

Maharaja Ranjit Singh Punjab Technical University
Bathinda-151001



FACULTY OF SCIENCES

SYLLABUS

FOR

B.Sc. (FOOD SCIENCE AND TECHNOLOGY) /

BACHELOR OF FOOD SCIENCE AND TECHNOLOGY (Hons.)

2021 BATCH ONWARDS

Note: (i) Copy rights are reserved.

Nobody is allowed to print it in any form.

Defaulters will be prosecuted.

(ii) Subject to change in the syllabi at any time.

Please visit the University website time to time.

SCHEME

Semester-I		Contact Hrs.			Marks			Credits
Subject code	Subject Name	L	T	P	Int.	Ext.	Total	
BFOTS1-101	General Microbiology	3	1	-	40	60	100	4
BFOTS1-106	Introduction to Food Technology-I	3	1	-	40	60	100	4
BFOTS1-103	*Mathematics	3	1	-	40	60	100	4
BFOTS1-104	Computer Science and Applications	3	1	-	40	60	100	4
BFOTS1-105	General Microbiology Lab I	-	-	4	60	40	100	2
BPHAR0-002	**Life Sciences	3	1	-	40	60	100	4
BHUMA0-001	Communicative English	3	-	-	40	60	100	3
Total		18	5	4	300	400	700	25

*Mathematics for Medical Students

** Life Sciences for Non-Medical students.

Semester-II		Contact Hrs.			Marks			Credits
Subject code	Subject Name	L	T	P	Int.	Ext.	Total	
BFOTS1-201	Introduction to Food Technology II	3	1	-	40	60	100	4
BFOTS1-202	Principles of Food Preservation	3	1	-	40	60	100	4
BFOTS1-203	Environmental Studies	3	-	-	40	60	100	3
BFOTS1-204	Food Chemistry	3	1	-	40	60	100	4
BFOTS1-205	Introduction to Food Technology II Lab-II	-	-	4	60	40	100	2
BFOTS1-206	Principles of Food Preservation Lab-III	-	-	4	60	40	100	2
Total		12	3	8	280	320	600	19

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

Semester-III		Contact Hrs.			Marks			Credits
Subject code	Subject Name	L	T	P	Int.	Ext.	Total	
BFOTS1-301	Dairy Technology	3	1	-	40	60	100	4
BFOTS1-302	Technology of Fruits & Vegetables	3	1	-	40	60	100	4
BFOTS1-303	Food Microbiology and Food Safety	3	1	-	40	60	100	4
BFOTS1-304	Dairy Technology Lab IV	-	-	4	60	40	100	2
BFOTS1-305	Technology of Fruits & Vegetables Lab V	-	-	4	60	40	100	2
BFOTS1-306	Food Microbiology and Food Safety Lab VI	-	-	4	60	40	100	2
Departmental Elective -I (Select any one)								
BFOTD1-311	Entrepreneurship Development	3	-	-	40	60	100	3
BFOTD1-312	Food Fermentation Technology							
BFOTD1-313	Food Additives							
BMNCC0-004	Drug Abuse	2	-	-	100	-	100	0
Total		14	3	12	440	360	800	21

Semester-IV		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BFOTS1-401	Technology of Cereals, Pulses and Oilseeds	3	1	-	40	60	100	4
BFOTS1-402	Egg, Poultry & Meat Technology	3	1	-	40	60	100	4
BFOTS1-403	Food Plant Hygiene and Sanitation	3	1	-	40	60	100	4
BFOTS1-404	Technology of Cereals, Pulses and Oil Seeds Lab VII	-	-	4	60	40	100	2
BFOTS1-405	Egg, Poultry & Meat Technology Lab VIII	-	-	4	60	40	100	2
BFOTS1-406	Food Plant Hygiene and Sanitation Lab IX	-	-	4	60	40	100	2

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

Departmental Elective-II								
BFOTD1-411	Nutraceutical and Functional Foods	4	-	-	40	60	100	4
BFOTD1-412	Nutraceutical and Functional Foods Lab X	-	-	4	60	40	100	2
OR								
BFOTD1-413	Bakery Technology	4	-	-	40	60	100	4
BFOTD1-414	Bakery Technology Lab XI	-	-	4	60	40	100	2
Total		13	3	16	400	400	800	24

Note: All the students are required to undergo 'In Plant Training' for 4 weeks in a Food Processing unit after final examinations of 4th semester. Final degree to the students will be awarded subject to their successfully completion of 'In Plant Training' as per university norms.

Semester-V		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BFOTS1-501	Unit Operations in Food Engineering	3	1	-	40	60	100	4
BFOTS1-502	Food Packaging	3	1	-	40	60	100	4
BFOTS1-503	Sugar & Confectionary Technology	4	-	-	40	60	100	4
BFOTS1-504	Food Packaging Lab XII	-	-	4	60	40	100	2
BFOTS1-505	Sugar & Confectionary Technology Lab XIII	-	-	4	60	40	100	2
Departmental Elective-III								
BFOTD1-511	Spices and Flavour Technology	4	-	-	40	60	100	4
BFOTD1-512	Spices and Flavour Technology Lab XIV	-	-	4	60	40	100	2
OR								
BFOTD1-513	Technology of Oils and Fats	4	-	-	40	60	100	4
BFOTD1-514	Technology of Oils and Fats Lab XV	-	-	4	60	40	100	2
TOTAL		14	2	12	340	360	700	22

Note: In Semester-V students have to choose either between:
BFOTD1-511, BFOTD1-512 or BFOTD1-513, BFOTD1-514

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

Semester-VI		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BFOTS1-601	Food Engineering	3	1	-	40	60	100	4
BFOTS1-602	Food and Nutrition	3	1	-	40	60	100	4
Departmental Elective-IV								
BFOTD1-611	Sensory Evaluation of Food	4	-	-	40	60	100	4
BFOTD1-612	Sensory Evaluation of Food Lab XVI	-	-	4	60	40	100	2
OR								
BFOTD1-613	Food Plant Layout	4	-	-	40	60	100	4
BFOTD1-614	Food Plant Layout Lab XVII	-	-	4	60	40	100	2
Departmental Elective-V								
BFOTD1-621	Food Safety	4	-	-	40	60	100	4
BFOTD1-622	Food Safety Lab XVIII	-	-	4	60	40	100	2
OR								
BFOTD1-623	Food Quality Management	4	-	-	40	60	100	4
BFOTD1-624	Food Quality Management Lab XIX	-	-	4	60	40	100	2
TOTAL		14	2	8	280	320	600	20

Note: In Semester-VI students have to choose between:

BFOTD1-611, BFOTD1-612 or BFOTD1-613, BFOTD1-614

BFOTD1-621, BFOTD1-622 or BFOTD1-623, BFOTD1-624

Semester-VII		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BFOTS1-701	Food Storage Engineering	4	-	-	40	60	100	4
BFOTS1-702	Food Biotechnology	4	-	-	40	60	100	4
BFOTS1-703	Technology of Beverages	4	-	-	40	60	100	4
BFOTS1-704	Snacks and Extrusion Technology	4	-	0	40	60	100	4
BFOTS1-705	Technology of Beverages Lab XX	-	-	4	60	40	100	2
BFOTS1-706	Snacks and Extrusion Technology Lab XXI	-	-	4	60	40	100	2
TOTAL		16	-	8	280	320	600	20

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

Semester-VIII			Contact Hrs.			Marks			Credits
Subject Code	Subject name		L	T	P	Int.	Ext.	Total	
BFOTS1-801	PROJECT WORK	*Monthly Progress Report	-	-	-	100	-	100	4
		Seminar	-	-	-	100	100	200	8
		Viva-voice	-	-	-	100	100	200	8
TOTAL			-	-	-	300	200	500	20

Overall Marks / Credits:

Semester	Marks	Credits
I	700	25
II	600	19
III	800	21
IV	800	24
V	700	22
VI	600	20
VII	600	20
VIII	500	20
Total	5300	171

SEMESTER FIRST

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

GENERAL MICROBIOLOGY

Subject Code: BFOTS1-101

**L T P C
3 1 0 4**

Duration: 60Hrs.

Course Objectives:

1. To understand theories related to growth of micro-organisms and their disease causing abilities.
2. To memorize the general characteristics of micro-organisms in relation to their effect on plant and human health.
3. To identify suitable tools, equipments and environmental conditions for the growth of micro-organisms.
4. To analyze the appropriate techniques for the control of microbial spoilage in foods.
5. To evaluate the various environmental factors affecting microbial growth.

Course Outcomes:

1. Understanding the various theories related to growth of micro-organisms and their disease causing abilities
2. Remembering the general characteristics of micro-organisms in relation to their effect on plant and human health.
3. Selection of suitable tools, equipments and environmental conditions for the growth of micro-organisms.
4. Identifying the appropriate method for the control of micro-organisms that result in food preservation.
5. Evaluation of various environmental factors affecting microbial growth.

UNIT-I (15Hrs.)

Introduction: Discovery of microbial world, theory of spontaneous generation, Germ theory of disease, Koch's postulates, Pure culture concept, Nature and properties of prokaryotic and eukaryotic micro-organisms.

UNIT-II (15Hrs.)

General characteristics and Nutritional requirements: General characteristics of bacteria, yeast, mold, viruses, algae. Types of bacteria, nutritional classification of bacteria.

Reproduction of micro-organisms: Brief account of bacteria, yeast and mold reproduction.

UNIT-III (15Hrs.)

Microbial Growth: Definition of growth, growth cycle, growth rate, generation time, measurement of growth, effect of environmental factors such as temperature, oxygen, moisture, salt, pH, oxidation-reduction potential and radiations on growth.

UNIT-IV (15Hrs.)

Cultivation of micro-organisms: Pour plate method, spread plate method and streak plate Control of Micro-organisms: Control of micro-organisms by physical, chemical and biological methods.

Recommended Books:

1. Pelczar M. J., Chan E.C.S. and Krieg N.R., 'Microbiology', 5th Edition., McGraw Hill Co, Singapore,1987.
2. Stanier R.Y., Graham J.L., Wheelies M.L. and Painter P.R., 'General Microbiology', 5th Edition., The Macmillan Press Ltd., London,1993.
3. Cappuccino J.G. and Sherman N., 'Microbiology: A Laboratory Manual', Benjamin- Cummings Publishing Co., USA,2004.
4. Gunase K. P., 'Laboratory Manual in Microbiology', New Age International (P) Ltd. New Delhi,1996

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

INTRODUCTION TO FOOD TECHNOLOGY-I

Subject code: BFOTS1-106

**L T P C
3 1 0 4**

Duration: 60Hrs.

Course Objectives:

1. To impart knowledge regarding various disciplines of food science and technology and their applications in food production and preservation.
2. To understand the selection of appropriate techniques for the production of nutrient dense foods.
3. To acquire knowledge about compositional and nutritional properties of different cereal grains that aid in the production of different food products.
4. To summarize degradation of fats and oils and its prevention.
5. To analyze the effects of various physico-chemical changes occur during processing of foods.

Course Outcomes:

1. Creating awareness about various disciplines of food science and technology and their applications in food production and preservation.
2. Understanding about selection of appropriate techniques for the production of nutrient dense foods.
3. Acquire knowledge about compositional and nutritional properties of different cereal grains that aids in the production of different food products.
4. Identifying problems related to the degradation of fats and their solutions that results in preservation.
5. Imparting knowledge about various physical and chemical changes occur during processing.

UNIT-I (11Hrs.)

Introduction to Food Science and Technology, its scope and importance.

UNIT-II (18Hrs.)

Compositional, Nutritional and Technological aspects of Plant foods

Wheat: structure and composition, types (hard, soft/strong, weak) Diagrammatic representation of structure of wheat grain.

Rice: Structure and composition, parboiling of rice- advantages and disadvantages. Malting, gelatinization of starch, types of browning- Maillard & caramelization.

Corn: Structure and composition, Dry and wet milling.

Millets: Types of millets and its nutritional properties.

UNIT-III (15Hrs.)

Pulses: Structure and composition of pulses, toxic constituents in pulses, processing of pulses: soaking, germination, decortication, cooking and fermentation.

UNIT-IV (16Hrs.)

Fats and Oils: Classification of lipids, types of fatty acids - saturated fatty acids, unsaturated fatty acids, essential fatty acids, trans fatty acids. Rancidity –Types- hydrolytic and oxidative rancidity and its prevention.

Recommended Books

1. Manay, S. and Shadaksharaswami, M., 'Foods: Facts and Principles', New Age Publishers, 2004.
2. Srilakshmi B., 'Food science', New Age Publishers, 2002.
3. Meyer L. H., 'Food Chemistry', New Age, 2004
4. Kenneth F. et al, edited-Vol-1, 2, 'The Cambridge World History of Food, Cambridge', Univ. Press, 2000.
5. Eastwood M., 'Principles of Human Nutrition', 2nd Edition, Blackwell Publishing, 2003.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

MATHEMATICS

Subject Code: BFOTS1-103

L T PC

Duration: 60Hrs.

3 1 0 4

Course Objectives:

1. To impart knowledge about basics of algebra and geometry.
2. To understand the numerical part and its application in solving problems related to processing and preservation.
3. To summarize the link between mathematics and Food Science.
4. To select appropriate techniques and methodologies for application in food engineering.
5. To develop an ability of cost analysis involved during construction and designing of food processing plants.

Course Outcomes:

1. Imparting knowledge about basics of algebra and geometry.
2. Understanding the numericals and their application in solving problems related to processing and preservation.
3. Summarizing the link between mathematics and Food Science.
4. Selection of appropriate techniques and methodologies for application in food engineering.
5. Developing an ability of cost analysis involved during construction and designing of food processing plants.

UNIT-I (17Hrs.)

Mensuration: Mensuration of rectangles, easy examples of garden paths, cost of planting trees and fencing gardens. Area of right angled triangles area and height of isosceles and equilateral triangles, area of triangles in terms of sides, rent of field. Area of parallelograms, rhombus, quadrilateral and trapezoid. Regular polygons with emphasis on hexagon and octagon. Simple cases of similar figures. Circumference and area of circles. Circular rings. Cost of fencing circular fields and paths.

UNIT-II (14Hrs.)

Mensuration: Volumes of cubes and rectangular solids. Cubic contents of tanks and cisterns, Volumes of triangular & rectangular prisms, right circular cylinders and segments of cylinders (Easy numerical examples based on Science only to be set Proofs of formulae).

UNIT-III (15Hrs.)

Algebra: Solution of quadratic equations and of those reducible to quadratic equation (One variable). Relation between roots and co-efficients. nth term and sum to n terms of an A. P. and G.P. nth term of an H. P. (excluding means and problems on numbers). Permutation and combinations: simple problems only. (Proofs of formulae not required).

UNIT-IV (14Hrs.)

Matrix and Determinant: Introduction matrices, Types of matrices, Operation of matrices, Transpose of matrix, Matrix multiplication, Determinants, Properties of determinants, Products of determinants, Minors and co-factors, Adjoint of a square matrix, Singular and non singular matrices, Inverse of Matrices.

Recommended Books

1. Algebra by Kapoor D. C. and Singh G.
2. Algebra by Nagpal T. N. and Gupta K.K.
3. Comprehensive Calculus by Dehiya R.S.
4. New Style Calculus for T. D.C

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

COMPUTER SCIENCE & APPLICATIONS

Subject Code: BFOTS1-104

L T PC

Duration: 60Hrs.

3 1 0 4

Course Objectives:

1. To understand the basics of computers and terminologies used.
2. To identify problems related to security against computer viruses along with their preventive measures.
3. To provide knowledge about collection, storage and analysis of data with least human errors.
4. To create an ability to prepare effective presentations and communicate with target audience.
5. To develop managerial skills by imparting knowledge about applications of computers in different fields.

Course Outcomes:

1. Understanding the basics of computers and terminologies used.
2. Identifying the problems related to security against computer viruses along with their preventive measures.
3. Providing knowledge about collection, storage and analysis of data with least human errors.
4. Creating an ability to prepare effective presentations and communicating with target audience.
5. Developing managerial skills by imparting knowledge about applications of computers in different fields.

UNIT-I (16Hrs.)

Computer Fundamentals Introduction to Computers: Characteristics of computers, Historical perspectives of computers, Computer generations, types of computers and uses, Software, Hardware, Basic architecture and functions of CPU and its parts, Important I/O devices like Keyboard, Mouse, Printers, Video Monitors. Memory Storage: Memory Cells, Semiconductor and Magnetic core memory, ROM (its types), RAM, Cache and Virtual memory, Secondary storage devices and their organization (Hard disk, Floppy disk, CD, DVD).

UNIT-II (16Hrs.)

Operating Systems: Definitions, Need, Organization, Functions, Types of Operating Systems, DOS, Windows, Handling Drives, Directories and files, Commands (Internal & External), Icons, Clipboard, Folders, Major differences between DOS & Windows.

Communication Networks: Hardware and software components, seven layers of OSI architecture, Network Topologies (Ring, Star, Fully Connected and Bus), LAN and WAN, Bounded and unbounded communication media, Internet, World Wide Web and I.T., Browsers, Important terminology regarding Internet applications.

UNIT-III (14Hrs.)

Computer Applications Word Processing: Techniques, File manipulation, Formatting, Printing setups Table handling, Mail merge, etc. using MS-Word.

Spreadsheet Package: Worksheets, formatting sheets, Calculations and graphing using formulae and functions, Import and export of data using MS-Excel.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

UNIT- IV (14Hrs.)

Computer Applications Graphics: Objectives and types of graphics, Presentation packages, Slides designing, Diagrams and graphs, Import & Export data using MS-Power Point.

Data Security against Viruses: Definition of computer viruses, detection, prevention and cure against viruses using anti-virus software packages.

Recommended. Books

1. Rajaraman, 'Fundamentals of Computers', Prentice Hall of India.
2. N.K. Tiwari, 'Computer Fundamental with Pharmacy Applications', 1st Edition, Pharm. MedPress, 2008.
3. Stultz, 'Learn MS-Office 2000', BPB Publications.
4. Ivens, 'Using Microsoft Windows', Prentice Hall of India, 1998.
5. Stultz, 'Learn DOS in a day', BPB Publication

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

GENERAL MICROBIOLOGY LAB-I

Subject Code: BFOTS1-105

**L T P C
0 0 4 2**

Duration: 60Hrs.

Course Objectives:

1. To understand working of different equipments used in microbiology and their applications in food production and preservation.
2. To impart knowledge about practical handling of microbiological tools.
3. To determine the microbial load of different food products with suitable techniques and interpret the factors associated with them.
4. To identify the methods for cultivation, isolation and storage of micro-organisms that can be beneficial for human health and environment.
5. To develop an ability to work effectively both individually and as a team member during the collection of samples from different sources.

Course Outcomes:

1. Understanding about working of different equipment's of microbiology and their applications in food production and preservation.
2. Imparting knowledge about practical handling of microbiological tools that ensures safety of food products.
3. Determination of microbial load of different food products with suitable techniques and interpret the factors associated with them.
4. Identification of suitable methods for the cultivation, isolation and storage of micro-organisms that can be beneficial for human health and environment.
5. Creating ability to work effectively both individually and as a team during the collection of samples from different sources.

Practical

1. To study different parts of a microscope.
2. Study of instruments (Autoclave, Hot air oven, Incubator, Laminar flow, pH meter, and spectrophotometer) of microbiology laboratory.
3. Preparation of nutrient agar and MacConkey's Agar plates, slants and broth.
4. To study the serial dilution method.
5. To perform pour plate, spread plate and streak plate methods for isolation and enumeration of micro-organisms.
6. To perform Simple staining.
7. To stain the given bacteria by Gram's staining method.
8. To perform negative staining.
9. To determine the number of micro-organisms with a Haemocytometer.
10. To determine the motility of bacteria by hanging drop method.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

LIFE SCIENCES

Subject code: BPHAR0-002

**L T PC
3 1 0 4**

Duration: 60 Hrs.

Course Objectives

1. To understand the basics of cell and molecular biology.
2. To impart knowledge regarding physiology and anatomy of human body.
3. To identify the micro-organisms responsible for infectious and contagious diseases along with their preventive measures.
4. To create an ability to develop vaccines and antibiotics for societal benefits.
5. To apply basics of genetic engineering in food and human health that can support agro-food industries.

Course outcome:

1. Understanding the basics of cell and molecular biology.
2. Imparting knowledge regarding physiology and anatomy of human body.
3. Identification of micro-organisms responsible for infectious and contagious diseases along with their preventive measures.
4. Creating an ability to develop vaccines and antibiotics for societal benefits.
5. Application of basics of genetic engineering in food and human health that can support agro-food industries.

UNIT-I (15Hrs.)

Cell & Molecular Biology: Cell theory, Prokaryotic cell, eukaryotic cell, cell wall, cell membrane, cytoskeleton, nucleus, chloroplast, mitochondria, endoplasmic reticulum, golgi bodies, ribosomes, lysosomes, vacuoles and centrosomes.

UNIT- II (15Hrs.)

Cell cycle & division, amitosis, mitosis and meiosis. Study of genetic material, structure of DNA and RNA, replication, transcription, genetic code, translation & DNA repair.

Human physiology: Digestion and absorption, breathing and respiration, circulation, excretory system, nervous system, skeletal and muscular systems.

UNIT-III (12Hrs.)

Human health and diseases: Pathogens, Parasites causing human disease (malaria, dengue, chickenguiena, typhoid, pneumonia, common cold, ringworm) and their control. Basic concepts of immunology, vaccines, antibiotics, cancer, HIV and AIDS.

UNIT-IV (18Hrs.)

Biotechnology and its applications: Recombinant DNA technology, applications in health, agriculture and industries, genetically modified organisms; Plant breeding, tissue culture, single cell protein, Transgenic plants and transgenic animals.

Recommended books:

1. Lehninger A. L., David L. N. and Michael M. C., 'Principles of Biochemistry', Worth Publishers, 1993.
2. Singh B.D., 'Biotechnology', KalyaniPublishers.
3. Harvey L., Arnold B., Chris A. K., Paul M., Monty K., Jems D. and Mathew P. S., 'Molecular Cell Biology', W.H. Freeman,2004.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

COMMUNICATIVE ENGLISH

Subject Code: BHUMA0-001

**L T P C
3 0 0 3**

Duration: 45 Hrs.

Course Objectives:

1. To understand the concept of effective communication, its components, and importance for life-long learning.
2. To impart knowledge regarding different communication styles and their matrix.
3. To engage students in team work by organizing group discussions on different topics.
4. To improve interview skills of students and applying those to crack future interviews.
5. To develop the art of being an effective presenter using specific presentation and communication skills.

Course Outcomes:

1. Understanding the concept of effective communication, its components, and importance for life-long learning.
2. Imparting knowledge regarding different communication styles and their matrix.
3. Engaging students in team work by organizing group discussions on different topics.
4. Improving interview skills of students and applying those to crack future interviews.
5. Developing the art of being an effective presenter using specific presentation and communication skills.

UNIT-I (12 Hrs.)

Communication Skills: Introduction, Definition, the Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context.
Barriers to communication: Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers.

UNIT-II (11Hrs.)

Perspectives in Communication: Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment.
Elements of Communication: Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication.

UNIT-III (12Hrs.)

Communication Styles: Introduction, The Communication Styles Matrix with example for each Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style.
Basic Listening Skills: Introduction, Self-Awareness, Active Listening, becoming an Active Listener, Listening in Difficult Situations.

UNIT-IV (10Hrs.)

Interview Skills: Purpose of an interview, Do's and Don'ts of an interview
Giving Presentations: Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery
Group Discussion: Introduction, Communication skills in group discussion, Do's and Don'ts of group discussion.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

Recommended Books

1. Ruther Ford A. J., 'Basic Communication Skills for Technology', 2nd Edition, Pearson Education, 2011.
2. Kumar S. and Pushplata, 'Communication Skills', 1st Edition, Oxford Press, 2011.
3. Stephen P. Robbins, 'Organizational Behaviour', 1st Edition, Pearson, 2013.
4. Gill H., 'Brilliant-Communication Skills', 1st Edition, Pearson Life, 2011.
5. Gopalawamy R., 'The Ace of Soft Skills: Attitude, Communication and Etiquette for Success', 5th Edition, Pearson, 2013.
6. Dalley D., Burton L. and Margaret G., 'Developing your Influencing Skills', Green Hall, 1st Edition, Universe of Learning LTD, 2010.
7. Konarnira, 'Communication Skills for Professionals', 2nd Edition, PHI, 2011.
8. Mitra B. K., 'Personality Development and Soft Skills', 1st Edition, Oxford Press, 2011.
9. 'Soft Skill for Everyone', Butter Field, 1st Edition, Cengage Learning India Pvt. Ltd., 2011.
10. Francis Peters S.J., 'Soft Skills and Professional Communication', 1st Edition, McGraw Hill Education, 2011.
11. John A., 'Effective Communication', 4th Edition, Pan MacMillan, 2009.
12. Aubrey D., 'Bringing out the Best in People', 2nd Edition, McGraw Hill, 1999.

SEMESTER SECOND

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

INTRODUCTION TO FOOD TECHNOLOGY-II

Subject Code: BFOTS1-201

**L T P C
3 1 0 4**

Duration: 60Hrs.

Course Objectives:

1. To understand the physiological-, physical-, chemical-, and pathological changes during storage of fruits and vegetables.
2. To impart knowledge regarding compositional and nutritional aspects of fruits and vegetables, useful in the development of value-added products.
3. To apply ethics during the handling, processing and preservation of animal products.
4. To summarize the general processing methods of Indian spices and their therapeutic uses.
5. To identify appropriate techniques for the quality evaluation of plant and animal based food products.

Course Outcomes:

1. Understanding the physiological-, physical-, chemical-, and pathological changes during storage of fruits and vegetables.
2. Imparting knowledge regarding compositional and nutritional aspects of fruits and vegetables, useful in the development of value-added products.
3. Applying ethics during the handling, processing and preservation of animal products.
4. Summarizing the general processing methods of Indian spices and their therapeutic uses.
5. Identification of appropriate techniques for the quality evaluation of plant and animal based food products.

UNIT-I (16Hrs.)

Fruits and Vegetables: Classification of fruits and vegetables, general composition, enzymatic browning, names and sources of pigments, Dietary fibre.

Postharvest 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.

UNIT-II (17Hrs.)

Compositional, Nutritional and Technological aspects of Animal foods Flesh Foods - Meat, Fish, Poultry Meat- Definition of carcass, concept of red meat and white meat, composition of meat, marbling, post-mortem changes in meat- rigor mortis, tenderization of meat, ageing of meat.

Fish- Classification of fish (fresh water and marine), aquaculture, composition of fish, characteristics of fresh fish, spoilage of fish- microbiological, physiological, biochemical.

Poultry- Structure of hen's egg, composition and nutritive value, egg proteins, characteristics of fresh egg, deterioration of egg quality, difference between broiler and layers.

UNIT-III (12Hrs.)

Milk and Milk Products: Definition of milk, chemical composition of milk, its constituents, processing of milk, pasteurization, homogenization. An overview of types of market milk & milk products.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

UNIT-IV (15Hrs.)

Food Spices and Condiments: Types and uses of spices and condiments, Chemical composition, Extraction, General processing, uses and special attributes of important Indian spices like pepper, cinnamon, clove, ginger, turmeric, cardamom, fenugreek and fennel, seasonings and condiments blend.

Recommended Books

1. Manay S. and Shadaksharaswami M., 'Foods: Facts and Principles', New Age Publishers, 2004.
2. 2004.
3. Srilakshmi B., 'Food Science', New Age Publishers, 2002.
4. Meyer L. H., 'Food Chemistry', New Age, 2004
5. Kenneth F. et al, edited-Vol-1, 2, 'The Cambridge World History of Food', Cambridge Univ. Press, 2000.
6. Eastwood M., 'Principles of Human Nutrition', 2nd Edition Blackwell publishing, 2003.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

PRINCIPLES OF FOOD PRESERVATION

Subject Code: BFOTS1-202

**L T PC
3 1 0 4**

Duration: 60Hrs

Course Objectives:

1. To impart knowledge regarding various methods of preservation of food and their effect on physiochemical properties of food.
2. To identify appropriate equipments for preservation of different food products aiming at minimal degradation of nutrients.
3. To understand the problems associated with food spoilage and selection of suitable methods of their preservation.
4. To analyze and interpret freezing and drying curves of different food products.
5. To create awareness regarding the effect of chemical and physical preservation techniques on health and nutritional components of food.

Course Outcomes:

1. Imparting knowledge regarding various methods of preservation of food and their effect on physiochemical properties of food.
2. Identification of appropriate equipments for preservation of different food products aiming at minimal degradation of nutrients.
3. Understanding the problems associated with food spoilage and selection of suitable methods of their preservation.
4. Analyzing and interpreting freezing and drying curves of different food products.
5. Creating awareness regarding the effect of chemical and physical preservation techniques on health and nutritional components of food.

UNIT-I (11Hrs.)

Introduction: Historical developments of food preservation. Principles of Food preservation, Scope & its benefits. Chemical preservation: Class I and Class II preservatives.

UNIT-II (16Hrs.)

Preservation by low temperature: Introduction, Freezing and Refrigeration, cold storage and freezing, freezing curve, changes during freezing, types of freezing; slow freezing, quick freezing, thawing, changes during thawing and its effects on food.

UNIT-III (16Hrs.)

Preservation by high temperature: Thermal processing, Sterilization, commercial sterilization, pasteurization, and blanching. boiling, canning, aseptic processing, thermal death time.

UNIT-IV (17Hrs.)

Preservation by Drying: Definition, drying as a means of preservation, differences between sun drying and dehydration (i.e. mechanical drying), factors affecting rate of drying, normal drying curve, Various types of driers used in food industry.

Irradiation: Units of radiation, Ultraviolet and ionizing irradiations, their effect on microorganisms & uses in food processing.

Recommended Books

1. Desrosier N. W. and Desrosier J. N., 'The Technology of Food Preservation', CBS Publication, New Delhi, 1998.
2. Paine F.A. and Paine H.Y., 'Handbook of Food Packaging', Thomson Press India Pvt Ltd, New Delhi, 1992.
3. Potter N.H., 'Food Science', CBS Publication, New Delhi, 1998.
4. Ramaswamy Hand Marcott M., 'Food Processing Principles and Applications', CRC Press, 2006.
5. Rao P.G., 'Fundamentals of Food Engineering', PHI Learning Pvt Ltd, New Delhi, 2010.
6. Toledo R. T., 'Fundamentals of Food Process Engineering', Aspen Publishers, 1999.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

ENVIRONMENTAL STUDIES

Subject Code: BFOTS1-203

**L T P C
3 0 0 3**

Duration: 45Hrs.

Course Objectives:

1. To understand the concept of renewable and non-renewable resources of environment.
2. To identify the problems associated with different environmental resources.
3. To impart knowledge regarding different types of ecosystems and their characteristic features.
4. To analyze the causes of water, soil and air pollution and implementing some effective measures to save them for societal benefits.
5. To create awareness regarding role of an individual in conservation of natural resources and communicating it to society.

Course Outcomes:

1. Understanding the concept of renewable and non-renewable resources of environment.
2. Identifying the problems associated with different environmental resources.
3. Imparting knowledge regarding different types of ecosystems and their characteristic features.
4. Analyzing the causes of water, soil and air pollution and implementing some effective measures to save them for societal benefits.
5. Creating awareness regarding role of an individual in conservation of natural resources and communicating it to society.

UNIT-I (11Hrs.)

The multidisciplinary nature of environmental studies, Natural Resources, Renewable and non-renewable resources: Natural resources and associated problems.

UNIT-II (12Hrs.)

Forest Resources, Water Resources, Mineral Resources, Food resources, Energy resources, Land resources, Role of an individual in conservation of natural resources.

UNIT-III (12Hrs.)

Ecosystems, Concept of an ecosystem, Structure and function of an ecosystem, Introduction, types, characteristic features, Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT- IV (10Hrs.)

Environmental Pollution: Air pollution; Water pollution; Soil pollution.

Recommended Books

1. Sing Y.K., 'Environmental Science', New Age International Pvt, Publishers, Bangalore.
2. Agarwal K.C., 'Environmental Biology', Nidi Publ. Ltd. Bikaner, 2001.
3. Erach B., 'The Biodiversity of India,' Mapin Publishing Pvt. Ltd.
4. Brunner R.C., 'Hazardous Waste Incineration', McGraw Hill Inc.
5. Clark R.S., 'Marine Pollution', Clarendon Press Oxford.
6. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 'Environmental Encyclopedia', Jaico Publ. House, Mumbai, 1196p, 2001.
7. De A.K., 'Environmental Chemistry', Wiley Eastern Ltd.
8. Down of Earth, Centre for Science and Environment. <https://www.downtoearth.org.in/>

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

FOOD CHEMISTRY

Subject Code: BFOTS1-204

**L T PC
3 1 0 4**

Duration: 60Hrs.

Course Objectives:

1. To understand the compositional aspects of different categories of foods.
2. To impart knowledge regarding role of water activity in extending the shelf life of food products and selection of appropriate packaging material.
3. To summarize various deteriorative changes of fats and oils.
4. To analyze physico-chemical-, and functional properties of proteins and carbohydrates and development of various food products.
5. To create awareness regarding different types of food flavors and importance of water- and fat soluble vitamins.

Course Outcomes:

1. Understanding the compositional aspects of different categories of foods.
2. Imparting knowledge regarding role of water activity in extending the shelf life of food products and selection of appropriate packaging material.
3. Summarizing various deteriorative changes of fats and oils.
4. Analyzing physico-chemical-, and functional properties of proteins and carbohydrates and development of various food products.
5. Creating awareness regarding different types of food flavors and importance of water- and fat soluble vitamins.

UNIT-I (12Hrs.)

Introduction to Food: Definition and Composition.

Water: Structure of water and ice, Types of water, Sorption phenomenon, Water activity and packaging.

UNIT-II (16Hrs.)

Lipids: Classification, Physical properties-melting point, softening point, specific gravity, refractive index, smoke, flash and fire point, turbidity point. Chemical properties- reichertmeissel value, polenske value, iodine value, peroxide value, saponificationvalue.

Changes in fats and oils: rancidity, lipolysis, flavor reversion, Fat Mimetics.

UNIT-III (17Hrs.)

Proteins: Protein classification and structure, Nature of food proteins (plant and animal proteins). Properties of proteins (electrophoresis, sedimentation, amphoterism and denaturation),

Functional properties of proteins, organoleptic, solubility, viscosity, binding gelation/texturization, emulsification, foaming.

Carbohydrates: Classification and Functions (monosaccharides, oligosaccharides and polysaccharides), Modified celluloses and starches.

UNIT-IV (15Hrs.)

Vitamin: Importance and Stability, Water soluble & Fat soluble vitamins.

Flavour: Definition and basic tastes, Description of food flavours, Flavour enhancers.

Recommended Books

1. Fennema O. R, 'Food Chemistry', 3rd Edition, Marcell Dekker, New York, 1996.
2. Whitehurst R. J. and Law B. A., 'Enzymes in Food Technology', CRC Press, Canada, 2002.
3. Wong Dominic W. S., 'Food Enzyme, Chapman and Hall, New York, 1995.
4. Potter N.N. and Hotchkiss J. H, 'Food Science', 5th Edition., Chapman & Hall, 1995.
5. DeMan J.M., 'Principles of Food Chemistry', AVI, New York, 1980.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

INTRODUCTION TO FOOD TECHNOLOGY-II LAB II

Subject Code: BFOTS1-205

**L T P C
0 0 4 2**

Duration: 60Hrs.

Course Objectives

1. To impart knowledge regarding basic instruments used in the food industries for analysis of food components.
2. To familiarize the students with methodologies used for determination of various quality attributes, adhering to legal specifications.
3. To conduct qualitative tests for major food components.
4. To determine chemical components of food products quantitatively.
5. To analyze and interpret data for various quality attributes and using this information for product improvement.

Course Outcomes:

1. Imparting knowledge regarding basic instruments used in the food industries for analysis of food components.
2. Familiarizing the students with methodologies used for determination of various quality attributes, adhering to legal specifications.
3. Conducting qualitative tests for major food components.
4. Determination of chemical components of food products quantitatively.
5. Analysis and interpretation of data for various quality attributes and using this information for product improvement.

PRACTICALS

1. Demonstration of the instruments used in food technology.
2. Determination of moisture content in different food samples.
3. Determination of ash content of different food samples.
4. Determination of TSS of ketchup by refractometer.
5. Determination of acidity of milk and juices.
6. To study the effect of blanching on vegetables.
7. Determination of specific gravity of oil and milk.
8. Determination of pH of food samples by pH meter.
9. Determination of saponification value and acid value.
10. Qualitative test for starch and protein.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

PRINCIPLES OF FOOD PRESERVATION LAB III

Subject Code: BFOTS1-206

L T P C

Duration: 60Hrs

0 0 4 2

Course Objectives:

1. To prepare value added products from fruits and vegetables.
2. To understand the effects of hydrothermal processes on different vegetables.
3. To analyze quality attributes of packaged food products.
4. To apply different food preservation techniques for preservation of food products.
5. To gain practical knowledge of various instruments used in food processing industries.

Course Outcomes:

1. Preparation of value added products from fruits and vegetables.
2. Understand the effects of hydrothermal processes on different vegetables.
3. Analysis of quality attributes of packaged food products.
4. Application of different food preservation techniques for preservation of food products.
5. Gaining practical knowledge of various instruments used in food processing industries.

Practical's

1. Cut out analysis of canned foods.
2. Preservation of fruits and vegetables by syruling and salting.
3. Preservation by paraffining.
4. Preparation of sauerkraut.
5. To determine the adequacy of blanching on vegetables.
6. To enhance the shelf life of eggs by oiling and pickling.
7. To study the curing of meat.
8. Preservative effect of honey and different concentrations.
9. Preservation of fruits and vegetables by salt, oil and vinegar.
10. Visit to food industry

SEMESTER THIRD

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

DAIRY TECHNOLOGY

Subject Code: BFOTS1-301

**L T P C
3 1 0 4**

Duration: 60 (Hrs.)

Course Objectives:

1. To understand physico-chemical properties, microbiology, and nutritive value of milk.
2. To impart knowledge regarding various steps involved in the production of market milk as per specified legal standards.
3. To summarize process of manufacturing of cream, ghee, butter, milk powders, ice cream, and cheese and identify associated defects.
4. To develop fermented milk and other indigenous milk products.
5. To create awareness regarding selection of equipment's for the processing and quality assessment of milk and milk products.

Course Outcomes:

1. Understanding the physico-chemical properties, microbiology, and nutritive value of milk.
2. Imparting knowledge regarding various steps involved in the production of market milk as per specified legal standards.
3. Summarizing the process of manufacturing of cream, ghee, butter, milk powders, ice cream, and cheese and identifying the associated defects.
4. Development of fermented milk and other indigenous milk products.
5. Creating awareness regarding selection of equipment's for the processing and quality assessment of milk and milk products.

UNIT-I (15 Hours)

Definition of milk, Market milk, Composition, Physicochemical properties and nutritive value of milk, microbiology of milk, Factors affecting composition of milk.

UNIT-II (15 Hours)

Liquid milk processing: Collection of milk, Reception, Platform testing.

Various stages of processing: Filtration, Clarification, Homogenization and Pasteurization.

Description and working of clarifier, cream separator, homogenizer and plate heat exchanger.

UNIT-III 15 Hours)

Cream: Types, manufacturing and defects.

Butter: Types, preparation, theories of churning, defects.

Preparation and defects of Ghee, flavored milk, condensed milk and milk powder.

UNIT-IV (15 Hours)

Manufacturing and defects of Ice-cream and cheese.

Fermented milk and milk products: Yoghurt, dahi and shrikhand.

Indigenous milk products.

Recommended Text Books / Reference Books:

1. De Sukumar, Outlines of Dairy Technology, Oxford University Press, Oxford, UK, 2007.
2. Webb and Johnson, Fundamentals of Dairy Chemistry, 3rd ed., CBS Publishers, New Delhi, 1988.
3. Eckles, Combs, Henery C, and Willes C, Milk & Milk Products, Tata McGraw Hill Publishers, USA, 1997.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

TECHNOLOGY OF FRUITS AND VEGETABLES

Subject Code: BFOTS1-302

**L T P C
3 1 0 4**

Duration: 60 (Hrs.)

Course Objectives:

1. To understand nutritional profile, methods of preservations and indices of fruits and vegetables maturity.
2. To impart knowledge regarding process of canning of fruits and vegetables.
3. To summarize various quality characteristics of fruits and vegetables involved in their processing.
4. To develop value added products from fruits and vegetables using appropriate processing techniques and equipments.
5. To create awareness regarding utilization of fruits and vegetable industry wastes.

Course Outcomes:

1. Understanding nutritional profile, methods of preservations and indices of fruits and vegetables maturity.
2. Imparting knowledge regarding process of canning of fruits and vegetables.
3. Summarizing various quality characteristics of fruits and vegetables involved in their processing.
4. Developing value added products from fruits and vegetables using appropriate processing techniques and equipments.
5. Creating awareness regarding utilization of fruits and vegetable industry wastes.

UNIT-I (10 Hours)

Classification and nutritive value of fruits and vegetables, methods of preservation (short & long term), Physical and chemical indices of fruit maturity.

UNIT-II (10 Hours)

Quality characteristics of fruits and vegetables for processing.

Canning of fruits and vegetables: Selection of fruits and vegetables, process of canning, factors affecting the process- time and temperature, syrups and brines for canning.

UNIT-III (20 Hours)

Squashes, cordials, nectars, RTS, Syrups and blending of juices.

Jam: Constituents, selection of fruits, processing & technology, defects.

Jelly: Essential Constituents, Role of pectin, Theory of jelly formation, Processing & technology, defects.

UNIT-IV (20 Hours)

Pickles and sauces: Processing, Types, Causes of spoilage in pickling.

Processing of Tomato puree, paste, ketchup and sauce.

Dehydration of fruits and vegetables: Sun drying & mechanical dehydration.

Refrigeration of fruits and vegetable (Air blast freezing, immersion freezing, plate freezing, cryogenic freezing and IQF).

Utilization of fruits and vegetable industry wastes.

Recommended Text Books / Reference Books:

1. Khurdia DS, Preservation of fruits and vegetables. Indian Council of Agriculture Research, New Delhi 1995.
2. Potter N, Hotchkiss JH, Food Science. CBS Publishers, Delhi 2006.
3. Siddhapa GS, Lal G and Tandon, Preservation of fruits and vegetables, Indian Council of Agriculture Research, New Delhi, 1986.
4. Srivastava RS, Kumar S. Fruit and Vegetable Preservation; Principles and Practices, International Book Distributing Company, Lucknow, 2005.
5. Srivastava SS, Phal Parirakshan, Kitab Mahal, Lucknow, 2006.
6. Subbalakshmi G, Udipi SA, Food Processing and Preservation, New Age International Publishers, Delhi, 2007.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

FOOD MICROBIOLOGY AND FOOD SAFETY

Subject Code: BFOTS1-303

**L T P C
3 1 0 4**

Duration: 60 (Hrs.)

Course Objectives:

1. To understand the morphology of micro-organisms and their importance in foods.
2. To identify enumeration techniques involved in qualitative and quantitative determination of micro-organisms in food products.
3. To impart knowledge regarding different methods of preservation to prevent microbial spoilage of food products.
4. To differentiate between food infection and food intoxication and understand the microbiology of different raw and processed foods.
5. Creating awareness regarding types of hazards, food safety and management tools.

Course Outcomes:

1. Understanding the morphology of micro-organisms and their importance in foods.
2. Identification of enumeration techniques involved in qualitative and quantitative determination of micro-organisms in food products.
3. Imparting knowledge regarding different methods of preservation to prevent microbial spoilage of food products.
4. Differentiating between food infection and food intoxication and understand the microbiology of different raw and processed foods.
5. Creating awareness regarding types of hazards, food safety and management tools.

UNIT-I (15 Hours)

Types of Microorganisms in Food, Classification, Morphology and Structure of microorganisms, Importance in food (bacteria, fungi and viruses), Significance of spores.

UNIT-II (15 Hours)

Enumeration techniques & control of microorganisms in foods, Qualitative and quantitative methods-conventional as well as rapid, Principles and methods of preservation (thermal and non-thermal), Introduction to Hurdle Technology.

UNIT-III (15 Hours)

Microbiology of raw, processed and spoiled foods: Fruits and vegetables, Meat and meat products, milk and milk products, eggs, canned foods, cereals and cereal products. Food infection and Food intoxication.

UNIT-IV (15 Hours)

Introduction to Food Safety, Definition, Types of hazards, biological, chemical, physical hazards, Factors affecting food safety. Sources of contamination, Control methods using physical and chemical agents, waste disposal, pest and rodent control, personnel hygiene. Food Safety Management Tools: HACCP, ISO series, TQM and Risk Analysis.

Recommended Text Books / Reference Books:

1. Frazier William C and Westhoff, Dennis C, Food Microbiology, TMH, New Delhi, 2004.
2. Jay, James M., Modern Food Microbiology, CBS Publication, New Delhi, 2000.
3. Garbutt, John., Essentials of Food Microbiology, Arnold, London,1997.
4. Pelczar MJ, Chan E.C.S and Krieg, Noel R , Microbiology, TMH, New Delhi, 1993.
5. Lawley, R., Curtis L. and Davis,J. , The Food Safety Hazard Guidebook , RSC Publication, 2004.
6. De Vries, Food Safety and Toxicity, CRC, New York, 1997.
7. Marriott, Norman G., Principles of Food Sanitation, AVI, New York, 1985.
8. Forsythe, S J., Microbiology of Safe Food, Blackwell Science, Oxford, USA, 1987.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

DAIRY TECHNOLOGY LAB-IV

Subject Code: BFOTS1-304

**L T P C
0 0 4 2**

Duration: 60 (Hrs.)

Course Objectives:

1. To understand procedures and significance of platform tests in milk.
2. To determine different components of milk affecting its quality.
3. To impart knowledge regarding various equipments used in milk industry.
4. To develop various milk based products in compliance with legal specifications.
5. To create awareness regarding adulteration of milk and detection methods.

Course Outcomes:

1. Understanding procedures and significance of platform tests in milk.
2. Determination of different components of milk affecting its quality.
3. Imparting knowledge regarding various equipments used in milk industry.
4. Development of various milk based products in compliance with legal specifications.
5. Creating awareness regarding adulteration of milk and detection methods.

Practical's:

1. To perform platform tests in milk (Alcohol-Alizarin test, COB, MBRT, specific gravity).
2. To estimate milk fat by Gerber method.
3. Determination of titrable acidity and pH of milk.
4. To determine adulteration of milk.
5. Preparation of pasteurized milk.
6. Preparation of flavoured milk.
7. Preparation of Paneer.
8. To perform neutralization of cream.
9. To study the working of cream separator.
10. Preparation of butter and determination of overrun in butter.
11. Preparation of Ice-cream.
12. Preparation of shrikhand.
13. Preparation of ghee.
14. Visit to milk processing plant.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

TECHNOLOGY OF FRUITS AND VEGETABLES LAB-V

Subject Code: BFOTS1-305

**L T P C
0 0 4 2**

Duration: 60 (Hrs.)

Course Objectives:

1. To understand the processing techniques involved in production of various value added products from fruits and vegetables meeting the specified needs of society.
2. To impart knowledge regarding quality parameters of products to meet legal specifications.
3. To analyze quality attributes of packaged food product.
4. To utilize by-products of fruits and vegetables industry for societal benefits and reducing environmental stress.
5. To create an ability to communicate the related issues during industrial visits.

Course Outcomes:

1. Understanding the processing techniques involved in production of various value-added products from fruits and vegetables meeting the specified needs of society.
2. Imparting knowledge regarding quality parameters of products to meet legal specifications.
3. Analyzing quality attributes of packaged food product.
4. Utilization of by-products of fruits and vegetables industry for societal benefits and reducing environmental stress.
5. Creating an ability to communicate the related issues during industrial visits.

Practical's:

1. Estimation of total soluble solids (TSS).
2. Estimation of brix: acid ratio.
3. Preparation of pickles.
4. Preparation of tomato paste.
5. Preparation of tomato ketchup and sauce.
6. Preparation of Jam and marmalades.
7. Preparation of Jelly.
8. Cut out analysis of canned food products.
9. Preparation of fruit preserve from Amla, Apple and carrot.
10. Preparation of Mango Leather.
11. Determination of dehydration and rehydration ratio of dehydrated vegetables.
12. Preparation of candied peels, glazed fruits and reformed fruits.
13. Visit to fruits and vegetable processing industry.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

FOOD MICROBIOLOGY AND FOOD SAFETY LAB-VI

Subject Code: BFOTS1-306

**L T P C
0 0 4 2**

Duration: 60 (Hrs.)

Course Objectives:

1. To understand the application of various equipments used in microbiology.
2. To summarize methodologies and techniques involved in microbial analysis of different food commodities.
3. To describe the effect of various preservation methods on microbial load of different food products.
4. To analyze various food samples in terms of their pathogenic counts to ensure their safety for consumption.
5. To develop various fermented food products meeting the specified needs of population.

Course Outcomes:

1. Understanding the application of various equipments used in microbiology.
2. Summarizing the methodologies and techniques involved in microbial analysis of different food commodities.
3. Describing the effect of various preservation methods on microbial load of different food products.
4. Analyzing various food samples in terms of their pathogenic counts to ensure their safety for consumption.
5. Developing various fermented food products meeting the specified needs of population.

Practical's:

1. Sterilization and disinfection of equipment used in food microbiology laboratory.
2. Study of different types of microorganism colony shapes on agar plates.
3. Effect of extrinsic factors on growth of micro-organisms.
4. Effect of preservation methods on microbial load of different food samples.
5. Detection of food borne pathogens in a given food sample.
6. Isolation of fungi from food materials.
7. Study of incubation test of heated canned foods.
8. Study of Dye reduction test of milk.
9. Microbiological analysis of egg, cereal product and fruit product.
10. Spawn preparation of different mushrooms.
11. Production of red and white wine.
12. Production of vinegar.
13. Effect of sanitizers on microbial load.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

ENTREPRENEURSHIP DEVELOPMENT

Subject Code: BFOTD1-311

L T P C

Duration: 45 (Hrs.)

3 0 0 3

Course Objectives:

1. To understand the basics of Entrepreneur, Entrepreneurship and Enterprise for future prospectives.
2. To summarize entrepreneurial skills, techniques to develop, and assessment tests.
3. To interpret case studies of successful entrepreneurs in order to deal with different situations arising during Entrepreneurship.
4. To create an ability to identify opportunities in business and generation of unique business ideas.
5. To apply SWOT Analysis for business and for competitors.

Course Outcomes:

1. Understanding the basics of Entrepreneur, Entrepreneurship and Enterprise for future prospectives.
2. Summarizing entrepreneurial skills, techniques to develop, and assessment tests.
3. Interpreting case studies of successful entrepreneurs in order to deal with different situations arising during Entrepreneurship.
4. Creating an ability to identify opportunities in business and generation of unique business ideas.
5. Application of SWOT Analysis for business and for competitors.

UNIT-I (9 Hours)

Entrepreneur, Entrepreneurship and Enterprise: Concept and role in development, characteristics of entrepreneurs, developing entrepreneurial competencies, types of enterprise and ownership, charms of becoming an entrepreneur, reinforcing entrepreneurial motivation and competencies.

UNIT-II (12 Hours)

Entrepreneurial development

Case studies of successful entrepreneurs.

Exercises on ways of sensing opportunities – sources of idea, creating efforts, SWOT analysis.

Entrepreneurial skill assessment test.

Techniques of development of entrepreneurial skills, positive self-image and locus of control

UNIT-III (12 Hours)

Food business management

Case studies of Food processing business and its aspects.

Business opportunity identification and assessment techniques.

Business idea generation and evaluation exercise.

Market assessment study and analysis of competitive situation.

UNIT-IV (12 Hours)

SWOT Analysis for business and for competitors.

Preparation of business plan.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

Preparation of project report.

Methods of arrangement of inputs–finance and material.

Recommended Text Books / Reference Books:

1. Vasant Desai, Fundamentals of Entrepreneurship and Small Business Management, Himalya Publishing House Pvt. Ltd., Mumbai, 2012.
2. Vasant Desai, The Dynamics of Entrepreneurial Development and Management, Himalya Publishing House Pvt. Ltd., Mumbai, 2011.
3. D. David and S Erickson, Principles of Agri Business Management, Mc Graw Hill Book Co., New Delhi, 1987.
4. Acharya S S and Agarwal N L, Agricultural Marketing in India, Oxford & ISH Publishing Co., New Delhi, 1987.
5. David H. Holt, Entrepreneurship – Anew Venture Creation, Prentice Hall of India, New Delhi, 2002.
6. Phill Kottler, Marketing Management, Prentice Hall of India Private Limited, New Delhi, 1994.
7. Chandra, Prasanna, Projects, Planning, Analysis, Selection, Implementation and Review, Tata McGraw-Hill Publishing Company Limited, New Delhi, 1996.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

FOOD FERMENTATION TECHNOLOGY

Subject Code: BFOTD1-312

**L T P C
3 0 0 3**

Duration: 45 (Hrs.)

Course Objectives:

1. To understand the basics of food fermentation.
2. To impart knowledge regarding design and operation of a bio-fermenter.
3. To identify types of starters useful for food industries.
4. To summarize the techniques involved in production of organic acids, vitamins, and yeast.
5. To create an ability to develop different types of fermented foods for desired health benefits.

Course Outcomes:

1. Understanding the basics of food fermentation.
2. Imparting knowledge regarding design and operation of a bio-fermenter.
3. Identification of different types of starters useful for food industries.
4. Summarizing the techniques involved in production of organic acids, vitamins, and yeast.
5. Creating an ability to develop different types of fermented foods for desired health benefits.

UNIT-I (10 Hours)

Introduction to fermentation technology, Principles of food fermentation, Types of fermentation (Continuous fermentation, Batch fermentation, Submerged fermentation and solid state fermentation), Microbial culture selection for fermentation.

UNIT-II (11 Hours)

Study of a Bio fermenter – its design and operation, Down Stream Processing and Product recovery. Raw material availability, quality, processes and pre-treatments of raw materials. Major alcoholic raw materials.

UNIT-III (12 Hours)

Starter cultures, Types of starters used in Food Industry. Fermented foods: methods of manufacture for vinegar, sauerkraut, Yoghurt, soya sauce, wine and traditional Indian foods, Fermented milk and products such as cheese, Fermented pickles.

UNIT-IV (12 Hours)

Production of organic acids (citric acid, lactic acid, gluconic acid and acetic acid), production of vitamins (Vitamin B2) and yeast (SCP).

Recommended Text Books / Reference Books:

1. Adams M & Moss, M., Food Microbiology. 2nd Edition, RSC Publishing, 2008.
2. Joshi V. K. & Pandey, A., Biotechnology: Food Fermentation Microbiology, Biochemistry and Technology. Volume 2, Sanjanya Books, 1999.
3. John Garbutt, Essentials of Food Microbiology, Arnold International Students, 1997.
4. Brian J. Wood. Elsevier, Microbiology of Fermented Foods. Volume II and I, Applied Science Publication, 1997.
5. Stanbury, P.F., Whitekar A. and Hall, Principles of Fermentation Technology, Pergaman. McNeul and Harvey. (AC) NEW, 1995.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

FOOD ADDITIVES

Subject Code: BFOTD1-313

**L T P C
3 0 0 3**

Duration: 45 (Hrs.)

Course Objectives:

1. To understand the types, applications, and legal specifications of different food additives.
2. To impart knowledge regarding types, mode of action, and applications of different types of preservatives and flavoring agents.
3. To summarize the properties and applications of different types of sweeteners and emulsifiers used in food industries.
4. To create awareness regarding chemical composition, extraction procedures, and uses of different spices and condiments.
5. To differentiate between natural-, and synthetic food colors and their applications.

Course Outcomes:

1. Understanding the types, applications, and legal specifications of different food additives.
2. Imparting knowledge regarding types, mode of action, and applications of different types of preservatives and flavoring agents.
3. Summarizing the properties and applications of different types of sweeteners and emulsifiers used in food industries.
4. Creating awareness regarding chemical composition, extraction procedures, and uses of different spices and condiments.
5. Differentiating between natural-, and synthetic food colors and their applications.

UNIT-I (10 Hours)

Introduction to food additives: General Classification, types (On basis of their origin, natural and synthetic), uses, functions, legal aspects, risks and benefits

UNIT-II (11 Hours)

Preservatives: Antimicrobial agents, antioxidants and anti-browning agents (Types, mode of action and their applications in different food products)

Flavouring agents: Flavours (Natural and artificial), flavour enhancers, flavour stabilisation and flavour encapsulation.

UNIT-III (12 Hours)

Sweeteners: Natural and artificial sweeteners, Nutritive and non-nutritive sweeteners, properties and uses of saccharin, aspartame, acesulfame-K, corn sweeteners, invert sugar and sugar alcohols.

Emulsifiers: Types, selection of emulsifier, emulsion stability, functions and mechanism of action.

Stabilizers: Types, uses and functions

UNIT-IV (12 Hours)

Food Spices and condiments: Types and uses of spices and condiments, Chemical composition, Extraction and processing of Indian spices like pepper, cinnamon, cardamom, clove, ginger, turmeric, fenugreek and fennel, Seasonings and condiment blends.

Food Colors: Introduction, natural (biocolors) and synthetic food colors.

Recommended Books

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

1. A.L. Branen, 'Food Additives', Marcel Dekker Inc., New York, U.S.A.
2. J.W. Purseglove 'Spices' Longman Publishers, London, England.
3. D.R. Tainter and A.T. Grenis, 'Spices and Seasonings- A Food Technology Handbook', VCH Publishers, Inc., Hoboken, U.S.A.
4. J. Merory, 'Food Flavorings, Composition, Manufacture and Use', AVI Publishing Inc., Westport, U.S.A.
5. K.T. Farrell 'Spices, Condiments and Seasonings', Springer, U.S.A.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

DRUG ABUSE

Subject Code: BMNCC0-004

**L T P C
2 0 0 0**

Duration: 30 (Hrs.)

Course Objectives:

1. To understand the basics of drug abuse, drug dependence and drug addiction, and drug tolerance.
2. To identify nature of problem, sign, and symptoms associated with drug abuse.
3. To impart basic knowledge regarding causes and consequences of drug abuse.
4. To create awareness regarding prevention of drug abuse.
5. To analyze short term, long term effects and withdrawal symptoms of drug abuse.

Course Outcomes:

1. Understanding the basics of drug abuse, drug dependence and drug addiction, and drug tolerance.
2. Identification of nature of problem, sign, and symptoms associated with drug abuse.
3. Imparting basic knowledge regarding causes and consequences of drug abuse.
4. Creating awareness regarding prevention of drug abuse.
5. Analyzing short term, long term effects and withdrawal symptoms of drug abuse.

UNIT-I (10 Hours)

Problem of Drug Abuse: Concept and Overview; Types of Drug Often Abused

Concept and Overview

What are drugs and what constitutes Drug Abuse?

Prevalence of menace of Drug Abuse

How drug Abuse is different from Drug Dependence and Drug Addiction?

Physical and psychological dependence- concepts of drug tolerance

Introduction to drugs of abuse: Short Term, Long term effects & withdrawal symptoms

Stimulants: Amphetamines, Cocaine, Nicotine

Depressants: Alcohol, Barbiturates- Nembutal, Seconal, Phenobarbital Benzodiazepines –Diazepam, Alprazolam, Flunitrazepam

Narcotics: Opium, morphine, heroin

Hallucinogens: Cannabis & derivatives (marijuana, hashish, hash oil), Steroids and inhalants

UNIT-II (8 Hours)

Nature of the Problem

Vulnerable Age Groups

Signs and symptoms of Drug Abuse

(a)- Physical indicators

(b)- Academic indicators

(c)- Behavioural and Psychological indicators

UNIT-III (6 Hours)

Causes and Consequences of Drug Abuse

Causes

Physiological

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

Psychological
Sociological
Consequences of Drug Abuse
For individuals
For families
For society & Nation

UNIT-IV (6 Hours)

Management & Prevention of Drug Abuse
Management of Drug Abuse
Prevention of Drug Abuse
Role of Family, School, Media, Legislation & Deaddiction Centres

Recommended Text Books / Reference Books:

1. Kapoor. T., Drug Epidemic among Indian Youth, Mittal Pub, New Delhi, 1985.
2. Modi, Ishwar and Modi, Shalini, Drugs: Addiction and Prevention, Rawat Publication, Jaipur, 1997.
3. Ahuja, Ram, Social Problems in India, Rawat Publications, Jaipur, 2003.
4. National Household Survey of Alcohol and Drug Abuse. New Delhi, Clinical Epidemiological Unit, All India Institute of Medical Sciences, 2004.
5. World Drug Report , United Nations Office of Drug and Crime,2011
6. World Drug Report, United nations Office of Drug and Crime, 2010.
7. Extent, Pattern and Trend of Drug Use in India, Ministry of Social Justice and Empowerment, Government of India, 2004.
8. The Narcotic Drugs and Psychotropic Substances Act, 1985, New Delhi: Universal, 2012.

SEMESTER FOURTH

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

TECHNOLOGY OF CEREALS, PULSES AND OIL SEEDS

Subject Code: BFOTS1-401

L T P C
3 1 0 4

Duration: 60 (Hrs.)

Course Objectives:

1. To understand the structure, composition, and physico-chemical properties of cereals, pulses and oilseeds.
2. To impart knowledge regarding milling of cereals and pulses.
3. To familiarize students with extraction and processing of fats and oils.
4. To develop value added products from cereals, pulses and oilseeds.
5. To create awareness regarding advantages and disadvantages of steps involved in processing of cereals, pulses and oilseeds.

Course Outcomes:

1. Understanding the structure, composition, and physico-chemical properties of cereals, pulses and oilseeds.
2. Imparting knowledge regarding milling of cereals and pulses.
3. Familiarizing students with extraction and processing of fats and oils.
4. Development of value added products from cereals, pulses and oilseeds.
5. Creating awareness regarding advantages and disadvantages of steps involved in processing of cereals, pulses and oilseeds.

UNIT-I (15 Hours)

Wheat-Structure and chemical composition of wheat grain, Types, milling, flour grade, flour treatments (bleaching, maturing), flour for various purposes, bread, biscuit, cake manufacturing.

UNIT-II (15 Hours)

Rice – Structure and chemical composition of rice grain, physicochemical properties, milling, parboiling of rice, changes during parboiling, Advantages and disadvantages of parboiling, ageing of rice

UNIT-III (15 Hours)

Corn – Milling (wet & dry), cornflakes, corn starch and corn sweeteners.
Barley- Milling, Malting of barley: steeping, Germination and drying.
Sorghum and millets – Milling and uses.

UNIT-IV (15 Hours)

Milling of pulses: Dry milling, wet milling, improved milling methods
Technology of oil seeds
Extraction of oil and refining.
Preparation of defatted flour, protein concentrates, isolates, Uses.

Recommended Text Books / Reference Books:

1. Kent, N.L., Technology of Cereal, 5th Ed., Pergamon Press, 2003.
2. Chakraverty, Post Harvest Technology of Cereals, Pulses and Oilseeds, revised Ed., Oxford & IBH Publishing Co. Pvt Ltd., 1988.
3. Marshall, Rice Science and Technology, Wadsworth, New York, 1994.
4. Manay, S. and Sharaswamy, M., Food Facts and Principles, Wiley Eastern Limited, 1994.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

EGG, POULTRY AND MEAT TECHNOLOGY

Subject Code: BFOTS1-402

**L T P C
3 1 0 4**

Duration: 60 (Hrs.)

Course Objectives:

1. To understand the chemical composition and nutritive value of egg, meat and poultry.
2. To impart knowledge regarding packaging, spoilage and preservation of egg, meat and poultry.
3. To apply ethical principles during handling of animal and their conversion into meat and other products.
4. To analyze quality parameters of eggs, meat and poultry.
5. To create awareness regarding by product utilization of meat industry.

Course Outcomes:

1. Understanding the chemical composition and nutritive value of egg, meat and poultry.
2. Imparting knowledge regarding packaging, spoilage and preservation of egg, meat and poultry.
3. Application of ethical principles during handling of animal and their conversion into meat and other products.
4. Analysis of quality parameters of eggs, meat and poultry.
5. Creating awareness regarding by product utilization of meat industry.

UNIT-I (15 Hours)

Egg: Structure and composition, Nutritive value and functional properties. Quality of egg: Interior quality evaluation, candling, grading, handling, packaging, storage, transportation. Egg powder. Liquid egg preservation. Packaging and transportation of eggs.

UNIT-II (15 Hours)

Poultry: Types, chemical and nutritive value of poultry meat.
Poultry dressing and slaughtering methods.
Preservation, grading and packaging of poultry meat.

UNIT-III (15 Hours)

Status and scope of meat industry in India. Ante-mortem and post-mortem examination of meat animal, their slaughtering and dressing. Structure and physico-chemical properties of muscle. Post-mortem changes in meat. Ageing of meat, meat tenderization-natural and artificial methods. Quality Parameters: Meat color, water holding capacity, Marbling, Firmness and factors affecting it.

UNIT-IV (15 Hours)

Restructured meat products, meat analogs.
Preservation and spoilage of meat.
Meat industry by products: Importance and utilization.

Recommended Text Books / Reference Books:

1. Lawrie R A, Lawrie's, Meat Science, 5th Ed, Woodhead Publisher, England, 1998.
2. Parkhurst & Mountney, Poultry Meat and Egg Production, CBS Publication, New Delhi, 1997.
3. Pearson & Gillet Processed Meats, 3rd Ed, CBS Publication, New Delhi, 1997.
4. Shai Barbut, Poultry Products Processing, CRC Press, 2005.
5. Stadelman WJ, Owen J Cotterill Egg Science and Technology, 4th Ed. CBS Publication New Delhi, 2002.
6. Romans. JR and Costllo WJ, Carlson WC, Greaser, ML and Jones KW, The Meat we eat, Interstate Publishers, USA, 2004.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

FOOD PLANT HYGIENE AND SANITATION

Subject Code: BFOTS1-403

**L T P C
3 1 0 4**

Duration: 60 (Hrs.)

Course Objectives:

1. To understand the concept and importance of personal hygiene and its role in food safety.
2. To impart knowledge regarding principles and methods of cleaning and sanitation.
3. To design layout of ETP plants keeping in view all the requirements of food processing industry.
4. To develop value added products from wastes of food industry.
5. To create awareness regarding disposal and treatment of waste.

Course Outcomes:

1. Understanding the concept and importance of personal hygiene and its role in food safety.
2. Imparting knowledge regarding principles and methods of cleaning and sanitation.
3. Designing the layout of ETP plants keeping in view all the requirements of food processing industry.
4. Development of value added products from wastes of food industry.
5. Creating awareness regarding disposal and treatment of waste.

UNIT-I (15 Hours)

Introduction:

Importance of personal hygiene of food handler-habits, clothes, illness, education of handler in

Handling and service.

UNIT-II (15 Hours)

Industrial Hygiene:

Cleaning methods – sterilization, disinfection, heat & chemicals, chemical tests for sanitizer strength.
Cleaning agents and disinfectants.

Food sanitation-Principles & methods, control, inspection. Sanitation in fruits & vegetables industry, cereals industry, dairy industry, meat, egg & poultry units.

UNIT-III (15 Hours)

Waste disposal, Control methods using physical and chemical agents, Pest and rodent control, ETP design and layout. Food storage sanitation, transport sanitation and water sanitation.

UNIT-IV (15 Hours)

By-products utilization obtained from dairy plant, egg & poultry processing industry and meat industry.
Wastewater and solid waste treatment: Waste-types-solid and liquid waste characterization, physical, chemical, biological, aerobic, anaerobic, primary, secondary and tertiary (advanced) treatments.

Recommended Text Books / Reference Books:

1. Norman G. Marriott and Robert B. Gravani, Principles of Food Sanitation, 5th edition, 2006.
2. Rao, D. G., Fundamentals of Food Engineering, PHI learning Private Ltd., 2010.
3. Fellows P., Food Processing Technology, 2nd Edition. Woodhead Publishing Limited and CRC Press LLC, 2000.
4. James A, The supply chain handbook, distribution group, 2013.
5. FAO, US, Design and operations of cold store in developing, 1984.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

TECHNOLOGY OF CEREALS, PULSES AND OILSEEDS LAB-VII

Subject Code: BFOTS1-404

L T P C

Duration: 60 (Hrs.)

0 0 4 2

Course Objectives:

1. To impart knowledge regarding proximate composition of flour and its analysis.
2. To familiarize students with processing of cereals, pulses and oilseeds.
3. To develop value added products from cereals, pulses and oilseeds.
4. To analyze physico-chemical characteristics of grains and flour relating to product quality.
5. To create awareness regarding adulteration of fats and oils and detection techniques.

Course Outcomes:

1. Imparting knowledge regarding proximate composition of flour and its analysis.
2. Familiarizing the students with processing of cereals, pulses and oilseeds.
3. Development of value added products from cereals, pulses and oilseeds.
4. Analysis of physico-chemical characteristics of grains and flour relating to product quality.
5. Creating awareness regarding adulteration of fats and oils and detection techniques.

PRACTICALS:

1. Physical characteristics of cereal grains.
2. Proximate analysis of wheat flour (moisture, ash, fat, protein and crude fiber content).
3. Estimation of gluten content of flour.
4. Estimation of Polenske value of flour.
5. Estimation of alkaline water retention capacity of flour.
6. Determination of sedimentation value of flour
7. Cooking characteristics of rice.
8. Experimental parboiling of rice by different methods.
9. Determination of soaking and hydration capacity of pulses.
10. Preparation of full fat and defatted soya flour.
11. Extraction of oil from groundnuts.
12. Determination of saponification value.
13. Detection of adulteration of cotton seed oil and ground nut oil.
14. Visit to cereal and oilseed processing industry.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

EGG, POULTRY AND MEAT TECHNOLOGY LAB-VIII

Subject Code: BFOTS1-405

**L T P C
0 0 4 2**

Duration: 60 (Hrs.)

Course Objectives:

1. To determine the proportion of different constituents present in eggs
2. To impart knowledge regarding techniques involved in grading and quality evaluation of eggs, poultry and meat products.
3. To familiarize students about ethical principles of slaughtering and dressing for the conversion of muscles into meat.
4. To formulate value added products from eggs, poultry, and meat to meet needs of society.
5. To create awareness regarding various methods used to preserve eggs, poultry, and meat.

Course Outcomes:

1. Determination of different constituents present in eggs
2. Imparting knowledge regarding techniques involved in grading and quality evaluation of eggs, poultry and meat products.
3. Familiarizing students about ethical principles of slaughtering and dressing for the conversion of muscles into meat.
4. Formulating value added products from eggs, poultry, and meat to meet needs of society.
5. Creating awareness regarding various methods used to preserve eggs, poultry, and meat.

Practical's:

1. Determination of moisture and ash contents of egg components.
2. Determination of percentage of various egg constituents
3. Grading and Quality evaluation of eggs.
4. Preservation of shell eggs by various methods.
5. Candling of eggs.
6. Determination of time temperature condition on formation of iron sulphide in egg.
7. Preparation of egg products: boiled, fried, poached, scrambled, poached.
8. Preparation of egg pickle
9. Slaughtering and dressing of poultry.
10. Post mortem examination of poultry meat and identifying different parts of poultry.
11. Preservation of meat by pickling method.
12. Preparation of different meat products.
13. Evaluation of meat quality.
14. Visit to poultry and meat industry.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

FOOD PLANT HYGIENE AND SANITATION LAB-IX

Subject Code: BFOTS1-406

**L T P C
0 0 4 2**

Duration: 60 (Hrs.)

Course Objectives:

1. To understand the importance of sterilization of equipments and different ways to achieve the same.
2. To impart knowledge regarding methodology and significance of BOD and COD.
3. To familiarize the students with importance of cleaning and sanitation of equipments in the plant and methods to ensure the same.
4. To analyze microbial load of air, workplace, and equipments.
5. To create awareness regarding evaluation of different quality parameters of water.

Course Outcomes:

1. Understanding the importance of sterilization of equipments and different ways to achieve the same.
2. Imparting knowledge regarding methodology and significance of BOD and COD.
3. Familiarizing the students with importance of cleaning and sanitation of equipments in the plant and methods to ensure the same.
4. Analysis of microbial load of air, workplace, and equipments.
5. Creating awareness regarding evaluation of different quality parameters of water.

Practical's:

1. Sterilization of equipments used in the laboratory by using heat and chemicals.
2. Determination of B.O.D
3. Determination of C.O.D
4. Determination of sanitary status of plant equipment.
5. Measurement of Chlorine content in water.
6. Measurement of hardness of water.
7. Measurement of quality parameters and chemical analysis of water.
8. Determination of microbial load of air.
9. Determination of microbial load of workplace.
10. Determination of microbial load of equipments using swab test.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

NUTRACEUTICAL AND FUNCTIONAL FOODS

Subject Code: BFOTD1-411

L T P C
4 0 0 4

Duration: 60 (Hrs.)

Course Objectives:

1. To understand the basics of nutraceuticals, their types and importance.
2. To impart knowledge regarding different food commodities with potential to be used as functional foods.
3. To familiarize students with fermented foods and their role in addressing specific needs of society.
4. To develop an ability to differentiate between nutraceuticals and functional foods.
5. To create awareness regarding nutraceuticals and functional foods and their potential role in human health.

Course Outcomes:

1. Understanding the basics of nutraceuticals, their types and importance.
2. Imparting knowledge regarding different food commodities with potential to be used as functional foods.
3. Familiarizing students with fermented foods and their role in addressing specific needs of society.
4. Developing an ability to differentiate between nutraceuticals and functional foods.
5. Creating awareness regarding nutraceuticals and functional foods and their potential role in human health.

UNIT-I (15 Hours)

Introduction

Background, definitions, difference between nutraceuticals and functional foods, types of nutraceutical compounds and their health benefits, current scenario.

UNIT-II (15 Hours)

Nutraceuticals

Types of nutraceutical compounds – Phytochemicals, phytosterols and other bioactive compounds, peptides and proteins, carbohydrates (dietary fibers, oligosaccharides and resistant starch).

Prebiotics, probiotics and synbiotics.

Lipids (Conjugated Linoleic Acid, omega-3 fatty acids, fat replacers), vitamins and minerals; their sources and role in promoting human health.

UNIT-III (15 Hours)

Functional Foods

Cereal and cereal products, milk and milk products, egg, oils, meat and products, sea foods, nuts and oilseeds, functional fruits and vegetables, herbs and spices, beverages (tea, wine etc)

UNIT-IV (15 Hours)

Fermented foods – their health benefits and role in conditions like cardiovascular diseases, hypertension, diabetes etc. Future prospects of functional foods and nutraceuticals and their potential for use in improving health.

Recommended Text Books / Reference Books:

1. Wildman REC, Handbook of Nutraceutical and Functional Foods, CRC Press, 2001.
2. Ghosh D et al, Innovations in Healthy and Functional Foods, CRC Press, 2012.
3. Pathak YV, Handbook of nutraceuticals Volume 2, CRC Press, 2011.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

NUTRACEUTICAL AND FUNCTIONAL FOODS LAB X

Subject Code: BFOTD1-412

**L T P C
0 0 4 2**

Duration: 60 (Hrs.)

Course Objectives:

1. To identify various Nutraceuticals and functional foods available in the market.
2. To impart knowledge regarding compounds responsible for imparting nutraceutical and functional properties to the food product.
3. To develop various functional foods adhering to legal specifications.
4. To analyze different food components which may act as nutraceuticals and functional foods.
5. To create awareness regarding health benefits of Nutraceuticals and functional foods.

Course Outcomes:

1. Identification of various nutraceuticals and functional foods available in the market.
2. Imparting knowledge regarding compounds responsible for imparting nutraceutical and functional properties to the food product.
3. Development of various functional foods adhering to legal specifications.
4. Analysis of different food components which may act as nutraceuticals and functional foods.
5. Creating awareness regarding health benefits of nutraceuticals and functional foods.

PRACTICALS

1. Identification of various nutraceuticals and functional foods available in the market
2. Estimation of chlorophyll content of green vegetable
3. Determination of lycopene in fruit/vegetable
4. Determination of total pectin in plant material
5. Estimation of crude fibre/dietary fibre content in cereals and their products
6. Estimation of anthocyanins in food sample
7. Determination of Vitamin C content of sample
8. Preparation and evaluation of probiotic/prebiotic foods
9. Determination of antioxidant activity in food.
10. Determination of total phenolic content in foods
11. Determination of total flavonoids content in foods
12. Development of functional foods.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

BAKERY TECHNOLOGY

Subject Code: BFOTD1-413

**L T P C
4 0 0 4**

Duration: 60 (Hrs.)

Course Objectives:

1. To familiarize the students with current scenario and economic importance of Bakery industry in India.
2. To understand the role of different ingredients used in the formulation of different bakery products.
3. To impart knowledge regarding processing techniques involved in manufacturing of various baked products.
4. To create awareness regarding quality attributes of different bakery products.
5. To develop modified bakery products addressing specific needs of society.

Course Outcomes:

1. Familiarizing the students with current scenario and economic importance of Bakery industry in India.
2. Understanding the role of different ingredients used in the formulation of different bakery products.
3. Imparting knowledge regarding processing techniques involved in manufacturing of various baked products.
4. Creating awareness regarding quality attributes of different bakery products.
5. Development of modified bakery products addressing specific needs of society.

UNIT-I (15 Hours)

Bakery industry: Current status, growth rate, and economic importance of Bakery Industry in India. Product types, nutritional quality.

UNIT-II (15 Hours)

Bread: Ingredients, bread making process, faults and corrective measures

Cakes: Ingredients, cake making process, different types of icings.

UNIT-III (15 Hours)

Biscuits, cookies & crackers

Technology of biscuit, cookies and cracker manufacturing. Baking powders as leavening agents in bakery industry.

Modified bakery products

Modification of bakery products for people with special nutritional requirements e.g. high fiber, low sugar, low fat, gluten free bakery products.

UNIT-IV (15 Hours)

Breakfast cereals, macaroni products and malt

Production and quality of breakfast cereals, macaroni products and malt.

Recommended Text Books / Reference Books:

1. Dubey, S.C., Basic Baking 5th Ed., Chanakya Mudrak Pvt. Ltd., 2007.
2. Raina et.al., Basic Food Preparation-A complete Manual. 3rd Ed., Orient Longman Pvt. Ltd., 2003.
3. Manay, S. & Shadaksharaswami, M., Foods: Facts and Principles, New Age Publishers, 2004.
4. Barndt R. L., Fat & Calorie – Modified Bakery Products, Springer US, 1993.
5. Samuel A. Matz, Bakery Technology and Engineering, PAN-TECH International Incorporated, 1999.
6. Faridi Faubion , Dough Rheology and Baked Product Texture, CBS Publications, 1997.
7. Samuel A. Matz, Cookies & Cracker Technology, Van Nostrand Reinhold, 1992.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

BAKERY TECHNOLOGY LAB XI

Subject Code: BFOTD1-414

L T P C

Duration: 60 (Hrs.)

0 0 4 2

Course Objectives:

1. To impart knowledge regarding selection of ingredients for the development of various baked products and ensuring their safety to the allergic persons.
2. To familiarize students with methodologies of sensory evaluation of baked products.
3. To determine various quality attributes of baked products.
4. To develop various baked products adhering to legal standards.
5. To create awareness regarding ingredients falling under category of allergens as per legal standards.

Course Outcomes:

1. Imparting knowledge regarding selection of ingredients for the development of various baked products and ensuring their safety to the allergic persons.
2. Familiarizing students with methodologies of sensory evaluation of baked products.
3. Determination of various quality attributes of baked products.
4. Development of various baked products adhering to legal standards.
5. Creating awareness regarding ingredients falling under category of allergens as per legal standards.

Practical's:

1. Preparation of bread and assessment of its quality
2. Estimation of fermentation power of yeast.
3. Preparation of buns and assessment of quality
4. Preparation of cake and assessment of its quality.
5. Icing of cake.
6. Preparation of cookies and assessment of quality.
7. Preparation of biscuits and assessment of quality.
8. Sensory evaluation of bakery products.
9. Preparation of gluten free biscuits from pseudo cereals.
10. Preparation of low calorie biscuits and cakes.
11. Preparation of high fiber biscuits and cakes.
12. Preparation of pasta and evaluation of its quality.
13. Visit to local bakery.

SEMESTER FIFTH

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

UNIT OPERATIONS IN FOOD ENGINEERING

Subject Code: BFOTS1-501

**L T P C
3 1 0 4**

Duration: 60(Hrs.)

Course Objectives:

1. To understand the basics of unit operations.
2. To impart knowledge regarding methods of cleaning, sorting, grading, and size reduction.
3. To familiarize students with low-temperature, and high-temperature unit operations and their applications in food industry.
4. To formulate and analyze the problems related to unit operations used in food engineering.
5. To create awareness regarding selection and application of appropriate tools and techniques used in food industry.

Course Outcomes:

1. Understanding the basics of unit operations.
2. Imparting knowledge regarding methods of cleaning, sorting, grading, and size reduction.
3. Familiarizing students with low-temperature, and high-temperature unit operations and their applications in food industry.
4. Formulating and analyzing the problems related to unit operations used in food engineering.
5. Creating awareness regarding selection and application of appropriate tools and techniques used in food industry.

UNIT I (12 Hrs.)

Introduction: Concept of unit operations

Preliminary Unit Operations: Material handling; Conveyors and elevators, types of conveyors and elevators.

UNIT II (17 Hrs.)

Cleaning: Dry-cleaning; screening, aspiration and magnetic cleaning, wet cleaning; soaking, spray washing, ultrasonic washing, sorting and grading: methods, advantages of sorting and grading

Size reduction: Benefits, criteria for size reduction, size reduction of solid, fibrous and liquid foods.

UNIT III (16 Hrs.)

Refrigeration and Freezing: Refrigeration, components of refrigeration system, compressors, condensers and expansion valve, selection of refrigerant, cooling load, coefficient of performance, refrigerant flow rate.

Direct contact and indirect freezing systems.

UNIT IV (15 Hrs.)

High temperature operations: Pasteurization, pasteurizer and its functioning.

Evaporation: Single effect evaporators and multiple effect evaporators, natural and forced circulations, falling and rising film evaporators.

Recommended Readings

1. Rao D. G., 'Fundamentals of Food Engineering', PHI learning private ltd.,2010.
2. Singh R. P. and Heldman D. R., 'Introduction to Food Engineering', Academic press 2nd, 3rd and 4th Edition, 1993, 2003,2009.
3. Rao C.G., 'Essentials of Food Process Engineering', B.S. publications,2006.
4. Fellow P., Food Processing Technology,1988.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

FOOD PACKAGING

Subject Code: BFOTS1-502

**L T P C
3 1 0 4**

Duration: 60(Hrs.)

Course Objectives:

1. To understand the basics of food packaging.
2. To impart knowledge regarding different types of packaging materials and their suitability for packaging of different food products.
3. To familiarize students with various types of packaging machinery and systems.
4. To develop eco-friendly packaging and addressing environmental concerns.
5. To create awareness regarding novel methods of food packaging and communicating its benefits to consumers.

Course Outcomes:

1. Understanding the basics of food packaging.
2. Imparting knowledge regarding different types of packaging materials and their suitability for packaging of different food products.
3. Familiarizing students with various types of packaging machinery and systems.
4. Development of eco-friendly packaging and addressing environmental concerns.
5. Creating awareness regarding novel methods of food packaging and communicating its benefits to consumers.

UNIT I (15 Hrs.)

Introduction to Food Packaging

Packaging Functions and Requirements, Printing of packages, Barcodes & other marking, Labelling Laws

UNIT II (16 Hrs.)

Food Packaging Materials: Paper and paper-based materials, corrugated fiber board (CFB). Plastics, formation- Injection molding, Blow molding, Types of plastics, Lamination, Biodegradable plastics, Edible packaging and Bio-composites. Environmental Concerns recycling and disposal of plastic waste.

UNIT III (14 Hrs.)

Metal packaging- Metals: Tinplate, tinning process, components of tinplate, tin free can (TFC) types of can, metallic films, lacquers

Glass: Composition, Properties, Methods of bottle making, Types of closures.

UNIT IV (15 Hrs.)

Packaging Machinery and Systems: Bottling machines, Cartoning systems, Seal and Shrink packaging machine; Form, Fill and Sealing machine(FFS).

Vacuum, Controlled and Modified atmosphere packaging systems; Aseptic packaging systems; Retort packaging, Active and Intelligent packaging systems

Recommended Readings:

1. Robertson G. L., 'Food Packaging – Principles and Practice', CRC Press Taylor and Francis Group, 2012.
2. Paine F.A. and Paine H.Y., 'A Handbook of Food Packaging', Blackie Academic and Professional, 1992.
3. Coles R., McDowell D. and Kirwan M. J., 'Food Packaging Technology', Blackwell, 2003.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

SUGAR AND CONFECTIONARY TECHNOLOGY

Subject Code: BFOTS1-503

L T P C

Duration: 60(Hrs.)

4 0 0 4

Course Objectives:

1. To understand the manufacturing process and deterioration of sugar.
2. To impart knowledge regarding different types of icings and toppings.
3. To familiarize students with different types of confectionary products. .
4. To develop various value added products from cocoa and understand associated defects.
5. To create awareness regarding by-products of sugar industry and their utilization in an eco-friendly manner and for societal benefits.

Course Outcomes:

1. Understanding the manufacturing process and deterioration of sugar.
2. Imparting knowledge regarding different types of icings and toppings.
3. Familiarizing students with different types of confectionary products. .
4. Development of various value added products from cocoa and understand associated defects.
5. Creating awareness regarding by-products of sugar industry and their utilization in an eco-friendly manner and for societal benefits.

UNIT-I (15 Hrs.)

Composition and characteristics of cane juice, Cane juice extraction. Manufacturing of sugar. Deterioration of sugars during storage & transportation and its prevention, By-products of sugar industry and their utilization.

UNIT-II (15 Hrs.)

Icings and Toppings: Fondant, American frosting, Butter cream icing, royal icing, gum paste, glaze icing, marshmallow, almond paste and fudge.

UNIT III (15 Hrs.)

Chocolates: Cocoa processing, Cocoa liquor, Cocoa butter. Cocoa powder and chocolate manufacturing Chocolate tempering and lipid crystallization, Chocolate enrobing and chocolate defects.

UNIT-IV (15Hrs.)

Classification of confectionary: Hard and soft boiled sugar confectionary; fondant, fudge, caramel, toffee butterscotch, Sugar panning, hard boiled candy.

Recommended Books:

1. Minife B.W, 'Chocolate, Cocoa and Confectionary: Science & Technology', AVI Publishing Co., New York, 1997.
2. Mathur R.B.L., 'Handbook of Cane Sugar Technology', Oxford & IBH Publishing Co., New Delhi, 1986.
3. Faridi H., 'The Science of Cookie & Cracker Production', Chapman & Hall, UK, 1994.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

FOOD PACKAGING LAB XII

Subject Code: BFOTS1-504

L T P C

Duration: 60(Hrs.)

0 0 4 2

Course Objectives:

1. To impart knowledge regarding testing of physico-mechanical parameters of packaging materials.
2. To familiarize students regarding different types of packaging machinery.
3. To analyze various quality parameters of different packaging materials and packaged food products.
4. To develop edible packaging for food products.
5. To create awareness regarding effect of packaging on shelf life of food products.

Course Outcomes:

1. Imparting knowledge regarding testing of physico-mechanical parameters of packaging materials.
2. Familiarizing students regarding different types of packaging machinery.
3. Analysis of various quality parameters of different packaging materials and packaged food products.
4. Development of edible packaging for food products.
5. Creating awareness regarding effect of packaging on shelf life of food products.

PRACTICALS

1. Testing of physical/mechanical properties of food packaging materials.
2. Testing of thermal shock resistance of glass.
3. Gas/Vacuum packaging of foods
4. To Study the effect of packaging on shelf life of food products.
5. Determination of Water Vapor Transmission Rate of Packaging Material.
6. Edible packaging of Food Samples.
7. Study of Sorption Isotherm for Food Package Design.
8. Packaged food cut-out analysis.
9. To study the operation of FFS machine.

Recommended Readings:

1. Robertson G.L., 'Food Packaging – Principles and Practice', CRC Press Taylor and Francis Group, 2012.
2. Paine F.A. and Paine H.Y., A Handbook of Food Packaging, Blackie Academic and Professional, 1992.
3. Coles R., McDowell D. and Kirwan M. J., 'Food Packaging Technology', Blackwell, 2003.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

SUGAR AND CONFECTIONARY TECHNOLOGY LAB XIII

Subject Code: BFOTS1-505

**L T P C
0 0 4 2**

Duration: 60(Hrs.)

Course Objective:

1. To understand the effect of different processing conditions on sugar.
2. To impart knowledge regarding instruments used for the analysis of various quality parameters of confectionary products.
3. To familiarize students with different types of packaging used for confectionary products.
4. To develop the ability to prepare various types of sugar and confectionary products.
5. To analyze sensorial attributes of various confectionary products.

Course Outcomes:

1. Understanding the effect of different processing conditions on sugar.
2. Imparting knowledge regarding instruments used for the analysis of various quality parameters of confectionary products.
3. Familiarizing students with different types of packaging used for confectionary products.
4. Developing ability to prepare various types of sugar and confectionary products.
5. Analysis of sensorial attributes of various confectionary products.

PRACTICAL

1. Determine the effect of heat on sugar solution and perform the thread and cold water test.
2. To study the process of inversion, melting and caramelization in sucrose.
3. Preparation of fondant, fudge and brittles.
4. Preparation of Shakarpara and Chhanamurki.
5. Preparation of candy and toffee and to perform quality assessment tests.
6. Preparation of cake decorations.
7. Collection of various types of confectionary packages.
8. Determination of sugar in confectionary product by saccharometer.
9. Determination of refractive index of sugar – solutions of different consistencies.
10. Organoleptic testing of different confectionary products.
11. Visit to sugar and confectionary industry.

Recommended Readings:

1. Raina et.al., 'Basic Food Preparation-A complete Manual', 3rd Edition, Orient Longman Pvt. Ltd., 2003.
2. Manay, S. and Shadaksharaswami, M., 'Foods: Facts and Principles', New Age Publishers, 2004.
3. Beckett S.T., 'Industrial Chocolate Manufacture', Blackwell Publishing Ltd., 2009. 4. Minifie B.W., 'Chocolate, Cocoa and Confectionary', Aspen Publications, 1999.
4. Mohini S. and Eram R., 'Food science- Experiments and applications', 2nd Edition., CBS publishers & Distributors Pvt. Ltd. 2011.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

SPICES AND FLAVOUR TECHNOLOGY

Subject Code: BFOTD1-511

L T P C

Duration: 60(Hrs.)

4 0 0 4

Course Objectives:

1. To understand types, chemical composition, processing, and applications of different spices.
2. To impart knowledge regarding processing of spices.
3. To familiarize students with packaging of spices and spice products.
4. To summarize about different flavoring compounds and their stability during processing.
5. To create awareness regarding microbial contamination and insect infestation in spices and its control.

Course Outcomes:

1. Understanding types, chemical composition, processing, and applications of different spices.
2. Imparting knowledge regarding processing of spices.
3. Familiarizing students with packaging of spices and spice products.
4. Summarizing about different flavoring compounds and their stability during processing.
5. Creating awareness regarding microbial contamination and insect infestation in spices and its control.

UNIT I (15 Hrs.)

Classification & use of spices, Chemical constituents of spices, Processing of white pepper. Dehydration products of onion, garlic.

UNIT-II (15 Hrs.)

Cryomilling of spices. Spice oleoresins and spice emulsion. Packaging of spices and spice products. Microbial contamination and insect infestation in spices and its control.

UNIT-III (16 Hrs.)

Classification of flavouring compounds. Stability of flavourings. Flavor encapsulation Processing of Cocoa and Coffee.

UNIT IV (14 Hrs.)

Processing of white pepper, cardamom, cinnamon, cloves, turmeric, ginger, fenugreek and fennel.

Recommended Books:

1. Peter K.V., 'Handbook of Spices', Woodhead Publishers, UK, 2001.
2. Pruthi, J. S., 'Spices and Condiments', NBT India, 1976.
3. Spice Statistics by Spices Board, GOI, Cochin, 2007.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

SPICES AND FLAVOUR TECHNOLOGY LAB XIV

Subject Code: BFOTD1-512

L T P C

Duration: 60(Hrs.)

0 0 4 2

Course Objective:

1. To impart knowledge regarding proximate composition of spices.
2. To familiarize students regarding organoleptic evaluation of flavoring compounds and their role in different food products.
3. To understand the methods used to assess quality of spices.
4. To analyze microbiological quality of spices in order to ensure their safety for human consumption.
5. To create awareness regarding adulteration of spices and their detection methods.

Course Outcomes:

1. Imparting knowledge regarding proximate composition of spices.
2. Familiarizing students regarding organoleptic evaluation of flavoring compounds and their role in different food products.
3. Understanding the methods used to assess quality of spices.
4. Analysis of microbiological quality of spices in order to ensure their safety for human consumption.
5. Creating awareness regarding adulteration of spices and their detection methods

PRACTICAL

1. Determination of moisture in ground spices.
2. Determination of total ash in spices.
3. Determination of extraneous matter in spices.
4. Determination of pungency rating (Scoville method) in Red Pepper.
5. Adulteration tests for different spices.
6. Organoleptic evaluation of flavours.
7. Identification of Saffron by sulphuric – diphenylamine test.
8. To evaluate microbiological quality of spices.

Recommended Books:

1. Peter K.V., 'Handbook of Spices', Woodhead Publishers, UK,2001.
2. Pruthi, J. S., 'Spices and Condiments', NBT India,1976.
3. Spice Statistics by Spices Board, GOI, Cochin,2007.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

TECHNOLOGY OF OILS AND FATS

Subject Code: BFOTD1-513

**L T P C
4 0 0 4**

Duration: 60(Hrs.)

Course Objectives:

1. To understand the basics of fats and oils.
2. To impart knowledge regarding processing of fats and oils.
3. To familiarize students with deteriorative changes in fats and oils.
4. To analyze physico-chemical properties of fats and oils.
5. To create awareness about nutritional importance of oils and fats.

Course Outcomes:

1. Understanding the basics of fats and oils.
2. Imparting knowledge regarding processing of fats and oils.
3. Familiarizing students with deteriorative changes in fats and oils.
4. Analyzing physico-chemical properties of fats and oils.
5. Creating awareness about nutritional importance of oils and fats.

UNIT-I (14 Hrs.)

Introduction to oils and fats, Physical and chemical properties of fats and oils, Nutritional importance of oils and fats.

UNIT-II (16 Hrs.)

Source and physico-chemical properties of following oils:

Animal – Butter oil, lard and tallow.

Plant – Groundnut, Sunflower, Soybean and Coconut oil. Extraction of oils/fats.

Problems during storage – rancidity, reversion.

UNIT-III (15 Hrs.)

Refining: degumming, choice of alkali, batch and continuous refining.

Bleaching: choice of adsorbent, batch and continuous bleaching.

Deodorization: process parameters: batch and continuous processing

UNIT-IV (15 Hrs.)

Hydrogenation of oils: mechanism, process parameters and batch processing. Fractionation and winterization of oils.

Alternative processing methods: PCT (physical cleaning techniques)

Recommended Books:

1. Meyer L.H., 'Food Chemistry', CBS Publisher, New Delhi, 2006.
2. Potter N. N. 'Food Science', 5th Edition, CBS Publisher, New Delhi, 2006
3. Lawson H., 'Food Oils & Fats: Technology, Utilization and Nutrition', CBS Publisher, New Delhi, 1995.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

TECHNOLOGY OF OILS AND FATS LAB XV

Subject Code: BFOTD1-514

**L T P C
0 0 4 2**

Duration: 60(Hrs.)

Course Objectives:

1. To familiarize students with physico-chemical properties of fats and oils.
2. To impart knowledge regarding various quality indices of fats and oils.
3. To understand organoleptic properties of fats and oils for their appropriate use in food products.
4. To analyze extent of rancidity in fats and oils using appropriate tests.
5. To create awareness regarding adulteration of fats and oils and detection techniques.

Course Outcomes:

1. Familiarizing students with physico-chemical properties of fats and oils.
2. Imparting knowledge regarding various quality indices of fats and oils.
3. Understanding organoleptic properties of fats and oils for their appropriate use in food products.
4. Analyzing the extent of rancidity in fats and oils using appropriate tests.
5. Creating awareness regarding adulteration of fats and oils and detection techniques.

PRACTICAL

1. To determine moisture content of oilseed.
2. To determine FFA of oil.
3. Determination of Iodine Value, R.M. Value and Polenske Value.
4. To determine Saponification value, anisidine value and peroxide value of oil.
5. Determination of melting point of fats.
6. Detection of sesame oil in vanaspati by furfural test.
7. Detection of adulteration with mineral oil, Cotton seed oil or Groundnut oil.
8. Organoleptic evaluation of fats and oils.
9. To carry out refining and bleaching of oil in lab.
10. To estimate colour of oil.
11. Visit to vegetable oils industry.

SEMESTER SIXTH

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

FOOD ENGINEERING

Subject Code: BFOTS1-601

L T P C

Duration: 60(Hrs.)

3 1 0 4

Course Objectives:

1. To familiarize the students with fundamental concepts and terminology of food engineering.
2. To understand the basic principles, processes and components of material and energy balances.
3. To impart knowledge regarding principles of fluid flow, types of fluids, and equations involved.
4. To develop an ability for an appropriate selection of pump for different types of fluids.
5. To interpret data using psychrometry and utilize this information for developing appropriate storage and processing conditions for different products.

Course Outcomes:

1. Familiarizing the students with fundamental concepts and terminology of food engineering.
2. Understanding the basic principles, processes and components of material and energy balances.
3. Imparting knowledge regarding principles of fluid flow, types of fluids, and equations involved.
4. Developing an ability for an appropriate selection of pump for different types of fluids.
5. Interpretation of data using psychrometry and utilizing this information for developing appropriate storage and processing conditions for different products.

UNIT I (15 Hrs.)

Fundamental Concepts and Definitions: Dimensions and units, thermodynamic systems (closed, open and isolated), intensive and extensive properties, equilibrium state, density, specific volume, specific weight, specific heat, enthalpy, entropy, pressure, temperature scales.

UNIT II (15 Hrs.)

Material Balances: Basic principles, process flow diagrams, total mass balance, component mass balance. Energy Balances: Basic principles, energy terms, specific heat of solids and liquids, properties of saturated and superheated steam, heatbalances.

UNIT III (15 Hrs.)

Fluid Flow Principles: Fluid statics and dynamics, mass balance and energy balance, Bernoulli's equation, concept of viscosity, Newtonian and non-Newtonian fluids, streamline and turbulent flow, Reynold's number, Selection of pumps

UNIT IV (15 Hrs.)

Psychrometrics: Properties of dry air: composition of air, specific heat of dry air, enthalpy of dry air, dry bulb temperature, Wet bulb temperature, Relative humidity, Dew point temperature.

Recommended Readings:

1. Rao C.G., 'Essentials of Food Process Engineering'. B S publications,2006
2. Rao D.G., 'Fundamentals of Food Engineering', PHI learning private Ltd.,2010.
3. Singh R.P. and Heldman D.R., Introduction to Food Engineering, 2nd, 3rd and 4th Edition, Academic press, 1993, 2003,2009.
4. Fellow P., Food Processing Technology,1988.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

FOOD AND NUTRITION

Subject Code: BFOTS1-602

**L T P C
3 1 0 4**

Duration: 60(Hrs.)

Course Objectives:

1. To understand the concept, terminology, and importance of food and nutrition.
2. To familiarize students with different methods of cooking, their effects on properties of foods, merits and demerits.
3. To impart knowledge regarding global trends, nutritional labeling, codex-, and FSSAI guidelines.
4. To develop an ability to plan meals addressing specific needs of society.
5. To create awareness regarding micro-, and macro nutrients present in food in terms of their sources, role, RDA and deficiency.

Course Outcomes:

1. Understanding the concept, terminology, and importance of food and nutrition.
2. Familiarizing the students with different methods of cooking, their effects on properties of foods, merits and demerits.
3. Imparting knowledge regarding global trends, nutritional labeling, codex-, and FSSAI guidelines.
4. Developing an ability to plan meals addressing specific needs of society.
5. Creating awareness regarding micro-, and macro nutrients present in food in terms of their sources, role, RDA and deficiency.

UNIT I (15 Hrs.)

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.

UNIT II (16 Hrs.)

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

UNIT III (14Hrs.)

Concepts of Meal planning: Factors affecting meal planning, understanding specific considerations for planning meal for different groups of people (Infants, Toddler, Adolescents, Adults, Old age and pregnant women)

UNIT IV (15 Hrs.)

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.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

Recommended Readings

1. Bamji M.S., Krishnaswamy K. and Brahmam G.N.V., 'Textbook of Human Nutrition', 3rd Edition, Oxford and IBH Publishing Co. Pvt. Ltd.,2009.
2. Srilakshmi 'Food Science', 4th Edition, New Age International Ltd.,2007.
3. Srilakshmi, 'Dietetics', Revised 5th Edition. New Age International Ltd.,2005.
4. Wardlaw M.G. and Paul M Insel Mosby, 'Perspectives in Nutrition', 3rd Edition,1996.
5. Codex Guidelines on Nutrition Labelling (CAC/GL 2_1985) (Rev.1_1993). Rome, Food and Agriculture Organisation of the United Nations / World Health Organisation,1993.
6. Food Safety and Standards Authority of India portal, Government of India
7. Gopalan C., 'Nutritive Value of Indian Foods', NIN, ICMR,1990.
8. Seth V. and Singh K., 'Diet planning through the Life Cycle: Part 1. Normal Nutrition.A
9. Practical Manual., 4th Edition, Elite Publishing House Pvt. Ltd.,2005.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

SENSORY EVALUATION OF FOOD

Subject Code: BFOTD1-611

**L T P C
4 0 0 4**

Duration: 60(Hrs.)

Course Objectives:

1. To understand the structure and physiology of taste organs, and mechanism of taste perception.
2. To impart knowledge regarding sensory evaluation of different quality attributes of foods and their significance.
3. To familiarize students with taste-, olfactory-, and color abnormalities.
4. To analyze taste, odor, color, and texture of food products using different techniques.
5. To summarize different types of equipments involved in evaluation of sensory attributes of food products.

Course Outcomes:

1. Understanding the structure and physiology of taste organs, and mechanism of taste perception.
2. Imparting knowledge regarding sensory evaluation of different quality attributes of foods and their significance.
3. Familiarizing students with taste-, olfactory-, and color abnormalities.
4. Analyzing taste, odor, color, and texture of food products using different techniques.
5. Summarizing different types of equipments involved in evaluation of sensory attributes of food products.

UNIT I (16 Hrs.)

Taste: Introduction and importance of taste, Structure and physiology of taste organs- tongue, papillae, taste buds, salivary glands, Mechanism of taste perception. Chemical dimensions of basic tastes: sweet, salt, sour, bitter and umami. Factors affecting taste quality, reaction time, taste modification, absolute and recognition of threshold taste abnormalities. Taste measurement

UNIT II (15 Hrs.)

Odour: Introduction, definition and importance of odour and flavor, Anatomy of nose, physiology of odour perception, Mechanism of odour perception, Odour classification, chemical specificity of odour. Odour measurement using different techniques – primitive to recent techniques. Merits and demerits of each method. Olfactory abnormalities.

UNIT III (16 Hrs.)

Colour: Introduction and importance of colour. Dimensions of colour and attributes of colour, appearance factors, gloss etc. Perception of colour, Colour abnormalities Measurement of colour; Munsell colour system, CIE colour system, Hunter colour system, spectrophotometry and colorimetry etc.

UNIT IV (13 Hrs.)

Texture: Introduction, definition and importance of texture Phases of oral processing
Texture perception, receptors involved in texture perception Texture classification
Texture measurement – basic rheological models, forces involved in texture measurement.

Recommended Readings

1. Rao E. S., 'Food Quality Evaluation', Variety Books, 2013.
2. Amerine P. and Roessler, 'Principles of Sensory Evaluation of Food', Academic Press, London, 1965.
3. Meilgard D., 'Sensory Evaluation Techniques', 3rd Edition. CRC Press LLC, 1999.
4. Man J., 'Principles of Food Chemistry', 3rd Edition., Springer, 2007.
5. Brannen and et al., 'Food Additives', Marcel Dekker, New York, 1990.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

SENSORY EVALUATION OF FOOD LAB XVI

Subject Code: BFOTD1-612

L T P C

Duration: 60(Hrs.)

0 0 4 2

Course Objectives:

1. To impart knowledge regarding training of sensory panel.
2. To perform different analytical tests for sensory evaluation of food.
3. To measure quality attributes of various food products.
4. To create awareness regarding sensory attributes of food products and their importance.
5. To evaluate different quality parameters of food products using instruments.

Course Outcomes:

1. Imparting knowledge regarding training of sensory panel.
2. Performing different analytical tests for sensory evaluation of food.
3. Measuring quality attributes of various food products.
4. Creating awareness regarding sensory attributes of food products and their importance.
5. Evaluation of different quality parameters of food products using instruments.

PRACTICAL

1. Training of sensory panel.
2. To perform recognition and sensitivity tests for four basic tastes.
3. To perform analytical tests of sensory evaluation.
4. Recognition tests for various food flavors, flavor defects in milk.
5. Sensory evaluation of milk and milk products.
6. Texture evaluation of various food samples- crispier/ cookies/ biscuits/ snack foods
7. Measurement of colour by using Tintometer/ Hunter Color Labetc.
8. Qualitative tests for hydrogenated fats, butter, ghee
9. Platform tests for milk
10. Quality evaluation of various food stuffs- cereals, pulses, honey, jaggery, sugar, tea, coffee etc.

Recommended Readings

1. Rao E. S., 'Food Quality Evaluation', Variety Books, 2013.
2. Amerine P. and Roessler, 'Principles of Sensory Evaluation of Food', Academic Press, London, 1965.
3. Meilgard 'Sensory Evaluation Techniques', 3rd Edition. CRC Press LLC,1999.
4. deMan J., 'Principles of Food Chemistry', 3rd Edition., Springer,2007.
5. Brannen and et al., 'Food Additives', Marcel Dekker, New York,1990.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

FOOD PLANT LAYOUT

Subject Code: BFOTD1-613

L T P C

Duration: 60(Hrs.)

4 0 0 4

Course Objectives:

1. To understand the concept of layout designing and its importance.
2. To impart knowledge regarding factors to be considered for selection of site for setting up a plant.
3. To familiarize the students with considerations for selection of material, process, and machinery.
4. To summarize the importance of management in setting up a plant.
5. To create awareness regarding layout symbols.

Course Outcomes:

1. Understanding the concept of layout designing and its importance.
2. Imparting knowledge regarding factors to be considered for selection of site for setting up a plant.
3. Familiarizing the students with considerations for selection of material, process, and machinery.
4. Summarizing the importance of management in setting up a plant.
5. Creating awareness regarding layout symbols.

UNIT-I (15 Hrs.)

Plant design concepts and general design considerations Plant Layout problems, Importance and Objectives
Advantages of a good layout

UNIT-II (15 Hrs.)

Plant location: location factors and their interaction with plant location, Importance of a plant layout
selection of site and layouts of different food industries.

UNIT-III (15 Hrs.)

Selection of building material, selection and planning of manufacturing process and service facilities.
Process selection; process flow charts, selection of equipment and machinery; maintenance and
replacement, depreciation of machinery

UNIT IV (15 Hrs.)

Management set up in a plant. Plant layout, layout symbols.

Recommended Books:

1. Marriott, 'Principle of Food Sanitation', 5th Edition, CBS Publishers, New Delhi,2006.
2. Green J.H. and Kramer A., 'Food Processing Waste Management', AVI Publishers,USA.,1979.
3. Potter N. N., 'Food Science', 5th Edition., CBS Publishers, New Delhi,2006.
4. Sharma S.C., 'Plant Layout and Material Handling',3rd Edition Khanna Publishers,2000.
5. James M. M., 'Plant layout & design', Collier Macmillan Ltd.,1962

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

FOOD PLANT LAYOUT LAB XVII

Subject Code: BFOTD1-614

**L T P C
0 0 4 2**

Duration: 60(Hrs.)

Course Objectives:

1. To impart knowledge regarding preparation of process diagrams for different food products.
2. To familiarize students with calculation of cost in relation to designing, processing, and depreciation.
3. To understand the factors to be considered while designing the layout and process diagrams of different manufacturing units.
4. To develop an ability to prepare layout for manufacturing plants of different food products.
5. To create awareness regarding depreciation of machinery and processing.

Course Outcomes:

1. Imparting knowledge regarding preparation of process diagrams for different food products.
2. Familiarizing students with calculation of cost in relation to designing, processing, and depreciation.
3. Understanding the factors to be considered while designing the layout and process diagrams of different manufacturing units.
4. Developing an ability to prepare layout for manufacturing plants of different food products.
5. Creating awareness regarding depreciation of machinery and processing.

PRACTICAL

1. Preparation of layout and process diagram of potato crisp manufacturing plant.
2. Preparation of layout and process diagram of Jam/Marmalade manufacturing plant.
3. Preparation of layout and process diagram of Bread making plant.
4. Preparation of layout and process diagram of a dairy industry.
5. Preparation of layout and process diagram of wine making unit.
6. Preparation of layout and process diagram of a modern slaughter house.
7. Preparation of layout and process of diagram of a confectionary unit.
8. Calculation of depreciation of machinery and processing costs.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

FOOD SAFETY

Subject Code: BFOTD1-621

**L T P C
4 0 0 4**

Duration: 60(Hrs.)

Course Objectives:

1. To understand the concept of food safety, factors involved, and its importance.
2. To impart knowledge regarding importance of hygiene and sanitation in food service establishments and ways to ensure the same.
3. To familiarize students with Indian food regulatory regime and Global Scenario.
4. To develop an ability of hazard management and ensuring food safety.
5. To create awareness regarding emerging pathogens, and recent advancements in food production, processing, and safety.

Course Outcomes:

1. Understanding the concept of food safety, factors involved, and its importance.
2. Imparting knowledge regarding importance of hygiene and sanitation in food service establishments and ways to ensure the same.
3. Familiarizing students with Indian food regulatory regime and Global Scenario.
4. Developing an ability of hazard management and ensuring food safety.
5. Creating awareness regarding emerging pathogens, and recent advancements in food production, processing, and safety.

UNIT I (15 Hrs.)

Introduction to Food Safety: Definition, Types of hazards, biological, chemical, physical hazards, Factors affecting Food Safety, Importance of Safe Foods.

Food Hazards of Physical and Chemical and Microbiological origin, Management of hazards, Need, Control of parameters, Temperature control and Food storage.

UNIT II (14 Hrs.)

Hygiene and Sanitation in Food Service Establishments, Introduction, Sources of contamination, Control methods using physical and chemical agents, Waste Disposal, Pest and Rodent Control and Personnel Hygiene, Food laws and Standards

UNIT III (16 Hrs.)

Indian Food Regulatory Regime, Global Scenario and Other laws and standards related to food safety (FSSAI, AGMARK, FPO, MFPO, MPO, BIS AND ISO)

UNIT IV (15 Hrs.)

Recent concerns: New and Emerging Pathogens, Genetically modified foods\Transgenics, Organic foods and newer approaches to food safety

Recommended Readings

1. Lawley R., Curtis L. and Davis J., 'The Food Safety Hazard Guidebook', RSC publishing, 2004.
2. De Vries, 'Food Safety and Toxicity', CRC, New York, 1997'
3. Marriott, N. G., 'Principles of Food Sanitation', AVI, New York, 1985.
4. Forsythe, S. J., 'Microbiology of Safe Food', Blackwell Science, Oxford, 2000.
5. Forsythe S. J., 'The Microbiology of Safe Food', 2nd Edition, Willey- Blackwell, U.K., 2010.
6. Mortimore S. and Wallace C. 'HACCP, A practical approach', Chapman and Hill, London, 1995.
7. Clive de Blackburn and Peter McClure., Foodborne Pathogens Woodhead Publishing, 2009.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

FOOD SAFETY LAB XVIII

Subject Code: BFOTD1-622

L T P C

Duration: 60(Hrs.)

0 0 4 2

Course Objectives:

1. To familiarize students with different types of media preparations used in microbiology.
2. To identify type of microbes present using different microbiological techniques.
3. To impart knowledge regarding microbiological contamination of water and its analysis.
4. To develop an ability for microbiological examination of food samples and interpretation of data.
5. To create awareness regarding types of hazards, importance of hygiene and sanitation and ways for their assessment.

Course Outcomes:

1. Familiarizing students with different types of media preparations used in microbiology.
2. Identifying type of microbes present using different microbiological techniques.
3. Imparting knowledge regarding microbiological contamination of water and its analysis.
4. Developing an ability for microbiological examination of food samples and interpretation of data.
5. Creating awareness regarding types of hazards, importance of hygiene and sanitation and ways for their assessment.

PRACTICAL

1. Preparation of different types of media (complex, differential and selective)
2. Enumeration of aerial microflora using PDA
3. Identification of Molds by lactophenol bluestaining
4. Negative Staining
5. Microbiological Examination of food
6. Bacteriological Analysis of Water by MPN method
7. Assessment of surface sanitation by swab and rinse method
8. Assessment of personal hygiene
9. Detection of Physical and chemical hazards in food.
10. Determination of coliforms in water.

Recommended Readings

1. Lawley R., Curtis L. and Davis J., 'The Food Safety Hazard Guidebook', RSC publishing, 2004.
2. De Vries, 'Food Safety and Toxicity', CRC, New York, 1997.
3. Marriott, N. G., 'Principles of Food Sanitation', AVI, New York, 1985.
4. Forsythe, S. J., 'Microbiology of Safe Food', Blackwell Science, Oxford, 2000.
5. Forsythe S. J., 'The Microbiology of Safe Food', 2nd Edition, Willey- Blackwell, U.K., 2010.
6. Mortimore S. and Wallace C. 'HACCP, A practical approach', Chapman and Hill, London, 1995.
7. Clive de Blackburn and Peter McClure., 'Foodborne Pathogens' Woodhead Publishing, 2009.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

FOOD QUALITY MANAGEMENT

Subject Code: BFOTD1-623

**L T P C
4 0 0 4**

Duration: 60(Hrs.)

Course Objectives:

1. To understand the concept of quality and its importance in agri-food production chain.
2. To familiarize students with quality management systems in India and their role in quality control and assurance.
3. To impart knowledge regarding different types of ingredients and processing techniques involved in food production.
4. To analyze chemical, technological and toxicological aspects of different types of food additives used in food industry.
5. To create awareness regarding contamination of food, its sources and control.

Course Outcomes:

1. Understanding the concept of quality and its importance in agri-food production chain.
2. Familiarize the students with quality management systems in India and their role in quality control and assurance.
3. Imparting knowledge regarding different types of ingredients and processing techniques involved in food production.
4. Analyzing chemical, technological and toxicological aspects of different types of food additives used in food industry.
5. Creating awareness regarding contamination of food, its sources and control.

UNIT I (15 Hrs.)

Introduction to food quality management – Definition of quality, quality concepts, quality perception, quality attributes.

Concepts of quality management: Objectives, importance and functions of quality control and quality assurance; Quality management systems in India

Quality in the Agri- food production chain-Techno- managerial approach, food quality relationship and food quality management functions. Dynamics on the agri- food production chain, core developments in food quality management.

UNIT II (15 Hrs.)

Contamination in Food: Physical, chemical contaminants (heavy metals, pesticide residues, antibiotics, agrochemicals, veterinary drug residues, environmental pollutants, radio-nucleides, solvent residues, chemicals) and Natural toxins.

UNIT III (15 Hrs.)

Chemical, technological and toxicological aspects

Risk assessment studies: Safety and quality evaluation of additives and contaminants, Acute and chronic studies. Introduction, need of food additives in food processing and preservation, Characteristics and classification of food additives.

Antimicrobial agents. -Nitrites, sulphides, sulphur dioxide, sodium chloride, hydrogen peroxide.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

UNIT IV (15 Hrs.)

High fructose corn syrup, cryogenic freezing, supercritical fluid extraction, fat mimetics, flavour encapsulation, use of nano technology in foods etc.

Recommended Readings

1. Pieterneel A, L. and Willem J. M., 'Food Quality Management Technological and Managerial principles and practices', Wageningen,2009.
2. Brannen and et al., 'Food Additives', Marcel Dekker, New York,1990.
3. Jones J. M., 'Food Safety', Eagan Press,1992.
4. Shapton D.A. and Shapton N.F., 'Principles and Practices for the safe processing of Foods' CRC Press,1998.
5. DeMan, 'Principles of Food Chemistry', 3rd edition, Springer,2007.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

FOOD QUALITY MANAGEMENT LAB XIX

Subject Code: BFOTD1-624

**L T P C
0 0 4 2**

Duration: 60(Hrs.)

Course Objectives:

1. To familiarize students with qualitative estimation of different food components in various food stuffs.
2. To conduct quality inspection of different food stuffs.
3. To analyze different food components quantitatively.
4. To implement GMP and HACCP in food industry.
5. To evaluate different food contaminants in food stuffs.

Course Outcomes:

1. Familiarizing students with qualitative estimation of different food components in various food stuffs.
2. Conducting quality inspection of different food stuffs.
3. Analyzing different food components quantitatively.
4. Implementing GMP and HACCP in food industry.
5. Evaluating different food contaminants in food stuffs.

PRACTICAL

1. Qualitative tests for hydrogenated fats, butter, and ghee.
2. Quality inspection of various food stuffs- cereals, pulses, spices and condiments etc.
3. Estimation of sulphur dioxide in foods
4. Chromatographic estimation of colour.
5. Analysis of edible common salt for moisture content, MIW and total chlorides.
6. Estimation of ammonia nitrogen in water.
7. Estimation of benzoic acid/ sorbic acid in foods.
8. To implement HACCP plan in particular phases of food chain.
9. To evaluate various processes in food plant for implementation of GMP.
10. Determination of insecticides in given food samples.
11. Determination of heavy metals in food samples.

Recommended Readings

1. Pieternel A, L. and Willem J. M., 'Food Quality Management Technological and Managerial principles and practices', Wageningen, 2009.
2. Brannen and et al., 'Food Additives', Marcel Dekker, New York, 1990.
3. Jones J. M., 'Food Safety', Eagan Press, 1992.
4. Shapton D.A. and Shapton N.F., 'Principles and Practices for the safe processing of Foods' CRC Press, 1998.
5. DeMan, 'Principles of Food Chemistry', 3rd edition, Springer, 2007

SEMESTER SEVENTH

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

FOOD STORAGE ENGINEERING

Subject Code: BFOTS1-701

L T P C

Duration: 60(Hrs.)

4 0 0 4

Course Objectives

1. To familiarize students with the importance of scientific storage systems.
2. To understand various post-harvest changes and causes of spoilage in fruits and grains.
3. To provide the knowledge about various storage structures.
4. To create awareness regarding prevention methods to protect fruits and grains from insects and pests.
5. To understand the design of storage structures and various specifications for designs of storage systems.

Course Outcomes

1. Familiarize students with the importance of scientific storage systems.
2. Understanding various post-harvest changes and causes of spoilage in fruits and grains.
3. Providing knowledge about various storage structures.
4. Creating awareness amongst students about prevention of fruits and grains from insects and pests.
5. Understanding the design of storage structures and various specifications for designs of storage systems.

UNIT I (12 Hrs.)

Introduction: Importance of scientific storage systems, post-harvest physiology of semi- perishables and perishables, climacteric and non-climacteric fruits, respiration, ripening, changes during ripening, ethylene bio-synthesis. Damages Direct damages, indirect damages, causes of spoilage in storage (moisture, temperature, humidity, respiration loss, heat of respiration, sprouting), destructive agents (rodents, birds, insects, etc.), sources of infestation and control

UNIT II (17 Hrs.)

Storage structures: Traditional storage structures, improved storage structures, modern storage structures, godown layout, staking pattern and rodent proof godown design; Farm silos: Horizontal silos, tower silos, pit silos, trench silos, size and capacity of silos. Storage of grains Respiration of grains, moisture and temperature changes in stored grains; conditioning of environment inside storage through ventilation. Aeration and stored grain management Purposes of aeration, aeration theory, aeration system design, aeration system operation

UNIT III (16 Hrs.)

Damage due to insects and pests during storage and its control, seed coating, fumigations, etc.; Damage caused by rodents and its control. Storage of perishables cold storage, controlled and modified atmospheric storage, hypobaric storage, evaporative cooling storage, conditions for storage of perishable products, control of temperature and relative humidity inside storage

UNIT IV (15 Hrs.)

Design of storage structures Functional and structural design of grain storage structures, pressure theories, pressure distribution in the bin, grain storage loads, pressure and capacities, warehouse and silos, BIS specifications, functional, structural and thermal design of cold stores

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

Recommended Readings:

1. R. Paul Singh and Dennis R. Heldman. 2014. Introduction to Food Engineering, 5th Ed. Elsevier, Amsterdam, The Netherlands.
2. Albert Ibarz and Gustavo V. Barbosa-Cánovas. 2003. Unit Operations in Food Engineering. CRC Press, Boca Raton, FL, USA.
3. George D. Saravacos and Athanasios E. Kostaropoulos. 2002. Handbook of Food Processing Equipment. Springer ScienceBusiness Media, New York, USA. R. K. Sinnott. 1999. Chemical Engineering, Vol. 6, Chemical Engineering Design, 3rd Ed. Butterworth-Heinemann, Oxford, UK.
4. Kenneth J. Valentas, Enrique Rotstein and R. Paul Singh. 1997. Handbook of Food Engineering Practice. CRC Press, Boca Raton, FL, USA.
5. Peter F. Stanbury, Allan Whitakar and Stephen J. Hall. 1995. Principles of Fermentation Technology, 2 nd Ed. Elsevier Science Ltd., Burlington, MA, USA.
6. J.F. Richardson and D.G. Peacock. 1994. Coulson &Richardsons's Chemical Engineering, Vol. 3, Chemical &Biochemical Reactors & Process Control, 3rd Ed. Elsevier Butterworth-Heinemann, Amsterdam, The Netherlands.
7. James R. Couper, W. Roy Penney, James R. Fair and Stanley M. Walas 2012 Chemical Process Equipment: Selection and Design. Elsevier Inc
8. Mahajani, V. V. and Umarji, S. B., Process equipment design, Macmillan.
9. Bhattacharyya, B. C., Introduction to Chemical Equipment design, CBS Publishers and Distributors.
10. Geankoplis C. J. Transport processes and unit operations, Prentice-Hall

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

FOOD BIOTECHNOLOGY

Subject Code: BFOTS1-702

**L T P C
4 0 0 4**

Duration: 60(Hrs.)

Course Objectives

1. To impart knowledge about basics of food biotechnology.
2. To create the awareness about different toxins and various natural antimicrobial agents used in food preservation.
3. To remember the concept of genetic engineering and its role in food production enhancement.
4. To understand the methods and applications of protein engineering in food technology.
5. To analyze the role of Intellectual property rights (IPR) in biotechnology and their associated benefits.

Course Outcomes

1. Imparting knowledge about basics of food biotechnology.
2. Creating the awareness about different toxins and various natural antimicrobial agents used in food preservation.
3. Remembering the concept of genetic engineering and its role in food production enhancement.
4. Understanding the methods and applications of protein engineering in food technology.
5. Analyzing the role of Intellectual property rights (IPR) in biotechnology and their associated benefits.

UNIT I(15 Hrs.)

Introduction to food biotechnology: basic principles of genetic engineering, improvement of the processing of various crops by genetic engineering, food safety.

UNIT II(16 Hrs.)

Natural antimicrobials for food preservation: Phytoalexins, essential oils and their components, bacteriocins of Lactic acid bacteria, nisin, pediocin etc, applications of bacteriocins in food systems. Aflatoxins-production, control and reduction using molecular strategy.

UNIT III(14 Hrs.)

Protein engineering in food technology: Methods and applications of protein engineering (e.g. glucose isomerase, Lactobacillus beta-galactosidase and peptide antibiotic nisin). Biotechnology and Food ingredients: biogums, fat substitutes, biocolours, organic acids and sweeteners.

UNIT IV(15 Hrs.)

Food Bio-technology and Intellectual property rights (IPR), benefits of securing IPRs; bioethics in food biotechnology. Transgenic plants and animals: Their contribution to food production enhancement.

Recommended Readings:

1. B.H.Lee, 'Fundamentals of Food Biotechnology', VCH Publishers, New York, U.S.A.
2. M.P.Tombs, 'Biotechnology in Food Industry', Wiley-Blackwell, U.K.
3. D.Knorr, 'Food Biotechnology', Marcel Dekker, INC, New York, U.S.A.
4. A.Schwartzberg and A Rao 'Biotechnology & Food Process Engineering' Marcel Dekker, INC, New York.
5. I.Goldberg and R. Williams, 'Biotechnology and Food Ingredients', Springer Science & Business Media, Germany.
6. R.D.King and P.S.J.Cheetham, 'Food Biotechnology', Elsevier Applied Science, London.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

TECHNOLOGY OF BEVERAGES

Subject Code: BFOTS1-703

**L T P C
4 0 0 4**

Duration: 60(Hrs.)

Course Objectives

1. To impart the knowledge of types and importance of beverages.
2. To understand the technology behind processing of different beverages to meet the legal specifications.
3. To familiarize with the concept of water treatment along with quality parameters involved.
4. To use different types of additives to address the specified needs of consumers.
5. To create awareness regarding quality control tests used in beverages.

Course Outcomes

1. Imparting the knowledge of types and importance of beverages.
2. Understanding the technology behind processing of different beverages to meet the legal specifications.
3. Familiarize with the concept of water treatment along with quality parameters involved.
4. Application of different types of additives to address the specified needs of consumers.
5. Creating awareness regarding quality control tests used in beverages.

UNIT-I (15 Hrs.)

History and importance of beverages and status of beverage industry, Processing of beverages: Packaged drinking water, juice-based beverages, synthetic beverages, still, carbonated, Low-calorie and dry beverages, isotonic and sports drinks Dairy based beverages Alcoholic beverages, fruit beverages, specialty beverages.

UNIT-II (15 Hrs.)

Tea, coffee, cocoa, plant extracts, etc. FSSAI specifications for beverages, Ingredients, manufacturing and packaging processes and equipment for different beverages, Water treatment and quality of process water.

UNIT III (15 Hrs.)

Sweeteners, colorants, acidulants, Clouding and clarifying and flavouring agents for beverages. Use of carbon dioxide in carbonation.

UNIT-IV (15 Hrs.)

Quality tests and control in beverages. Miscellaneous beverages: Coconut water, sweet toddy Sugar cane juice, coconut beverage, flavoured syrups.

Recommended Readings:

1. Hans Michael Eblinger. 2009. Handbook of Brewing: Processes, Technology, Markets. Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim. Germany.
2. Y.H. Hui. 2007. Handbook of Food Products Manufacturing: Principles, Bakery, Beverages, Cereals, Cheese, Confectionary, Fats, Fruits, and Functional Foods. John Wiley & Sons, Inc., Hoboken, New Jersey, USA.
3. Philip R. Ashurst. 2005. Chemistry and Technology of Soft Drinks and Fruit Juices, 2nd Ed. Blackwell Publishing Ltd., Oxford, UK.
4. Amalendu Chakraverty, Arun S. Mujumdar, G.S. VijayaRaghavan and Hosahalli S. Ramaswamy. 2003. Handbook of Post Harvest Technology: Cereals, Fruits, Vegetables, Tea, and Spices. Marcel Dekker, Inc., NY, USA.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

SNACKS AND EXTRUSION TECHNOLOGY

Subject Code: BFOTS1-704

L T P C

Duration: 60 (Hrs.)

4 0 0 4

Course Objectives

1. To acquire knowledge about compositions, formulations and quality testing of Snack foods.
2. To make students aware about specifications, compositions, ingredients, processing techniques of breakfast cereals and texturized vegetable protein
3. To familiarize with different types of extruders.
4. To learn about manufacturing of different extruded products.
5. To get knowledge about Chemical and nutritional changes in food during extrusion.

Course Outcomes

1. Imparting knowledge about compositions, formulations and quality testing of Snack foods.
2. Creating awareness aware about specifications, composition, ingredients, processing techniques of breakfast cereals and texturized vegetable protein
3. Familiarizing with different types of extruders.
4. Understanding manufacturing of different extruded products.
5. Analyzing the chemical and nutritional changes in food during extrusion.

UNIT I (14 Hrs.)

Snack foods: Types, specifications, compositions, ingredients, Formulations, processing, equipment, packaging, storage and quality testing, Snack food seasonings

UNIT II (15 Hrs.)

Classification of Breakfast cereals: Raw materials, process and quality testing of vermicelli, spaghetti: and macronic products Texturized vegetable protein: Definition, processing techniques, and foods Ready to eat breakfast cereals by extrusion cooking. Specifications, compositions, ingredients Formulations, processing Packaging, storage and quality testing for breakfast cereals, macaroni and malts.

UNIT III (15 Hrs.)

Extrusion: definition, introduction to extruders, principles and types, Uses of extruders in the food industry, Single screw extruder: principle of working, factors affecting extrusion process, Twin screw extruder: counter rotating and co-rotating twin screw extruder, Process characteristics of the twin screw extruder

UNIT IV (16 Hrs.)

Pre-conditioning of raw materials used in extrusion process Use of dry extruders in extrusion Chemical and nutritional changes in food during extrusion. Extrusion technology and applications in food processing.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

Recommended Readings:

1. NIIR Board of Consultants & Engineers. 2014. The Complete Technology Book on Bakery Products (Baking Science with Formulation & Production), 3rd Ed. NIIR, New Delhi.
2. Peter P. Grewling. 2013. Chocolates & Confections, 2nd Ed. John Wiley & Sons, Inc., Hoboken, New Jersey, USA.
3. E.J. Pyler and L.A. Gorton. 2009. Baking Science & Technology, Vol. II: Formulation & Production, 4th Ed. Sosland Publishing Company, Kansas City, MO, USA.
4. E.J. Pyler and L.A. Gorton. 2008. Baking Science & Technology, Vol. I: Fundamentals & Ingredients, 4th Ed. Sosland Publishing Company, Kansas City, MO, USA.
5. Y.H. Hui. 2007. Handbook of Food Products Manufacturing: Principles, Bakery, Beverages, Cereals, Cheese, Confectionary, Fats, Fruits, and Functional Foods. John Wiley & Sons, Inc., Hoboken, New Jersey, USA.
6. John J. Kingslee. 2006. A Professional Text to Bakery and Confectionery. New Age International, New Delhi.
7. Harold Corke, Ingrid De Leyn, Nanna A. Cross, Wai-Kit Nip, Y.H. Hui. 2006. Bakery Products: Science and Technology. Blackwell Publishing Ltd., Oxford, UK.
8. Joseph Amendola and Nicole Rees. 2003. Understanding Baking: The Art and Science of Baking, 3rd Ed. John Wiley & Sons, Inc., Hoboken, New Jersey, USA.
9. Duncan Manley. 2000. Technology of Biscuits, Crackers and Cookies, 3rd Ed. Woodhead Publishing Limited, Cambridge, England.
10. N.L. Kent and A.D. Evers. 1994. Kent's Technology of Cereals: An Introduction for Students of Food Science and Agriculture, 4th Ed. Elsevier Science Ltd., Oxford, UK.
11. E.B. Jackson. 1995. Sugar Confectionery Manufacture, 2nd Ed. Springer-Verlag, US.
12. B.W. Minife. 1989. Chocolate, Cocoa, and Confectionery – Science and Technology, 3rd Ed. Chapman and Hall, Inc., New York, USA.
13. Samuel A. Matz. 1976. Snack Food Technology, 2nd Ed. AVI Publishing Co., Inc., Westport, Connecticut, USA.

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

TECHNOLOGY OF BEVERAGES LAB XX

Subject Code: BFOTS1-705

**L T P C
0 0 4 2**

Duration: 60(Hrs.)

Course Objectives

1. To impart knowledge regarding quality analysis of water.
2. To understand the technology behind processing of different types of beverages.
3. To familiarize with the methods involved in determination of different additives used in the formulation of beverages.
4. To analyze different quality parameters of beverages so as to meet the legal specifications.
5. To understand the mode of working in industrial setups as an individual and as a team.

Course Outcomes

1. Imparting knowledge regarding quality analysis of water.
2. Understanding the technology behind processing of different types of beverages.
3. Familiarize with the methods involved in determination of different additives used in the formulation of beverages.
4. Analysis of quality parameters of beverages so as to meet the legal specifications.
5. Understanding the mode of working in industrial setups as an individual and as a team.

PRACTICALS

1. Quality analysis of raw water
2. Determination of brix value, pH and acidity of beverages
3. Determination of density and viscosity of caramel
4. Preparation of synthetic beverage
5. Determination of colours in soft drinks by wool technique
6. Preparation of iced and flavoured tea
7. Preparation of instant tea
8. Assessment of purity of carbon dioxide
9. Preparation of carbonated and non-carbonated beverages
10. Preparation of sports drink
11. Preparation of dairy/ fruit-based beverage
12. Determination of caffeine in beverages
13. Quality analysis of tea and coffee
14. Preparation of miscellaneous beverages
15. Visit to carbonation unit
16. Visit to mineral water plant

**MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.)
SYLLABUS 2021 BATCH ONWARDS**

SNACKS AND EXTRUSION TECHNOLOGY LAB XXI

Subject Code: BFOTS1-706

**L T P C
0 0 4 2**

Duration: 60(Hrs.)

Course Objectives

1. To learn about identifications and composition of various ingredients used for manufacturing of snacks and extruded products.
2. To gain knowledge about testing of different raw materials used in preparation of snacks and extruded products.
3. To learn about manufacturing of different snack food products and extruded products.
4. To become familiarize with different tests to quality evaluation of extruded products.
5. To become aware about packaging of snack food products and extruded products.

Course Outcomes

1. Understanding of identifications and composition of various ingredients used for manufacturing of snacks and extruded products.
2. Imparting knowledge about testing of different raw materials used in preparation of snacks and extruded products.
3. Development of different snack food products and extruded products.
4. Familiarizing with different tests to quality evaluation of extruded products.
5. Creating awareness about packaging of snack food products and extruded products.

PRACTICALS

1. Identification and composition of various ingredients used for preparation of snacks
2. Flours, their classifications and characterization
3. Determination of flour gluten
4. Determination of water absorption characteristics and dough development time
5. Determination of dough rising capacity
6. Determination of calcium carbonate in fortified atta
7. Quality evaluation of selected snack items
8. Preparation of pasta
9. Preparation of macroni
10. Preparation of vermicelli
11. Preparation of noodles
12. Preparation of selected extruded products
13. Packaging and quality evaluation of extruded products
14. Visit to snack industry