

# **ROYAL SCHOOL OF BIOSCIENCES (RSBSC)**

DEPARTMENT OF FOOD TECHNOLOGY

# COURSE STRUCTURE & SYLLABUS (BASED ON NATIONAL EDUCATION POLICY 2020)

FOR

**B.Sc. IN FOOD TECHNOLOGY** (4 YEARS SINGLE MAJOR)

W.E.F

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Sl No.	Contents	Page No
1	Preamble	1
2	Introduction	2
3	Learning Outcomes Based Approach to Curriculum Planning	2
4	Award of Degree	4
5	Graduate Attributes	5
6	Programme Learning Outcomes	6
7	Programme Specific Outcomes	6
10	Teaching Learning Process	7
11	Assessment Methods	7
12	Program Structure	8
13	Detailed syllabus of Semester-I	9
14	Detailed syllabus of Semester-II	18
15	Detailed syllabus of Semester-III	25
16	Detailed syllabus of Semester-IV	34
17	Detailed syllabus of Semester- V	41
18	Detailed syllabus of Semester-VI	52
19	Detailed syllabus of Semester-VII	60
20	Detailed syllabus of Semester- VIII	70

#### 1. Preamble

The National Education Policy (NEP) 2020 conceives a new vision for India's higher education system. It recognizes that higher education plays an extremely important role in promoting equity, human as well as societal well-being and in developing India as envisioned in its Constitution. It is desired that higher education will significantly contribute towards sustainable livelihoods and economic development of the nation as India moves towards becoming a knowledge economy and society.

If we focus on the 21<sup>st</sup> century requirements, the higher education framework of the nation must aim to develop good, thoughtful, well-rounded, and creative individuals and must enable an individual to study one or more specialized areas of interest at a deep level, and also develop character, ethical and Constitutional values, intellectual curiosity, scientific temper, creativity, spirit of service, and twenty-first-century capabilities across a range of disciplines including sciences, social sciences, arts, humanities, languages, as well as professional, technical, and vocational subjects. A quality higher education should be capable enough to enable personal accomplishment and enlightenment, constructive public engagement, and productive contribution to the society. Overall, it should focus on preparing students for more meaningful and satisfying lives and work roles and enable economic independence.

Towards the attainment of holistic and multidisciplinary education, the flexible curricula of the University will include credit-based courses, projects in the areas of community engagement and service, environmental education, and value-based education. As part of holistic education, students will also be provided with opportunities for internships with local industries, businesses, artists, crafts persons, and so on, as well as research internships with faculty and researchers at the University, so that students may actively engage with the practical aspects of their learning and thereby improve their employability.

The undergraduate curriculums are diverse and have varied subjects to be covered to meet the needs of the programs. As per the recommendations from the UGC, introduction of courses related to Indian Knowledge System (IKS) is being incorporated in the curriculum structure which encompasses all of the systematized disciplines of Knowledge which were developed to a high degree of sophistication in India from ancient times and all of the traditions and practises that the various communities of India—including the tribal communities—have evolved, refined and preserved over generations, like for example Vedic Mathematics, Vedangas, Indian Astronomy, Fine Arts, Metallurgy, etc.

At RGU, we are committed that at the societal level, higher education will enable each student to develop themselves to be an enlightened, socially conscious, knowledgeable, and skilled citizen who can find and implement robust solutions to its own problems. For the students at the University, Higher education is expected to form the basis for knowledge creation and innovation thereby contributing to a more vibrant, socially engaged, cooperative community leading towards a happier, cohesive, cultured, productive, innovative, progressive, and prosperous nation."

#### **1.1 INTRODUCTION**

The National Education Policy (NEP) 2020 clearly indicates that higher education plays an extremely important role in promoting human as well as societal well-being in India. As envisioned in the 21st-century requirements, quality higher education must aim to develop good, thoughtful, well-rounded, and creative individuals. According to the new education policy, assessments of educational approaches in undergraduate education will integrate the humanities and arts with Science, Technology, Engineering and Mathematics (STEM) that will lead to positive learning outcomes. This will lead to develop creativity and innovation, critical thinking and higher-order thinking capacities, problem-solving abilities, teamwork, communication skills, more in-depth learning, and mastery of curricula across fields, increases in social and moral awareness, etc., besides general engagement and enjoyment of learning.

The NEP highlights that the following fundamental principles that have a direct bearing on the curricula would guide the education system at large, viz.

- Recognizing, identifying, and fostering the unique capabilities of each student to promote her/his holistic development.
- Flexibility, so that learners can select their learning trajectories and programmes, and thereby choose their own paths in life according to their talents and interests.
- Multidisciplinary and holistic education across the sciences, social sciences, arts, humanities, and sports for a multidisciplinary world.
- Emphasis on conceptual understanding rather than rote learning, critical thinking to encourage logical decision-making and innovation; ethics and human & constitutional values, and life skills such as communication, teamwork, leadership, and resilience.
- Extensive use of technology in teaching and learning, removing language barriers, increasing access for Divyang students, and educational planning and management.
- Respect for diversity and respect for the local context in all curricula, pedagogy, and policy.
- Equity and inclusion as the cornerstone of all educational decisions to ensure that all students can thrive in the education system and the institutional environment are responsive to differences to ensure that high-quality education is available for all.
- Rootedness and pride in India, and its rich, diverse, ancient, and modern culture, languages, knowledge systems, and traditions.

#### **1.2 Learning Outcomes-Based Approach to Curricular Planning:**

The learning outcomes-based curriculum framework is based on the premise that every student and graduate is unique. Each student or graduate has his/her own characteristics in terms of previous learning levels and experiences, life experiences, learning styles and approaches to future career- 2 related actions. The quality, depth and breadth of the learning experiences made available to the students while at the higher education institutions help develop their characteristic attributes.

The key objectives that underpin curriculum planning and development at the undergraduate level include Programme Learning Outcomes, and Course Learning Outcomes. For the B.Sc. (H) Food Technology course it includes:

- To demonstrate comprehensive knowledge and understanding of the food technology curriculum.
- To apply the principles of food science to preserve, process and package to assure the quality and safety of food products.
- To understand that the real-world problems in the food industry requires continuous acquisition of knowledge and its application to improve the safety and quality of a given food or process.
- To analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.
- To acquire knowledge and skills, including "learning how to learn", that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.
- To use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources.
- To acquire professional competency and entrepreneurial skills for economic empowerment.
- To demonstrate the ability to acquire, analyze, interpret and appropriately present laboratory data

#### 2. Award of Degree

The structure and duration of undergraduate programmes of study offered by the University as per NEP 2020 include:

**2.1. Undergraduate programmes** of either 3 or 4-year duration with Single Major, with multiple entry and exit options, with appropriate certifications:

**2.1.1. UG Certificate:** Students who opt to exit after completion of the first year and have secured 40 credits will be awarded a UG certificate if, in addition, they complete one vocational course of 4 credits during the summer vacation of the first year. These students are allowed to re-enter the degree programme within three years and complete the degree programme within the stipulated maximum period of seven years.

**2.1.2. UG Diploma:** Students who opt to exit after completion of the second year and have secured 80 credits will be awarded the UG diploma if, in addition, they complete one vocational course of 4 credits during the summer vacation of the second year. These students are allowed to re-enter within a period of three years and complete the degree programme within the maximum period of seven years.

**2.1.3. 3-year UG Degree:** Students who will undergo a 3-year UG programme will be awarded UG Degree in the Major discipline after successful completion of three years, securing 120 credits and satisfying the minimum credit requirement.

**2.1.4. 4-year UG Degree (Honours):** A four-year UG Honours degree in the major discipline will be awarded to those who complete a four-year degree programme with 160 credits and have satisfied the credit requirements as given in Table 6 in Section 5.

**2.1.5. 4-year UG Degree (Honours with Research):** Students who secure 75% marks and above in the first six semesters and wish to undertake research at the undergraduate level can choose a research stream in the fourth year. They should do a research project or dissertation under the guidance of a Faculty Member of the University. The research project/dissertation will be in the major discipline. The students who secure 160 credits, including 12 credits from a research project/dissertation, will be awarded UG Degree (Honours with Research).

Award	Year	Credits to earn	Additional Credits	Re-entry allowed within (yrs)	Years to Complete	
UG Certificate	1	40	4	3	7	
UG Diploma	2	80	4	3	7	
3-year UG Degree (Major)	3	120	х	Х	х	
4-year UG Degree (Honours)	4	160	x	X	x	
4-year UG Degree (Honors with Research):	4	160	Students who secure cumulative 75% marks and above in the first six semesters			

Table: 1: Award of Degree and Credit Structure with ME-ME

#### 3. Graduate Attributes:

Table: 2: The Learning Outcomes Descriptors and Graduate Attributes

Sl. No.	Graduate Attribute	The Learning Outcomes Descriptors (The graduates should be able to demonstrate the capability to:)
GA1	Disciplinary Knowledge	acquire knowledge and coherent understanding of the chosen disciplinary/interdisciplinary areas of study.
GA 2	Complex problem solving	solve different kinds of problems in familiar and non-familiar contexts and apply learning to real-life situations.
GA 3	Analytical & Critical thinking	apply analytical thought including the analysis and evaluation of policies, and practices. Able to identify relevant assumptions or implications. Identify logical flaws and holes in the arguments of others. Analyse and synthesize data from a variety of sources and draw valid conclusions and support them with evidence and examples.
GA 4	Creativity	create, perform, or think in different and diverse ways about the same objects or scenarios and deal with problems and situations that do not have simple solutions. Think 'out of the box' and generate solutions to complex problems in unfamiliar contexts by adopting innovative, imaginative, lateral thinking, interpersonal skills, and emotional intelligence.
GA 5	Communication Skills	listen carefully, read texts and research papers analytically, and present complex information in a clear and concise manner to different groups/audiences. Express thoughts and ideas effectively

		in writing and orally and communicate with others using appropriate media.
GA 6	Research-related skills	develop a keen sense of observation, inquiry, and capability for asking relevant/ appropriate questions. Should acquire the ability to problematize, synthesize and articulate issues and design research proposals, define problems, formulate appropriate and relevant research questions, formulate hypotheses, test hypotheses using quantitative and qualitative data, establish hypotheses, make inferences based on the analysis and interpretation of data, and predict cause-and-effect relationships. Should develop the ability to acquire the understanding of basic research ethics and skills in practicing/doing ethics in the field/ in personal research work.
GA 7	Collaboration	work effectively and respectfully with diverse teams in the interests of a common cause and work efficiently as a member of a team.
GA 8	Leadership readiness/qualities	plan the tasks of a team or an organization and setting direction by formulating an inspiring vision and building a team that can help achieve the vision.
GA 9	Digital and technological skills	use ICT in a variety of learning and work situations. Access, evaluate, and use a variety of relevant information sources and use appropriate software for analysis of data.
GA 10	Environmental awareness and action	mitigate the effects of environmental degradation, climate change, and pollution. Should develop the technique of effective waste management, conservation of biological diversity, management of biological resources and biodiversity, forest and wildlife conservation, and sustainable development and living.

# 4. Programme Learning Outcomes relating to B. Sc (Honours) degree programme in Food Technology

Students graduating with the degree B.Sc. (Food technology) will be able to achieve the following:

**PLO1: Knowledge of Food Technology:** Students are able to demonstrate comprehensive knowledge and understanding of one or more disciplines such as chemistry, bio-chemistry, mathematics, statistics, microbiology, engineering, management; regulations with support of different allied subjects of Life Science; Physical Science

**PLO2: Develop the ability to solve complex problems Develop**: Identify, formulate, review research literature, and analyze complex. Food Technology/applications problems and Design solutions for complex problems and design system components or processes that meet the specified needs with appropriate consideration for the food sustainability

**PLO3**: **Develop Critical thinking and analytical reasoning ability:** Recognize the need for, and have the preparation and ability to engage in independent/as an entrepreneur and life-long learning in the broadest context of technological change logical reasoning and capability of recognizing and distinguishing the various aspects of real-life problems.

**PLO4: Develop the ability to create:** Recognize new skills, ideas and technologies and its implementation in new product developments.

**PLO5: Communication Skills:** Communicate effectively and write effective reports and design documentation, make effective presentation through seminars, project dissertations

**PLO6: Develop Research related skills:** Acquire the practical knowledge and demonstrate the ability to design, conduct/trouble shoot experiments and analyze data in the field of food technology

**PLO7: Develop the skills for collaborative work and team building:** Work effectively with food industries, laboratories and production processing team to build the technical and practical learning aspects.

**PLO8**: **Develop Leadership qualities:** Work effectively with the team work and building capabilities and leadership qualities for achieving the vision.

**PLO9: Develop Digital and technological skills**: The completion of this programme will enable the learner to use appropriate software's to apply for bulk scale/industrial production of technology-based food products.

**PLO10: Develop Environmental awareness and imbibe skills for addressing the problems:** Examining the role of health consciousness, environmental awareness and intention on purchase of organic food.

#### 5. B.Sc. Food Technology Programme Specific Outcomes

The programme specific outcomes of the course are-

**PSO 1**: Knowledge of various areas related to Food science and technology,

**PSO 2:** Understanding of the food composition and its physico-chemical, nutritional, microbiological and sensory aspects,

**PSO 3:** Knowledge of processing and preservation techniques of pulses, oilseeds, spices, fruits and vegetables, meat, fish, poultry, milk & milk products,

**PSO 4:** Relevance and significance of food safety, food quality, food plant sanitation, food laws and regulations, food engineering and packaging in food industry.

#### 6. Teaching Learning Process

Teaching and learning in this programme involve classroom lectures as well as tutorial and remedial classes.

**Tutorial classes:** Tutorials allow closer interaction between students and teacher as each student gets individual attention. The tutorials are conducted for students who are unable to achieve average grades in their weekly assessments. Tutorials are divided into three categories, viz. discussion-based tutorials (focusing on deeper exploration of course content through discussions and debates), problem-solving tutorials (focusing on problem solving processes and quantitative reasoning), and Q&A tutorials (students ask questions about course content and assignments and consolidate their learning in the guiding presence of the tutor).

**Remedial classes**: The remedial classes are conducted for students who achieve average and above average grades in their weekly assessments. The focus is laid to equip the students to perform better in the exams/assessments. The students are divided into small groups to provide dedicated learning support. Tutors are assigned to provide extra time and resources to help them understand concepts with advanced nuances. Small groups allow tutors to address their specific needs and monitor them. Following methods are adopted for tutorial and remedial classes:

- Written assignments and projects submitted by students
- Project-based learning
- Group discussions
- Home assignments
- Class tests, quizzes, debates organised in the department
- PPT (Presentation), Seminars and conferences
- Extra-curricular activities like cultural activities, community outreach programmes etc.
- Industrial tour / field visit

#### 7. Assessment Methods

	Component of Evaluation	Marks	Frequency	Code	Weightage (%)
Α	<b>Continuous Evaluation</b>				
Ι	Analysis/Class test	Combination	1-3	С	
II	Home Assignment	of any three	1-3	Н	
III	Project	Projectfrom (i) toSeminar(v) with 5		Р	
IV	Seminar			S	25%
V	Viva-Voce/Presentation	marks each	1-2	V	
VI	MSE	MSE shallbe of 10 Marks	1-3	Q/CT	
VII	Attendance	Attendance shall be of 5 marks	100%	А	5%
В	Semester End Examination		1	SEE	70%
	Project				100%

#### **Course Structure B.Sc. in Food Technology**

	1 <sup>st</sup> Semester							
Sl. No.	Subject Code	Names of Subject	L	Level	Р	С		
		Major						
1	FTC152M101	Principles of Food Processing and Preservation	3	100	0	3		
2	FTC152M112	Practical I	0	100	6	3		
		Minor						
3	FTC152N101	Basic Food Science	3	100	0	3		
		Interdisciplinary						
1	IDC 1	IKS I (Introduction to Indian Knowledge	3		0	3		
-		System- I)	5		0	5		
		AEC (Ability Enhancement Courses)						
5	AEC982A101	Communicative English and Behavioral	2		0	2		
5	ALC702A101	Science –I	2		0	2		
		SEC (Skill Enhancement Courses)						
6	FTC152S111	Fruits and Vegetables Processing	0		6	3		
		VAC (Value Added Courses)						
7	VAC 1	Basket Course	3		0	3		
		TOTAL CREDIT	14		12	20		

	2nd Semester						
Sl. No.	Subject Code	Names of Subject	L	Level	Р	С	
		Major					
1	FTC152M201	Fruits and Vegetables Product Technology	3	100	0	3	
2	FTC152M211	Practical II	0	100	6	3	
		Minor					
3	FTC152N201	Food Microbiology	3	100	0	3	
		Interdisciplinary					
4	IDC 2	IKS II (Introduction to Indian Knowledge	2		0	2	
4	IDC 2	System- II)	5		0	5	
		AEC (Ability Enhancement Courses)					
5	AEC982A201	Communicative English and Behavioral Science	2		0	2	
	ALC702A201	-II	2		U	2	
		SEC (Skill Enhancement Courses)					
6	FTC152S211	Waste and By-product Utilization	0		6	3	
		VAC (Value Added Courses)					
7	VAC 2	Basket Course	3		0	3	
		TOTAL CREDIT	14		12	20	

		3rd Semester				
Sl. No.	Subject Code	Names of Subject	L	Level	Р	С
		Major				
1	FTC152M301	Food Chemistry	4	200	0	4
2	FTC152M312	Practical III	0	200	8	4
		Minor				
3	FTC152N301	Food Ingredients and Additives	4	200	0	4
		Interdisciplinary				
4	IDC 3	IKS III (Introduction to Indian Knowledge	3		0	3
		System- III)				
		AEC (Ability Enhancement Courses)				
5	AEC982A301	Communicative English and Behavioral Science	2		0	2
		-III				
		SEC (Skill Enhancement Courses)				
6	FTC152S311	Basic techniques in bakery	0		6	3
		TOTAL CREDIT	13		14	20

	4 <sup>th</sup> Semester						
Sl. No.	Subject Code	Names of Subject	L	Level	Р	С	
		Major					
1	FTC152M401	Cereals, Pulses and Oilseeds Product Technology	4	200	0	4	
2	FTC152M402	Traditional Knowledge of Indian Foods	4	200	0	4	
3	FTC152M413	Practical IV	0	200	8	4	
		Minor					
4	FTC152N401	Food Product Development	3	200	0	3	
5	FTC152N402	Sugar Confectionary and Chocolate Processing	3	200	0	3	
		AEC (Ability Enhancement Courses)					
6	AEC982A401	Communicative English and Behavioral Science	2		0	2	
		-IV					
		TOTAL CREDIT	16		8	20	

		5 <sup>th</sup> Semester				
Sl. No.	Subject Code	Names of Subject	L	Level	Р	С
		Major				
1	FTC152M501	Dairy Technology	4	300	0	4
2	FTC152M502	Animal Product Technology	4	300	0	4
3	FTC152M513	Practical V	0	300	8	4
		Minor				
4	FTC152N501	Basic of Food Processing and Preservation	4	200	0	4
		Internship	0		0	4
5	Internship					
		TOTAL CREDIT	12		8	20

		6 <sup>th</sup> Semester				
Sl. No.	Subject Code	Names of Subject	L	Level	Р	С
		Major				
1	FTC152M601	Unit Operations in food processing	4	300	0	4
2	FTC152M602	Food Packaging Technology	4	300	0	4
3	FTC152M603	Food Safety and Quality Management	4	300	0	4
4	FTC152M611	Practical VI	0	300	8	4
		Minor				
5	FTC152N601	Extrusion Technology	4	200	0	4
		TOTAL CREDIT	16		8	20

7 <sup>th</sup> Semester						
Sl. No.	Subject Code	Names of Subject	L	Level	Р	С
		Major				
1	FTC152M701	Food Plant Sanitation	4	400	0	4
2	FTC152M702	Traditional Foods	4	400	0	4
3	FTC152M703	Fermentation Technology	4	400	0	4
4	FTC152M711	Practical VII	0	400	8	4
		Minor				
5	FTC152N701	Food Business Management	4	300	0	4
		TOTAL CREDIT	16		8	20

	8 <sup>th</sup> Semester					
Sl. No.	Subject Code	Names of Subject	L	Level	Р	С
		Major				
1	FTC152M801	Nutraceutical and Functional Foods	4	400	0	4
		Minor				
2	FTC152M802	Research Methodology	4	300	0	4
		Dissertation				
3	FTC152M812	Research Project	0		0	12
		OR				
4	FTC152M803	Food Quality and Sensory Evaluation	4	400	0	4
5	FTC152M804	Food Adulteration and Additives	4	400	0	4
6	FTC152M805	Technology of Spices, Condiments and	4	400	0	4
		Plantation Crops				
		TOTAL CREDIT	8		0	20

#### Semester I

#### **Course: Major**

#### Scheme of Evaluation(T)

Level of Course:100

#### Title of Paper: Principles of Food Processing and Preservation

Subject Code: FTC152M101

L-T-P-C: 3-0-0-3

#### **Total credits:3**

#### **Course Objectives**

To train the students with various types of processing techniques used in food industry and to understand how processing can lead to increase in food shelf life and palatability.

#### **Course Outcomes**

On successful completion of the course the students will be able to:			
SI No.	Course Outcome	<b>Blooms TaxonomyLevel</b>	
CO 1	<b>Relate</b> the principle of food processing techniques, its function and application	BT 1	
CO 2	Explain different techniques of freezing in food processing	BT 2	
CO 3	<b>Develop</b> an insight into the different techniques of food	BT 3	
<b>CO 4</b>	Analyse the novel techniques of food preservation	<b>BT 4</b>	

Modules	Topics (if applicable) & Course		
	Contents		
I.	<ul> <li>Food processing and preservation principles: Method of preservation: pasteurization (definition, time-temperature combination and equipment's) sterilization (definition, time-temperature combination and equipment's), blanching (definition, time-temperature combination and equipment's, adequacy in blanching), canning (definition, time-temperature combination and equipment's), packaging (Introduction, Metal Containers, Glass Containers, Rigid Plastic Containers, Retortable Pouches)</li> </ul>		
II.	<b>Food Concentration:</b> Definition of drying and dehydration, Factors affecting drying, types of dryers. Definition of evaporation, types of evaporators. Freeze concentration and food freezing and thawing and the general principles of crystallization and nucleation of ice. Water Activity, free water, bound water and its role in preservation	15	
III.	<b>Basic unit operations in food processing:</b> Cleaning, sorting, grading, blanching, cutting, dicing, mincing, slicing, chopping, grating, sieving, soaking, coating, germination and fermentation, filtration techniques	15	

IV.	Introduction to Novel Food Preservation Techniques: Basics of Ohmic Heating, irradiation, pulsed electric field, pulsed light, high pressure processing, cold plasma	15
	TOTAL	60
	Pedagogy: Lectures, Assignments, Seminars	

- Group Discussion
- Seminar/presentation on any of the relevant topics
- Case Studies

#### **Textbooks:**

- 1.Potter NH,5<sup>th</sup> edition, Food Science, CBS Publication, New Delhi.
- 2.RamSaswamy H and Marcotte M,1st edition, Food Processing Principles and Applications CRCPress

#### **Reference books:**

- 1.Manay NS and Shadaksharaswamy M,Latest edition, Food-Facts and Principles, New AgeInternational (P) Ltd. Publishers, New Delhi.
- 2.Sivasankar B. Latest edition. *Food Processing and Preservation*. First Edition. PHILearning.

Credit Distribution				
Theory	Practical	Experimental Learning		
60	-	30		

#### Semester I

#### Course: Major

#### Scheme of Evaluation: (P)

Level of Course: 100

#### Title of Paper: Practical on Principles of Food Processing and Preservation

Subject Code: FTC152M111

L-T-P-C: 0-0-6-3

#### Total credits: 3

#### **Course Objectives**

Understanding the application of various laboratory equipment's used in food technology in terms of food poesigand food safety

#### **Course Outcomes**

On successful completion of the course the students will be able to:			
SI No.	Course Outcome	<b>Blooms Taxonomy Level</b>	
	Define basic food technology laboratory equipment's and		
CO 1	appliances	BT 1	
	Classify different food groups, determination of moisture		
CO 2	content of different food samples	<b>B</b> T 2	
<u> </u>	Construct the procedures for drying and packaging of fruits and		
003	vegetables	BT 3	
CO 4	Analyse the process of malting from cereals, millets and pulses	BT 4	

Modules	Topics (if applicable) & Course	Periods
	Contents	
I.	<ol> <li>Introduction to basic laboratory facilities-tools and appliances</li> <li>Introduction to basic food processing equipment.</li> <li>Care and maintenance of laboratory tools, appliances and equipment.</li> </ol>	20
П	<ol> <li>Identification of foods under different food groups</li> <li>Determination of moisture content of different food groups like fruits, vegetables, green leafy vegetables, cereals and pulses</li> <li>Brix analysis by refractometer for different food samples like fruit juices, jam, jelly</li> </ol>	25
	4. Determination of pH of different food products like pickles, fruit juice and sauces	
III	<ol> <li>Drying of fruits and vegetables</li> <li>Drying of green leafy vegetables</li> <li>Fruit/vegetable puree making</li> <li>Packaging of prepared food products</li> </ol>	20

IV	<ol> <li>Rice flour making from waxy and non-waxy rice</li> <li>Waxy rice products</li> <li>Non waxy rice products</li> <li>Preparation of products from different food groups</li> <li>Preparation of cereal, millet, pulse malts</li> </ol>	25
	Total	90
	Pedagogy: Lectures, Experiments, Laboratory sessions	

**Recommended Texts:** As suggested under the theory papers

Semester I

Course: SEC 1

Scheme of Evaluation: (P)

Title of Paper: Fruits and Vegetables Processing

Subject Code: FTC152S111

L-T-P-C: 0-0-6-3

Total credits: 3

**Course Objectives** 

Understanding the physiological parameters for fruits and vegetables processing

#### **Course Outcomes**

On successful completion of the course the students will be able to:			
SI No.	Course Outcome	<b>Blooms Taxonomy Level</b>	
CO 1	<b>Define</b> basic fruits and vegetable varieties and identify their maturity indices	BT 1	
CO 2	Classify the TSS and acidity of different fruits and vegetables	BT 2	
CO 3	<b>Construct</b> the process for identification of spices and additives in different fruits and vegetables	BT 3	
<b>CO 4</b>	Analyse and planning of project for setting up of food processing units	BT 4	

#### Course Outline

Modules	Topics (if applicable) & Course	Periods
	Contents	
I.	<ol> <li>Identification of various fruit and vegetable varieties</li> <li>Determination of maturity indices of fruits and vegetables: Days from full bloom (DFFB), firmness.</li> <li>Determination of Starch-iodine ratio, Brix-acid ratio</li> <li>Dehydration and rehydration of fruits and vegetables</li> </ol>	20
п	<ol> <li>Determination of moisture content of different food products</li> <li>Determination of TSS of different food products</li> <li>Determination of acidity of fruits and vegetables</li> </ol>	25
ш	<ol> <li>Identification of spices and condiments in fruits and vegetables.</li> <li>Preparation of jam, jelly and marmalade</li> <li>Preparation of pickles</li> </ol>	30
IV	1. Project planning on food processing unit	15
	Total	90
	Pedagogy: Lectures, Experiments, Laboratory sessions	

**Recommended Texts:** As suggested under the theory paper.

Semester I

Scheme of Evaluation: (T)

Course: Minor

Level of Course: 100

**Title of Paper: Basic Food Science** 

Subject Code: FTC152N101

L-T-P-C: 3-0-0-3

Total credits: 3

**Course Objectives** To train the students with introductory knowledge of food science, scope of food science and its applications in food industries

#### **Course Outcomes**

On successful completion of the course the students will be able to:			
SI No.	Course Outcome	Blooms TaxonomyLevel	
CO 1	<b>Relate</b> the principle of food science, and food constituents- its properties and functions	BT 1	
CO 2	Explain the basic preservation techniques used in food science	BT2	
CO 3	<b>Develop</b> different types of n o n - thermal processing techniques used in food Industry	BT 3	
CO 4	Analyse the different advantages and disadvantages of different preservation techniques in terms of increasing shelf life	BT 4	

Modules	Topics (if applicable) & Course Contents	Periods
	Introduction: Introduction to Food Science, Different kinds of Food Industries,	
	Components of Food industries. Scope of food processing and technology.	
I.	Food constituents: Carbohydrates, lipids, proteins, vitamins and minerals,	15
	water. Nutritional and chemical properties of food constituents and its function.	
	Introduction to Food preservation techniques: Pasteurization, Sterilization,	
	Ultra High temperature, Blanching, etc. Low temperature preservation	
II.	techniques: Cooling, Evaporation, refrigeration and freezing, Drying and their	15
	importance in the food processing.	
	Introduction to non-thermal food preservation techniques: Introduction to	
	new techniques in preservation of food like High Pressure Processing, Ohmic	
III.	heating, Pulse electric field processing, Irradiation etc.	15
	<b>Basic introduction</b> : Unit operations in Food Processing, Cleaning, dry	
IV.	cleaning methods wet cleaning methods neeling grading sorting	
	creating methods, wet creating methods, peering, grading, sorting.	15
	TOTAL	60
	Pedagogy: Lectures, Assignments, Seminars	

- Group Discussion
- Seminar/presentation on any of the relevant topics
- Case Studies

#### **Textbooks:**

- Food Science by Norman N Potter and Joseph H. Hotchkiss, CBS Publishers and Distributors.
- Advanced Textbook on Food and Nutrition by Dr. M. Swaminathan Vol: I & II, The Bangalore Printing and Publishing Co. Ltd.

#### **Reference books:**

- 1.Fellows PJ, 2016. Food Processing Technology, Principles and Practice. Fourth Edition. Woodhead Publishing
- 2.Sivasankar B. Latest edition. *Food Processing and Preservation*. First Edition. PHILearning

Credit Distribution			
Theory	Practical	Experimental Learning	
60	-	30	

# Semester II

# **Course: Major**

Level of Course: 100

Title of Paper: Fruits and Vegetables Processing Technology

Subject Code: FTC152M201

L-T-P-C: 3-0-0-3

#### **Course Objectives**

To understand the processing of fruits and vegetables, maturity indices and canning of fruits and vegetables

### **Course Outcomes**

On successful completion of the course the students will be able to:			
SI No.	Course Outcome	Blooms TaxonomyLevel	
CO 1	<b>Explain</b> the causes and effects of different post-harvest changes in fruits andvegetables	BT 1	
CO 2	<b>Identify</b> the processing and preservation techniques of different fruits and vegetable products (Jam, Jelly and Marmalade)	BT 2	
CO 3	<b>Apply</b> different pickling and dehydration processes in fruits and vegetables, their packaging and storage methods	BT 3	
CO 4	<b>Analyse</b> the processing flowchart for canning of fruits and vegetables	BT 4	

#### **Course Outline**

Modules	Topics (if applicable) & Course Contents	Periods
I.	<b>Fruits and Vegetables:</b> Classification of fruits and vegetables, general composition, enzymatic browning, names and sources of pigments, Dietary fibre. Post-harvest changes in fruits and vegetables – Climacteric rise, horticultural maturity, physiological maturity, physiological changes, physical changes, chemical changes, pathological changes during the storage of fruits and vegetables.	15
П.	<b>Fruits beverages:</b> Introduction, Processing of fruit juices, preservation of fruit juices, processing of squashes, cordials, nectars, concentrates and powder. Jams, jellies and marmalades: Jam: Constituents, selection of fruits, processing & technology, Jelly: Essential constituents (Role of pectin, ratio), Theory of jelly formation, Processing & technology, defects in jelly, Marmalade: Types, processing & technology, defects	15

Scheme of Evaluation(T)

Total credits: 3

Pedagogy: Lectures, Assignments, Seminars				
	TOTAL	60		
	spoilage in canning of foods.			
	canning- pressure canning and water bath canning, common causes of			
	filling, exhausting, sealing, processing, cooling and storage; types of	1 storage; types of 15		
IV	fruits and vegetables, grading, washing, peeling, cutting, blanching, cooling,	1.		
	Canning: Introduction, can manufacture, canning process - selection of			
	packing and storage methods			
	mechanical dehydration, process variation for fruits and vegetables,			
	of foods and vegetables: Sun drying &			
111.	tomato juice, tomato puree, paste, ketchup, sauce and soup. Dehydration	15		
	pickling. Tomato products: Selection of tomatoes, pulping& processing of			
	Pickles, chutneys and sauces: processing, types, causes of spoilage			

- Group Discussion
- Seminar/presentation on any of the relevant topics
- Case Studies

#### **Textbooks:**

- Manay, S. & Shadaksharaswami, M.2004. Foods: Facts and Principles, New Age Publishers
- Srivastava, R.P. and Kumar, S. 2006. Fruits and Vegetables Preservation- Principles and Practices. 3rd Ed. International Book DistributingCo

#### **Reference books:**

- Girdharilal, Siddappaa, G.S and Tandon, G.L.latest edition. Preservation of fruits & vegetables, ICAR, NewDelhi
- Ranganna S.latest edition. Handbook of analysis and quality control for fruits and vegetable products, Tata McGraw-Hill publishing company limited, Second edition.

Credit Distribution			
Theory	Practical	Experiential Learning	
60	-	30	

# Total credits: 3

#### **Course Objectives**

L-T-P-C: 0-0-6-3

Level of Course: 100

Understanding the application of various laboratory equipment's used in terms of fruits and vegetables product technology

#### **Course Outcomes**

On successful completion of the course the students will be able to:		
SI No.	Course Outcome	<b>Blooms Taxonomy Level</b>
CO 1	<b>Define</b> the manufacturing process of chutneys, sauces and fruit leather preparation	BT 1
CO 2	<b>Classify</b> the various preparation techniques of dips, spreads and mayonnaise	BT 2
CO 3	<b>Construct</b> the preparation methods on pickles, jam and jellies	BT 3
CO 4	<b>Analyse</b> the different dehydration and rehydration techniques of fruits and vegetables	BT 4

#### Course Outline

Modules	Topics (if applicable) & Course Contents	Periods
I.	<ol> <li>Osmotic drying of fruits</li> <li>Candied fruits from different sources</li> <li>Fruit leather preparation</li> <li>Preparation of chutneys and sauces</li> </ol>	25
п	<ol> <li>Preparation of mayonnaise</li> <li>Preparation of dips</li> <li>Preparation of spreads</li> <li>Preparation of salad dressings</li> </ol>	20
ш	<ol> <li>Quantity production of jam and jellies</li> <li>Quantity production of squash and RTS</li> <li>Quantity production of ketchups</li> <li>Quantity production of pickles</li> </ol>	25
IV	1.Preparation of concentrates 2.Preparation of chips	20

#### Title of Paper: Practical on Fruits and Vegetables Products Technology

Semester II

Course: Major

Subject Code: FTC152M212

Scheme of Evaluation: (P)

3. Preparation of papads and khakras	
Total	90
Pedagogy: Lectures, Experiments, Laboratory sessions	

Recommended Texts: As suggested under the theory paper

Semester II

Course: SEC 2

Scheme of Evaluation: (P)

Title of Paper: Waste and By- Product Utilization

Subject Code: FTC152S211

L-T-P-C: 0-0-6-3

Total credits: 3

**Course Objectives** 

Understanding the various waste product utilization techniques in food industries for

development of new products

#### **Course Outcomes**

On successful completion of the course the students will be able to:		
SI No.	Course Outcome	<b>Blooms Taxonomy Level</b>
	Define the different cereals waste products for product	
CO 1	development and waste utilization	<b>BT 1</b>
	Classify the different pulses waste products for product	
CO 2	development and waste utilization	<b>B</b> T 2
<b>CO 1</b>	Construct the different fruit waste products for product	
03	development and waste utilization	BT 3
	Analyse the different vegetables waste products for product	рт Л
<b>CO 4</b>	development and waste utilization	DI 4

#### Course Outline

Modules	Topics (if applicable) & Course Content	Periods
I.	1.Utilization of cereal by products for food/ product development/functional ingredients	25
II	1.Utilization of pulses by products for food/ product development/functional ingredients	20
Ш	1. Utilization of fruit by product for food/ product development/functional ingredients	25
IV	1. Utilization of vegetables by product for food/ product development/functional ingredients	20
	Total	90
	Pedagogy: Lectures, Experiments, Laboratory sessions	

Recommended Texts: As suggested under the theory paper

**Semester II** 

**Course: Minor** 

Level of Course: 100

**Title of Paper: Food Microbiology** 

Subject Code: FTC152N201

L-T-P-C: 3-0-0-3

#### **Total credits: 3**

Scheme of Evaluation: (T)

# **Course Objectives**

To train the students with various microbial growth control techniques in food preparation

#### **Course Outcomes**

On successful completion of the course the students will be able to:		
SI No.	Course Outcome	Blooms TaxonomyLevel
CO 1	Relate the scope, importance, basic techniques of microbiology	BT 1
CO 2	<b>Explain</b> the various sterilization- both physical and chemical methods	BT 2
CO 3	<b>Develop</b> the different methods for isolation and preservation of food microbes	BT 3
CO 4	Analyse the application of food microbiology and its comparison to the industrial fields of microbiology	BT 4

Modules	Topics (if applicable) & Course Contents	Periods
	History and scope of Microbiology: discovery, importance and relevance of microorganisms. Microscopy: basic techniques of Microscopy optical and	
I.	electron techniques of microscopy staining and its types.	15
II.	<b>Microorganisms in fermentation:</b> dairy and plant-based fermentation, probiotics.	15
III.	<b>Isolation and preservation</b> of pure cultures, pour plate method, streak plate spread plate and single cell isolation, microbial enzymes in food processing.	15
IV.	<b>Industrial applications</b> – microbial processes for food ingredient and enzyme production.	
	TOTAL	48
	Pedagogy: Lectures, Assignments, Seminars	

- Group Discussion
- Seminar/presentation on any of the relevant topics
- Case Studies

#### **Textbooks:**

- Microbiology (5th Ed) by M. J. Pelczar, E. C. S. Chan and Noel R. Krieg. Tata McGraw-Hill.
- Microbiology by R. P. Singh Kalyani Publishers.

#### **Reference books:**

- Fellows PJ, 2016. Food Processing Technology, Principles and Practice. Fourth Edition. Woodhead Publishing
- Sivasankar B. Latest edition. *Food Processing and Preservation*. First Edition. PHI Learning

Credit Distribution			
Theory	Practical	Experimental Learning	
60	-	30	

#### Level: Semester III

#### **Course: Major**

Scheme of Evaluation: (T)

**Title of the Paper: Food Chemistry** 

Subject Code: FTC152M301

L-T-P-C : 3-1-0-4

**Total credits: 4** 

# **Course Objectives**

Understanding the composition of different chemicals present in foods and their relation to its taste and togain basic knowledge on metabolic roles and functional aspects of food components.

#### **Course Outcomes**

On successful completion of the course the students will be able to:		
SI No	Course Outcome	Blooms Taxonomy Level
CO 1	explain the properties, the composition, structure of nutrients	BT 2
CO 2	<b>identify</b> the role of food constituents, nutrients, techniques used for estimation	BT 3
CO 3	apply the knowledge of proteins, carbohydrates, fats	BT 3
CO 4	<b>analyse</b> the structural and functional properties of lipids, fats and oil, its deficiencies and excess, role of vitamins and minerals and their recommended dietary allowances	BT 4

Modules	Topics (if applicable) & Course	Periods
	Contents	
	Food And Its Constituents: Food and Nutrients - Definition, Classification, and	
	Functions: Role of Water in Food and Human Health, Pigments, Phytonutrients,	
I.	Antioxidants, Flavour Components.	15
	Carbohydrates: Definition, Structure, Properties, Functions, Classification, Dietary	
	Sources, Chemical Reactions	
II.	Proteins: Definition, Structure, Properties, Functions, Classification, Dietary	15
	Sources, Chemical Reactions, Deficiencies and Excess, Recommended Dietary	
	Allowances, chemical reactions	

	<b>Enzymes</b> : general characteristics, enzymes in food processing, immobilization of enzymes, Enzymatic and non-enzymatic browning such as Maillard reactions			
IV	<b>Food Additives and its importance:</b> Need of food additives in food processing and preservation, Characteristics and classification of food additives, major categories of food addit.ives, functions and uses of different types of food additives			
	TOTAL	60		
Pedagogy: Lectures, Assignments, Seminars				

1. Group Discussion

2. Seminar/presentation on any of the relevant topics Case Studies

#### Texts:

- 1. Agarwal A and Udipi SA. 2014. Textbook of Human Nutrition. JaypeeBrothers Medical Publishers (P) Ltd.
- 2. Bamji MS, Krishnaswamy K, and Brahmam GNV. 2009. Textbook of Human Nutrition. ThirdEdition. Oxford and IBH Publishing Co. Pvt.Ltd.

#### **References:**

- 1. Belitz H.-D, Grosch W, and Schieberle P. 1<sup>st</sup> edition. Food Chemistry. FourthEdition. Springer.
- 2. Civille GV and Carr BT. 2016. Sensory Evaluation Techniques. Fifth Edition.CRC Press.
- 3. Rodwell VW, Bender DA, Botham KM, Kennelly PJ, Weil PA. 2015.Harper's Illustrated Biochemistry. 30th Edition. McGraw Hill Education.

Credit Distribution			
Theory	Practical	Experimental Learning	
60	-	30	

#### Level: Semester III

### Course: Major

Title of the Paper: Practical on Food Chemistry

# Subject Code: FTC152M312

#### L-T-P-C : 0-0-8-4

#### Total credits: 4

#### **Course Objectives**

To gain knowledge about proximate analysis of food samples and their manufacturing techniques

#### **Course Outcomes**

On successful completion of the course the students will be able to:		
SI No	Course Outcome	<b>Blooms Taxonomy Level</b>
CO 1	find the estimation for total protein, lipid, reducing and non-	BT 1
	reducing sugar content in food samples	
	demonstrate the ash, moisture, gluten, iodine value determination in	
CO 2	foodsamples	BT 2
CO 3	apply the techniques of dehydration and rehydration of fruits and	
	vegetables and its manufacturing practices	BT 3
<b>CO 4</b>	list preparation methods for fruits and vegetable samples (Jam,	
	jelly, ketchup, pickles)	<b>BT 4</b>

Modules	Topics (if applicable) & Course	Period
	Contents	S
	1 Estimation of Total Protein Content of Food Sample	
	2. Estimation of Total Lipid Content in Food Sample	
	3.Estimation of Total Ash	
I.	4.Estimation of Moisture Content	20
	1.Determination of vitamin c.	
	2 Estimation of Moisture Content	
II.	3.Determination of phenolic compound	25
	1.Determination of saponification value	
	2.Determination of peroxide value.	
III.	3.Determination of acid value	20

	1.Determination of titratable acidity	
IV	2. Determination of total volatile basic nitrogen (TVBN)	25
	TOTAL	90
	Pedagogy: Lectures, Experiments, Laboratory	
	sessions	

**<u>References:</u>** As suggested in the theory papers.

#### Level: Semester III

#### **Course: Minor**

#### Scheme of Evaluation: (T)

Title of the Paper: Food Ingredients and Additives

### Subject Code: FTC152N301

L-T-P-C: 3-1-0-4

#### Total credits: 4

#### **Course Objectives**

The students should be well versed with basic knowledge of the type of food, chemistry and microbiology

#### **Course Outcomes**

On successful completion of the course the students will be able to:		
SI No	Course Outcome	<b>Blooms Taxonomy Level</b>
	define properties of food and various ingredients	
CO 1		BT 1
	explain the role of food ingredients in food product	
CO 2		BT 2
	apply knowledge with the additives relevant to the processed food	
CO 3	industry for shelf-life extension, processing support and sensory	DT 2
	appeal	DIJ
	categorize the microbial, chemical and natural toxicants and	
<b>CO 4</b>	allergens indigenously present and developed during food processing	<b>BT 4</b>

Modules	Topics (if applicable) & Course Contents	Periods
Ι	Introduction to Food Ingredients: Food Additives and its importance,	15
	need of food additives in food processing and preservation,	
	Characteristics and classification of food additives, major categories of	
	food additives, functions and uses of different types of food additives	
II	Food Preservatives: Different categories of food preservatives, its	15
	properties and uses and its toxic effect, Sorbic Acid, Benzoic Acid,	
	propyl-4-hydroxybenzoate, Sulphur dioxide, Nisin, Sodium nitrate,	
	Acetic acid, Propionic Acid.	
	Sweeteners: Introduction, importance, classification-Natural and	
	artificial, toxicity and consideration for choosing sweetening agents	
III	Colours and flavours: Different types of food colours, its importance and	15
	toxicity, classification (Natural and synthetic colours), permitted and non-	
	permitted, synthetic colours	
	Flavouring agents and its importance in the food industry	
IV	Antioxidants and Emulsifiers: Antioxidants, emulsifiers, stabilizers,	15
	chelating agents, hydrocolloids, thickeners, acidulants, curing agents,	
	government rules and regulations on food additives	
	TOTAL	60
	<b>PEDAGOGY: Lectures, Assignments and Seminars</b>	

- Group Discussion
- Seminar/presentation on any of the relevant topics
- Case Studies

#### Texts:

- 1. A Larry Branen, P Michael Davidson and Seppo Salminen, Food Additives: CRC Book Press. USA.
- 2. S.N. Mahindru, Food Additives: APH Publishing Corporation, Drya Ganj, New Delhi.

#### **References:**

- 1. Food Facts and Principles -N. ShakuntalaManay& M. Shadaksharaswamy, New Age International (P) Limited, New Delhi.
- 2. Branen AL, Davidson PM & Salminen S. 2001. Food Additives. 2nd Ed.Marcel Dekker.
- 3. Gerorge AB. 2004. Fenaroli's Handbook of Flavor Ingredients. 5th Ed.CRC Press

Credit Distribution			
Theory	Practical	Experimental Learning	
60	-	30	

#### Level: Semester III

#### **Course: SEC**

#### Scheme of Evaluation: (P)

Title of the Paper: Basics techniques in bakery.

#### Subject Code: FTC152S311

#### L-T-P-C: 3-1-0-4

#### Total credits: 3

#### **Course Objectives**

Apply techniques of baking and preparing various types of bakery preparations.

Develop art of modifying, decorating bakery foods to enhance aesthetic appeal.

#### **Course Outcomes**

On successful completion of the course the students will be able to:		
SI No	Course Outcome	Blooms Taxonomy Level
CO 1	define equipment's and explain their use in bakery.	BT 1
CO 2	explain ingredients and their specifications for various baked items.	BT 2
CO 3	<b>apply</b> knowledge for basic techniques for the preparation of bakery products.	BT 3
CO 4	categorize the different varieties of cakes, brownies and muffins	BT 4

#### **Course Outline**

Modules	Topics (if applicable) & Course Contents	Periods
Ι	Introduction to Bakery, History of baking, Cookery terms, Bakery	20
	equipment, Ingredients	
II	<b>Yeast products</b> : Different methods and steps in bread making. Role of ingredients used in bread	25
III	<b>Pastry and cakes</b> : role of ingredients, basic techniques and preparation of different varieties of pastry and cakes, factors affecting qualities of pastry and cakes.	20
IV	<b>Biscuits and cookies</b> : role of ingredients, basic techniques and preparation of different varieties of biscuits and cookies, factors affecting qualities of biscuits and cookies.	25
	TOTAL	90
	PEDAGOGY: Lectures, Assignments and Seminars	

**Recommended Texts:** - As suggested under the theory papers.

#### Level: Semester IV

#### **Course: Major**

# Title of the Paper: Cereals, Pulses and Oilseeds Product Technology Subject Code: FTC152M401

# L-T-P-C: 3-1-0-4

#### **Total credits: 4**

#### **Course Objectives**

To understand the technology of milling of various cereals and processing of pulses and oilseeds. To gain knowledge on the importance and processing of protein-rich products and to introduce concepts of manufacturing alcoholic beverages

#### **Course Outcomes**

On successful completion of the course the students will be able to:		
SI No	Course Outcome	Blooms Taxonomy Level
CO 1	<b>define</b> the milling techniques for wheat, flour treatments, types of flour etc.	BT 2
CO 2	explain the processing of rice, corn, barley and other cereal crops.	BT 3
CO 3	<b>explain</b> the processing of pulses, milling procedures, and anti- nutritional factors	BT 3
CO 4	<b>apply</b> the knowledge of the processing of oilseeds (Soybean, Coconut), refining fats and oil, concepts of protein isolates, their sources, properties, and uses	BT 4

#### **Course Outline:**

Modules	Topics (if applicable) & Course Contents	Periods
I.	Wheat technology: Wheat-Types, milling, flour grade, flour treatments (bleaching,	
	maturing), flour for various purposes, Products and By- products.	15
	Rice and other cereal crop technology – Physicochemical properties, milling	
	(mechanical &solvent extraction), parboiling, rice aging, and byproducts utilization.	
II.	Corn-Milling (wet & dry), cornflakes, corn flour. Barley- Milling (pearl barley,	15
	barley flakes & flour) Oats-Milling (oatmeal, oat flour & oat flakes) Sorghum and	
	millets - Traditional & commercial milling (dry	
	&wet)	
III	Pulse technology: Processing- Soaking, Germination, Decortication, Cooking and	15
	Fermentation. Changes during germination, Milling- decortication, and splitting (dry	
	and wet milling). Antinutritional factors,	
	Factors affecting cooking time	
IV	Oilseeds technology: Sources, Composition, Processing of oil seeds	15
	- Soya bean, coconut. Hydrogenation. Refining of fats & oils, bleaching, deodorizing,	
	hydroxylation, Protein isolates, Sources of protein(defatted flour, protein concentrates,	
	and isolates), properties and uses, protein texturization, fibre spinning	
	TOTAL	60
	Pedagogy: Lectures, Assignments, Seminars	

#### Scheme of Evaluation: (T)

- Group Discussion
- Seminar/presentation on any of the relevant topics
- Case Studies

#### Texts:

1. Chakraverty. 2019. Post-Harvest Technology of Cereals, Pulses and Oilseeds, revised Ed., Oxford &IBH Publishing Co. Pvt Ltd.

2. Manay, S. and Sharaswamy, M. 2004. Food Facts and Priniciples. Wiley Eastern Limited

#### **References:**

1. Kent, N.L. 2003. Technology of Cereal, 5th Ed. Pergamon Press.

2. Marshall, Rice Science and Technology. 1st edition,. Wadsworth Ed., Marcel Dekker, New York

Credit Distribution			
Theory	Practical	Experimental Learning	
60	-	30	

#### Semester IV Course: IKS Scheme of Evaluation: (T) Title of Paper: Traditional Knowledge of Indian Foods Subject Code: FTC152M402 L-T-P-C: 2-1-0-3

# **Total credits: 3**

# **Course Objectives**

To train the students on various aspect of traditional foods of India

### **Course Outcomes**

On successful completion of the course the students will be able to:		
SI No	Course Outcome	Blooms Taxonomy Level
CO 1	relate the history and cultural aspect of Indian traditional food	BT 1
CO 2	identify the traditional food items from different regions of India	BT 2
CO 3	<b>explain</b> the food processing principles involved in the traditional Indian food preparation/processing	BT 3
CO 4	<b>learn</b> the traditional methods of preparation/processing of the Indian food items	BT 4

Modules	Topics (if applicable) & Course Contents	Periods
I.	<b>Historical and cultural perspectives:</b> Food as source of physical sustenance, food as religious and cultural symbols; Importance of food in understanding human culture - variability, diversity, from basic ingredients to food preparation; Impact of customs and traditions on food habits, heterogeneity within cultures (social groups) and specific social contexts - festive occasions, specific religious festivals, mourning etc. Kosher, Halal foods; foods for religious and other fasts.	15
П.	<b>Traditional methods of food processing:</b> Traditional methods of milling grains – rice, wheat and corn – equipment's and processes as compared to modern methods; Equipment's and processes for edible oil extraction, paneer, butter and ghee manufacture; Comparison of traditional and modern methods; Traditional methods of food preservation – sun-drying, osmotic drying, brining, pickling and smoking.	15
III.	<b>Traditional food patterns:</b> Typical breakfast, meal and snack foods of different regions of India; Popular regional foods; Regional foods that have gone Pan Indian / Global; Traditional fermented foods, , beverages, snacks, desserts and sweets, street foods;	15
IV.	<b>Traditional food of Northeast India</b> – Traditional food consumption pattern in North East India: Traditional food products of Northeast India- Cereal based- ,Fruits and Vegetable food product Milk based-, Fish and meat based food products; Probiotic food; Commercialization opportunity	15
	TOTAL Dedagogyu Leaturog Assignments Seminery	60
	reaagogy: Lectures, Assignments, Seminars	
- Group Discussion
- Seminar/presentation on any of the relevant topics
- Case Studies

#### Texts:

- 1. Taylor, S. C., 2005, Food Culture in India. Greenwood Press.
- 2. Ruth, N. D., 2001, Indian Food Science: A Health and Nutrition Guide to Traditional Recipes. East West Books.

#### **References:**

- 1. Tamang JP (2010). Himalayan fermented foods: microbiology, nutrition and ethnic value. New York: CRC Press, Taylor and Francis Group
- 2. Boon-Lung, N. (1986). Traditional Foods: Some Products and Technologies. Central Food Technological Research Institute, 114-133.

Credit Distribution		
Theory	Practical	Experimental Learning
60	-	-

**Course: Major** 

#### Scheme of Evaluation: (P)

Title of the Paper: Practical on Cereals, Pulses and Oilseeds Product and Food Microbiology

## Subject Code: FTC152M413

L-T-P-C: 0-0-8-4

**Total credits: 4** 

#### **Course Objectives**

To gain knowledge about the proximate analysis of food samples and their manufacturing techniques

### **Course Outcomes**

On successful completion of the course the students will be able to:			
SI No	Course Outcome	<b>Blooms Taxonomy Level</b>	
CO 1	<b>define</b> the basic microbiological laboratory practices and equipments with their functioning.	BT 1	
CO 2	<b>explain</b> the different staining and plating techniques used for detection of microbes in food samples, detailed study on morphological study on bacteria and fungi using permanent slides, preparation of various fermented food products and beverages	BT 2	
CO 3	develop malt from cereals and millets	BT 3	
CO 4	<b>analyse</b> the proximate and cooking characteristics of wheat and rice	BT 4	

#### **Course Outline**

Modules	Topics (if applicable) & Course Contents	Periods
	1. Introduction to the basic Microbiology laboratory Practices and	
I.	Equipment's	
	2. Functioning and use of compound microscope	
	3. Cleaning and sterilization of glassware	20
	1. Morphological study of bacteria and fungi using permanent	
II.	slides	
	2. Simple staining	25
	3. Gram staining	
	1. Physical parameters of wheat	
	2. Determination of moisture content of the given sample of	
III.	wheat flour.	20
	3. Determination of gluten percentage in wheat flour	
	4. Determination of ash content of wheat flour	
	1. Measurement of Physical parameters of rice	
IV	2. Determination of Milling quality of rice (head rice yield,	25
	broken rice yield)	
	3. Determination of cooking quality of rice (alkali test, cooking	
	time/glass slide method)	
	4. Preparation of malt from cereals	
	TOTAL	90
	Pedagogy: Lectures, Assignments, S	Seminars

**Recommended Texts-** As suggested under the theory papers

## Level: Semester IV

**Course: Minor** 

Scheme of Evaluation: (T)

**Title of the Paper: Food Product Development** 

Subject Code: FTC152N401

L-T-P-C: 0-0-8-4

Total

credits: 3

## **Course Objectives**

To gain knowledge about proximate analysis of food samples and their manufacturing techniques

## **Course Outcomes**

On successful completion of the course the students will be able to:		
SI No	Course Outcome	Blooms Taxonomy Level
CO 1	<b>define</b> the Opportunities in the marketplace for new product development, technological advances driving new product development, government's role in new product development.	BT 1
CO 2	<b>Explain</b> the scope of new product development and modification of traditional methods.	BT 2
CO 3	<b>Develop</b> the design for production and sensory evaluation.	BT 3
CO 4	<b>Analyse</b> the development of food products from commercially available ingredients.	BT 4

Module s	Topics (if applicable) & Course Contents	Periods
I.	New product development: Introduction- new products, customers and consumers, value addition, and market, marketing characteristics of new products-product life cycle and profit picture, opportunities in the marketplace for new product development technological advances driving new product development, government's role in new product development.	15
П.	<b>Designing new products:</b> New Food Product Development (NPD) process and activities; recipe development; use of traditional recipe and modification; selection of materials/ingredients for specific purposes; modifications for production on large scale, cost-effectiveness, nutritional needs or uniqueness; use of novel food ingredients and novel processing technologies	15
III.	<b>Standardization &amp; large-scale production:</b> Process design; Sensory evaluation; Food testing lab requirements, different techniques and tests; statistical quality control; • comparison of market samples	15

IV	<ul> <li>New Food product development using locally available ingredients.</li> <li>Sensory-based evaluation of the developed food products and comparison with the commercially available products (as reference products) and its analysis using novel consumer acceptance techniques such as fuzzy logic approaches.</li> </ul>		
	TOTAL	60	
	Pedagogy: Lectures, Assignments, Seminars		

- Group Discussion
- Seminar/presentation on any of the relevant topics
- Case Studies

### Texts:

1. Moskowitz, H.R., Saguy, S. and Straus, T. An Integrated Approach to New Food Product Development, CRC Press, 2006.

#### **<u>References</u>**:

1.Gordon W Fuller, "New Food Product Development: From Concept to Marketplace", 3<sup>rd</sup> Edition, CRC press, Taylor and Francis Group, UK, 2016.

 Catherine Side., "Food Product Development: Based on Experience", 2<sup>nd</sup> Edition, Iowa State Press, Blackwell publications, 2008

Credit Distribution		
Theory	Practical	Experimental Learning
60	-	30

#### Level: Semester IV

### **Course: Minor**

### Scheme of Evaluation: (T)

# Title of the Paper: Sugar Confectionery and Chocolate Processing

Subject Code: FTC152N402

#### L-T-P-C: 0-0-8-4

#### Total credits: 3

### **Course Objectives**

To acquaint students with production and processing technologies for product development and value addition of various bakery and confectionery products.

## **Course Outcomes**

On successful completion of the course the students will be able to:			
SI No	Course Outcome	Blooms Taxonomy Level	
CO 1	<b>define</b> the basic principles of bakery and introduction of the tools and equipment's with their uses	BT 1	
CO 2	<b>explain</b> . knowledge of Principles of Confectionery its manufacture. and their Role	BT 2	
CO 3	<b>develop</b> the ability to understand chemistry of dough chemistry and rheological testing	BT 3	
CO 4	<b>analyse t</b> he chocolate manufacturing, chewing gum and pan coating basics	BT 4	

Modules	Topics (if applicable) & Course Contents	Periods
	Principles of Baking Raw Material and their Role - flour, leavening agents,	
	sugars, fats, additives, spice, Types of Bakery Products and Technology for their	
	Manufacture - dough and batters; cakes, pies, pastries, bread, biscuits Icings and	
I.	Fillings.	15
	Principles of Confectionery Manufacture. Raw Material and their Role -	
	interfering agents, inversion of sugars, etc. Types of Confectionery Products and	
II.	Technology for their Manufacture. Quality Parameters of Confectionery	15
	Products. Nutrient and other Losses in Confectionery Products. Sanitation and	
	Hygiene in a Confectionery Unit. Equipment used in the Confectionery Industry.	
	Sugar- Manufacturing of sugar, types of sugar, byproducts, jaggery, honey.	
	Additional ingredients: colours, flavors, gums, pectin and gelatin, chocolate	
III.	processing. Types: imitation chocolate, milk chocolate. Crystalline and non-	15
	crystalline candies.	
	Chocolate – raw material, types, and manufacture, Ingredients of chocolate	
	sugar substitutes-sucrose, invert sugars, corn syrup, non-nutritive sweeteners,	
IV	Chewing Gum - raw material, types, and manufacture	15
	<b>Pan Coating</b> – hard and soft panning; problems in coating; glazing, polishing,	
	and tableting Nutritional Value, Quality Parameters	
	TOTAL	60
	Pedagogy: Lectures, Assignments, Seminars	

- Group Discussion
- Seminar/presentation on any of the relevant topics
- Case Studies

### Texts:

1.Samuel, A.M.(1996) "The Chemistry and Technology of Cereals as Food and Feed ", CBS Publisher & Distribution, New Delhi. Jay, James M. Modern Food Microbiology, CBS Publication, New Delhi, 2000.

2. Pomeranz, Y.(1998) "Wheat : Chemistry and Technology", Vol 1,3" Am. Assoc.Cereal Chemists. St. Paul, MN, USA.

### **References:**

- 1. Dubey SC. 2002. Basic Baking. The Society of Indian Bakers, New Delhi
- Pomeranz, Y. (1993) "Advances in Cereal Science and Technology", Am. AssocCereal Chemists St.Paul, MN, USA

Credit Distribution		
Theory	Practical	Experimental Learning
60	-	30

Level: Semester V

Course: Major

Level of Course: 300

Title of the Paper: Dairy Technology

Subject Code: FTC152M501

L-T-P-C: 4-0-0-4

#### **Course Objectives**

To acquaint students with production and processing technologies for product development and value addition of various dairy based products.

#### **Course Outcomes**

On successful completion of the course the students will be able to:		
Sl No.	Course Outcome	<b>Blooms Taxonomy Level</b>
CO 1	<b>Define</b> the basic composition of milk, physical and chemical properties and various grades of milk.	BT 1
CO 2	<b>Explain</b> the processing techniques of marketed milk, pasteurization methods of milk.	BT 2
CO 3	<b>Develop</b> the ability to understand various types of milk and their properties.	BT 3
<b>CO 4</b>	Analyse the manufacturing methods of fermented and indigenous milk products.	BT 4

**Course Outline** 

Modules	Topics (if applicable) & Course Contents	Periods
Ι	<b>Introduction:</b> Definition, sources, and composition of milk; Factors effecting composition of milk; Physiochemical properties of milk; Grading of milk: definition and types of grades; Collection and transportation of milk.	15
II	<b>Processing of market milk:</b> Flowchart of milk processing; Different types of cooling systems; Clarification and filtration process; Standardization: Pearson's square method; Pasteurization: LTLT, HTST and UHT; Sterilisation and homogenisation; Cream separation: centrifugal cream separator; Bactofugation.	15
ш	<b>Special Milk:</b> Skim milk; Evaporated milk; Condensed milk; Standardized milk; Toned milk; Double toned milk; Flavoured milk; Reconstituted milk; Spray drying system: dried milk, whole milk and skim milk powder; Instantization of milk.	15
IV	<b>Indigenous and fermented milk products:</b> Methods for manufacture: butter; cheese; ice cream; khoa; channa; paneer; shrikhand; ghee.	15
	Total	60
	Pedagogy: Lectures, Assignments, Seminars	

Scheme of Evaluation: T

Total credits: 4

- Group discussion
- Seminar/presentation on any of the relevant topics
- Case studies

### Textbooks

- Dairy Technology: Principles of Milk Properties and Processing, P. Walstra, T.J. Geurts, A. Noomen, and J.S. Van Boekel, Marcel Dekker, Illustrated Edition, 1999.
- Outlines of Dairy Technology, Sukumar De, Oxford University Press, 3rd Edition, 2006.
- Food Engineering and Dairy Technology, HG Kessler, Verlag- A Kessler publication, 1981.

- Dairy Processing and Quality Assurance, Chandan RC, Kilara A and Shah NP, Blackwell Publishing, 2008.
- Milk Processing and Quality Management, Tamime AY, Blackwell Publishing, 2009.

Credit Distribution		
Theory	Practical	Experimental Learning
60	-	30

Level: Semester V

**Course: Major** 

Level of Course: 300

Title of the Paper: Animal Product Technology

Subject Code: FTC152M502

L-T-P-C: 4-0-0-4

#### **Course Objectives**

To acquaint students with production and processing technologies for product development and value addition of various animal and egg products.

#### **Course Outcomes**

On successful completion of the course the students will be able to:		
Sl No.	Course Outcome	<b>Blooms Taxonomy Level</b>
CO 1	<b>Define</b> the basic composition and classification of poultry meat.	BT 1
CO 2	<b>Explain</b> the slaughtering methods of various categories of animals.	BT 2
CO 3	<b>Develop</b> the ability to understand the classification of various grades of animals	BT 3
CO 4	<b>Analyse</b> the processing methods of eggs and egg products.	BT 4

### **Course Outline**

Modules	Topics (if applicable) & Course Contents	Periods
I	<b>Introduction:</b> Classification, composition and nutritional value of poultry meat; Effects of feed, breed and stress on production of meat and their quality; Meat quality: colour, flavor, texture, water holding capacity, emulsification capacity.	15
п	<b>Slaughtering of animals:</b> Buffalo, sheep/goat, poultry, pig; Antemortem and post-mortem examination of meat; Post-mortem changes of meat; Grading; Importance of by-products: utilization, classification and uses; Refrigeration and freezing; Thermal processing: canning, retort pouch, dehydration, irradiation, meat curing; Sausages: processing, types and defects; Packaging of meat.	15
ш	<b>Freshwater and marine fish:</b> Composition, storage and transport; Preservation: drying, smoking, curing, freezing, salting and canning; Surimi: introduction, surimi process, comparison of surimi and fish mince products; Fish protein concentrates; Fish protein extracts; Fish protein hydrolysis; Flowchart of indigenous products: fish sauce and paste.	15

Scheme of Evaluation: T

**Total credits: 4** 

IV	<b>Eggs:</b> Structure, composition and nutritional value; Factors affecting egg quality and measures of egg quality; Egg processing and manufacturing of egg powder; Egg coatings; Processing of lecithin.	15
	Total	60
	Pedagogy: Lectures, Assignments, Seminars	

- Group discussion
- Seminar/presentation on any of the relevant topics
- Case studies

### Textbooks

- Stadelman, W. J., Newkirk, D., & Newby, L., Egg Science and Technology. 4th ed. New Delhi: CBS Publication, 2002.
- Pearson, A. M., & Gillett, T. A., Processed Meats. 3rd ed. New Delhi, CBS Publication, 1997.
- Sen, D.P., Advances in Fish Processing Technology. Allied Publishers Pvt.Limited, 2005.

- Shai, Barbut., Poultry Products Processing. CRC Press, 2005.
- Parkhurst, C., & Mountney, G. J., Poultry Meat and Egg Production. New Delhi: CBS Publishers, 2004.

Credit Distribution		
Theory	Practical	Experimental Learning
60	-	30

Level: Semester V

Course: MajorScheme of Evaluation: PLevel of Course: 300Title of the Paper: Practical VSubject Code: FTC152M513L-T-P-C: 0-0-8-4Total credits: 4

#### **Course Objectives**

To acquaint students with production and processing technologies for product development and value addition of various milk, animal and egg products.

#### **Course Outcomes**

On successful completion of the course the students will be able to:		
Sl No.	Course Outcome	Blooms Taxonomy Level
CO 1	<b>Define</b> the basic laboratory equipment's and their handling practices.	BT 1
CO 2	<b>Explain</b> the methods for estimation of moisture and protein content in milk and meat.	BT 2
CO 3	<b>Develop</b> the methods to study the shelf life of eggs and evaluate the quality of eggs.	BT 3
CO 4	Analyse evaluation methods for various fish categories.	BT 4

Modules	Topics (if applicable) & Course Contents	Periods	
	Introduction to glassware and equipment		
т	Quality analysis of milk	20	
1	Milk processing techniques	20	
	Milk product formulations		
	Quality evaluation of meat		
п	Cut out analysis of canned meats/retort pouches	25	
11	Meat product formulations	25	
	Analysis of frozen meat/meat emulsion products		
ш	Quality evaluation of fish/prawn		
	Cut out examination of canned fish. (Sardine, Mackerel, Tuna)	20	
	Analysis of frozen meat/meat emulsion products	20	
	Fish product formulations		

IV	To study shelf-life of eggs by different methods of preservation. Evaluation of eggs for quality parameters (market eggs, branded eggs) To perform freezing of yolk/albumen Egg product formulations	25
	Total	90
	Pedagogy: Lectures, Assignments, Seminars	

**Recommended Text:** As suggested under the theory papers.

#### Level: Semester V

### **Course: Minor**

Scheme of Evaluation: T

Level of Course: 200

## Title of the Paper: Basic of Food Processing and Preservation

Subject Code: FTC152N501

L-T-P-C: 4-0-0-4

### Total credits: 4

## **Course Objectives**

To acquaint students with contaminants and toxins associated with food processing.

### **Course Outcomes**

On successful completion of the course the students will be able to:		
Sl No.	Course Outcome	<b>Blooms Taxonomy Level</b>
CO 1	<b>Define</b> the basic terms of food toxicology and classifications.	BT 1
CO 2	<b>Explain</b> the concepts of carcinogenesis, mutagenesis, teratogenesis.	BT 2
CO 3	<b>Develop</b> the knowledge to identify the naturally occurring toxicants and food contaminants.	BT 3
CO 4	Analyse the different types of food additives as toxicants.	<b>BT 4</b>

Modules	Topics (if applicable) & Course Contents	
I	<b>Introduction:</b> Principles of Food Preservation; Water Activity and its significance in food preservation; Overview of the Traditional Methods of Food Preservation; Natural and Chemical Food Preservatives.	15
II	<b>Preservation:</b> Blanching; Pasteurization; Sterilization; Canning; Extrusion Cooking; Baking; Roasting; Grilling; Dehydration; Concentration; Evaporation; Refrigeration; Freezing; Intermediate Moisture Foods.	15
Ш	<b>Food processing:</b> Definition and Difference between food processing and food preservation; Functions; Benefits and Drawbacks of Food Processing; Primary Processing Techniques: Novel Food Processing.	
IV	<b>Performance parameters for food processing:</b> Hygiene, Energy efficiency, Minimization of waste, labour; Overview of the types of food processing industries; Shelf life, Perishable foods, Semi perishable foods, Shelf stable foods.	
	Total	60
	Pedagogy: Lectures, Assignments, Seminars	

- Group discussion
- Seminar/presentation on any of the relevant topics
- Case studies

### Textbooks

- Potter NH., Food Science, 5<sup>th</sup> edition, CBS Publication, New Delhi, 2009.
- Manay NS and Shadaksharaswamy M, Food-Facts and Principles, New Age International (P) Ltd. Publishers, New Delhi, 2014.
- Fellows PJ. 2016. Food Processing Technology Principles and Practice. Fourth Edition. Woodhead Publishing, 2016.

- Sivasankar B. Food Processing and Preservation. First Edition. PHI Learning, 2000.
- Ramsaswamy H and Marcotte M, Food Processing Principles and Applications CRC Press, 2002.

Credit Distribution		
Theory	Practical	Experimental Learning
60	-	30

#### Level: Semester V

### Course: SEC 4

Scheme of Evaluation: P

### Title of the Paper: Sugar Confectionary and Chocolate Processing

Subject Code: FTC152S511

L-T-P-C: 0-0-6-3

Total credits: 3

## **Course Objectives**

To acquaint students with production and processing technologies for product development and value addition of sugar confectionary and chocolate processing.

### **Course Outcomes**

On successful completion of the course the students will be able to:		
SI No.	Course Outcome	<b>Blooms Taxonomy Level</b>
CO 1	<b>Define</b> the basic laboratory equipment's and their handling practices.	BT 1
CO 2	<b>Explain</b> the methods for quality analysis of sugar and chocolate products.	BT 2
CO 3	<b>Develop</b> the methods to study the shelf life of sugar and chocolate products.	BT 3
CO 4	<b>Analyse</b> methods for various of sugar and chocolate products formulations.	BT 4

Modules	Topics (if applicable) & Course Contents	Periods
	Introduction to glassware and equipment	
Ι	Soft candy formulation	20
	Jellies, gummies, licorices	
	Caramel, fudge, toffee	
п	Aerated confections	25
	Fondant formulation	43
	Sugar and sugar free panned confections	
	Chewing gum	
111	Chocolate tempering	20
111	Chocolate coatings	
	Chocolate panning	
	Fat estimation in chocolate	
IN/	Moisture estimation in chocolate	25
11	Chocolate tasting	
	Chocolate bars	
	Total	90
	Pedagogy: Lectures, Assignments, Seminars	

#### Level: Semester VI

## Course: Major

Level of Course: 300

Title of the Paper: Unit Operation in Food Processing

Subject Code: FTC152M601

L-T-P-C: 4-0-0-4

#### **Course Objectives**

To acquaint students with knowledge of types of operation techniques used in the food processing industry.

#### **Course Outcomes**

	On successful completion of the course the students will be able to:		
Sl No.	Course Outcome	<b>Blooms Taxonomy Level</b>	
CO 1	<b>Define</b> the types of operations and their principle.	BT 1	
CO 2	<b>Explain</b> the types of separators and their operations.	BT 2	
CO 3	<b>Develop</b> the knowledge to identify the size reduction methods.	BT 3	
CO 4	Analyse the different techniques of drying.	BT 4	

### **Course Outline**

Modules	Topics (if applicable) & Course Contents	Periods
I	<b>Screening:</b> Types of screens: grizzly, revolving screen, shaking screen, rotary screen, vibratory screen, horizontal screen, perforated metal screens, wire mesh screen; Ideal and Actual screen; Effectiveness of screen; Air screen cleaners.	15
II	<b>Separation:</b> Types of Separators: disk, indented cylinder, spiral, specific gravity, destoner, inclined draper, velvet roll, pneumatic and aspirator; Separation-based fluidization technique; Magnetic and cyclone separator.	15
ш	<b>Size reduction procedures:</b> Crushing; Impact; Shearing; Cutting; Cereal grinding; Degree of grinding; Size reduction machinery: crusher, grinder, attrition mills, hammer mill, ball mills, rietz mill; Oil expression and extractions: hydraulic press, screw press.	15
IV	<b>Utilities of drying:</b> Thermal properties: equilibrium moisture content, drying theories, drying rate period; Methods of drying: contact drying, convective drying, freeze drying, radiation drying, superheated steam; Types of dryers:	15

Scheme of Evaluation: T

**Total credits: 4** 

deep bed, flat bed, continuous, recirculating, fluidized bed, rotary, tray, tunnel and solar.	
Total	60
Pedagogy: Lectures, Assignments, Seminars	

- Group discussion
- Seminar/presentation on any of the relevant topics
- Case studies

### Textbooks

- Sahay K.M & Singh K.K., Unit Operation of Agricultural Processing. Vikash Publication House, 1994.
- Potter NN & Hochkiss, Food Science 5th Ed. CBS, 1994.
- Earle, R. L. Unit Operations in Food Processing, Elsevier. 2013.

- Fellows, P. J. Food Processing Technology: Principles and Practice. Woodhead publishing, 2022.
- Saravacos, G. D., & Maroulis, Z. B. Food Process Engineering Operations. CRC Press, 2011.

Credit Distribution			
Theory	Practical	Experimental Learning	
60	-	30	

Level: Semester VI

## Course: Major

Level of Course: 300

Title of the Paper: Food Packaging Technology

Subject Code: FTC152M602

L-T-P-C: 4-0-0-4

## **Course Objectives**

To provide knowledge about trends and development in food packaging technologies and materials.

#### **Course Outcomes**

On successful completion of the course the students will be able to:		
Sl No.	Course Outcome	<b>Blooms Taxonomy Level</b>
CO 1	<b>Define</b> the functions and basic types of packaging materials.	BT 1
CO 2	Explain the deteriorative reactions and shelf life of food.	BT 2
CO 3	<b>Develop</b> the knowledge of packaging materials and their functions.	BT 3
CO 4	<b>Analyse</b> the different types of special packaging materials.	BT 4

### **Course Outline**

Modules	Topics (if applicable) & Course Contents	Periods
Ι	<b>Introduction to packaging:</b> Definition; Functions of packaging: containment, protection, preservation, promotion, convenience, communication; Requirements of effective package; Types of food packaging: primary, secondary and tertiary packaging.	15
п	<b>Shelf Life of Food:</b> Introduction; Deteriorative reactions in food: factors affecting deterioration of foods; physical changes; biological changes; chemical changes. Intrinsic and extrinsic factors controlling the rate of reactions; Shelf-life determination tests.	15
Ш	<b>Packaging materials:</b> Rigid containers: glass, wooden boxes, metal cans; Semi rigid containers: paperboard cartons; Flexible packaging: paper, plastic pouches, low density polyethylene, high density polyethylene and polypropylene.	15
IV	<b>Special Packaging:</b> Aseptic packaging; Active packaging; Intelligent packaging; Modified atmospheric packaging; Controlled atmospheric packaging; Shrink packaging; Stretch packaging; Biodegradable packaging; Edible packaging; Tetra packs.	15
	Total	60
	Pedagogy: Lectures, Assignments, Seminars	

Scheme of Evaluation: T

Total credits: 4

- Group discussion
- Seminar/presentation on any of the relevant topics
- Case studies

### Textbooks

- Robertson GL, Food Packaging Principles and Practice, CRC Press Taylor and Francis Group, 2012.
- Paine FA and Paine HY, A Handbook of Food Packaging, Blackie Academic and 46 Professional, 1992.
- Coles R, McDowell D, Kirwan MJ Food Packaging Technology. Blackwell, 2003.

- Richard C, Derek M, Mark J.K, Food Packaging Technology CRC Press, 2003.
- Sacharwo S and Griffin RC, Principles of Food Packaging AVI Publication, 2013.

Credit Distribution			
Theory	Practical	Experimental Learning	
60	-	30	

#### Level: Semester VI

### **Course: Major**

Level of Course: 300

### Title of the Paper: Food Safety and Quality Management

Subject Code: FTC152M603

L-T-P-C: 4-0-0-4

### Total credits: 4

Scheme of Evaluation: T

## **Course Objectives**

To understand the role of various safety measures to be taken in food industries.

### **Course Outcomes**

On successful completion of the course the students will be able to:		
SI No.	Course Outcome	<b>Blooms Taxonomy Level</b>
CO 1	<b>Define</b> the types of hazards and factors affecting food safety.	BT 1
CO 2	Explain the different types of food borne pathogens.	BT 2
CO 3	<b>Develop</b> the knowledge for food certification and prerequisites.	BT 3
<b>CO 4</b>	Analyse the quality concepts and quality attributes.	BT 4

#### **Course Outline**

Modules	Topics (if applicable) & Course Contents	Periods
Ι	<b>Definition of food safety:</b> Types and examples of hazards: biological, chemical, physical hazards; Factors affecting food safety; Importance of safe foods; Impact of food safety on health; Control measures; Accreditation and auditing.	15
п	<b>Hazards of origin:</b> Biological: Indicator organisms; Food borne pathogens; Sea food and shellfish poisoning; Methods to detect adulterant of various foods; Basic steps in detection of food borne pathogens; Water analysis; Chemical hazards; Physical Hazards.	15
ш	<b>Tools of food safety management:</b> Food certification; Prerequisites: GHPs, GMPs, SSOPs, HACCP, ISO series; TQM; Codex Alimentarius; Kaizen; Risk Analysis; Objective of food laws; Major food laws and regulations of India; Regulation of food sanitation; FSSAI.	15
IV	<b>Food quality management:</b> Quality concepts; Quality perception; Quality attributes; Safety; Health; Sensory; Shelf life, Convenience, Extrinsic attributes, Factors affecting food behaviours and quality; Halal; Kosher.	15
	Total Podegogy: Loctures Assignments Sominers	60
	i cuagogy. Lectures, Assignments, Semmars	

#### **Experiential Learning**

- Group discussion
- Seminar/presentation on any of the relevant topics
- Case studies

#### Textbooks

- Pieternel A, Luning, Willem J. Marcelis, Food Quality Management Technological and Managerial principles and practices, Wageningen, 2009.
- Lawley, R., Curtis L. and Davis, J. The Food Safety Hazard Guidebook, RSC publishing, 2004
- Khan, M. S., & Rahman, M. S., Techniques to Measure Food Safety and Quality. Springer International Publishing, 2021.

- Early, R. Guide to Quality Management Systems for the Food Industry. Springer Science & Business Media, 2012.
- Lelieveld, H. L., & Motarjemi, Y. (Eds.). Food Safety Management: A Practical Guide for the Food Industry. Academic Press, 2013.

Credit Distribution			
Theory	Practical	Experimental Learning	
60	-	30	

Level: Semester VI

**Course: Major** 

Level of Course: 300

Title of the Paper: Practical VI

Subject Code: FTC152M614

L-T-P-C: 0-0-8-4

## **Course Objectives**

To understand practical knowledge about food packaging and unit operations skills.

#### **Course Outcomes**

On successful completion of the course the students will be able to:		
Sl No.	Course Outcome	<b>Blooms Taxonomy Level</b>
CO 1	<b>Define</b> the identification methods for testing of food packaging materials.	BT 1
CO 2	<b>Explain</b> the characteristics of different packaging materials and unit operations.	BT 2
CO 3	Develop competence in process management technique.	BT 3
CO 4	<b>Analyse</b> processing techniques to ensure food safety and quality.	BT 4

#### **Course Outline**

Modules	Topics (if applicable) & Course Contents	Periods
Ι	Identification of different types of packaging and packaging materials. Determination of tearing strength of paper. Determination of drop test of food package. Determination of water vapor permeability of packaging material.	20
П	Determination of cooking properties of parboiled and raw rice. Experiment on osmotic dehydration of foods. Determination of rehydration ratio of dehydrated foods. Study of separation of cream.	25
III	Test food samples for microbial contaminants Measure quality parameters of packaged foods under different storage conditions over time. Evaluate cleaning methods on food contact surfaces through microbial load assessments. Evaluation of food packaging materials.	20
IV	Analysis of food packaging labels for regulatory compliance and nutritional information. Conduction of mock food safety audits to assess compliance with safety standards.	25

Scheme of Evaluation: P

Total credits: 4

Scheme for the detection of food borne pathogens. Preparation of plans for implementation of FSMS - HACCP, ISO: 22000.	
Total	90
Pedagogy: Lectures, Assignments, Seminars	

**Recommended Text:** As suggested under the theory papers.

Level: Semester VI

### **Course: Minor**

Level of Course: 200

Title of the Paper: Extrusion Technology

Subject Code: FTC152N601

L-T-P-C: 4-0-0-4

## **Course Objectives**

To understand the role of extrusion processes taken in food industries.

#### **Course Outcomes**

On successful completion of the course the students will be able to:		
Sl No.	Course Outcome	<b>Blooms Taxonomy Level</b>
CO 1	<b>Define</b> the extrusion process and its principles.	BT 1
CO 2	<b>Explain</b> the different types of extrusion equipment.	BT 2
CO 3	<b>Develop</b> the knowledge for food extrusion and its prerequisites.	BT 3
CO 4	Analyse the principles and importance of extrusion technology.	BT 4

#### **Course Outline**

Modules	Topics (if applicable) & Course Contents	Periods
Ι	<b>Introduction:</b> Principles of extrusion cooking; Methods of extrusion cooking; Types of extruders: single screw, twin screw, applications, construction and operational characteristics; Model and strategies for computer control of twin screw extruder.	15
II	<b>Design:</b> Aspect of extruder; Extruder components; extrusion models; extrusion measurement and experiments.	15
ш	<b>Food products:</b> Effect of dependent and independent variables on the product; Extruded products: raw materials, process of manufacture, quality, evaluation, packaging; Properties: chemical changes, sensory, rheology, texture; Nutritional value.	15
IV	<b>Application:</b> Cold extrusion; Extrusion cooking; New extrusion technology for confectionary; Ready to eat breakfast cereals; Cereals products: vermicelli, spaghetti, pasta, macaroni; Texturized vegetable protein; Other extruded food products.	15
	Total	60
	Pedagogy: Lectures, Assignments, Seminars	

Scheme of Evaluation: T

Total credits: 4

- Group discussion
- Seminar/presentation on any of the relevant topics
- Case studies

### Textbooks

- Matza. S., Extruded Foods, Springer, 2000.
- Frame, N.D., Technology of Extrusion Cooking, Springer, 2012.
- Riaz, M. N., Extruders in Food Applications, CRC Press, 2000.

- Maskan and Altan, Advances in Food Extrusion Technology, CRC Press, 2012.
- Harper, J.M., Extrusion of Foods, CRC Press, 1981.

Credit Distribution			
Theory	Practical	Experimental Learning	
60	-	30	

#### Level: Semester VII

**Course: Major** 

Level of Course: 400

Title of the Paper: Plant hygiene and sanitation

Subject Code: FTC152M70

L-T-P-C: 3-1-0-4

Total credits: 4

Scheme of Evaluation: T

## **Course Objectives**

Understanding the importance and process of sanitation in food processing facilities and learning of the sanitary processes and practices for production of safe and quality food products.

### **Course Outcomes**

On successful completion of the course the students will be able to:		
SI No.	Course Outcome	<b>Blooms Taxonomy Level</b>
CO 1	<b>Explain</b> the importance of sanitation in food processing facilities.	BT 1
CO 2	<b>Identify</b> different contaminants of potential hazards in the food processing plants and equipment	BT 2
CO 3	<b>Apply</b> the knowledge of hygienic design principles to avoid contaminants	BT 3
CO 4	<b>Analyse</b> the food processing plants and methods to employ appropriate sanitation protocol and practices	BT 4

Modules	Topics (if applicable) & Course Contents	Periods	
I	<b>Introduction to Food Plant Sanitation</b> : Definitions and importance of sanitation, Regulatory standards, Key terminologies (Clean, sanitize, disinfect), Microbial Contamination in Food Processing, Types of contaminants, Common foodborne pathogens, Sources of contamination, Types of soil contaminants- Organic, inorganic soils, Biofilms, Understanding allergens and cross-contamination, Cleaning and Sanitation Methods, Detergents and cleaning agents, Sanitizers, Physical methods.	15	
Ш	<b>Hygienic Layout and equipment design</b> : Hygienic Design Principles: Layout considerations for sanitation, separation of clean and unclean areas, and hygienic design of walls, floors, ceilings, and drains, Sanitation in Equipment Design: Materials of construction (stainless steel, plastics), clean- in-place (CIP) systems, and proper equipment maintenance, Water and Waste Management: Water quality standards, waste management practices, and environmental impacts.	15	
ш	<b>Sanitation Protocols and Practices:</b> Standard Operating Procedures (SOPs), Development, implementation, and monitoring of SOPs for cleaning and sanitation, Employee Hygiene, Personal hygiene practices, training, and compliance, Cleaning and Sanitizing Techniques: Proper use of cleaning agents, allergen control, and verification of sanitation.	15	
IV	New methods of sanitation and safety standards: new cleaning technologies (e.g., UV light, ozone), Simple automation in sanitation: CIP	15	

and basic robotics, Sustainability in sanitation: Reducing chemical use and water consumption, GHP- personal and plant, Food Safety Audits: Types of audits (internal, external), audit procedures, and corrective actions, Certification Standards: ISO 22000, FSSC 22000, and SQF certification requirements	
Total	60
Pedagogy: Lectures, Assignments, Seminars	

- Group discussion
- Seminar/presentation on any of the relevant topics
- Case studies

#### Textbooks

- Roday, S. 1998. Food Hygiene and Sanitation, Tata McGraw-Hill Education.
- Principles of Food Sanitation, 4th ed., Norman G. Marriott, 1999
- Heldman, D. R. latest edition. Food Process Engineering: AVI Publications.

- Sanitation in Food Processing, John A. Troller, 1993. Academic Press
- Food safety management: A practical guide for the food industry. Lelieveld, H. L., & Motarjemi, Y. 2013. Academic Press.

Credit Distribution			
Theory	Practical	Experimental Learning	
60	-	30	

#### Level: Semester VII

**Course: Major** 

Level of Course: 400

Title of the Paper: Concepts of Food Engineering

Subject Code: FTC152M702

L-T-P-C: 3-1-0-4

**Total credits: 4** 

Scheme of Evaluation: T

### **Course Objectives**

To acquaint students with the fundamentals of food engineering and its process and to understand the basics of designing food plants and systems

## **Course Outcomes**

On successful completion of the course the students will be able to:		
Sl No.	Course Outcome	Blooms Taxonomy Level
CO 1	Understand the basic laws of engineering.	BT 1
CO 2	Explain heat, mass and momentum transfer	BT 2
CO 3	Apply transport phenomenon in food processing operations	BT 3
<b>CO 4</b>	Solve problems related to transport phenomenon	BT 4

### **Course Outline**

Modules	Topics (if applicable) & Course Contents	Periods
Ι	<b>Physical properties of Foods</b> : Methods of Estimation of Shape-Roundness, sphericity, roundness ratio, size, volume- platform scale method, density, specific gravity-apparatus, porosity and surface area	15
п	<b>Thermal Properties of Foods</b> : Definitions-Specific heat, enthalpy, conductivity and diffusivity, surface heat transfer coefficient. Measurement of thermal properties like specific heat, thermal conductivity and thermal diffusivity	15
ш	Aerodynamic properties and Frictional properties of Foods: Aerodynamic Property- definition- drag coefficient, terminal velocity- application in handling and separation of food materials. Frictional property- coefficient of friction, angle of repose, angle of internal friction, application in food handling and storage	15
IV	<b>Rheology and texture of Foods</b> : Rheology-Rheological classification- viscoelasticity-viscometers, Hookean Body, St Venant body and Newtonian Body. Texture of foods-Methods of textural evaluation, Subjective and objective Method-texture profile method	15
	Total	60
	Pedagogy: Lectures, Assignments, Seminars	

## **Experiential Learning**

- Group discussion
- Seminar/presentation on any of the relevant topics
- Case studies

#### Textbooks

- Rao, M. A., Rizvi, S. S. H. and Datta A.K. latest edition. Engineering Properties of Foods: CRC Press.
- Heldman, D. R. latest edition. Food Process Engineering: AVI Publications.
- Toledo, R. T. latest edition. Fundamentals of Food Process Engineering (2 ed.): CBS Publications, New Delhi.

- Warren McCabe, Julian Smith, Peter Harriott. Unit Operations of Chemical Engineering. 7th Edition. McGraw Hill.
- R. Paul Singh, Dennis R. Heldman, and Ferruh Erdogdu. Introduction to Food Engineering.Latest Edition. Elsevier Science.

Credit Distribution			
Theory	Practical	Experimental Learning	
60	-	30	

64

## Level: Semester VII

**Course: Major** 

Level of Course: 400

## Title of the Paper: Fermentation Technology

Subject Code: FTC152M703

L-T-P-C: 3-1-0-4

### **Course Objectives**

Understanding food processing through fermentation, including microbial biochemistry, fermentation techniques, equipment used, and production methods for various fermented foods**Course Outcomes** 

On successful completion of the course the students will be able to:			
SI No.	Course Outcome	<b>Blooms Taxonomy Level</b>	
CO 1	<b>Explain</b> the fundamental principles of fermentation, including the role of microorganisms as starter culture and food material as a substrate	BT 1	
CO 2	<b>Identify</b> the role of different microorganism, food materials and environmental conditions in producing fermented food products	BT 2	
CO 3	<b>Apply</b> the principle of microbiology and food processing to understand the production of various types fermented food products	BT 3	
CO 4	<b>Analyse</b> the starter cultures, raw materials, processing parameters to ensure the safe production of high-quality fermented food products	BT 4	

### **Course Outline**

Modules	Topics (if applicable) & Course Contents	Periods
Ι	<b>Introduction to fermentation:</b> History of fermented foods, traditional and modern fermented foods, properties of fermented foods, Micro-organisms in fermented foods (Lactic acid bacteria, Acetobacter, Gluconobacter, Yeast and Molds etc.), Biochemical pathways of metabolic reactions for utilization of carbon sources and formation of different metabolites by microorganisms.	15
п	<b>Types of fermentation</b> : Different types of fermentation process, Starter cultures (bacterial starter culture, yeast starter culture and fungal starter culture), Media formulation, fermenters and other equipment used during fermentation.	15
ш	<b>Fermentation Processes of food products</b> : Preparation of Fermented Dairy Products (Yogurt and Shrikhand), Traditional Indian Fermented Foods (Idli, Dosa, Dhokla), Cheese Production Processes;	15
IV	<b>Fermentation Processes and Product Quality Control</b> : Alcoholic Beverages (Wines, Whiskies, Beers, Rum) production process. Monitoring Fermentation Parameters (pH, Temperature, Time), Quality Assurance Techniques for Fermented Products	15
	Total	60
	Pedagogy: Lectures, Assignments, Seminars	

**Total credits: 4** 

Scheme of Evaluation: T

- Group discussion
- Seminar/presentation on any of the relevant topics
- Case studies

### Textbooks

- Hutkins, R. W. (2018). Microbiology and Technology of Fermented Foods.
- Mansi EMTEL, Bryce CFA. Fermentation Microbiology and Biotechnology, 2nd Edition, Taylor & Francis Ltd, UK, 2007
- Ray, B., & Joshi, V. K. (2014). Fermented Foods: Part I-Biochemistry and Microbiology. Reference Books
  - Hutkins, R. W. (2018). Microbiology and Technology of Fermented Foods.
  - Mansi EMTEL, Bryce CFA. Fermentation Microbiology and Biotechnology, 2nd Edition, Taylor & Francis Ltd, UK, 2007

Credit Distribution			
Theory	Practical	Experimental Learning	
60	-	30	

Level: Semester VII

**Course: Major** 

Level of Course: 400

**Title of the Paper: Practical VII** 

Subject Code: FTC152M714

L-T-P-C: 0-0-8-4

Total credits: 4

Scheme of Evaluation: P

### **Course Objectives**

Understanding of food plant sanitation, traditional food processing, and fermentation techniques and applying hygiene practices, conducting microbial analyses, and ensuring quality control in food production

### **Course Outcomes**

On successful completion of the course the students will be able to:			
SI No.	Course Outcome	<b>Blooms Taxonomy Level</b>	
CO 1	<b>Define</b> key concepts related to food plant sanitation, traditional food processing, and fermentation technologies, including hygiene and safety standards	BT 1	
CO 2	<b>Classify</b> various traditional food products and fermentation methods based on their preparation techniques, ingredients, and regional variations	BT 2	
CO 3	<b>Construct</b> practical solutions for enhancing food safety and quality during the production of traditional and fermented foods	BT 3	
CO 4	<b>Analyse</b> the impact of processing techniques on the microbial quality, safety, and nutritional value of traditional and fermented food products	BT 4	

Modules	Topics (if applicable) & Course Contents	Periods
I	Introduction to basic laboratory facilities-tools and appliances Introduction to basic food processing layout design Cleaning and maintenance of the food processing equipment	20
П	Assessment of microbial load by swab tests on different food plant surfaces and following standard plating methods Determination of the effectiveness of different sanitizers (chlorine, quaternary ammonium, hydrogen peroxide) on microbial load reduction on equipment surfaces Analysis of water used in food processing for chlorine content Identification of biofilm formation on food plant surfaces and testing the effectiveness of cleaning agents in removing biofilms	25
Ш	Measurement of roundness, sphericity, bulk density, angle of repose, viscosity measurement using viscometer	20
IV	Implementation of hygienic protocols during the preparation of fermented foods and assess the reduction in microbial contamination Shelf-life analysis on traditionally processed and fermented foods under controlled and open environments.	25

Preparation of a starter culture for alcoholic beverage production Preparation of acetic acid (vinegar) by fermentation of fruit juice	
Total	90
Pedagogy: Lectures, Assignments, Seminars	

Recommended Text: As suggested under the theory papers

**Course: Minor** 

Level of Course: 300

Title of the Paper: Food Business Management

Subject Code: FTC152N701

L-T-P-C: 3-1-0-4

### **Course Objectives**

Understanding of the fundamental principles and practices necessary for effectively managing and operating food businesses, with an emphasis on marketing, operations, finance, and entrepreneurship within the food industry

### **Course Outcomes**

On successful completion of the course the students will be able to:			
Sl No.	Course Outcome	<b>Blooms Taxonomy Level</b>	
CO 1	<b>Explain</b> the key concepts and principles of food business management, including operational, marketing, and financial strategies	BT 1	
CO 2	<b>Identify</b> the various sectors within the food industry and the specific challenges and opportunities each sector presents for business management	BT 2	
CO 3	<b>Apply</b> effective marketing and operational strategies to real-world food business scenarios to enhance performance and customer satisfaction.	BT 3	
CO 4	<b>Analyse</b> financial statements and performance metrics to assess the viability and profitability of food business ventures	BT 4	

## **Course Outline**

Modules	Topics (if applicable) & Course Contents	Periods
Ι	<b>Introduction to Food Business Management</b> : Importance of the food industry, key sectors in the food business: production, processing, distribution, and retail, business models in the food industry, understanding the food supply chain, legal and regulatory framework (FSSAI, CODEX, etc) for food businesses, ethical considerations in food management,	15
п	<b>Marketing and Consumer Behaviour in the Food Industry:</b> Fundamentals of food marketing, understanding consumer behaviour and preferences, market research techniques in the food sector, segmentation, targeting, and positioning strategies, branding and product development in food businesses, pricing and promotional strategies; case studies of successful food marketing campaigns.	15
III	<b>Operations and Supply Chain Management in Food Businesses:</b> Overview of operations management in food production and service, quality management systems in the food industry, supply chain management concepts and practices, inventory management and control techniques, logistics and distribution strategies, sustainability in food supply chains, role of technology in food operations, food safety and traceability in supply chains, case studies on efficient food operations.	15

Scheme of Evaluation: T

**Total credits: 4** 

IV	<b>Financial Management and Entrepreneurship in the Food Industry:</b> Introduction to financial management principles in food businesses, budgeting and forecasting for food enterprises, financial statement analysis and key performance indicators, sources of funding for food businesses: loans, venture capital, and grants, entrepreneurship in the food sector: starting and managing a food business, business plan development for food ventures, risk management in food businesses, case studies of successful food entrepreneurs, exploring trends and innovations in the food industry.	15
	Total	60
	Pedagogy: Lectures, Assignments, Seminars	

- Group discussion
- Seminar/presentation on any of the relevant topics
- Case studies

#### Textbooks

- David D and Erickson S. 1987. Principles of Agri Business Management. Mc Graw HillBook Co., New Delhi.
- Acharya S S and Agarwal N L. 1987. Agricultural Marketing in India. Oxford & ISH Publishing Co., New Delhi.
- Phill Kottler .1994. Marketing Management Prentice Hall of India, New Delhi

- Cundiff Higler. 1993.Marketing in the International Environment, Prentice Hall of India,New Delhi.
- Batra G S & Kumar N. 1994. GAD implications of Denkel proposals Azmol PublicationsPvt., New Delhi.

	Credit Distribution	
Theory	Practical	Experimental Learning
60	-	30

#### Level: Semester VIII

#### **Course: Major**

Level of Course: 400

#### **Title of the Paper: Nutraceuticals and Functional Foods**

Subject Code: FTC152M801

L-T-P-C: 3-1-0-4

**Total credits: 4** 

Scheme of Evaluation: T

### **Course Objectives**

To understand the Fundamental knowledge of nutraceuticals and functional foods and knowledge about health promoting effect of nutraceuticals and various metabolic disorders and their prevention and treatment by nutraceuticals and processing and storage of functional foods.

### **Course Outcomes**

On successful completion of the course the students will be able to:			
Sl No.	Course Outcome	<b>Blooms Taxonomy Level</b>	
CO 1	Define knowledge of nutraceuticals and functional foods	BT 1	
CO 2	Explain the health promoting effect of nutraceuticals.	BT 2	
CO 3	<b>Explain</b> role of functional beverages and herbs and their market aspects	BT 3	
CO 4	Apply the role of functional beverages and herbs and their market aspects	BT 4	

Modules	Topics (if applicable) & Course Contents	Periods
Ι	<b>Technological Aspects of Nutraceuticals and functional Foods:</b> Defining nutraceuticals and functional foods, nature, type and scope. Nutraceuticals and functional foods applications and their health benefits, classification based on chemical and biochemical nature with suitable and relevant descriptions.	15
п	<b>Nutraceuticals for Specific Diseases:</b> Food recommended and restricted in metabolic disorders and disturbances, gastrointestinal disorders; fever and infection; liver, gall, bladder and pancreatic disturbances; blood circulatory and cardiac diseases; urinary and musculoskeletal diseases; allergies.	15
ш	<b>Functional Role of Food Components:</b> Antioxidants, phytochemicals, isoflavones, lycopene, their role in Nutraceutical and functional foods, dietary fibers and complex carbohydrates as functional food ingredients. Proteins as a functional food ingredient, probiotic foods and their functional role.	15
IV	<b>Role of Specific Food Products as a Functional Food</b> Herbs as functional foods, health promoting activity of common herbs. Cereal products as functional foods- Oats, Wheat bran, rice bran etc. Functional vegetable products, oil seeds and sea foods. Coffee, tea and other beverages as functional foods/ drinks and their protective effects	15
	Total	60
	Pedagogy: Lectures, Assignments, Seminars	
## **Experiential Learning**

- Group discussion
- Seminar/presentation on any of the relevant topics

### Textbooks

- Handbook of Nutraceuticals. Pathak YV, CRC Press, 2009
- Innovations in Healthy and Functional Foods Ghosh D et al., CRC Press,2012
- Functional Foods and Nutraceuticals- Bioactive Components, Formulations and Innovations. Chukwuebuka Egbuna, Genevieve Dable Tupas. Springer Nature. 2020.

- Handbook of Nutraceutical and Functional Foods. Wildman REC
- Anti-angiogenic Functional and Medicinal Foods. Losso JN

Credit Distribution		
Theory	Practical	Experimental Learning
60	-	30

**Course: Minor** 

Level of Course: 300

Title of the Paper: Research Methodology

Subject Code: FTC152N801

L-T-P-C: 3-1-0-4

Total credits: 4

Scheme of Evaluation: T

## **Course Objectives**

To understand design a research problem by applying appropriate experimental design and statistically analyze the collected data and explain the ethics in research and plagiarism and write research papers, reports and research proposals

### **Course Outcomes**

On successful completion of the course the students will be able to:		
SI No.	Course Outcome	Blooms Taxonomy Level
CO 1	<b>Define</b> research problem by applying appropriate experimental design	BT 1
CO 2	Explain statistically analyze the collected data.	BT 2
CO 3	Explain the ethics in research and plagiarism	BT 3
<b>CO 4</b>	Apply to write research papers, reports and research proposals	BT 4

### **Course Outline**

Modules	Topics (if applicable) & Course Contents	Periods
Ι	<b>Research:</b> Types, Research process and steps in it, Hypothesis, Research proposals and aspects; Research Design: Need, Problem Definition, variables, research design concepts, Literature survey and review, Research design process, Errors in research; Research Modeling: Types of Models, Model building and stages, Data consideration and testing, Report Writing: Pre writing considerations, Thesis writing, Formats of report writing and publications in Research journals. Ethical issues, ethical committees Commercialization, Copy right, royalty, Intellectual property rights and patent law, Trade Related aspects of Intellectual Property Rights, Plagiarism, Citation and acknowledgement, Reproducibility and accountability.	15
п	<b>Design of Experiments:</b> Objectives, strategies, Experimental design, Factorial design, Central composite design, Fractional factorial design, Taguchi's approach to design of experiments. Model development: Empirical model development, Validity of predicted equation, Graphic analysis, Adjusted coefficient of determination, F test for lack of fit. Statistical quality control: Introduction-Process control-control charts for variables-X and R, X and s charts control charts for attributes: p chart, np chart, c chart	15
ш	<b>Testing of hypothesis</b> : Introduction - Large sample tests based on normal distribution - Test for single mean, difference between means - proportion, difference between proportions - standard deviation, difference between standard deviation -Chi-square test for goodness of fit - Independence of attributes.	15

IV	<b>Analysis of variance:</b> Small sample tests based on t and F distribution-Test for, single mean, difference between means, Paired t-test, test for equality of variances. ANOVA one -way classification, Two-way classification	15
	Total	60
	Pedagogy: Lectures, Assignments, Seminars	

## **Experiential Learning**

- Group discussion
- Seminar/presentation on any of the relevant topics

#### Textbooks

- Montgomery, D. C. Design and Analysis of Experiments, Wiley India, 2007.
- Montgomery, D.C. and Runger, G.C. Applied Statistics & Probability for Engineers, Wiley India, 2007.
- Ewans W. & Grant G., "Statistical Methods in Bio informatics An Introduction", Springer, 2nd edition, 2005.

- Kothari, C.K. Research Methodology Methods and Techniques, New Age International, 2004.
- Gupta S.C. & Kapoor V.K., "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, New Delhi, 11th edition, 2007.

Credit Distribution		
Theory	Practical	Experimental Learning
60	-	30

**Course: Major** 

Level of Course: 400

### Title of the Paper: Food Quality and Sensory evaluation

Subject Code: FTC152M802

L-T-P-C: 3-1-0-4

Total credits: 4

Scheme of Evaluation: T

### **Course Objectives**

To understand the knowledge of food hygiene, quality control and importance of food safety and quality management system in food industry.

On successful completion of the course the students will be able to:		
SI No.	Course Outcome	<b>Blooms Taxonomy Level</b>
CO 1	<b>Define</b> the concepts of food quality and role of total quality management system in food industry	BT 1
CO 2	<b>explain</b> the quality of food products using various techniques	BT 2
CO 3	<b>explain</b> the national & international food laws and regulations for quality of foods	BT 3
<b>CO 4</b>	<b>apply</b> to different techniques to perform sensory evaluation study of foods	BT 4

### **Course Outline**

Modules	Topics (if applicable) & Course Contents	Periods
I	<b>Quality and Assurance:</b> Definition, scope, importance and difference, Total quality control and (TQC) Total quality management (TQM), Statistical quality control. Definition, importance, scope and difference between food quality and food safety.	15
II	<b>Raw materials &amp; Finished product quality</b> : Quality parameters and evaluation procedures: appearance, colour, texture, viscosity, consistency, flavour etc. Food safety standards and laws: FSSAI, BIS, FDA	15
III	<b>Quality Certification &amp; Accreditation</b> : Introduction and procedure Prevention of food adulteration: Act, method of detection, Food additives and legislation; Nutritional labelling Risk and Hazard.	15
IV	<ul> <li>Sensory Evaluation: Selection of panel of judges, Prerequisite for sensory analysis, application of consumer tests; control of factors affecting of sensory verdict, Instrumental measurements of sensory attribute of foods sensory characteristics of foods, types of tests, Texture profile analysis. Correlation between instrumental and Sensory analysis of food quality attributes.</li> </ul>	
	Total	60
	Pedagogy: Lectures, Assignments, Seminars	

## **Experiential Learning**

- Group discussion
- Seminar/presentation on any of the relevant topics

## Textbooks

- Food Quality Assurance: Principles and Practices, I. Ali, CRC Press, 2nd Edition, 2004.
- Quality Assurance in Food Industry: a Practical Approach, J. A. Vasconcellos, CRC Press, 1st Edition, 2003.
- Statistical Quality Control for the Food Industry, M. R. Hubbard, Kluwer Academic/ Plenum Publishers, 3rd Edition, 2003.

- HACCP in Meat, Poultry and Fish Processing, A. M. Pearson and T.R. Dutson, Kluwer Academic Publishers, 2nd Edition, 1999.
- Food Safety Contaminants and Toxins, J. P. F. D'Mello, Oxford University Press, 1st Edition, 2003.
- Quality of Fresh and Processed Foods, F.Shasidi, A.M.Spanier, Chi-Tang Ho and T.Braggins, Kluwer Academics/ Plenum Publishing, 3rd Edition, 2004.
- Rapid and On-line Instrumentation for Food Quality Assurance, Jotbill, Woodhead Publishing,2nd Edition, 2003.

Credit Distribution		
Theory	Practical	Experimental Learning
60	-	30

**Course: Major** 

Level of Course: 400

Title of the Paper: Food Adulteration and Additives

Subject Code: FTC152M803

L-T-P-C: 3-1-0-4

Total credits: 4

Scheme of Evaluation: T

## **Course Objectives**

To aware students about basic idea on various foods and about adulteration and know about adulteration of common foods and their adverse impact on health and develop the skills of detecting adulteration of common foods and extend their knowledge for remedial measures for common food adulterants and knowledge of food additives and their applications in food processing.

On successful completion of the course the students will be able to:		
Sl No.	Course Outcome	<b>Blooms Taxonomy Level</b>
CO 1	Define on various foods and about adulteration	BT 1
CO 2	<b>Explain</b> adulteration of common foods and their adverse impact on health	BT 2
CO 3	<b>Explain</b> the certain detecting adulteration of common foods	BT 3
CO 4	<b>Apply</b> for food additives and their functions and regulatory aspects of food additives	BT 4

# **Course Outline**

Modules	Topics (if applicable) & Course Contents	Periods
Ι	<b>Common Foods and Adulteration:</b> subjected to adulteration-Adulteration- Definition-Types, poisonous substance, Foreign Matter, cheap substitutes, spoilers part. Adulteration through food Additives	15
II	Adulteration in common Foods and methods of detection: Means of adulteration, methods of detection adulteration in the following foods; milk, oil, grains, sugar, spices and condiments, tea and coffee, process foods, fruits and vegetable	15
ш	<b>Present Law and Procedures of Adulteration:</b> Food Safety and standards Authority of India -Rules and Procedures of Local Authorities, International – Concept of C ISO 9000, ISO 22000, ISO 14000. Consumer Protection Act (1986), BIS/IS, Food Safety and standards – 2006, method for detection of food adulteration.	15
IV	<b>Food Additives:</b> Definitions, sources, uses and functions; nomenclature of food additives, Food additives: Used in fruit and vegetable preservation, food additives and legislation; PFA specification for food products, Nutritional labelling	15
	Total	60
	Pedagogy: Lectures, Assignments, Seminars	

# **Experiential Learning**

• Group discussion

• Seminar/presentation on any of the relevant topics

#### Textbooks

- Rapid Detection of Food Adulterants and Contaminants; Theory and Practice by Shyam Narayan Jha; Academic Press, 2016.
- A first course in Food Analysis A.Y. Sathe, New Age International (P) Ltd., 1999.
- Food Additive Toxicology. Joseph A. Maga, Anthony Y. Tu. Routledge. 1994

- Food adulteration and food fraud by Jonathan Rees, London, Reaktion Books, 2020.
- Fennema's Food Chemistry by Damodaran Parkin Fennema, CRC Press, 2017.

Credit Distribution		
Theory	Practical	Experimental Learning
60	-	30

**Course: Major** 

Scheme of Evaluation: T

Level of Course: 400

Title of the Paper: Technology of spices, condiments and plantation crops

Subject Code: FTC152M804

L-T-P-C: 3-1-0-4

**Total credits: 4** 

# **Course Objectives**

Skill and knowledge required to apply the principles and concepts behind spices, condiments and plantation products processing and Knowledge on post-harvest handling, specific processing technologies, preparing, quality analysis and stabilizing shelf life of spices, condiments and plantation-based products

On successful completion of the course the students will be able to:		
Sl No.	Course Outcome	<b>Blooms Taxonomy Level</b>
CO 1	<b>Define</b> the scope, processing and production of spices and condiments	BT 1
CO 2	<b>Explain</b> the processing methods for value addition of spices and condiments	BT 2
CO 3	Explain the processing of plantation products	BT 3
CO 4	<b>Apply</b> for standards, adulteration and packaging of spices and condiments	BT 4

# **Course Outline**

Modules	Topics (if applicable) & Course Contents	Periods	
I	<b>Spices &amp; Condiments -</b> Definition and classification and types of spices and condiments, composition, functional properties, flavoring agents, nutritive value; Intermediate Moisture Products. Challenges in production, processing and trade, spice-based food additives, extraction procedure and utilization; global trade scenario	15	
П	<b>Plantation Crops</b> - Description of various types of Plantation crops, viz., coconut, areca nut, coffee, tea, cocoa etc. Differences between plantation crops vs. fruit crops processing and preservation methods. Commercialization of plantations and value-added products shelf- stable products viz., coconut water bottling, desiccated coconut powder, coffee concentrate, instant coffee powder, instant tea powder, cocoa processing, their composition, nutritive value, health benefits.	15	
ш	<b>Processing of Tea leaves</b> : Black tea, green tea and Oolong tea. chemistry of tea manufacturing and tea quality; tea aroma precursors; tea flavour; tea grades; storing of tea Instant tea, tea concentrates, decaffeinated tea, flavoured tea; herbal tea.		
IV	<b>Processing of coffee:</b> Coffee cherries by wet and dry methods to obtain coffee beans, grinding, storage and preparation of brew, Soluble /Instant coffee, Use of chicory in coffee, decaffeinated coffee	15	
	Total	60	
	Pedagogy: Lectures, Assignments, Seminars		

## **Experiential Learning**

- Group discussion
- Seminar/presentation on any of the relevant topics

### Textbooks

- Tea Production and Processing. B. Banerjee, Oxford & IBH Pub. Co., 1st Edition, 1993.
- Coffee Technology. M. Sivetz, AVI publishing Co., 1st Edition, 1979.
- Minor Spices and Condiments: Crop Management and Post Harvest Technology. J.S.Purthi, ICAR publication, 1st Edition, 2001.
- Major Spices of India: Crop Management and Post Harvest Technology. J.S.Purthi, ICAR publication, 1st Edition, 2003.

- Handbook of Fruit Science and Technology: Production, Composition, Storage, and Processing. D. K. Salunkhe, S. S. Kadam, CRC Press, 1st Edition, 1995.
- Global Advances in Tea Science. N.K.Jain, Aravali Books International, 1st Edition, 1999.
- Coffee: Botany, Biochemistry and Production of Beans and Beverage. M.N. Clifford and K.C.Willson, AVI publishing Co., 1st Edition, 1985.

Credit Distribution				
Theory	Practical	Experimental Learning		
60	-	30		