	Research Methodology						

* Swayam MOOC Course

SCHEME OF TEACHING & EXAMINATION
NAME OF THE DEPARTMENT: FOOD PROCESSING TECHNOLOGY
NAME OF THE COURSE: M. Sc. Food Processing Technology

SEMESTER-III

COURSE CODE	TITLE	CONTACT HOURS			CREDIT	MAX. MARKS	
		L	T	P		INT.	EXT.
MFP 301	Food Engineering	3	1	0	4	25	75
MFP 302	Technology of Cereals and Pulses	3	1	0	4	25	75
MFP 303	Packaging Technology	3	1	0	4	25	75
MFP 304	Food Analysis & Quality Assurance	3	1	0	4	25	75
MFP 305	Elective Paper [#]	3	1	0	4	25	75
MFP 306 L	Practical paper pertaining to MFP 301 & MFP 302	0	0	4	2	25	75
MFP 307 L	Practical paper pertaining to MFP 303 & MFP 304	0	0	4	2	25	75
MFP 308	Industrial Training	0	0	4	2	50	00
		15	5	8	26	225	525
TOTAL						750	
[#] Elective (Select any one)							
(i)	Statistical Analysis						
(ii)	Fermentation Technology						

SEMESTER-IV

COURSE CODE	TITLE	CONTACT HOURS				MAX. MARKS	
		L	T	P	CREDIT	INT.	EXT.
MFP 401	Thesis	0	0	36	18	250	500
	TOTAL	0	0	36	18	750	

Program code: [SGGSWU FPT]

PROGRAM OUTCOME: Students will be able to engage in their collaborative learning, and they facilitated with group projects .Their ability of working independently as well as the ability to team work demonstrated. Provide managerial skills in a variety of situations with sensitivity to diverse backgrounds.

PROGRAM SPECIFIC OUTCOME: M.Sc. in food processing technology can take up jobs in different domains such as food industries such as dairy, food processing companies; catering establishments; soft drink manufacturing firms; spice, cereal , rice and sugar mills. Quality control organizations, food research laboratories; and packaging industries. Food technologist can also be selected as Food inspector, Food security officer food scientist, food quality control manager/supervisor, sensory evaluator, and so on. After passing professional degree of food processing technology program he or she can establish their own startups.

COURSE OUTCOME: Food chemistry course help regarding nutrition knowledge and its metabolism balance inside the body. They understand the principal base Food processing and product manufacture at industry and various food processing technologies and value added product development. The learning outcome of the nutraceutical constituents present in various food products and Health benefits of functional foods. Food toxicology is concerned with assessing the injurious effects on living systems of chemicals present in foods. Food microbiology provides knowledge about micro-organisms associated with food, their activities, destruction and detection in food. Statistical methods in food science exposed to various statistical tools required to analyze the experimental data in food research and industry. Food safety and quality control enable various tests and standards for quality assessment and food safety. The dietary guideline, principles of diet related disease prevention, nutrition at various age groups. Gain knowledge on various technologies used in food packaging to extend the shelf life of food products is under food packaging course. The project provides practical exposure cum training in food industries and organizations related to food technology. This research work is based on research activity and strengthening the student to solve the problem and also create authentic documents in the form of Thesis.

FATEHGARH SAHIB (INDIA)

*M.Sc. Food Processing Technology (Semester System), Batch-2020 and 2021
(Under Choice Based Credit System)*



Paper Code: MFP 101
Principles of Food Processing and Preservation

[SGGSWU- DFPT]
Teaching Hours: 60
Time Allowed: 3 hour

L/T: 3/1/0
Maximum Marks: 75
Pass Marks: 40%

Instructions for the Paper-Setters and Students: The question paper should consist of three sections A, B and C. Section A should comprise of nine (09) short answer questions of three (03) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B will have four (04) questions of twelve (12) marks each from Part I of the syllabus and a student is required to attempt any two. Similarly, Section C will have four (04) questions of twelve (12) marks each from Part II of the syllabus and a student is required to attempt any two questions from this section.

Objective of Subject: The aim of the subject is to introduce students to factors responsible for spoilage of food and various methods involved in processing and preservation of food.

Outcome of the Subject: By learning this subject students will gain knowledge about different techniques employed by food industries to preserve the raw material and finished products and to increase its shelf life by tackling various physical, chemical and biological constraints.

Relevance of the subject: The knowledge of subject will provide necessary skills required by students to begin career in any food industry.

PART-I

Introduction: Principles of Food preservation and status of food processing in India.

Food Spoilage: Microbial, Physical, Chemical & Miscellaneous.

Water activity: Concept of water activity and its relation to food spoilage.

Ambient temperature processing: Raw material preparation, cooling of raw material, cleaning, sorting, grading and peeling.

High temperature processing: Introduction, Effect of heat on microorganisms and enzymes, theory and equipment (blanching, pasteurization, sterilization, UHT, concentration and drying)

Intermediate Moisture (IM) Foods: Principles, characteristics, advantages, and Problems in developing new IM foods.

PART-II

Low temperature processing: Chilling and Freezing (Theory, equipment, applications, effect on food and microorganisms and thawing), freeze drying and freeze concentration.

Non-thermal technologies: HPP, Pulse electric field, ohmic heat.

Irradiation Processing: Microwaves and Irradiation-Source.

Hurdle Technology: Concept, types (physical, chemical and microbial), preservation by hurdle technology.

Recommended books:

1. *The Technology of Food Preservation by Desrosier & Desrosier.*
2. *Food Science by N.N. Potter.*
3. *Introduction to Food Science and Technology by Stewart.*

**Paper Code: MFP 102
Food Microbiology**

**[SGGSWU- DFPT]
Teaching Hours: 60
Time Allowed: 3 hour**

**L/T/P: 3/1/0
Maximum Marks: 75
Pass Marks: 40%**

Instructions for the Paper-Setters and Students: The question paper should consist of three sections A, B and C. Section A should comprise of nine (09) short answer questions of three (03) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B will have four (04) questions of twelve (12) marks each from Part I of the syllabus and a student is required to attempt any two. Similarly, Section C will have four (04) questions of twelve (12) marks each from Part II of the syllabus and a student is required to attempt any two questions from this section.

Objective of Subject: The aim of the subject is to acquaint students to know the important genera of microorganisms associated with food and their characteristics.

Outcome of Subject: After completing the course the students shall be well acquainted about the role of microbes in fermentation, spoilage and food borne diseases.

Relevance of Subject: The relevant knowledge of subject will provide necessary skills to join food industry as microbiologist in quality control section.

Part-I

Introduction: Definition, history and development of microbiology, scope and relevance of microbiology, Bacterial Classification and Diversity, Prokaryotic and Eukaryotic cell, morphology, structure, and reproduction of bacteria, yeast and mold.

Pure culture techniques- serial dilution, pour plating, streak plating, spread plate, slant, broth and enrichment culture.

Growth and survival of microorganisms in foods; spoilage organisms of milk, fruits, vegetables, grains and oilseeds, meat and poultry.

Microbial growth and death kinetics: Lag, log and decline phase.

Microbial spoilage of Food products: Biochemical changes caused by microorganisms, putrefaction, lipolysis; Antagonism and synergism in microorganisms; Food borne intoxication and food borne infections, Microbial toxins produced by staphylococcus, clostridium, aspergillus, bacterial pathogens.

Part-II

Microbial control: Physical and chemical methods to control microorganisms, indicator organisms; Rapid methods in detection of microorganisms.

Microbiology of food products: microbiology of raw and fermented milk products viz. yoghurt, cheese, cereal products, fruits and vegetables, meat and meat products, egg and fish products.

Recommended books:

1. Banawart GJ. 1989. *Basic Food Microbiology*. 2nd Ed. AVI Publ.
2. Frazier J & Westhoff DC. 1988. *Food Microbiology*. 4th Ed. McGraw Hill.
3. Garbutt J. 1997. *Essentials of Food Microbiology*. Arnold Heinemann.
4. Jay JM, Loessner MJ & Golden DA. 2005. *Modern Food Microbiology*. 7th Ed. Springer.
5. Ray B. 2004. *Fundamentals of Food Microbiology*. 3rd Ed. CRC.
6. Robinson RK. (Ed.). 1983. *Dairy Microbiology*. Applied Science.
7. Steinkraus KS. 1996. *Handbook of Indigenous Fermented Foods*. Marcel Dekke

Paper Code: MFP 103
Food Chemistry

[SGGSWU- DFPT]
Teaching Hours: 60
Time Allowed: 3 hour

L/T/P: 3/1/0
Maximum Marks: 75
Pass Marks: 40%

Instructions for the Paper-Setters and Students: The question paper should consist of three sections A, B and C. Section A should comprise of nine (09) short answer questions of three (03) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B will have four (04) questions of twelve (12) marks each from Part I of the syllabus and a student is required to attempt any two. Similarly, Section C will have four (04) questions of twelve (12) marks each from Part II of the syllabus and a student is required to attempt any two questions from this section.

Objective of Subject: The objective of subject is to familiarize students to various food constituents and their properties.

Outcome of the Subject: By learning this subject students will gain knowledge about various food constituents and effect of these constituents on food color and flavor during processing.

Relevance of the subject: The subject will provide necessary skills to work as food chemist and in quality control.

Part-I

Introduction: to chemistry of foods.

Carbohydrates: a) Monosaccharides: Occurrence, Classification, hexos, isomerism, diagrammatic representation of optical isomers, absolute configuration, reactions of monosaccharides; enolization, reducing and oxidizing properties, dehydration.

b) Oligosaccharides: Disaccharide—sucrose, lactose, maltose biosynthesis, classification, commercial sources.

c) Polysaccharide: Classification, cellulose, and starches (amylose and amylopectin), control hydrolysis of starch, polysaccharides, plant gums and hemicellulose.

Proteins: Occurrence, amino acids, physical & chemical properties, peptides, proteins & their properties, denaturation, major source of protein. Protein quality: biological value, protein efficiency ratio, Net protein utilization, PDCAAS.

Plant Pigments: Chlorophyll, anthocyanins and carotenoids, occurrence, structure, Chemistry, functions and changes during processing.

Part-II

Lipids: Introduction, occurrence, composition, classification of glycosides, structure, physical and chemical properties, rancidity and flavor.

Browning reactions: Enzymatic and non-enzymatic browning reactions in foods

Micronutrients

Minerals of Foods: Micro and macro minerals; Calcium, phosphorus, iron, copper, zinc & fluoride; their sources, deficiency diseases, RDA, functions and stability.

Vitamins: Water and fat-soluble vitamins; their sources, deficiency diseases, RDA, functions and stability.

Recommended Books:

1. *Biochemistry, Volume 2* By Stryer. Published by Freeman (1981).
2. *Food Chemistry* by O.R. Fennema.
3. *Food Chemistry* by H. Meyer.
4. *Fundamentals of Food Chemistry Laboratory* – J. Kaur, Houghton Mifflin Company, New York (2006).

Paper Code: MFP 104
Enzymes in Food Processing

[SGGSWU- DFPT]
Teaching Hours: 60
Time Allowed: 3 hour

L/T/P: 3/1/0
Maximum Marks: 75
Pass Marks: 40%

Instructions for the Paper-Setters and Students: The question paper should consist of three sections A, B and C. Section A should comprise of nine (09) short answer questions of three (03) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B will have four (04) questions of twelve (12) marks each from Part I of the syllabus and a student is required to attempt any two. Similarly, Section C will have four (04) questions of twelve (12) marks each from Part II of the syllabus and a student is required to attempt any two questions from this section.

Objective of Subject: The aim of the subject is to impart knowledge regarding various enzymes used and their role in food industry .

Outcome of the Subject: By learning this subject students will gain knowledge about various enzymes, their production procedures and applications of those enzymes in different food industries such as baking, brewing, fruit and vegetable industry etc.

Relevance of the subject: The knowledge of subject will provide necessary skills required by students to join food and fermentation industry.

PART-I

Introduction to Enzymes: Nomenclature and Classification, properties, Enzyme activity and units of enzyme activity, Factors affecting the rate of enzyme catalyzed reactions, co-factors, co-enzymes, prosthetic groups and turnover number, Enzyme Kinetics (Michaelis-Menton Equation)

Industrial enzyme production: Microbial sources of enzymes, microbial production of amylases, cellulases and pectinases and their downstream processing, applications of enzymes in food industry

Immobilization of enzymes: Definition, reversible and irreversible methods of immobilizations, support systems used for immobilization and industrial applications of such enzymes, co-immobilization.

PART-II

Enzymes in Starch Industry: production of modified starches and corn syrups (maltodextrins, HFCS, FOS)

Role of Enzymes in Fruit and Vegetable Industry: Cell wall degrading, debittering and decolorization enzymes.

Role of Enzymes in baking and brewing industry: α -amylase for anti-staling, xylanases and pentonases as dough conditioner and role of enzymes in mashing and finishing operation of beer.

Recent advances in enzyme technology: Enzyme-aided extraction of flavours (plant and animal sources), enzyme based biosensors for food analysis (glucose oxidase based biosensor and biosensors for food safety)

Recommended books:

1. *Encyclopedia of Bioprocess Technology* by Flickinger MC & Drew SW.
2. *Enzymes and their Role in Cereal Technology* by Kruger JE. et al.
3. *Enzymes in Food Processing* by Nagodawithana T & Reed G.
4. *Enzymes in Food Processing* by Tucker GA & Woods LFJ.
5. *Enzymes in Food Technology* by Whitehurst R & Law B.

Elective Paper
Paper Code: MFP 105
Nutraceuticals and Functional Foods

[SGGSWU- DFPT]
Teaching Hours: 60
Time Allowed: 3 hour

L/T/P: 3/1/0
Maximum Marks: 75
Pass Marks: 40%

Instructions for the Paper-Setters and Students: The question paper should consist of three sections A, B and C. Section A should comprise of nine (09) short answer questions of three (03) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B will have four (04) questions of twelve (12) marks each from Part I of the syllabus and a student is required to attempt any two. Similarly, Section C will have four (04) questions of twelve (12) marks each from Part II of the syllabus and a student is required to attempt any two questions from this section.

Objective of Subject: The aim of the subject is to give students basic understanding regarding nutraceutical and functional foods.

Outcome of the Subject: By learning this subject students will gain knowledge about concept of nutraceutical and functional foods, their sources and role in prevention of chronic disorders.

Relevance of the subject: The knowledge of subject will provide necessary skills required by students to join industries promoting health and dietic foods and research in product development.

PART-I

Nutraceutical and Functional Foods: Overview and definition of nutraceutical and functional foods, Classification, Applications of nutraceuticals and functional foods and their health benefits.

Nutraceuticals remedies for specific and common disorders: Cancer, Heart Disease (Hypercholesteremia) and liver disorders (Mechanism of action).

Food Sources: Different foods as functional food: Cereal products (oats, wheat bran, rice bran), fruits and vegetables, milk and milk products, legumes, nuts, sea foods, spices, medicinal plants, tea, coffee as functional foods/drinks and their protective effect

PART-II

Antioxidants: Concept, role as nutraceutical and functional foods.

Probiotics: Definition, important function of probiotic microorganisms, health effects including mechanism of action. Probiotics in various foods-fermented milk products, non-milk products.

Prebiotics: Definition, chemistry, sources, non-digestible carbohydrates/oligosaccharides-dietary fibres.

Synbiotics: Concept and health benefits.

Recommended Books:

1. *Functional Foods: Biochemical and Processing Aspects* by Giuseppe Mazza.
2. *Handbook of Nutraceuticals and Functional Foods*, Robert E.C. Wildman.
3. *Dietary Supplements of Plant Origin* by Massimo Maffei
4. *Nutraceutical beverages Chemistry, Nutrition and health Effects*; Fereidoon Sahidi, Deepthi K.
5. *Vegetables, fruits, and herbs in health promotion* Ronald R. Watson.

Paper Code: MFP 106 L
Practical paper pertaining to MFP 101 and MFP 102

[SGGSWU – DFPT]

Teaching Hours: 4 hours/week

2 Credits

Maximum Marks: 75

Pass Marks: 40%

1. To study adequacy of blanching.
2. To study effectiveness of pasteurization by MBRT test.
3. Effect of heat and pH on milk proteins.
4. Demonstration and prevention of browning reactions by different methods.
5. To determine the moisture content of fresh and intermediate moisture foods.
6. To study the effect of drying on a given food sample.
7. To check the shelf life of a given food at ambient temperature and under refrigeration.
8. To study the effect of chilling injury on perishable products.
9. Introduction to food microbiology and laboratory safety.
10. Demonstration of various instruments used in food microbiology lab.
11. Morphological study of bacteria and fungi using permanent slides.
12. Functioning and use of compound microscope.
13. Preparation and sterilization of microbial media.
14. Cultivation and sub-culturing of microbes.
15. Preparation of slants and plates using nutrient agar.
16. Simple staining, Gram staining, Negative staining.
17. Isolation of bacteria and molds from food sample.
18. Standard Plate Count of Milk and Foods.
19. Heat, Cold and Other Stress Factors Affecting Microbial Growth.
20. Determination and enumeration of pathogenic and indicator organisms in foods.
(Coliform/Enterococcus)
21. Thermal death time determination.
22. Detection of Salmonella from food sample.
23. Detection of coliforms from milk by MPN method.

FATEHGARH SAHIB (INDIA)

Paper Code: MFP 107L
Practical paper pertaining to MFP 103 and MFP 104

[SGGSWU – DFPT]

Teaching Hours: 4 hours/week

2 Credits

Maximum Marks: 75

Pass Marks: 40%

1. Preparation of various solutions and buffers.
2. Estimation of sugars in fruits by Anthrone method.
3. Estimation of protein by Lowry method.
4. Determination of TSS value of given food product.
5. Determination of titrable acidity and pH of food products.
6. Determination of acid value in given oil.
7. Determination of vitamin C by titration method.
8. Determination of Protein by kjeldhal method.
9. Estimation of % protein value in supplement diet by Lowry method.
10. Determination of fat by soxhlet apparatus.
11. Qualitative estimation of sugars.
12. Determination of ash content.
13. Clarification of fruit juice using enzymes
14. Prevention of enzymatic browning in fresh fruits and vegetables
15. Enzyme immobilization using sodium alginate beads
16. Effect of dextrinization in given flour samples
17. To study the effect of blanching on enzymes
18. To study the individual effect of temperature, pH and storage on stability of enzymes.
19. To study enzyme kinetics.



*M.Sc. Food Processing Technology (Semester System), Batch-2020 and 2021
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MFP 108- Seminar

**[SGGSWU- DFPT]
Maximum Marks: 50**

**L/T/P: 0/2/0
Pass Marks: 40%**

The student will deliver a seminar based on the current topics related to various disciplines of Food Processing Technology.



*M.Sc. Food Processing Technology (Semester System), Batch-2020 and 2021
(Under Choice Based Credit System)*



**Paper Code: MFP 201
Technology of Fruits and Vegetables**

**[SGGSWU- DFPT]
Teaching Hours: 60
Time Allowed: 3 hour**

**L/T/P: 3/1/0
Maximum Marks: 75
Pass Marks: 40%**

Instructions for paper setters:

The external question paper will carry 75 marks and will be of 3 hrs duration. It will consist of three sections named A, B and C. Section A will be comprised of nine questions of three (3) marks each from the whole syllabus (Part I and Part II). Section B will have four questions of twelve (12) marks each from Part I of the syllabus and student is required to attempt any two. Similarly, Section C will have four questions of twelve (12) marks each from Part II of the syllabus and student is required to attempt any two questions from this section.

Objective of Subject: To provide the students an opportunity to gain knowledge about the storage procedure of different fruits and vegetables and to help students to understand the different procedures for production of various fruit based and vegetable based products.

Outcome of the Subject: On completion of this course, students will gain knowledge of pre and post processing methods of fruits and vegetables and to identify suitable equipments for processing.

Relevance of the subject: The knowledge of subject will provide necessary skills required for understanding processing and storage of fruits and vegetables for their value addition.

PART-I

Introduction: Classification, structure and nutritive value of fruits and vegetables; pre-harvest factors affecting post-harvest physiology; Maturity indices, Harvest and post-harvest techniques.

Storage methods of fresh fruits and vegetables; packaging of fruits and vegetables-MAP, CAP.

Pre-processing operations-washing, blanching, peeling, sorting/grading, peeling, blanching, coring, destoning.

Preservation of fruits and vegetables- preservation by high temperature (pasteurization, sterilization) drying and dehydration (techniques, equipments and changes), low temperature (freezing)- (techniques, equipments and changes) fermentation, chemicals and other methods such as carbonation, acids, salt, sugar, spices and irradiation.

PART-II

Manufacturing of fruit juices: ingredients, process, equipments; Manufacturing of fruit juice concentrate

Fruit juice beverages: unfermented (RTS, squashes, cordial, nectar, syrups, carbonated beverages), fermented (wine, champagne, port and sherry)

Preserves: Preparation of jam, jelly, marmalade, role of pectin and theories of gel formation. Candied, glazed and crystallized fruits/vegetables

Technology of tomato products: Sauce, puree, ketchup, chutney and soup

Fermented fruits and vegetables: Sauerkraut and pickles

Waste management in fruits and vegetable processing industry: By products and its utilization

Recommended books:

1. *Handbook of Analysis of Fruits and Vegetable Products* by S. Rangana, Tata McGraw Hill, New Delhi, 1986.
2. *Commercial Vegetable Processing – Tressler DK and Woodruff JG, AVI Publishing Co., West port, CT 2004.*
3. *Commercial Fruit Processing – Woodrooff J.G., Luh B.S. AVI Publishing Co, West Port, CT 2004.*

Paper Code: MFP 202
Snack and Beverage Technology

[SGGSWU- DFPT]
Teaching Hours: 60
Time Allowed: 3 hour

L/T/P: 3/1/0
Maximum Marks: 75
Pass Marks: 40%

Instructions for paper setters:

The external question paper will carry 75 marks and will be of 3 hrs duration. It will consists of three sections named A, B and C. Section A will be comprise of nine questions of three (3) marks each from the whole syllabus (Part I and Part II). Section B will have four questions of twelve (12) marks each from Part I of the syllabus and student is required to attempt any two. Similarly, Section C will have four questions of twelve (12) marks each from Part II of the syllabus and student is required to attempt any two questions from this section

Objective of Subject: The syllabus has been designed to make students aware of different types of snacks and beverages, their manufacturing process and machinery involved in the production.

Outcome of the Subject: By learning this subject students will gain knowledge about various types of snacks and beverages, their role in health, manufacturing processes, their types and machinery required for the production of particular product.

Relevance of the subject: The knowledge of subject will provide necessary skills required by students to begin career in Snack and beverage food industry.

PART-I

Introduction: Definition and classification. Types of beverages and their importance; status of beverage industry in India

Packaged drinking water: Manufacturing processes. Treatments of water (activated carbon, ion exchange, reverse osmosis). Manufacturing technology for juice-based beverages; synthetic beverages.

Carbonated beverages: Raw material, role of ingredients, machinery and equipments.

Alcoholic beverages: Beer and wine, whiskey, brandy, rum (Manufacturing and types)

Tea and Coffee: Production, Processing and types.

Whey and Cocoa based beverages: Production, Processing and types

PART-II

Technology for grain-based snacks: whole grains – roasted, toasted, puffed, popped and flakes, coated grains-salted, spiced and sweetened; flour based – batter and dough based products; formulated chips and wafers, extruded snacks

Traditional Indian snack foods: Roasted, Dehydrated and Fried (Cereal and Legume based)- Ingredients, process, shelf life and equipments. Nutritional value of Indian snack foods.

Snack Food Seasonings: Ingredients, fillers, dehydrated dairy powders and vegetable powders, spices, compounded flavors, flavor enhancers, sweeteners, colors, processing aids, anti-oxidants

Recommended books:

1. *Snack Foods Processing* by Edmund WL.
2. *The Technology of Extrusion Cooking* by Frame ND.
3. *Snack Food* by Gordon BR.
4. *Snack Food Technology* by Samuel AM.
5. *Handbook of Food and Beverage Fermentation Technology* by Hui YH. et al.
6. *Handbook of Brewing* by Priest FG & Stewart GG.
7. *Beverages: Technology, Chemistry and Microbiology* by Varnam AH & Sutherland JP.
8. *Beverages: Carbonated and NonCarbonated* by Woodroof JG & Phillips GF.

**Paper Code: MFP 203
Meat, Poultry and Fish Technology**

**[SGGSWU- DFPT]
Teaching Hours: 60
Time Allowed: 3 hour**

**L/T/P: 3/1/0
Maximum Marks: 75
Pass Marks: 40%**

Instructions for paper setters:

The external question paper will carry 75 marks and will be of 3 hrs duration. It will consists of three sections named A, B and C. Section A will be comprise of nine questions of three (3) marks each from the whole syllabus (Part I and Part II). Section B will have four questions of twelve (12) marks each from Part I of the syllabus and student is required to attempt any two. Similarly, Section C will have four questions of twelve (12) marks each from Part II of the syllabus and student is required to attempt any two questions from this section.

Objective of Subject: *The subject aims to provide an understanding of the technology for handling, processing, preservation and byproduct utilization of meat, poultry and fish processing industry.*

Outcome of the Subject: *Students will learn about chemistry of meat and various processing and storage methods used for meat, fish, poultry and eggs.*

Relevance of the subject: *The knowledge of subject will provide necessary skills required to join meat, poultry and fish industry.*

PART-I

Meat: Introduction, Scope of meat industry in India, Chemical composition and microscopic structure of meat.

Slaughtering: Slaughtering of animals and poultry, inspection and grading of meat. Ante-mortem examination of animals and poultry birds, Post-mortem changes in meat and factors affecting them; Rigor mortis, pH decline, cold shortening, meat cuts.

Properties of fresh meat: changes in color; water holding capacity

Processing and preservation of fresh meat: cooking methods of meat, chilling, freezing, curing, smoking, dehydration, canning, meat tenderization, meat analogs.

PART-II

Poultry and eggs: Type of poultry, structure, composition and nutritive value of poultry eggs. Internal and external quality of eggs, egg spoilage, Preservation methods

Egg products: Frozen eggs, dried eggs.

Fish and seafood: Fish structure and composition, fish dressing, Preservation techniques: freezing, canning, pickling, surimi processing, Fish protein concentrates, fishmeal and by products of fish processing industry.

Recommended books:

1. *Meat, Poultry and Sea Food Technology : R.L. Henricksons.*
2. *Meat Hand Book : Albert Lovie.*
3. *Poultry Products Technology : G.J. Mountney.*
4. *Fish as food (Vol. I, II, III, IV) : George Borgstorm.*
5. *Fish Technology : R.J. Roberts*

**Paper Code: MFP 204
Dairy Technology**

**[SGGSWU- DFPT]
Teaching Hours: 60
Time Allowed: 3 hour**

**L/T/P: 3/1/0
Maximum Marks: 75
Pass Marks: 40%**

Instructions for paper setters:

The external question paper will carry 75 marks and will be of 3 hrs duration. It will consist of three sections named A, B and C. Section A will be comprised of nine questions of three (3) marks each from the whole syllabus (Part I and Part II). Section B will have four questions of twelve (12) marks each from Part I of the syllabus and student is required to attempt any two. Similarly, Section C will have four questions of twelve (12) marks each from Part II of the syllabus and student is required to attempt any two questions from this section.

Objective of Subject: *The aim of the subject is to acquaint students with techniques and technologies of testing and processing of milk into various products and by products.*

Outcome of the Subject: *After completion of course students are expected to have an understanding of processing methods of milk in a dairy industry and management of dairy plant.*

Relevance of the subject: *The knowledge of subject will provide necessary skills required by students to work in dairy industry.*

PART-I

General: Dairy Cooperatives, NDRI, NDDB, Operation Flood, Milk and Milk Products Order '92, nutritive value of milk, ICMR recommendation of nutrients, milk production in India with reference to global milk production, per capita availability of milk in India, role of milk and milk products in human nutrition, dairy cattle breeds, indigenous and exotic dairy cattle.

Dairy processing and technology: Concepts of dairy processing, milk collection, transportation and Grading of milk, standardization, pasteurization, homogenisation of milk, packaging of milk, cleaning and sanitation, cleaning in place (CIP) System of cleaning, cleaning agents

PART-II

Dairy processing and technology: physico-chemical composition of milk, common microbes found in milk, manufacture of fat rich dairy products, cream, butter, ghee, ice cream, concentrated and dried milk products, cheese and paneer, manufacture of dahi and yoghurt.

Dairy plant management and quality analysis of milk: Food safety and Quality assurance strategies, implementation of HACCP/ ISO and certification, packaging of market milk and milk products, sensory analysis of milk, determination of specific gravity, fat, SNF, TS, acidity & pH in milk and their significance and interpretation, determination and significance of MBRT Test, SPC, phosphatase activity in milk, common adulterants in milk and their detection techniques.

Recommended books:

1. *Outlines of Dairy Technology by Sukumar (De)*
2. *Indian Dairy Products by Rangappa, K. S. & Acharya, K. T.*
3. *The technology of Milk Processing – Anantha krishnan, C. P., Khan, A.Q. and Padmanabhan, P. N.*

Elective Paper
Paper Code: MFP 205
Research Methodology

[SGGSWU- DFPT]
Teaching Hours: 60
Time Allowed: 3 hour

L/T/P: 3/1/0
Maximum Marks: 75
Pass Marks: 40%

Instructions for paper setters:

The external question paper will carry 75 marks and will be of 3 hrs duration. It will consists of three sections named A, B and C. Section A will be comprise of nine questions of three (3) marks each from the whole syllabus (Part I and Part II). Section B will have four questions of twelve (12) marks each from Part I of the syllabus and student is required to attempt any two. Similarly, Section C will have four questions of twelve (12) marks each from Part II of the syllabus and student is required to attempt any two questions from this section.

Objective of Subject: Student will learn the meaning of research, to find the research problem, to create the research objectives etc. They will also find suitable methods for fining the solution for their research problem. This course will through light on various aspects of thesis writing and judicial ways of paper publishing.

Outcome of Subject: At the end of the course, the students will be able to: Have the detailed knowledge about research problems, their types and their solutions as well.

Relevance of Subject: Learn about the sampling types and techniques. Gain insight knowledge regarding the thesis writing and paper publishing.

PART-I

Foundations of Research: Definition, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory, Characteristics of scientific method, Understanding the language of research and Concept.

Problem Identification and Formulation: Research Question, Investigation Question, Measurement Issues: formation of Hypothesis

Research Design: Concept and Importance in Research, Features of a good research design, Exploratory Research Design. Descriptive Research Designs and Experimental Design: Concept of Independent and Dependent variables

Qualitative and Quantitative Research: Qualitative research, Quantitative research, Concept of measurement, causality, generalization, replication, merging the two approaches

PART-II

Sampling: Introduction to Sample types, sampling frame, Sample error, determining size of the sample, Practical considerations in sampling

Interpretation of Data and Paper Writing: Layout of a Research Paper, Search for Journals, Impact factor of Journals, When and where to publish? Ethical issues related to publishing, plagiarism and self plagiarism, plagiarism detection (Urkund)

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Use of tools /techniques for Research: Methods to search required information effectively, Software for paper formatting (MS Office).

Recommended Books:

1. I.Kothari CR (2004) *Research Methodology: Methods and Techniques*, 2nd Ed., New Age International publishers
2. Marder MP (2011) *Research Methodology for Science*, First Ed. Cambridge University Press
3. Kumar R (2011) *Research Methodology: a step by step guide for beginners*, 3rd Ed., SAGE Publications Ltd, 1 Oliver's Yard 55 City Road London



**Paper Code: MFP 206 L
Practical paper pertaining to MFP 201 and MFP 202**

[SGGSWU – DFPT]

Teaching Hours: 4 hours/week

2 Credits

Maximum Marks: 75

Pass Marks: 40%

1. Qualitative analysis of pectin
2. Preparation of jam from selected fruits
3. Preparation of jelly from selected fruits
4. Preparation of fruit marmalade
5. Preparation of RTS/ nectar
6. Preparation of squash/ crush
7. Preparation of cordial
8. Preparation of pickles
9. Dehydration of ginger, onion and garlic
10. Preparation of vegetable sauces
11. Preparation of preserves
12. Preparation of banana and potato wafers
13. Preparation of candied fruit and glazed fruit
14. Visit to fruits and vegetables pack house/ canning plant/ vegetable dehydration plant
Preparation of fried snacks
15. Development of puffed snacks (sweet and salted) from fox nut (Makhana)
16. Study of malting of Barley
17. Degree brix determination of different market beverage samples
18. Preparation of RTS Beverage
19. Comparative sensory evaluation of RTS prepared in lab with market sample
20. Preparation of wine and study its physico-chemical properties
21. Preparation of whey fruit blend
22. Preparation of composite dairy product (BajraLassi)
23. Determination of Vitamin C in fruit juice sample

FATEHGARH SAHIB (INDIA)

**Paper Code: MFP 207 L
Practical paper pertaining to MFP 203 and MFP 204**

[SGGSWU – DFPT]

Teaching Hours: 4 hours/week

2 Credits

Maximum Marks: 75

Pass Marks: 40%

1. To study the composition of meat
2. To study the composition of egg
3. To perform grading of eggs on the basis of size
4. To study external and internal egg quality factors (candling and floating test)
5. To study iron sulfide formation in egg at different temperatures
6. To study the effect of coagulation time on egg
7. To study the foaming properties of whole egg, egg white and egg yolk
8. Protein estimation by Lowry method
9. To study microbiological quality of cooked and raw market meat sample
10. Visit to abattoir
11. To study the methylene blue reduction test for given sample.
12. Determination of milk fat, titrable acidity, total solids and SNF.
13. Detection of adulterant in milk (tests which can be done in laboratory)
14. Detection of adulterant in milk (tests which can be done at home)
15. Preparation of flavoured milk.
16. Preparation of Khoa.
17. Preparation of Paneer and Channa.
18. Preparation of ghee from cream.
19. Preparation of ghee from butter.
20. Visit to different milk plants to learn about milk condensing and drying operations.

FATEHGARH SAHIB (INDIA)

*M.Sc. Food Processing Technology (Semester System), Batch-2020 and 2021
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**Paper Code: MFP 208
Industrial Visit Seminar**

**[SGGSWU- DFPT]
Maximum Marks: 50**

**L/T/P: 0/2/0
Pass Marks: 40%**

The student will deliver a seminar based on the industrial visit carried out by the department to a food processing industry.



*M.Sc. Food Processing Technology (Semester System), Batch-2020 and 2021
(Under Choice Based Credit System)*



**Paper Code: MFP 301
Food Engineering**

**[SGGSWU- DFPT]
Teaching Hours: 60
Time Allowed: 3 hour**

**L/T/P: 3/1/0
Maximum Marks: 75
Pass Marks: 40%**

Instructions for paper setters:

The external question paper will carry 75 marks and will be of 3 hrs duration. It will consists of three sections named A, B and C. Section A will be comprise of nine questions of three (3) marks each from the whole syllabus (Part I and Part II). Section B will have four questions of twelve (12) marks each from Part I of the syllabus and student is required to attempt any two. Similarly, Section C will have four questions of twelve (12) marks each from Part II of the syllabus and student is required to attempt any two questions from this section.

Objective of Subject: *The aim of the subject is to acquaint with basic principle of Food Engineering and its Processes, with importance of various foods processes and their evaluation.*

Outcome of the Subject: *After completing the course the students shall be well acquainted about different food engineering processes and various principles working behind them.*

Relevance of the subject: *The students will be skilled in understanding principles behind food engineering.*

PART-I

Dimensions and Units: Basic and derived units, The SI system. Mathematical technique in process calculations: Linear and Non-linear equations.

Material Balance: Basic principles. Process flow diagram. Total mass balance, component mass balance, material balance problems involved in dilution, concentration and dehydration.

PART-II

Energy Balance: Energy terms, energy balance calculations, properties of saturated and superheated steam.

Fluid Flow: concept of viscosity, Nature and classification of fluids, measurement of viscometers– capillary tube viscometer, rotational viscometer. Reynold's number, Bernoulli's equation and its application, friction in pipes, pipe line fittings.

Pressure and its measurement– Simple and Differential manometers.

Recommended Books:

1. *Introduction to Food Engineering* by R.P. Singh & D.R. Heldman.
2. *Fundamentals of Food Process Engineering* by R.T. Toledo.
3. *Transport Processes and Unit Operations* by C.J. Geankoplis

Paper Code: MFP 302
Technology of Cereals and Pulses

[SGGSWU- DFPT]
Teaching Hours: 60
Time Allowed: 3 hour

L/T/P: 3/1/0
Maximum Marks: 75
Pass Marks: 40%

Instructions for paper setters:

The external question paper will carry 75 marks and will be of 3 hrs duration. It will consist of three sections named A, B and C. Section A will be comprised of nine questions of three (3) marks each from the whole syllabus (Part I and Part II). Section B will have four questions of twelve (12) marks each from Part I of the syllabus and student is required to attempt any two. Similarly, Section C will have four questions of twelve (12) marks each from Part II of the syllabus and student is required to attempt any two questions from this section.

Objective of Subject: To acquaint students with production and consumption trends, structure, composition, quality evaluation, and processing technologies for product development and value addition of various cereals and pulses.

Outcome of the Subject: On completion of this course, students shall become aware of composition, technology and machinery involved in processing of various cereals and pulses.

Relevance of the subject: The knowledge of subject will provide necessary skills required for understanding cereals and pulses and their value addition.

PART-I

Rice: Production, composition, structure and characteristics of varieties, classification and properties, milling, criteria of rice quality and parboiling of paddy, processed foods from rice, rice milling, Machinery and modern rice mill, stabilization of rice bran.

Wheat: Production, composition, structure and characteristics of varieties, criteria of grain and flour quality, wheat conditioning and milling, air classification of flour, Flour and its treatment, rheology and chemistry of dough, physical dough testing instruments. Technology of baking bread, biscuit, bakery ingredients and their functions. Durum wheat and pasta products like macaroni. Processing of wheat flakes.

PART-II

Corn: Production, corn type, composition, structure and characteristics of varieties, dry and wet milling of corn, composition and properties of corn starch, snacks from corn, tortilla chips, extruded snacks, corn starch modification and uses, corn sweeteners such as glucose syrup, high fructose corn syrups, dextrose and maltodextrin.

Legumes: Composition, Production of legumes, minor and major constituents, antinutritional factors production of protein isolates.

Recommended books:

1. *Technology of Cereals.* By N.L. Kent.
2. *Wheat Chemistry and Technology-* Pomeranz.
3. *Corn chemistry and Technology* by Tanley A Watson and Paul E. Ramstad.
4. *Legumes: Chemistry, Technology and Human Nutrition* by Ruth H. Matthews.
5. *Pulse Chemistry and Technology* by B. Tiwari and N. Singh (RSC).

Paper Code: MFP 303
Packaging Technology

[SGGSWU- DFPT]
Teaching Hours: 60
Time Allowed: 3 hour

L/T/P: 3/1/0
Maximum Marks: 75
Pass Marks: 40%

Instructions for paper setters:

The external question paper will carry 75 marks and will be of 3 hrs duration. It will consist of three sections named A, B and C. Section A will be comprised of nine questions of three (3) marks each from the whole syllabus (Part I and Part II). Section B will have four questions of twelve (12) marks each from Part I of the syllabus and student is required to attempt any two. Similarly, Section C will have four questions of twelve (12) marks each from Part II of the syllabus and student is required to attempt any two questions from this section.

Objective of Subject: To aim of the subject is to acquaint the students with packaging methods, packaging materials, packaging machineries, modern packaging techniques etc.

Outcome of the Subject: The subject will help students to learn about various packaging materials, methods and their applications in food industry.

Relevance of the subject: The knowledge of subject will provide necessary skills required by students to efficiently decipher about the type of packaging required to safely package the food without any alterations in physical and chemical properties.

PART-I

Introduction to packaging: Functions of packaging; Types of packaging; Packaging environment.

Properties: Burst Strength, Tear Resistance, Tensile Strength, Grease Resistance, Gas Transmission Rate (GTR), Water Vapour Transmission Rate (WVTR).

Package Testing: Thickness, Paper density, Basis weight, Grammage.

Paper and Paper Boards: Paper manufacture – Pulping, Digestion, Bleaching, Beating and Refining. Types of paper: Kraft paper, bleached paper, Grease proof paper, Glassine paper, Vegetable parchment Waxed paper, Paper board grades, Printing and varnishing, Die cutting and creasing, Gluing and sealing.

Glass: Parts of glass container, Shape of glass Container, Properties of glass, advantages and disadvantages of glass. Glass manufacture: Press and Blow (P&B), Narrow Neck Press and Blow (NNPB).

PART-II

Metal: Introduction, Manufacture of Tin Plate, Tin plating

Plastic: Classification of plastics: Polyethylene, Polypropylene, Polystyrene, Polycarbonate, Polyvinyl Chloride, Polyvinylidene Chloride, Ethylvinyl Alcohol, Polyethylene terephthalate; Advantages, Disadvantages; Manufacturing: Coating, Laminating.

Specialized techniques in food packaging: Aseptic Packaging: Introduction, Specific fields of application, Reasons for use of Aseptic Packaging, Retort pouches; Controlled Atmosphere Packaging Technology (CAP), Modified Atmosphere Packaging Technology (MAP): Advantages and disadvantages of MAP, Vacuum packaging; Shrink packaging.

Recommended books:

1. *Principles of Food Packaging by Saccharow and Griffin.*
2. *Food Packaging Principles by Gordon Robertson.*
3. *Food Packaging by Takashi Kadoya.*
4. *Handbook of Food Packaging by Paine & Paine.*

Paper Code: MFP 304
Food Analysis and Quality assurance

[SGGSWU- DFPT]
Teaching Hours: 60
Time Allowed: 3 hour

L/T/P: 3/1/0
Maximum Marks: 75
Pass Marks: 40%

Instructions for paper setters:

The external question paper will carry 75 marks and will be of 3 hrs duration. It will consists of three sections named A, B and C. Section A will be comprise of nine questions of three (3) marks each from the whole syllabus (Part I and Part II). Section B will have four questions of twelve (12) marks each from Part I of the syllabus and student is required to attempt any two. Similarly, Section C will have four questions of twelve (12) marks each from Part II of the syllabus and student is required to attempt any two questions from this section.

Objective of Subject: The aim of the subject is to create basic understanding regarding quality control and assurance and instruments needed to ensure quality.

Outcome of the Subject: By learning this subject students will learn about various quality control and assurance attributes, GMP and GHP regulations in food sector and food safety management systems.

Relevance of the subject: The students will be skilled to maintain food safety regulations and quality assurance in food sector.

PART-I

Concept of quality assurance: Quality attributes- physical, chemical, nutritional, microbial, and sensory; their measurement and evaluation; Sensory instrumental methods for testing quality.

Colour: Methods of color determination with spectrophotometer, colorimeter, hunter color lab, Lovi bond tintometer.

Food rheology and viscosity: Measurement of viscosity and consistency with Brookfield synchroelectric viscometer, bostwick consistometer.

Food texture: Texture measuring instruments; TPA.

PART-II

Chromatography: Application of chromatographic techniques to determine food quality, Principal and working and application of Thin Layer Chromatography, Gas Chromatography, High Performance Liquid Chromatography.

Non destructive methods of analysis: NIR, NMR, Ultrasonic equipment.

Sensory evaluation: Different methods of sensory analysis

Recommended books:

1. *Quality control in food industry (Vol. I and II), Kramer and Twigg*
2. *Modern method of analysis, Stewart and Whittaker*
3. *Sensory quality control, M.A. Amerian*
4. *Sensory analysis of food, J.R. Piggot*
5. *Food analysis Principle and technique, Dieter W. Geuwedi*

Elective Paper

Paper Code: MFP 305
Statistical Analysis

[SGGSWU- DFPT]
Teaching Hours: 60
Time Allowed: 3 hour

L/T/P: 3/1/0
Maximum Marks: 75
Pass Marks: 40%

Instructions for the Paper-Setters and Students: The question paper should consist of three sections A, B and C. Section A should comprise of nine (09) short answer questions of three (03) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B will have four (04) questions of twelve (12) marks each from Part I of the syllabus and a student is required to attempt any two. Similarly, Section C will have four (04) questions of twelve (12) marks each from Part II of the syllabus and a student is required to attempt any two questions from this section.

Objective of Subject: The aim of the subject is to make students familiar with the foundation of statistical, graphical and algebraic concepts.

Outcome of Subject: Students will gain knowledge about tools and techniques used in statistical analysis.

Relevance of Subject: The knowledge of subject will provide helps to use the proper methods to collect the data, employ the correct analyses & effectively present the results.

PART- I

Basic concepts: population, sample, parameter, statistic, frequency distribution, cumulative frequency distribution; graphic and diagrammatic representation of data; techniques of data collection, sampling vs. population, primary and secondary data.

Central Tendency and Dispersion: Measures of central tendency: mean, median, mode, measures of dispersion: range, quartile deviation mean deviation, standard deviation.

Correlation: Simple; coefficient of correlation; Karl Pearson and rank correlation, Partial and Multiple Correlation.

Data representation and Measurement: Diagrams and Graphs using MS Excel, Calculation of mean, median, mode, range, quartile deviation mean deviation, standard deviation, correlation in Excel.

PART- II

Probability and Distribution: Probability: concepts, rules of probability (addition and multiplication); random variables; mathematical expectation.

Probability Distributions: Binomial and Normal Distribution

Sampling and Testing of Hypotheses: Random sample; concept of sampling distribution; concepts of testing of hypothesis and test of significance; tests of significance of proportion, mean (based on z, t only). Chi-square Test.

Recommended Books:

1. *Probability and Statistics for Engineers, Cengage Learning by Jay L. Devore.*
2. *Mathematical Statistics, Prentice Hall by John E. Freund,*
3. *An Introduction to Mathematical Statistics and its Applications, Prentice Hall by Richard J. Larsen and Morris L. Marx*
4. *Sampling Techniques, John Wiley by William G. Cochran*

Elective Paper

**Paper Code: MFP 305
Fermentation Technology**

**[SGGSWU- DFPT]
Teaching Hours: 60
Time Allowed: 3 hour**

**L/T/P: 3/1/0
Maximum Marks: 75
Pass Marks: 40%**

Instructions for the Paper-Setters and Students: The question paper should consist of three sections A, B and C. Section A should comprise of nine (09) short answer questions of three (03) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B will have four (04) questions of twelve (12) marks each from Part I of the syllabus and a student is required to attempt any two. Similarly, Section C will have four (04) questions of twelve (12) marks each from Part II of the syllabus and a student is required to attempt any two questions from this section.

Objective of Subject: The subject will provide student's knowledge about importance of food fermentation and its applications in food fermentation industry.

Outcome of the Subject: This subject will enable students to learn about the positive role and benefits of micro-organisms in food and basic biological and chemical processes related to fermentations.

Relevance of the subject: The knowledge of subject will provide necessary skills required by students to join industries dealing with fermentation in food sector.

PART-I

Overview of Fermentation: Definition, Fermentation as an ancient art, modern era of fermentation technology, types of fermentation.

Industrially important micro-organisms- Isolation, screening and genetic improvement of industrially important micro-organisms.

Fermentation Media- Criteria used in media formulation, influence of medium, raw materials for process control.

Fermenter Design: Structure of fermenter, types of fermenters, instrumentation and process control, feedback systems,.

Fermentation systems: Types of fermentations, solid state, submerged, Batch, Fed batch and continuous systems, upstream processing.

PART-II

Downstream processing: Objectives, steps, problems, separation processes.

Microbial production of various primary and secondary metabolites- alcohol, organic acids (citric acid and acetic acid), enzymes (amylase), antibiotics (penicillin, cephalosporin).

Biomass production: microbial production of single cell protein, Baker's yeast.

Indian fermented Products: Production of Indian fermented products idli, dosa, vadi, etc.

Recommended Books:

1. *Biotechnology: A Textbook of Industrial Microbiology* by Crueger, W. & Crueger, A.
2. *Principles of Fermentation Technology* by Stansbury, P. F., Whitakar, A. and Hall, S. J.
3. *Industrial Microbiology* by Reed, G.
4. *Fermentation Microbiology and Biotechnology* by Mansi, E. M. T. E. L. & Bryce, C. F. A.

Paper Code: MFP 306 L
Practical paper pertaining to MFP 301 and MFP 302

[SGGSWU – DFPT]

Teaching Hours: 4 hours/week

2 Credits

Maximum Marks: 75

Pass Marks: 40%

1. To determine the evaporation capacity of an evaporator by material balance.
2. To calculate the specific heat of the given sample
3. To determine the flow rate of a fluid using Reynold's number.
4. To determine the viscosity of the given sample using Ostwald's viscometer.
5. Application of psychrometric charts in food engineering.
6. To perform dehydration of given food sample and to evaluate its moisture content on wet and dry basis.
7. To draw the drying curve and the rate of drying curve.
8. To study the effectiveness of different filter aids.
9. To study dimensional graphs.
10. Determination of physical properties of legumes
11. Determination of proximate composition of selected pulses
12. Determination of nutritional quality of selected pulses
13. Preconditioning of pulses before milling
14. Removal of anti-nutritional compounds from selected pulses and oilseeds
15. Laboratory milling of selected pulses and its quality evaluation
16. Study of cooking quality of dhal
17. Processing of composite legume mix and preparation of value added products
18. Processing of soy milk and value added products
19. Visit to commercial dhal mills and oil mills



Paper Code: MFP 307 L
Practical paper pertaining to MFP 303 and MFP 304

[SGGSWU – DFPT]

Teaching Hours: 4 hours/week

2 Credits

Maximum Marks: 75

Pass Marks: 40%

1. Classification of various packages based on material and rigidity.
2. Measurement of thickness of packaging materials.
3. Measurement of basic weight and grammage of paper and paperboards.
4. Measurement of water absorption of paper and paper boards (Cobb Test).
5. Measurement of bursting strength of paper and paper boards.
6. Measurement of tear resistance of papers.
7. Measurement of puncture resistance of paper and paperboard.
8. Identification of plastic films.
9. Head space analysis of packaged food.
10. Determination of gas and water transmission rate of package films.
11. Study of vacuum packaging machine, bottle filling machine and form-fill-seal machine.
12. Analysis (TSS, acidity, reducing and non-reducing sugar content) of jam/jelly/marmalade.
13. Analysis (ash content, moisture content and Polyphenol content) of spices.
14. Analysis (ash content, moisture content, fat content) of milk, milk powder.
15. Analysis (ash content, moisture content, Polyphenol content) of tea and coffee.
16. Analysis (ash content, moisture content, crude fibre content, loaf volume only for bread) of wheat flour, bread, biscuits.
17. Analysis (acidity, reducing and non-reducing sugar, TSS) of non-alcoholic beverages.
18. Estimation of (a) Iodine value, (b) Saponification value (c) acid value (d) peroxide value of fats and oils.



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**Paper Code: MFP 308
Industrial Training**

**[SGGSWU – DFPT]
Maximum Marks: 50**

**L/T/P: 0/0/4
Pass Marks: 40%**

The Candidate has to gain knowledge about the experimental techniques used in laboratories of any reputed Institute/Industry in relevant subject by working there for the minimum period of six weeks. Afterwards, the candidate has to submit the following documents:

1. The confidential report of candidate's participation in the training duly signed by the Head/Supervisor of the Institute/Industry in the sealed envelope.
2. A report about the techniques learned by him/her during the training.

On the basis of his report, Viva-voice will be conducted.



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*M.Sc. Food Processing Technology (Semester System), Batch-2020 and 2021
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Paper Code: MFP 401

Thesis

**[SGGSWU – DFPT]
Maximum Marks: 750**

**L/T/P: 0/0/18
Pass Marks: 40%**

- The project work may be done in the department/industry/national lab/university/CSIR labs and similar organization.
- Candidate have to present the final viva/presentation on the basis of the thesis.

