

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

OUTLINES OF TESTS, SYLLABI AND COURSES
FOR

**B. Tech. 4 Year Course
(Food Processing Technology)**

(UNDER CHOICE BASED CREDIT SYSTEM)

FOR

2020 onwards



FATEHGARH SAHIB (INDIA)

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

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

SEMESTER-I

COURSE CODE	TITLE	SCHEDULE OF TEACHING (Hours per week)			CREDIT	MAX. MARKS	
		L	T	P		INT.	EXT.
BFTF101	Applied Mathematics	4	1	0	5	40	60
BFTF102	Applied Physics	3	1	0	4	40	60
BFTF103	Applied Chemistry-I	3	1	0	4	40	60
BFTF104	Engineering Drawings and Graphics	2	1	4	4	40	60
BFTF105	Electrical and Electronic Engineering	3	1	0	4	40	60
BFTF 106	Sikhism: An Introduction (History & Values)	3	0	0	2	40	60
BFTF 107 L	Applied Physics Lab	0	0	2	1	20	30
BFTF108 L	Applied Chemistry-I Lab	0	0	2	1	20	30
BFTF 109 L	Electrical and Electronic Engineering Lab	0	0	2	1	20	30
TOTAL					26	300	450
TOTAL						750	

SEMESTER-II

COURSE CODE	TITLE	SCHEDULE OF TEACHING (Hours per week)			CREDITS	MAX. MARKS	
		L	T	P		INT.	EXT.
BFTF 201	Applied Chemistry –II	3	1	0	4	40	60
BFTF 202	Communication skills	3	0	0	3	40	60
BFTF 203	Computer Fundamentals and Internet Technology	3	0	0	3	40	60
BFTF 204	Fundamentals of Machanical Engineering	3	1	0	4	40	60
BFTF 205	Workshop Practice	1	0	4	3	40	60
BFTF 206	Introduction to Food Processing Technology	3	1	0	4	40	60
BFTF 207 L	Applied Chemistry –II Lab	0	0	2	1	20	30
BFTF 208 L	Communication skills Lab	0	0	2	1	50	-
BFTF 209 L	Computer Fundamentals and Internet Technology Lab	0	0	2	1	20	30
TOTAL					24	330	420
TOTAL						750	

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SEMESTER-III

COURSE CODE	TITLE	SCHEDULE OF TEACHING (Hours per week)			CREDIT	MAX. MARKS	
		L	T	P		INT.	EX T.
BFTF 301	Principles of Food Processing & Preservation	3	0	0	3	40	60
BFTF 302	Fundamentals of Food Biochemistry	3	0	0	3	40	60
BFTF 303	Food Microbiology	3	0	0	3	40	60
BFTF 304	Food Processing Equipment	3	0	0	3	40	60
BFTF 305	Elective Paper [#]	3	0	0	3	40	60
BFTF 306	Punjabi Professional/Elementary	3	0	0	3	40	60
BFTF 307 L	Principles of Food Processing & Preservation Lab	0	0	2	1	20	30
BFTF 308 L	Fundamentals of Food Biochemistry Lab	0	0	2	1	20	30
BFTF 309 L	Food Microbiology Lab	0	0	2	1	20	30
		18	0	6	21	300	450
Total						750	
[#] Elective (Select any one)							
(i)	Basic Biology						
(ii)	Spices and Health Benefits*						

*Swayam MOOC

SEMESTER-IV

COURSE CODE	TITLE	SCHEDULE OF TEACHING (Hours per week)			CREDIT	MAX. MARKS	
		L	T	P		INT.	EXT.
BFTF 401	Dairy Technology	3	0	0	3	40	60
BFTF 402	Heat and Mass Transfer	3	0	0	3	40	60
BFTF 403	Food and Nutrition	3	0	0	3	40	60
BFTF 404	Environmental Sciences	3	0	0	3	40	60
BFTF 405	Food Engineering	3	0	0	3	40	60
BFTF 406	Elective Paper [#]	3	0	0	3	40	60
BFTF 407 L	Dairy Technology Lab	0	0	2	1	20	30
BFTF 408 L	Heat and Mass Transfer Lab	0	0	2	1	20	30
BFTF 409 L	Food and Nutrition Lab	0	0	2	1	20	30
		18	0	6	21	300	450
Total						750	
[#] Elective (Select any one)							
(i)	Food Adulteration and Its Detection*						
(ii)	Food Biotechnology						

*SWAYAM MOOC

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SEMESTER-V

COURSE CODE	TITLE	SCHEDULE OF TEACHING (Hours per week)			CREDITS	MAX. MARKS	
		L	T	P		INT.	EXT.
BFTF 501	Technology of Fats and Oils	3	0	0	3	40	60
BFTF 502	Industrial Microbiology	3	0	0	3	40	60
BFTF 503	Snack and Beverage Technology	3	0	0	3	40	60
BFTF 504	Food Processing Plant Layout & Design	3	0	0	3	40	60
BFTF 505	Elective Paper [#]	3	0	0	3	40	60
BFTF 506L	Technology of Fats and Oils Lab	0	0	2	1	20	30
BFTF 507 L	Industrial Microbiology Lab	0	0	2	1	20	30
BFTF 508 L	Snack and Beverage Technology Lab	0	0	2	1	20	30
		15	0	6	18	260	390
Total						650	
[#] Elective (Select any one)							
(i)	Research Methodology						
(ii)	Nutraceuticals and Functional Foods						

SEMESTER-VI

COURSE CODE	TITLE	SCHEDULE OF TEACHING (Hours per week)			CREDITS	MAX. MARKS	
		L	T	P		INT.	EXT.
BFTF 601	Technology of Cereals and Pulses	3	0	0	3	40	60
BFTF 602	Technology of Fruits and Vegetables	3	0	0	3	40	60
BFTF 603	Meat, Poultry and Fish Technology	3	0	0	3	40	60
BFTF 604	Sugar and Chocolate Confectionery Technology	3	0	0	3	40	60
BFTF 605	Elective Paper [#]	3	0	0	3	40	60
BFTF 606L	Technology of Cereals and Pulses Lab	0	0	2	1	20	30
BFTF 607L	Technology of Fruits and Vegetables Lab	0	0	2	1	20	30
BFTF 608L	Meat, Poultry and Fish Technology Lab	0	0	2	1	20	30
BFTF 609L	Sugar and Chocolate Confectionery Technology Lab	0	0	2	1	20	30
BFTF 610	Technical Seminar	0	2	0	2	50	-
		15	2	8	21	330	420
Total						750	
[#] Elective (Select any one)							
(i)	Psychosocial aspects of food*						
(ii)	Statistics Analysis						

*SWAYAM MOOC

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SEMESTER-VII

COURSE CODE	TITLE	SCHEDULE OF TEACHING				MAX. MARKS	
		L	T	P	CREDITS	INT.	EXT.
BFTF 701	Project	0	0	36	18	250	500
	TOTAL	0	0	36	18	750	

SEMESTER-VIII

COURSE CODE	TITLE	SCHEDULE OF TEACHING (Hours per week)				CREDITS	MAX. MARKS	
		L	T	P	INT.		EXT.	
BFTF 801	Food Analysis and Quality Assurance	3	0	0	3	40	60	
BFTF 802	Enzymes in Food Processing	3	0	0	3	40	60	
BFTF 803	Packaging Technology	3	0	0	3	40	60	
BFTF 804	Food Laws, Standards and IPR	3	0	0	3	40	60	
BFTF 805	Elective Paper [#]	3	0	0	3	40	60	
BFTF 806 L	Food Analysis and Quality Assurance Lab	0	0	2	1	20	30	
BFTF 807 L	Enzymes in Food Processing Lab	0	0	2	1	20	30	
BFTF 808 L	Packaging Technology Lab	0	0	2	1	20	30	
		15	5	6	23	260	390	
Total						650		
[#]Elective (Select any one)								
(i)	Fermentation Technology							
(ii)	Food Additives and its application*							

*SWAYAM MOOC

FATEHGARN SAHIB (INDIA)

*B. Tech. Food Processing Technology (Semester System), Batch-2020 and 2021
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Program code: [SGGSWU- BTF]

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: B. Tech. 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: Bakery and confectionary course is engage job prospect as well as own bakery and confectionery unit establishment. 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 Project Report.

FATEHGARH SAHIB (INDIA)

*B. Tech. Food Processing Technology (Semester System), Batch-2020 and 2021
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SEMESTER I

The syllabus of subject BFTF 101, BFTF 102, BFTF 103, BFTF 104, BFTF 105 and BFTF 106 will be provided by concerned departments.

SEMESTER II

The syllabus of subject BFTF 201, BFTF 202, BFTF 203, BFTF 204 and BFTF 205 will be provided by concerned departments.



Paper Code: BFTF 206

Introduction to Food Processing Technology

[SGGSWU- DFPT]

L/T: 3/1

Teaching Hours: 45

Maximum Marks: 60

Time Allowed: 3 hour

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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each section.

Objective of Subject: The objective of subject is to acquaint students to different classes of foods.

Outcome of the Subject: By learning this subject students will gain knowledge about different classes of foods along with basic information regarding their structure, nutritional composition and processing techniques.

Relevance of the subject: The relevant knowledge of subject will provide necessary skills required to have basic understanding of raw material required for processing into valuable product as per the industry needs.

PART I

Introduction and Historical development of food science and technology: Evolution of Food Processing from prehistoric times till date. Introduction to various branches of Food Science and Technology

Introduction to Cereals and Pulses: Cereals and Millets. Introduction, structure, composition and uses and by-products of cereals. Wheat- Structure and composition of wheat, types (hard, soft/ strong, weak), process malting of wheat grains Gelatinization of starch, types of browning. Composition of Rice. Millets -Varieties, composition and uses of maize, sorghum, barley, rye, oats, triticale, pearl millet and finger millet. Pulses: Introduction, common names and scientific names of different pulses. Chemical composition of pulses, processing of pulses- soaking, germination, decortications, cooking and fermentation. Toxic constituents in pulses and its detoxification processes.

PART II

Introduction to Fats and Oils: Classification of lipids, types of fatty acids - saturated fatty acids, unsaturated fatty acids, essential fatty acids, trans fatty acids. Refining of oils, types- steam refining, alkali refining, bleaching, steam deodorization, hydrogenation. Rancidity - hydrolytic and oxidative rancidity and its prevention. Define - margarine, butter, hydrogenated vegetable oil, lard.

Introduction to Fruits and Vegetables: Classification of fruits and vegetables, general composition, enzymatic browning, names and sources of pigments, Dietary fiber. Post harvest changes in fruits and vegetables – Climacteric rise, horticultural maturity, physiological maturity, physiological changes, physical changes, chemical changes, pathological changes during the storage of fruits and vegetables.

Recommended books:

1. Food Science by N.N. Potter.
2. Introduction to Food Science and Technology by Stewart.
3. Food Chemistry by H. Meyer.

SEMESTER-III
Paper Code: BFTF 301
Principles of Food Processing & Preservation

[SGGSWU- DFPT]

Teaching Hours: 45

Time Allowed: 3 hour

L/T: 3/0

Maximum Marks: 60

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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each 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:BFTF 302
Fundamentals of Food Biochemistry

[SGGSWU – DFTF]

Teaching Hours: 45

Time Allowed: 3 hour

L/T: 3/0

Maximum Marks: 60

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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each section.

Objective of Subject: The subject will introduce students to biological basis of nutrition and various metabolic pathways by which food influence health.

Outcome of the Subject: This subject will enable students to learn about various metabolic pathways involved in metabolism of nutrients in the body and the role of nutrition in maintaining good health.

Relevance of the subject: The knowledge of subject will provide necessary skills required by students to join dietetics and nutrition experts.

PART-I

Introduction: General introduction to food biochemistry and definition, food micromolecules and macromolecules. Role of water in food, structure of water, water activity.

Enzymes: Enzymes classification, specificity of enzymes, co-enzymes, co-factors, enzyme inhibitors and activators, Factors effecting enzyme activity, Michaelis-Menten equation and Line weaver Burk plot.

Metabolism of carbohydrates: Digestion and absorption, glycolysis, gluconeogenesis, glycogenesis, glycogenolysis, Kreb's cycle, electron transport chain and oxidative phosphorylation.

PART-II

Metabolism of lipids: Digestion, absorption and function of lipid, oxidation of fatty acids, Biosynthesis of fatty acids and fats.

Metabolism of proteins: Importance of protein, digestion and absorption of proteins, nitrogen balance, Metabolism of protein and essential amino acids. End products of protein metabolism.

Recommended books:

1. A textbook of Biochemistry by Ramarao CBS
2. Principles of Biochemistry by Lehninger AVI
3. Modern Experimental Biochemistry, Boyer, Pearson Education
4. Lubert stryer, Biochemistry, Freeman & Co, N.Y.
5. Voet & Voet, Fundamentals of Biochemistry, Jonh Willey & Sons

Paper Code: BFTF 303
Food Microbiology

[SGGSWU- DFPT]

Teaching Hours: 45

Time Allowed: 3 hour

L/T: 3/0

Maximum Marks: 60

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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each section.

Objective of Subject: The objective of subject is to acquaint students with microflora associated with different food groups.

Outcome of the Subject: The knowledge of subject will make students aware of various microorganisms associated with food and also spoilage causing micro-organisms. The subject will provide understanding of various tests used to detect these micro-organisms.

Relevance of the 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 in bacteria, yeast and mold.

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

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

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

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. *Basic Food Microbiology* by Banawari GJ.
2. *Food Microbiology* by Frazier J & Westhoff DC.
3. *Essentials of Food Microbiology* Garbutt J.
4. *Modern Food Microbiology* by Jay JM, Loessne MJ & Golden DA.
5. *Fundamentals of Food Microbiology* by Ray B.
6. *Dairy Microbiology. Applied Science.* Robinson RK. (Ed.).
7. *Handbook of Indigenous Fermented Foods* Steinkraus KS.

Paper Code: BFTF 304
Food Processing Equipment

[SGGSWU- DFPT]

Teaching Hours: 45

Time Allowed: 3 hour

L/T: 3/0

Maximum Marks: 60

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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each section.

Objective of Subject: To aim of the subject is to facilitate the students with understanding of various food equipments and techniques along with their principles and working.

Outcome of the Subject: The subject will help students to explain principle and working of different techniques, equipments and machinery used in food processing operations.

Relevance of the subject: The knowledge of subject will provide necessary skills required with application of instruments in relevant field.

PART-I

Size Reduction: General principles, considerations governing equipment selection, size reduction equipment, modes of operation of size reduction plant, calculation of energy requirements for comminution of solids, disintegration of fibrous materials-slicing, dicing, shredding and pulping.

Drying equipments: Theory, drying curve and types of dryers used in food Industry including Drum dryers, spray dryers, tray dryers, Freeze dryers etc.

Screening: Terminology, types of screens, effectiveness of screens, screen analysis for particle size determination.

Material Handling Theory, types of material handling equipments like belt conveyor, screw conveyor, bucket elevator and pneumatic conveyor.

PART-II

Filtration: Theory of filtration, filtration equations for constant pressure and constant rate filtration, filtration equipments, filter media and filter aids.

Sedimentation: Theory, free and hindered settling, sedimentation equipments.

Centrifugal Separation: Theory, basic equation, rate of separation, liquid separation, gas-solid separation, centrifugation equipments.

Mixing: Theory, measurement of mixing, rates of mixing, types of mixers – mixers for liquids of low or moderate viscosity, mixers for high viscosity pastes and plastic solids, mixers for dry solids.

Recommended books:

1. *Transport Processes and Unit Operations* by Christie J Geankoplis.
2. *Food Engineering Operations* by J G Brennan, J R Butters, N D Cowell, A E V Lilley.
3. *Unit Operations of Chemical Engineering* by Warren L McCabe, Julian C Smith, Peter Harriott; McGraw-Hill.
4. *Unit Operations in Food Processing* by R L Earle.
5. *Unit Operations of Agricultural Processing* by K M Sahay and K K Singh.

Elective Subject
Paper Code: BFTF 305
Basic Biology

[SGGSWU – DFPT]
Teaching Hours: 45
Time Allowed: 3 hour

L/T: 3/0
Maximum Marks: 60
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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each section.

Objective of Subject: To aim of the subject is to facilitate the students with understanding of basic knowledge of living beings and concept of life science.

Outcome of the Subject: The subject will help students to learn basic principles of life science and cell and its structure and topology.

Relevance of the subject: The knowledge of subject will provide necessary knowledge of concepts of life sciences.

PART-I

Biological Systems, Evolution and Biodiversity

Introduction to concepts of biology: Themes in the study of biology; A closer look at ecosystem; A closer look at cell; The process of Science; Biology and everyday life.

Evolutionary history of biological diversity: Early earth and the origin of life; Major events in the history of life; Mechanism of Macroevolution; Phylogeny and the tree of life.

Classifying the diversity of life: Kingdoms of Life –Prokaryotes, Eukaryotes, Archaea.

Darwinian view of life and origin of species: Darwin's theory of evolution; The evolution of populations; Concepts of species; Mechanism of speciation.

Genetic approach to Biology: Patterns of inheritance and question of biology; Variation on Mendel's Law; The molecular basis of genetic information; The flow of genetic information from DNA to RNA to protein; Genetic Variation; Methodologies used to study genes and gene activities; Developmental noise; Detecting macromolecules of genetics; Model organisms for the genetic analysis; Distinction between Phenotype and Genotype.

PART- 2

Chemical Context of Living Systems

Chemistry of life: The constituents of matter; Structure of an atom; The energy level of electron; The formation and function of molecules depend on chemical bonding between atoms; Chemical reaction make or break chemical bonds

Water and life: The water molecule is polar; Properties of water; Ionization of water

Carbon and life: Organic chemistry-the study of carbon compounds; What makes carbon special? Properties of organic compounds.

Structure and function of biomolecules: Most macromolecules are Polymers; Carbohydrates act as fuel and building materials; Lipids are group of hydrophobic molecules; Protein have diverse structures and functions; Nucleic acids store and transmit hereditary information.

Recommended books:

1. Biology 8th edition by Campbell, N.A. and Reece, J. B.
2. Biology 7th edition by Raven, P.H *et al.*
3. Introduction to Genetic Analysis, 9th edition by Griffiths, A.J.F *et al.*

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Paper Code: BFTF 306

Punjabi Professional/Elementary

[SGGSWU – DFPT]

Teaching Hours: 45

Time Allowed: 3 hour

L/T: 3/0

Maximum Marks: 60

Pass Marks: 40%

The syllabus of subject BFTF 306 will be provided by concerned departments.



*B. Tech. Food Processing Technology (Semester System), Batch-2020 and 2021
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Paper Code: BFTF 307 L
Principles of Food Processing & Preservation Lab

[SGGSWU – DFPT]

Teaching Hours: 2 hours/week

Time Allowed: 3 hour

1 Credits

Maximum Marks: 30

Pass Marks: 40%

List of Practicals:

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.



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**Paper Code: BFTF 308 L
Fundamentals of Food Biochemistry Lab**

[SGGSWU – DFPT]

Teaching Hours: 2 hours/week

Time Allowed: 3 hour

1 Credits

Maximum Marks: 30

Pass Marks: 40%

List of Practicals:

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.



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**Paper Code: BFTF 309 L
Food Microbiology Lab**

[SGGSWU – DFPT]

Teaching Hours: 2 hours/week

Time Allowed: 3 hour

1 Credits

Maximum Marks: 30

Pass Marks: 40%

List of Practicals:

1. Introduction to food microbiology and laboratory safety.
2. Demonstration of various instruments used in food microbiology lab.
3. Morphological study of bacteria and fungi using permanent slides.
4. Functioning and use of compound microscope.
5. Preparation and sterilization of microbial media.
6. Cultivation and sub-culturing of microbes.
7. Preparation of slants and plates using nutrient agar.
8. Simple staining, Gram staining, Negative staining.
9. Isolation of bacteria and molds from food sample.
10. Standard Plate Count of Milk and Foods.
11. Heat, Cold and Other Stress Factors Affecting Microbial Growth.
12. Determination and enumeration of pathogenic and indicator organisms in foods.
(Coliform/Enterococcus)
13. Thermal death time determination.
14. Detection of Salmonella from food sample.
15. Detection of coliforms from milk by MPN method.



SEMESTER IV

Paper Code: BFTF 401 Dairy Technology

**[SGGSWU – DFPT]
Teaching Hours: 45
Time Allowed: 3 hour**

**L/T: 3/0
Maximum Marks: 60
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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each 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, NDDDB, 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 cattles.

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 – Sukumar (De) – Oxford University press*
2. *Indian Dairy Products – Rangappa (K.S.) & Acharya (KT) – Asia Publishing House.*
3. *The technology of milk Processing – Ananthkrishnan, C.P., Khan, A.Q. and Padmanabhan*

Paper Code: BFTF 402
Heat & Mass Transfer

[SGGSWU – DFPT]
Teaching Hours: 45
Time Allowed: 3 hour

L/T: 3/0
Maximum Marks: 60
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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each section.

Objective of Subject: To understand the fundamentals of heat transfer mechanisms in fluids and solids and their applications in various heat transfer equipments in industries.

Outcome of Subject: Students able to understand and solve conduction, convection and radiation problems..

Relevance of Subject: The students will be skilled to predict heat transfer rates and acquire an understanding of heat transfer effects .

PART-I

Introduction: Basic concepts of heat and mass transfer, importance of heat and mass transfer in food processing.

Conduction Heat Transfer: Steady state heat transfer through slabs, composite walls, cylinders, spheres; insulation and its purposes, critical thickness of insulation for cylinders and spheres.

Convection Heat Transfer: Natural and forced convection, dimensional analysis for free and forced convection, dimensionless numbers used in convective heat transfer, important correlations for free and forced convection.

Boiling and condensation: Boiling phenomenon, hysteresis in boiling curve, nucleate and forced convection boiling; condensation phenomenon

Radiation Heat Transfer: Characteristics of black, grey and real bodies in relation to thermal radiation, Stefan Boltzman law; Kirchoff's law; Wein displacement law, intensity of radiation, radiation between two bodies.

PART-II

Heat Exchangers: Classification, overall heat transfer coefficient, fouling factors, log-mean temperature difference for parallel and counter flow heat exchangers, effectiveness of parallel and counter flow heat exchanger by NTU method, Design of shell and tube heat exchanger.

Mass Transfer: Introduction to mass transfer, different modes of mass transfer, Mass flux and molar flux for a binary system, Fick's law of diffusion of mass transfer, Molecular diffusion in gases, liquids and solids having steady state equi-molar counter diffusion and through non diffusing body; Steady state equimolar counter diffusion, convective mass transfer coefficient, natural and forced convective mass transfer, dimensional analysis for free and forced convective mass transfer

Suggested Readings:

1. Arora & D'kundwar A course in Heat and Mass Transfer Dhanpat Rai & Sons
2. R.C. Sachdeva Fundamentals of Engg. Heat & Mass New Age Transfer
3. G.K. Roy Fundamental of Heat and Mass Transfer Khanna Pub
4. D.S. Kumar Heat and Mass Transfer Kataria & Sons

Paper Code: BFTF 403

Food and Nutrition

[SGGSWU- DFPT]

Teaching Hours: 45

Time Allowed: 3 hour

L/T: 3/0

Maximum Marks: 60

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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each section.

Objective of Subject: This course will enable the student to understand the relationship between food, nutrition and health.

Outcome of Subject: After completing the course the students shall be well acquainted about various food groups and balanced diet.

Relevance of Subject: The knowledge of subject will provide necessary skills required for understand the functions of food.

PART-I

INTRODUCTION TO FOOD AND NUTRITION: Basic terms used in study of food and nutrition, BMI and Nutritional Status, Understanding relationship between food, nutrition and health.

BALANCED DIET : Functions of food-physiological, psychological and social, Concept of Balanced Diet, Food Groups, Food Pyramid.

NUTRIENTS : Classification, digestion, functions, dietary sources, RDA, clinical manifestations of deficiency and excess and factors affecting absorption of the following in brief: Energy Carbohydrates, lipids and proteins, Fat soluble vitamins-A, D, E and K Water soluble vitamins – thiamin, riboflavin, niacin, pyridoxine, folate, vitamin B12 and vitamin C Minerals – calcium, iron, iodine, fluorine, copper and zinc.

PART-II

CONCEPTS OF MEAL PLANNING: Factors affecting meal planning, understanding specific considerations for planning meal for different groups of people.

METHODS OF COOKING: Dry, moist, frying and microwave cooking, Advantages, disadvantages and the effect of various methods of cooking on foods.

NUTRITIONAL LABELING: Importance, global trends, codex guidelines, nutritional labelling in India, FSSAI guidelines.

Recommended Readings:

1. Bamji MS, Krishnaswamy K, Brahmam GNV Textbook of Human.
2. Srilakshmi Food Science.
3. Wardlaw MG, Paul M Insel Mosby Perspectives in Nutrition.
4. Food Safety and Standards Authority of India portal, Government of India.
5. Gopalan, C, NIN, ICMR. Nutritive Value of Indian Foods.
6. Seth V, Singh K Diet planning through the Life.

**Paper Code: BFTF 404
Environmental Sciences**

[SGGSWU – DFPT]

Teaching Hours: 45

Time Allowed: 3 hour

L/T: 3/0

Maximum Marks: 60

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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each section.*

Objective of Subject: *The objectives of environmental sciences are to develop a world in which persons are aware of and concerned about environment, Natural resources, Ecosystem and the problems associated with it.*

Outcome of Subject: *After completing the course students will able to demonstrate a general understanding of the breadth and interdisciplinary nature of environmental issues.*

Relevance of Subject: *The Environmental Studies major prepares students for careers as leaders in understanding and addressing complex environmental issues from a problem-oriented, interdisciplinary perspective.*

PART-I

Introduction to environmental studies: Multidisciplinary nature of environmental studies; Scope and importance; Concept of sustainability and sustainable development

Natural Resources: Renewable and Non-renewable Resources

- Land resources and land use change; Land degradation, soil erosion and desertification.
- Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
- Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).
- Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

Ecosystems: What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems:

- a) Forest ecosystem
- b) Grassland ecosystem
- c) Desert ecosystem
- d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and Conservation:

- Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots
- India as a mega-biodiversity nation; Endangered and endemic species of India
- Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

PART-II

Environmental Pollution

- Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution
- Nuclear hazards and human health risks
- Solid waste management: Control measures of urban and industrial waste.
- Pollution case studies.

Environmental Policies & Practices

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture
- Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).
- Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

Human Communities and the Environment

- Human population growth: Impacts on environment, human health and welfare.
- Resettlement and rehabilitation of project affected persons; case studies.
- Disaster management: floods, earthquake, cyclones and landslides.
- Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan.
- Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.
- Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

Field work:

- Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds and basic principles of identification.
- Study of simple ecosystems-pond, river, Delhi Ridge, etc.

Recommended Books:

1. *Silent Spring*. Houghton Mifflin Harcourt.
2. *Fundamentals of Ecology*. Philadelphia: Saunders.
3. *3 Ecology and Environment* by Sharma, P.D.
4. *Textbook of Environmental Studies*, Bharucha.
5. *Cunningham, W. P., Cooper, T. H., Gorhani, E. & Hepworth, M. T. Environmental Encyclopedia*.
6. *Environmental Chemistry* by De, A. K.
7. *Pepper, I.L., Gerba, C.P. & Brusseau, Ecology and economics: An approach to sustainable development* by Sengupta, R
8. *Ecology, Environmental Science and Conservation* by Singh, J.S., Singh, S.P. and Gupta, S.R.
9. *Conservation Biology: Voices from the Tropics* by Sodhi, N.S., Gibson, L. & Raven, P.H. (eds).
10. *The Creation: An appeal to save life on earth* by Wilson, E. O.
11. *Ecology-Principles and Applications* Chapman, J.L. and Reiss, M.J.

Paper Code: BFTF 405
Food Engineering

[SGGSWU – DFPT]
Teaching Hours: 45
Time Allowed: 3 hour

L/T: 3/0
Maximum Marks: 60
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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each 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.

Suggested Readings:

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

Elective Subject
Paper Code: BFTF 406
Food Biotechnology

[SGGSWU – DFPT]
Teaching Hours: 45
Time Allowed: 3 hour

L/T: 3/0
Maximum Marks: 60
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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each section.

Objective of Subject: This course will offer basic concepts of food biotechnology along with principles of genetics in food industry.

Outcome of the Subject: On completion of this course, students shall become aware of fundamentals of food biotechnology and application of recombinant DNA technology in food processing industry.

Relevance of the subject: The knowledge of subject will provide necessary skills required with application of biotechnology in development and progression of food technology.

PART-I

Introduction to genetic material: Chemical nature, properties, and functions of the genetic material
Overview of bacterial DNA replication: Origin of replication, Enzymes and proteins required for DNA replication and overview of replication
Bacterial transcription: Types of RNA and overview of bacterial transcription.
Bacterial translation: Genetic code and overview of bacterial translation.
Mutation and DNA repair: Types of mutation, mechanisms of repair of damaged DNA (photo reactivation, excision repair, recombination repair, SOS repair and mismatch repair).
Regulation of gene expression in prokaryotes: Fine structure of gene (Operator, Promoter, Structural and regulatory gene sequence) and Mechanism of bacterial gene expression regulation - Lac operon.

PART-II

Cloning vectors: Introduction, plasmid and other vectors
Steps of gene cloning: Isolation and purification of insert DNA, selection and isolation of vector DNA, construction of recombinant DNA, introduction of recombinant DNA into host cell, identification and selection of cells containing cloned genes
Biosensors: Introduction, classification and application in food industries
GMO food: Introduction **DNA modifying enzymes:** Restriction enzymes and other modifying enzymes, Ethical issues and guidelines

Recommended Books:

1. *Biotechnology - Expanding Horizons* by B.D. Singh
2. *Biotechnology and Food Processing Mechanics* by Meenakshi Paul.
3. *Molecular Biology of the Gene* by James D. Watson.
4. *Introduction to Molecular Biology and Genetic Engineering.*
5. *Principles of Gene Manipulation and Genomics* by S.B. Primrose and R.M. Twyman.

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

Paper Code: BFTF 407 L

Dairy Technology Lab

[SGGSWU – DFPT]

Teaching Hours: 2 hours/week

Time Allowed: 3 hour

1 Credits

Maximum Marks: 30

Pass Marks: 40%

List of Practicals:

1. To study the methylene blue reduction test for given sample.
2. Determination of milk fat, titrable acidity, total solids and SNF.
3. Detection of adulterant in milk (tests which can be done in laboratory)
4. Detection of adulterant in milk (tests which can be done at home)
5. Preparation of flavoured milk.
6. Preparation of Paneer and Channa.
7. Preparation of ghee from cream.
8. Preparation of ghee from butter.
9. Visit to different milk plants to learn about milk condensing and drying operations.
10. Visit to Research/Academic institution.



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

**Paper Code: BFTF 408 L
Heat and Mass Transfer Lab**

[SGGSWU – DFPT]

Teaching Hours: 2 hours/week

Time Allowed: 3 hour

1 Credits

Maximum Marks: 30

Pass Marks: 40%

List of Practicals:

1. Heat transfer analysis during conduction and convection.
2. Determination of thermal conductivity of food products and insulators.
3. Determination of thermal properties (specific heat, thermal conductivity) of frozen foods.
4. Determination of thermal properties (specific heat, thermal conductivity) of unfrozen foods.
5. Determination of thermal diffusivity of food.
6. Determination of effectiveness of heat exchangers.
7. Determination of overall heat transfer coefficient of falling film and forced circulation.
8. Evaporator.
9. Study of water distillation plant.
10. Demonstration of continuous distillation apparatus in operation.
11. Study on temperature distribution & heat transfer in HTST pasteurizer.
12. Determination of mass transfer coefficient in foods.
13. Determination of glass transition temperature of food sample.
14. To study mass transfer during leaching process.



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

**Paper Code: BFTF 409 L
Food and Nutrition Lab**

[SGGSWU – DFPT]

Teaching Hours: 2 hours/week

Time Allowed: 3 hour

1 Credits

Maximum Marks: 30

Pass Marks: 40%

List of Practicals:

1. Identification of food sources for various nutrients using food composition tables.
2. Record diet of self using 24 hour dietary recall and its nutritional analysis.
3. Introduction to meal planning, concept of food exchange system.
4. Planning of meals for adults of different activity levels for various income groups.
5. Planning of nutritious snacks for different age and income groups.
6. Preparation of nutritious snacks using various methods of cooking.
7. Nutritional labeling of food products.
8. Estimation of BMI and other nutritional status parameters.
9. Plan a day's menu in the practical file for different age groups (pregnant and lactating mothers, pre-schoolers, teenagers and old age).
10. Departmental survey to determine BMI/BMR of students.
11. Market survey for available nutritional supplements and nutritional support substrates.
12. Diet menu planning as per RDA pattern for different age group population



SEMESTER V

Paper Code: BFTF 501 Technology of Fats and Oils

[SGGSWU – DFPT]

Teaching Hours: 45

Time Allowed: 3 hour

L/T: 3/0

Maximum Marks: 60

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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each section.

Objective of Subject: To aim of the subject is to study in depth the chemical, physical and nutritional properties of fats and oils and the technologies involved in the production of products.

Outcome of the Subject: The subject will help students to analyze various properties of oils and fats, to know about changes occurring during storage of oil and fats and production and refining of oilseeds.

Relevance of the subject: The knowledge of subject will provide necessary skills required with usage of fats and oils in food and to prevent their deterioration with time.

PART-I

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

Fatty acids: composition and classification. Essential fatty acids including mono and polyunsaturated fatty acids. Omega 3 and Omega 6 fatty acids; their occurrence, health benefits and food sources.

Deterioration of Oils and fats: Types of rancidity; Concept of oxidative and hydrolytic rancidity; factors influencing types of rancidity. Free radical chain mechanism. Flavor reversion in foods.

PART-II

Margarine and Spreads: Formulation and characterization of low-fat spreads, whipped creams, margarines, mayonnaise, salad dressings etc. Bakery shortenings. *Trans*-fatty acids- formation during processing and nutritional aspects. Fat substitutes.

Processing of oilseeds: Mechanical and chemical methods (solvent extraction) of extraction of oil from oil bearing materials; Batch and continuous methods.

Refining of crude oil: Refining methods of crude oil including degumming, bleaching, deodorization, winterization. Technology of oilseed protein isolate.

Recommended books:

1. *Principles of Sensory Evaluation of Food* by Amerine MA, Pangborn RM & Rosslos.
2. *Guide to Quality Management Systems for Food Industries* by Early R.
3. *Regulatory status of Direct Food Additive* by Furia TE.
4. *Sensory Evaluation of Food - Theory and Practice* by Jellinek G.
5. *Quality Control in Food Industry* by Krammer A & Twigg BA.
6. *Encyclopedia of Food Science & Technology & Nutrition* by Macrae R, Roloson R & Sadlu MJ.
7. *Sensory Evaluation of Foods* by Piggot J.R.
8. *Handbook of Analysis and Quality Control for Fruit and Vegetable Products* by Ranganna S.

**Paper Code: BFTF 502
Industrial Microbiology**

[SGGSWU – DFPT]

Teaching Hours: 45

Time Allowed: 3 hour

L/T: 3/0

Maximum Marks: 60

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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each section.*

Objective of Subject: *The subject will help students to gain inside into microbial processes along with development of industrially important product/processes.*

Outcome of the Subject: *This subject will enable students to learn about production of industrially important products and processes involving micro-organisms.*

Relevance of the subject: *The knowledge of subject will provide necessary skills required by students to join industries dealing with micro-organisms for the production of food based products.*

PART-I

Economic activities of microorganisms, Propagation of food and baker yeasts. Technology and mechanism of production of alcohol, glycerol and beer. Production of wine and other alcoholic beverages (Whiskey, rum etc.) Production of organic acids: Lactic, citric, gluconic, fumaric acids.

Activities of acetic acid bacteria and production of vinegar, sorbose and dihydroxyacetone. Microbial production of dextrans, amino acid fermentation, metabolic controls in industrial fermentation, saccharifying agents - methods of production and uses.

PART-II

Isolation and uses of microbial enzymes, immobilized enzymes and their applications. Production of glucose and fructose and starch by enzymatic methods. Production of mushroom mycelium by submerged culture process. Production and isolation of antibacterial antibiotics like penicillin, streptomycin, tetracycline, chloromycetin, tetracyclines, semisynthetic penicillins. Microbial production of vitamins: B-2 and B-12. Production of single cell protein (SCP).

Recommended books:

1. *Industrial Microbiology - Prescott & Dunn.*
2. *Industrial Microbiology – Casida.*
3. *Comprehensive Biotechnology – Moo Young.*
4. *New Research on Signal Transduction by Bruce R. Yanson.*

Paper Code: BFTF 503
Snack and Beverage Technology

[SGGSWU – DFPT]

Teaching Hours: 45

Time Allowed: 3 hour

L/T: 3/0

Maximum Marks: 60

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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each 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 (Manufacturing and types)

Non distilled spirits: Whisky, brandy, rum (Manufacturing 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, papads, traditional Indian snack foods.

Extruded snacks: Extrusion: definition, introduction to extruders and their principles, types of extruders in food industry. Concept of IIIrd Generation extruded products.

Equipments of Snack industry: Equipments for frying, Baking and drying, , roasting and flaking, popping, blending, Coating, chipping.

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: BFTF 504
Food processing plant layout and design

[SGGSWU –DFPT]

Teaching Hours: 45

Time Allowed: 3 hour

L/T: 3/0

Maximum Marks: 60

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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each section.

Objective of Subject: To impart basic knowledge about food plant layout and design and the importance of building equipments products and process design.

Outcome of Subject: The students will be able to understand role and application design and layout in food plant construction and understand the effect of various parameters.

Relevance of Subject: At the end of the course the students will be in a position to get the basics of process layout and get the idea about the material handling systems.

PART-I

Introduction-Plant design concepts - situations giving rise to plant design problems - differences in design of food processing and non-food processing.

General design considerations-Food processing unit operations, prevention of contamination, sanitation, deterioration, seasonal production. Flow chart for plant design, identification stage, looking for a need, finding a product, preliminary screening of ideas.

Comparative rating of product ideas- Present market, market growth potential, costs, risks. Pre selection / pre-feasibility stage, analysis stage: market analysis, situational analysis related to market. Technical analysis, financial analysis, sensitivity and risk analysis, feasibility cost estimates.

Break even analysis: Introduction, fixed cost, variable cost, break even chart, breakeven point calculation. Plant location, introduction, location decision process, factors involved in the plant location decision.

Territory selection and site/ community selection- Subjective, Qualitative and Semi-Quantitative Techniques, Equal Weights Method, Variable Weights Method, Weight-cum-Rating Method, Another weight-cum-rating method. Composite Measure method, Locational Break-Even analysis

PART-II

Food Plant Utilities-Process water, steam, electricity, plant effluents. Plant size and factors.

Basic Types of plant layouts-Product or line layout, process or functional layout, cellular or group layout, and fixed position layout, plant layout factors, layout design procedure.

General guidelines for plant layout- Typical clearances, areas and allowances, plant layout, layout of equipment, space determination.

Symbols used for food plant design and layout- introduction, valves, line symbols, fluid handling, heat transfer, mass transfer. Symbols used for food plant design and layout: storage vessels, conveyors and feeders, separators, mixing and commination and process control and instrumentation symbols. Experimentation in pilot layout: size and structure of the pilot plant, minimum and maximum size, types and applications.

Materials of construction of Food Equipment-Characteristics of suitable construction material : stainless steel, aluminium, nickel and plastic materials. Illumination and ventilation, cleaning & sanitization.maintenance of food plant building: safety colour code, roof inspection,care of concrete floors.

Recommended books:

1. *Plant Layout and Design* by James M. Moore, The Macmillan Company, New York.
2. *F.W. Farrall, Dairy & Food Engineering.* John Willy & Sons, New York



Elective Paper
Paper Code: BFTF 505
Research Methodology

[SGGSWU- DFPT]

Teaching Hours: 45

Time Allowed: 3 hour

L/T: 3//0

Maximum Marks: 60

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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each section.

Objectives of Subject: To aim of the subject is to study basic concepts of research and its methodologies.

Outcome of Subject: Upon completing this course, student will able to demonstrate knowledge of research processes.

Relevance of Subject: At the end of this course the students should be able to select and define appropriate research problem and parameters.

PART-I

Introduction: Definition, general and specific characteristics of research Kind, classification, Types and objective of Research, Research Process, Criteria of good research, basic concept of experiments and research, significance of research; Principles of research design and methodology, Checklist of research related concept and consideration.

Planning and Designing a Research Study: Choosing a research topic, literature review, formulation a research problem, articulating hypothesis, choosing variable to study, research participants.

Data Collection, Assessment Methods, and Measurement Strategies: need for data collection, meaning, nature, type and method of data, precautions in data collection, organization of data, Measurement, measurement strategies for data collection.

PART-II

General Types of Research Designs and Approaches: Experimental designs, Quasi-experimental designs, non-experimental or qualitative designs.

Data Analysis: descriptive statistics, central tendency, dispersion, measures of association, inferential statistics, T-test, ANOVA, Chi-square, regression, interpreting data and drawing inferences.

Ethical considerations in research: Fundamental ethical principles, informed consent, data safety monitoring, Adverse and serious adverse events.

Recommended Books:

1. *DRM, a design research methodology* by Luciene TM Blessing and Amaresh Chakrabarti
2. *Fundamental of Research Methodology and Statistics* by Yogesh Kumar Singh
3. *Essential of Research Design and Methodology* by Geoffrey Marczyk, David DeMatteo, David Festinger

Paper Code: BFTF 505

Nutraceutical and Functional Foods

[SGGSWU – DFPT]

Teaching Hours: 45

Time Allowed: 3 hour

L/T: 3/0

Maximum Marks: 60

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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each 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, seafoods, 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.

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

**Paper Code: BFTF 506 L
Technology of Fats and Oils Lab**

[SGGSWU – DFPT]

Teaching Hours: 2 hours/week

Time Allowed: 3 hour

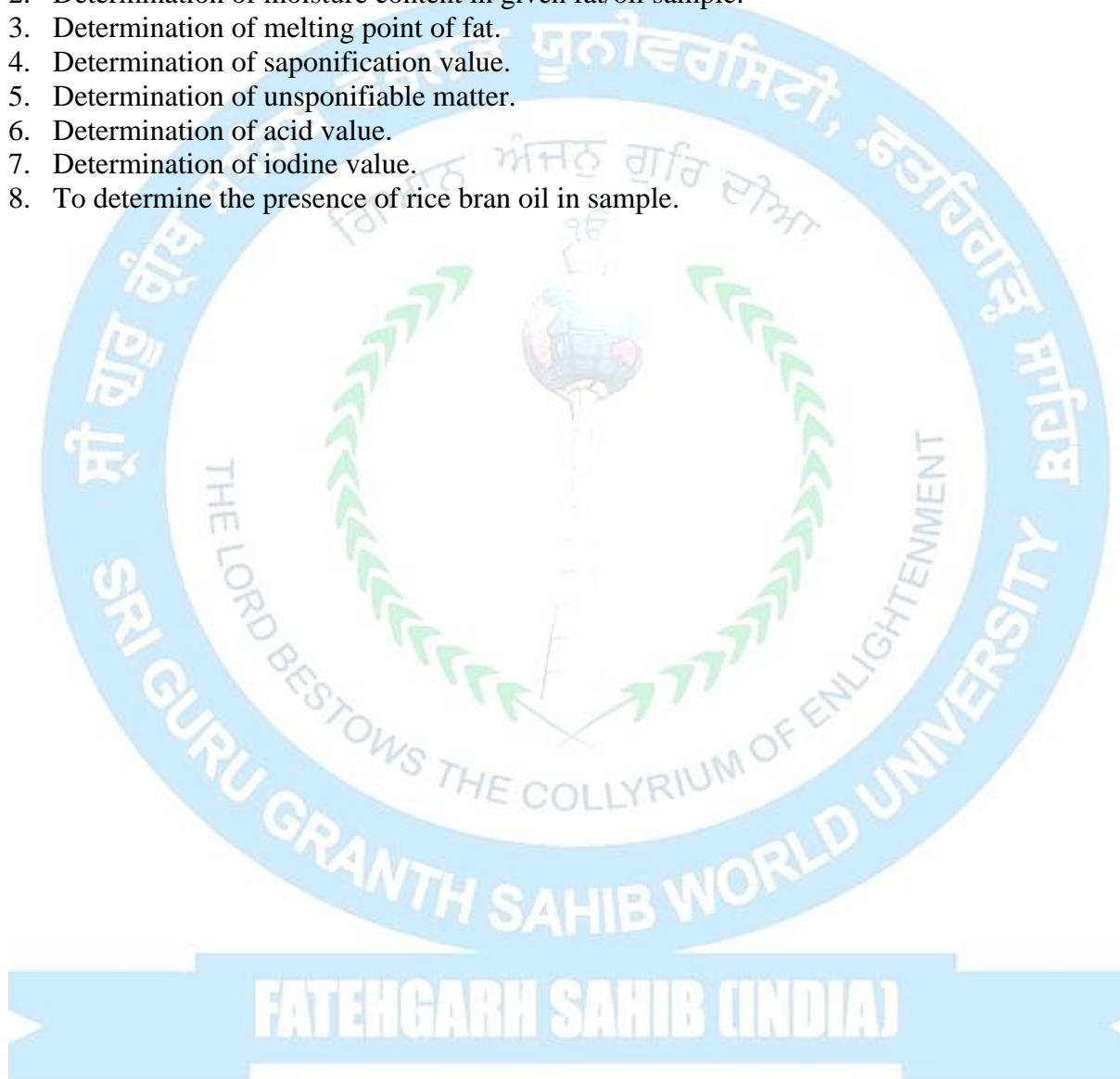
1 Credits

Maximum Marks: 30

Pass Marks: 40%

List of Practicals:

1. Demonstration of various types of oils and fats.
2. Determination of moisture content in given fat/oil sample.
3. Determination of melting point of fat.
4. Determination of saponification value.
5. Determination of unsaponifiable matter.
6. Determination of acid value.
7. Determination of iodine value.
8. To determine the presence of rice bran oil in sample.



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

**Paper Code: BFTF 507 L
Industrial Microbiology Lab**

[SGGSWU – DFPT]

Teaching Hours: 2 hours/week

Time Allowed: 3 hour

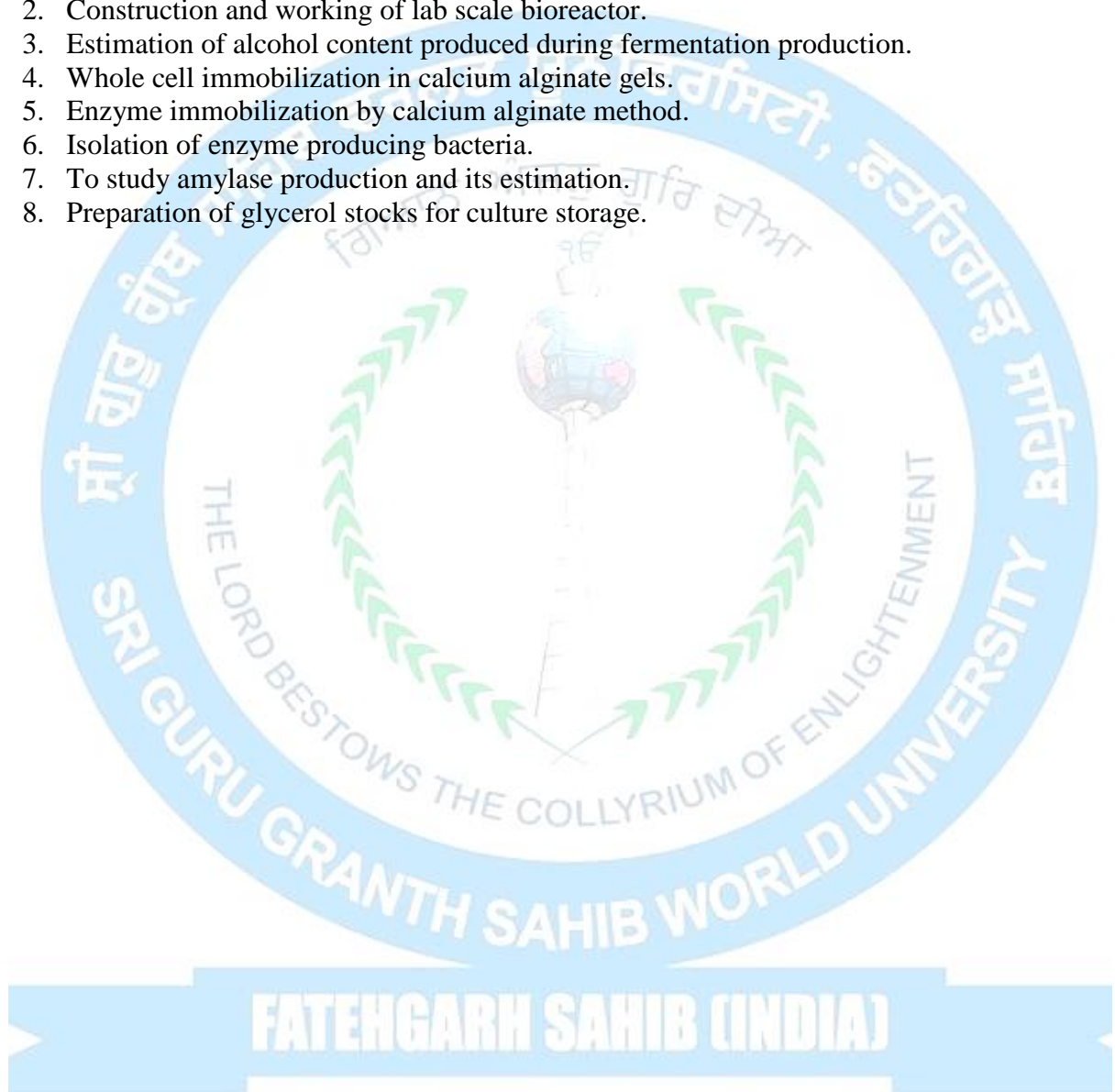
1 Credits

Maximum Marks: 30

Pass Marks: 40%

List of Practicals:

1. Learning the equipments of a common microbiology laboratory.
2. Construction and working of lab scale bioreactor.
3. Estimation of alcohol content produced during fermentation production.
4. Whole cell immobilization in calcium alginate gels.
5. Enzyme immobilization by calcium alginate method.
6. Isolation of enzyme producing bacteria.
7. To study amylase production and its estimation.
8. Preparation of glycerol stocks for culture storage.



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

**Paper Code: BFTF 508 L
Snack and Beverage Technology Lab**

[SGGSWU – DFPT]

Teaching Hours: 2 hours/week

Time Allowed: 3 hour

1 Credits

Maximum Marks: 30

Pass Marks: 40%

List of Practicals:

1. Preparation of fried snacks.
2. Development of puffed snacks (sweet and salted) from fox nut (Makhana).
3. Study of malting of Barley.
4. Degree brix determination of different market beverage samples.
5. Preparation of RTS Beverage.
6. Comparative sensory evaluation of RTS prepared in lab with market sample.
7. Preparation of wine and study its physico-chemical properties.
8. Preparation of whey fruit blend.
9. Preparation of composite dairy product (Bajra Lassi).
10. Determination of Vitamin C in fruit juice sample.



SEMESTER VI

Paper Code: BFTF 601 Technology of Cereals and Pulses

[SGGSWU – DFPT]

Teaching Hours: 45

Time Allowed: 3 hour

L/T: 3/0

Maximum Marks: 60

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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each 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-* Pomerenz.
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: BFTF 602

Technology of Fruits and Vegetables

[SGGSWU – DFPT]

Teaching Hours: 45

Time Allowed: 3 hour

L/T: 3/0

Maximum Marks: 60

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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each 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, method of method determination; 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, destining.

Processing of fruits and vegetables-drying and dehydration; drying curve and equipments; Freezing-freezing curve; methods and equipments for freezing; canning

PART-II

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

Fruit juice beverages: RTS, squashes, cordial, nectar, syrups

Preserves:Preparation of jam, jelly, marmalade, role of pectin and theories of gel formation.

Technology of tomato products: Sauce, puree, ketchup

Fermented fruits and vegetables: Sauerkraut, wine, 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.
2. *Commercial Vegetable Processing – Tressler DK and Woodruff JG.*
3. *Commercial Fruit Processing – Woodroof J.G., Luh B.S.*

Paper Code: BFTF 603
Meat, Poultry and Fish Technology

[SGGSWU – DFPT]
Teaching Hours: 45
Time Allowed: 3 hour

L/T: 3/0
Maximum Marks: 60
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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each section.

Objective of Subject: The subject aim is 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: BFTF 604
Sugar and Chocolate Confectionary Technology

[SGGSWU – DFPT]

Teaching Hours: 45

Time Allowed: 3 hour

L/T: 3/0

Maximum Marks: 60

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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each section.

Objective of Subject: The aim of the subject is to make students aware of different ingredients and products of sugar and chocolate confectionary industry.

Outcome of the Subject: Students will gain knowledge about raw materials used in sugar and confectionary industry. They will learn about processing steps involved in manufacture of major confectionary and chocolate products along with machinery involved in the preparation of various products.

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

PART-I

Introduction: Sugarcane and sugar beet as sugar raw materials. Flow charts for manufacture of Granulated sugar and Liquid sugars. Properties of Granulated sucrose and Liquid Sugars. Invert sugar and their characteristics.

Technology of Confectionery manufacture: General technical aspects of industrial sugar confectionery manufacture, Manufacture of high boiled sweets – Ingredients, Methods of manufacture – Types. Manufacture of gums and jellies,

PART-II

Bubble gum and Chewing gum: Manufacturing process, role of ingredients and machinery involved.

Technology of Chocolate manufacturing: Ingredients and their role as food additives in chocolate manufacturing. Machineries involved in the process of manufacturing chocolates. Enrobing technology, Tempering.

Manufacture of Miscellaneous Products: Caramel, Toffee and fudge – Liquorice paste and aerated confectionery, Lozenges, sugar panning.

Recommended books:

1. *Basic Baking* by Dubey SC.
2. *Wiley Encyclopedia of Food Science & Technology* by Francis FJ.
3. *Technology of Biscuits, Crackers & Cookies* by Manley D.
4. *Bakery Science & Technology* by Pylar E J.
5. *Flat Bread Technology* by Qarooni J.

Elective Paper

Paper Code: BFTF 605

Statistical Analysis

[SGGSWU- DFPT]

Teaching Hours: 45

Time Allowed: 3 hour

L/T: 3/0

Maximum Marks: 60

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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each section.

Objective of Subject: : The aim of the subject is to make students familiar with the foundation of experimental design and statistical concepts.

Outcome of Subject: Students will gain knowledge about how to choose appropriate designs, and how to conduct experiments and analyze the results.

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

Statistical concepts: Data structure, sampling methods, collection, classification and tabulation of data, graphical and diagrammatic representation, histogram, frequency polygon, frequency curve, bar graph, pie chart etc.

Measure of Central Frequency: Mean, median, mode.

Measure of dispersion of data: Range, semi-interquartile range, mean deviation, standard deviation, standard error, coefficient of variation, confidence limits.

PART-II

Design of experimentation: Factorial design of experimentation using statistical tools, Response Surface Methodology.

Types of distribution of data: Normal, Binomial, Poisson.

Z-test, t-test, ANOVA, multiple comparisons, LSD and DMRT, Chi-square test.

Regression estimate, correlation coefficient. Experimental designs, data transformation.

Recommended books:

1. *Probability and Statistics for Engineers* by Jay L. Devore.
2. *Mathematical Statistics* by Hohn E. Freund.
3. *An Introduction to Mathematical Statistics and Its Applications* by Richard J. Larsen & Morris L. Marx.
4. *Sampling Techniques* by William G. Cochran.

**Paper Code: BFTF 606 L
Technology of Cereals and Pulses Lab**

[SGGSWU – DFPT]

Teaching Hours: 2 hours/week

Time Allowed: 3 hour

1 credits

Maximum Marks: 30

Pass Marks: 40%

List of Practicals:

1. Determination of physical properties of legumes.
2. Determination of proximate composition of selected pulses.
3. Determination of nutritional quality of selected pulses.
4. Preconditioning of pulses before milling.
5. Removal of anti-nutritional compounds from selected pulses and oilseeds.
6. Laboratory milling of selected pulses and its quality evaluation.
7. Study of cooking quality of dhal.
8. Processing of composite legume mix and preparation of value added products.
9. Visit to commercial dhal mills and oil mills.



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

Paper Code: BFTF 607 L

Technology of Fruits and Vegetables Lab

[SGGSWU – DFPT]

Teaching Hours: 2 hours/week

Time Allowed: 3 hour

1 credits

Maximum Marks: 30

Pass Marks: 40%

List of Practicals:

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.



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

Paper Code: BFTF 608 L

Meat, Poultry and Fish Technology Lab

[SGGSWU – DFPT]

Teaching Hours: 2 hours/week

Time Allowed: 3 hour

1 credits

Maximum Marks: 30

Pass Marks: 40%

List of Practicals:

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



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

Paper Code: BFTF 609 L
Sugar and Chocolate Confectionary Technology Lab

[SGGSWU – DFPT]

Teaching Hours: 2 hours/week

Time Allowed: 3 hour

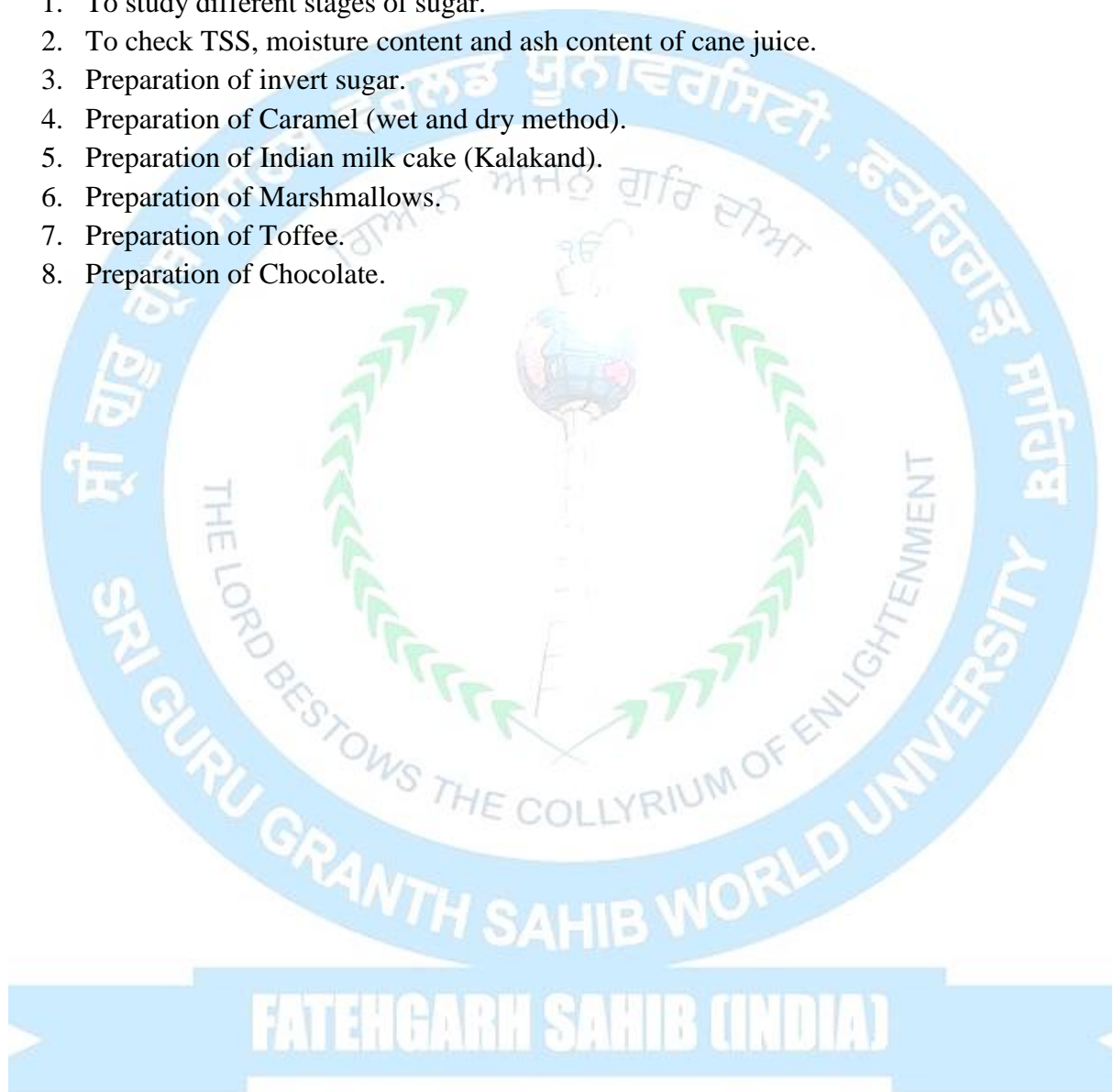
1 credits

Maximum Marks: 30

Pass Marks: 40%

List of Practicals:

1. To study different stages of sugar.
2. To check TSS, moisture content and ash content of cane juice.
3. Preparation of invert sugar.
4. Preparation of Caramel (wet and dry method).
5. Preparation of Indian milk cake (Kalakand).
6. Preparation of Marshmallows.
7. Preparation of Toffee.
8. Preparation of Chocolate.



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

**Paper Code: BFTF 610
Technical Seminar**

**[SGGSWU – DFPT]
Teaching Hours: 2 hours/week**

**2 credits
Maximum Marks: 50**

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



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

SEMESTER-VII

Paper Code: BFTF 701

Project

[SGGSWU- DFPT]

Practical Hours: 36

L/T/P: 0/0/18

Maximum Marks: 750

Students may choose a project in any branch of Food Processing Technology. Student may carry his/her project in any food industry/research institution/academic institution/university. The student will have to present the progress of work through seminars and reports. Student will have to submit a project report about the techniques learned by him/her during the project work. On the basis of this report, Viva-voice/presentation will be conducted.



Semester VIII

Paper code: **BFTF 801**

Food analysis and quality assurance

[SGGSWU – DFPT]

Teaching Hours: 45

Time Allowed: 3 hour

L/T: 3/0

Maximum Marks: 60

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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each 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, Lovibondtintometer.

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*

Course Code: BFTF 802
Enzymes in Food Processing

[SGGSWU – DFPT]

Teaching Hours: 45

Time Allowed: 3 hour

L/T: 3/0

Maximum Marks: 60

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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each 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.

Paper Code: BFTF 803
Packaging Technology

[SGGSWU – DFPT]

Teaching Hours: 45

Time Allowed: 3 hour

L/T: 3/0

Maximum Marks: 60

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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each 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, Ethylenvinyl 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: BFTF 804
Food Laws, Standards and IPR**

[SGGSWU- DFPT]

Teaching Hours: 45

Time Allowed: 3 hour

L/T: 3/0

Maximum Marks: 60

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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each section.

Objective of Subject: To aim of the subject is to acquaint the students with Food - Safety, Quality, QA and Current challenges to food safety .

Outcome of Subject: The subject will help students to learn about learn principles of TQM, GMP, GHP, GLP and role of management in QC.

Relevance of Subject: Pave the way for students to catch up Intelluctual Property as an career option.

PART-I

Introduction to concepts of food quality: Food safety, food quality assurance and food quality management: objectives, importance and functions of quality control, Current food safety.

Principles of food quality assurance: Total quality management (TQM), good manufacturing/management practices, good hygienic practices, good lab practices, general awareness and role of management practices in quality control.

Food safety management: Applications of HACCP in food safety, concept of food trace ability for food safety, Food safety and Standards Act 2006: salient provision and prospects.

PART-II

Role of national and international regulatory agencies: Bureau of Indian Standards (BIS), AGMARK, Food Safety and Standards Authority of India (FSSAI).

Introduction to WTO agreements: SPS and TBT agreements, Codex Alimentarius Commission ,, International organization for standards (ISO) and its standards for food quality and safety (ISO 9000 series, ISO 22000, ISO 15161, ISO 14000).

Food safety in USA, USFDA, Legislation in Europe: Directives of the official journal of the EU, council regulations, food legislation in UK. Regulating methods for food analysis, case studies. Enforcers of Food Laws Approval Process for Food Additives, Nutritional Labelling.

Concept of property, rights, duties and their correlation: History and evaluation of IPR; Copyrights and related rights. Distinction among Various forms of IPR. Patent rights/protection and procedure; Infringement or violation; Remedies against infringement; Indian Patent Act 1970 and TRIPS; Geographical indication and Industrial design.

Recommended Books:

1. *Law of trademarks in India* by Ashwani Kumar Bansal.
2. *The law of Trademarks, Copyright, Patents and Design* by G.V.GKrishnamurthy.
3. *The management of Intelluctual Property* by Satyawrat Ponkse.

Elective Paper
Paper Code: BFTF 808
Fermentation Technology

[SGGSWU – DFPT]

Teaching Hours: 45

Time Allowed: 3 hour

L/T: 3/0

Maximum Marks: 60

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 Ten (10) short answer questions of two (02) marks each, set uniformly from whole syllabus (Part I & II) and it is compulsory to attempt all the questions. Section B and C will have four (04) questions of ten (10) marks each from Part I and Part II, respectively of the syllabus and a student is required to attempt any two questions from each section.

Objective of Subject: The subject will provide students 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.

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

Paper Code: BFTF 806 L

Food Analysis and Quality Assurance Lab

[SGGSWU – DFPT]

Teaching Hours: 2 hours/week

Time Allowed: 3 hour

Credits: 1

Maximum Marks: 30

Pass Marks: 40%

List of Practicals:

1. Demonstration of various instruments in food lab.
2. Analysis (TSS, acidity, reducing and non reducing sugar content) of food samples.
3. Analysis (ash content, moisture content and Polyphenol content) of spices.
4. Analysis (ash content, moisture content, Polyphenol content) of tea and coffee.
5. Analysis (ash content, moisture content, crude fibre content, loaf volume only for bread) of wheat flour, bread, biscuits.
6. Analysis (acidity, reducing and non reducing sugar, TSS) of non-alcoholic beverages.
7. Estimation of (a) Iodine value, (b) Saponification value (c) acid value (d) peroxide value, (e) RM value (f) P value, (g) K value of fats and oils P olenske Number, Krishner value of ghee and oil samples.
8. Analysis (lactic acid content) of Sauerkraut.



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

Paper Code: BFTF 807 L
Enzymes in Food Processing Lab

[SGGSWU – DFPT]

Teaching Hours: 2 hours/week

Time Allowed: 3 hour

Credits: 1

Maximum Marks: 30

Pass Marks: 40%

List of Practicals:

1. To study the role of enzymes in cheese making.
2. To study the enzymes added extraction of fruit juices and clarification of juices.
3. To study the starch and protein hydrolysis by enzymes.
4. To study the applications of enzymes in Baking.
5. To carry out crude extraction of Papain from Papaya.
6. To study the individual effect of temperature, pH and storage on stability of enzymes.
7. To study enzyme kinetics.



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

**Paper Code: BFTF 808 L
Packaging Technology Lab**

[SGGSWU – DFPT]

Teaching Hours: 2 hours/week

Time Allowed: 3 hour

Credits: 1

Maximum Marks: 30

Pass Marks: 40%

List of Practicals:

1. Classification and Identification 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. Determination of machine direction, cross direction, top side and wire side of packaging materials.
9. Measurement of grease resistance of papers.
10. Measurement of tensile strength of packaging material.
11. Measurement of dart impact resistance for plastic films.
12. Determination of seal integrity, ink adhesion.
13. Head space analysis of packaged food.
14. Determination of lacquer integrity test.
15. Determination of gas and water transmission rate of package films.
16. Study of vacuum packaging machine, bottle filling machine and form-fill-seal machine.

