



ROYAL GLOBAL UNIVERSITY
— GUWAHATI —

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

AY - 2023 – 24

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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 21st 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. and more in-depth 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.

- i. Recognizing, identifying, and fostering the unique capabilities of each student to promote her/his holistic development.
- ii. 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.
- iii. Multidisciplinary and holistic education across the sciences, social sciences, arts, humanities, and sports for a multidisciplinary world.
- iv. 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.
- v. Extensive use of technology in teaching and learning, removing language barriers, increasing access for Divyang students, and educational planning and management.
- vi. Respect for diversity and respect for the local context in all curricula, pedagogy, and policy.
- vii. 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.
- viii. 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).

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

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	x	x	x
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		

3. Graduate Attributes:

Table: 7: The Learning Outcomes Descriptors and Graduate Attributes

Sl.no.	Graduate Attribute	The Learning Outcomes Descriptors (<i>The graduates should be able to demonstrate the capability to:</i>)
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 the 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. FoodTechnology/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 useappropriate 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
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					(%)
A	Continuous Evaluation				
I	Analysis/Class test	Combination of any three from (i) to (v) with 5 marks each	1-3	C	25 %
Ii	Home Assignment		1-3	H	
Iii	Project		1	P	
Iv	Seminar		1-2	S	
V	Viva-Voce/Presentation		1-2	V	
Vi	MSE	MSE shall be of 10 Marks	1-3	Q/CT	
Vii	Attendance	Attendance shall be of 5marks	100%	A	5%
B	Semester End Examination		1	SEE	70%
	Project				100%

Course Structure

B.Sc. in Food Technology

	1st Semester
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Sl. No.	Subject Code	Names of Subject	L	Level	P	C
		Major				
1	FTC152M101	Principles of Food Processing and Preservation	3	100	0	3
2	FTC152M111	Practical on Principles of Food Processing	0	100	6	3
		Minor				
3	FTC152N101	Basic Food Science	3	100	0	3
		Interdisciplinary				
4	IDC 1	IKS I(Introduction to Indian Knowledge System- I)	3		0	3
		AEC (Ability Enhancement Courses)				
5	AEC982A101	Communicative English and Behavioural 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	P	C
		Major				
1	FTC152M201	Fruits and Vegetables Product Technology	3	100	0	3
2	FTC152M211	Practical on Fruits and Vegetables Product Technology	0	100	6	3
		Minor				
3	FTC152N201	Food Microbiology	3	100	0	3
		Interdisciplinary				
4	IDC 2	IKS II (Introduction to Indian Knowledge System- II)	3		0	3
		AEC (Ability Enhancement Courses)				
5	AEC982A201	Communicative English and Behavioural Science –II	2		0	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	P	C
		Major				
1	FTC152M301	Food Chemistry	4	200	0	4
2	FTC152M311	Practical on Food Chemistry	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 System- III)	3		0	3
		AEC (Ability Enhancement Courses)				
5	AEC982A301	Communicative English and Behavioural Science –III	2		0	2
		SEC (Skill Enhancement Courses)				
6	FTC152S311	Basic techniques in bakery	0		6	3
		TOTAL CREDIT	13		14	20

4th Semester						
Sl. No.	Subject Code	Names of Subject	L	Level	P	C
		Major				
1	FTC152M401	Cereals, Pulses and Oilseeds Product Technology	4	200	0	4
2	FTC152M402	Food Microbiology	4	200	0	4
Cereals3	FTC152M411	Practical on Cereals, Pulses and Oilseeds Product Technology and food microbiology	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 Behavioural Science –IV	2		0	2
		TOTAL CREDIT	16		8	20
5th Semester						
Sl.No.	Subject Code	Names of Subject	L	Level	P	C

Major						
1	FTC152M501	Dairy Technology	4	300	0	4
2	FTC152M502	Animal Product Technology	4	300	0	4
3	FTC152M511	Practical on Dairy Technology and Animal Product Technology	0	300	8	4
Minor						
4	FTC152N501	Food Toxicology	4	200	0	4
Internship			0		0	4
5	Internship					
TOTAL CREDIT			12		8	20

6th Semester						
Sl. No.	Subject Code	Names of Subject	L	Level	P	C
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 on Unit operations, Food Packaging Technology and Food Safety and Quality Management	0	300	8	4
Minor						
5	FTC152N601	Extrusion Technology	4	200	0	4
TOTAL CREDIT			16		8	20

7th Semester						
Sl. No.	Subject Code	Names of Subject	L	Level	P	C
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 on Food Plant Sanitation, Traditional Foods and Fermentation Technology	0	400	8	4
Minor						
5	FTC152N701	Food Business Management	4	300	0	4
TOTAL CREDIT			16		8	20

8th Semester						
Sl.	Subject Code	Names of Subject	L	Level	P	C

No.						
		Major				
1	FTC152M801	Nutraceuticals 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 Plantation Crops	4	400	0	4
		TOTAL CREDIT	8		0	20

Semester I

Course: Major
Course Level-100

Scheme Evaluation: (T)

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	Blooms Taxonomy Level
CO 1	relate 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	develop an insight into the different techniques of food	BT 3
CO 4	analyse the novel techniques of food preservation	BT 4

Course Outline

Modules	Topics (if applicable) & Course Contents	Periods
I.	Food processing and preservation principles : Method of preservation: pasteurization (definition, time-temperature combination and equipment's), sterilization (definition, time-temperature combination and equipments), blanching (definition, time-temperature combination and equipments, adequacy in blanching), canning (definition, time-temperature combination and equipments), packaging (Introduction, Metal Containers, Glass Containers, Rigid Plastic Containers, Retortable Pouches).	15
II.	Food Concentration: 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.	Basic unit operations in food processing: 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	

Experiential Learning:

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

Texts:

1. Potter NH, 5th edition, Food Science, CBS Publication, New Delhi.
2. Ram Saswamy H and Marcotte M, 1st edition, Food Processing Principles and Applications CRC Press

References:

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

Credit Distribution		
Theory	Practical	Experimental Learning
60	-	30

Semester I

Course: Major

Level of Course: 100

Scheme of Evaluation: (P)

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 processing and food safety

Course Outcomes

On successful completion of the course the students will be able to:		
SI No.	Course Outcome	Blooms Taxonomy Level
CO 1	define basic food technology laboratory equipment's and appliances	BT 1
CO 2	classify different food groups, determination of moisture content of different food samples	BT 2

CO 3	construct the procedures for drying and packaging of fruits and vegetables	BT 3
CO 4	analyse the process of malting from cereals, millets and pulses	BT 4

Course Outline -

Module s	Topics (if applicable) & Course Contents	Periods
I.	1. Introduction to basic laboratory facilities-tools and appliances 2. Introduction to basic food processing equipment. 3. Care and maintenance of laboratory tools, appliances and equipment.	20
II	1. Identification of foods under different food groups 2. Determination of moisture content of different food groups like fruits, vegetables, green leafy vegetables, cereals and pulses 3. Brix analysis by refractometer for different food samples like fruit juices, jam , jelly 4. Determination of pH of different food products like pickles, fruit juice and sauces	25
III	1. Drying of fruits and vegetables 2. Drying of green leafy vegetables 3. Fruit/vegetable puree making 4. Packaging of prepared food products	20
IV	1. Rice flour making from waxy and non-waxy rice 2. Waxy rice products 3. Non waxy rice products 4. Preparation of products from different food groups 5. Preparation of cereal, millet, pulse malts	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	Blooms Taxonomy Level
CO 1	define 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	construct the process for identification of spices and additives in different fruits and vegetables	BT 3
CO 4	analyse and planning of project for setting up of food processing units	BT 4

Course Outline -

Modules	Topics (if applicable) & Course	Periods
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	Contents	
I.	1. Identification of various fruit and vegetable varieties 2. Determination of maturity indices of fruits and vegetables: Days from full bloom (DFFB), firmness. 3. Determination of Starch-iodine ratio, Brix-acid ratio 4. Dehydration and rehydration of fruits and vegetables	20
II	1.Determination of moisture content of different food products 2.Determination of TSS of different food products 3.Determination of acidity of fruits and vegetables	25
III	1. Identification of spices and condiments in fruits and vegetables. 2. Preparation of jam, jelly and marmalade 3. Preparation of pickles	30
IV	1. Project planning on food processing unit	15
	Total	90
	Pedagogy: Lectures, Experiments, Laboratory sessions	

Recommended Texts: As suggested under the theory papers

Semester I

Course: Minor

Level of Course: 100

Scheme of Evaluation: (T)

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 Taxonomy Level
CO 1	relate 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	BT 2
CO 3	develop different types of non 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

Course Outline

Module s	Topics (if applicable) & Course Contents	Periods
I.	Introduction: Introduction to Food Science, Different kinds of Food Industries, Components of Food industries. Scope of food processing and technology. Food constituents: Carbohydrates, lipids, proteins, vitamins and minerals, water. Nutritional and chemical properties of food constituents	15

	and its function.	
II.	Introduction to Food preservation techniques: Pasteurization, Sterilization, Ultra High temperature, Blanching, etc. Low temperature preservation techniques: Cooling, Evaporation, refrigeration and freezing, Drying and their importance in the food processing.	15
III.	Introduction to non-thermal food preservation techniques: Introduction to new techniques in preservation of food like High Pressure Processing, Ohmic heating, Pulse electric field processing, Irradiation etc.	15
IV.	Basic introduction: Unit operations in Food Processing, Cleaning, dry cleaning methods, wet cleaning methods, peeling, grading, sorting.	15
	TOTAL	60
	Pedagogy: Lectures, Assignments, Seminars	

Experiential Learning:

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

Texts:

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

References:

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

Scheme of Evaluation: (T)

Title of Paper: Fruits and Vegetables Processing Technology

Subject Code: FTC152M201

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

Total credits: 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 Taxonomy Level
CO 1	explain the causes and effects of different post-harvest changes in fruits and vegetables	BT 1
CO 2	identify the processing and preservation techniques of different fruits and vegetable products (Jam, Jelly and Marmalade)	BT 2
CO 3	apply different pickling and dehydration processes in fruits and vegetables, their packaging and storage methods	BT 3
CO 4	analyse the processing flowchart for canning of fruits and vegetables	BT 4

Course Outline

Module s	Topics (if applicable) & Course Contents	Periods
I.	Fruits and Vegetables: 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
II.	Fruits beverages: 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	15

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

Experiential Learning:

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

Texts:

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

References:

1. Girdharilal, Siddappaa, G.S and Tandon, G.L. latest edition. Preservation of fruits & vegetables, ICAR, New Delhi
2. 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

Semester II

Course: Major

Level of Course: 100

Scheme of Evaluation: (P)

Title of Paper: Practical on Fruits and Vegetables Products Technology

Subject Code: FTC152M211

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

Total credits: 3

Course Objectives

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	Blooms Taxonomy Level
CO 1	define the manufacturing process of chutneys, sauces and fruit leather preparation	BT 1
CO 2	classify the various preparation techniques of dips, spreads and mayonnaise	BT 2
CO 3	construct the preparation methods on pickles, jam and jellies	BT 3
CO 4	analyse the different dehydration and rehydration techniques of fruits and vegetables	BT 4

Course Outline -

Modules	Topics (if applicable) & Course Contents	Periods
I.	1. Osmotic drying of fruits 2. Candied fruits from different sources 3. Fruit leather preparation 4. Preparation of chutneys and sauces	25
II	1. Preparation of mayonnaise 2. Preparation of dips 3. Preparation of spreads 4. Preparation of salad dressings	20
III	1. Quantity production of jam and jellies 2. Quantity production of squash and RTS 3. Quantity production of ketchups 4. Quantity production of pickles	25

IV	1.Preparation of concentrates 2.Preparation of chips 3.Preparation of papads and khakras	20
	Total	90
	Pedagogy: Lectures, Experiments, Laboratory sessions	

Recommended Texts: As suggested under the theory papers

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	Blooms Taxonomy Level
CO 1	define the different cereals waste products for product development and waste utilization	BT 1
CO 2	classify the different pulses waste products for product development and waste utilization	BT 2
CO 3	construct the different fruit waste products for product development and waste utilization	BT 3
CO 4	analyse the different vegetables waste products for product development and waste utilization	BT 4

Course Outline -

Module s	Topics (if applicable) & Course Contents	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
III	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 papers

Semester II

Course: Minor

Level of Course: 100

Scheme of Evaluation: (T)

Title of Paper: Food Microbiology

Subject Code: FTC152N201

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

Total credits: 3

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 Taxonomy Level
CO 1	relate the scope, importance, basic techniques of microbiology	BT 1
CO 2	explain the various sterilization- both physical and chemical methods	BT 2
CO 3	develop the different methods for isolation and preservation of food microbes	BT 3
CO 4	analyse the application of food microbiology and its comparison to other fields of microbiology	BT 4

Course Outline

Modules	Topics (if applicable) & Course Contents	Periods
I.	History and scope of Microbiology, discovery, importance and relevance of microorganisms. Microscopy: basic techniques of Microscopy optical and electron techniques of microscopy staining and its types.	15
II.	Microbial Control: sterilization and disinfection techniques. Physical and chemical methods of sterilization. Important cultural characteristics of Bacteria, Virus, Fungus and algae. Culture of micro-organisms culture media natural complex, semi defined, synthetic media, minimal media. General and selective media, Anaerobic cultures.	15
III.	Isolation and preservation of pure cultures. Pour plate method, streak plate spread plate and single cell isolation, micromanipulator and capillary pipette method.	15
IV.	Applications – Food microbiology, Agriculture microbiology, Medical microbiology, Industrial microbiology Environmental and Biotechnology microbiology.	15
	TOTAL	48
	Pedagogy: Lectures, Assignments, Seminars	

Experiential Learning:

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

Texts:

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

References:

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. 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 to gain 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 functions, properties, structure, classification of different metabolic pathways, browning reactions, sources and functions of dietary fibre	BT 2
CO 2	identify the role of food constituents, nutrients, techniques used for sensory evaluation of food	BT 3
CO 3	apply the knowledge on denaturation and evaluation of protein quality, metabolic pathways etc	BT 3
CO 4	analyse 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

Course Outline:

Modules	Topics (if applicable) & Course Contents	Periods
I.	Food And Its Constituents: Food and Nutrients - Definition, Classification, and Functions: Role of Water in Food and Human Health, Pigments, Phytonutrients, Antioxidants, Flavour Components – Definition, Classification, and Functions, Sensory Evaluation of foods – Organoleptic Analysis, Methods and Tests of Sensory Evaluation, Anti-nutritional Factors in Foods, Digestion, Absorption, and Transport of Foods and Nutrients	15
II.	Carbohydrates: Definition, Structure, Properties, Functions, Classification, Dietary Sources, Chemical Reactions, Deficiencies and Excess, Recommended Dietary Allowances, Metabolic Pathways - Glycolysis, Gluconeogenesis, Glycogenesis, Glycogenolysis, Citric Acid Cycle, Browning Reactions in Foods, Resistant Starches and Dietary Fibre – Definition, Sources and Functions	15

III.	Proteins and amino acids, fats and oil: Definition, Structure, Properties, Functions, Classification, Dietary Sources, Chemical Reactions, Deficiencies and Excess, Recommended Dietary Allowances, Metabolic Pathways- Transamination, Deamination, Decarboxylation, Urea Cycle, Stress and Anti-freeze Proteins; Protein Isolates and Concentrates, Denaturation of Proteins, Evaluation of Protein Quality, Recommended Dietary Allowances, Metabolic Pathways - Fatty Acid Oxidation, Biosynthesis of Fatty Acids, Synthesis and Functions of Cholesterol; Ketogenesis, Rancidity of Fats, Emulsions	15
IV	Food Additives and its importance: 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 Vitamins And Minerals: Classification, Functions, Dietary Sources, Deficiencies and Excess, Recommended Dietary Allowances.	15
TOTAL		60
Pedagogy: Lectures, Assignments, Seminars		

Experiential Learning:

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 Brahman GNV. 2009. Textbook of Human Nutrition. ThirdEdition. Oxford and IBH Publishing Co. Pvt.Ltd.

References:

1. Belitz H.-D, Grosch W, and Schieberle P. 1st 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****Scheme of Evaluation: (P)****Title of the Paper: Practical on Food Chemistry and Fruits and Vegetables Processing****Subject Code: FTC152M311****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	Blooms Taxonomy Level
CO 1	find the estimation for total protein, lipid, reducing and non-reducing sugar content in food samples	BT 1
CO 2	demonstrate the ash, moisture, gluten, iodine value determination in foodsamples	BT 2
CO 3	apply the techniques of dehydration and rehydration of fruits and vegetables and its manufacturing practices	BT 3
CO 4	list preparation methods for fruits and vegetable samples (Jam, jelly, ketchup, pickles)	BT 4

Course Outline

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

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

References: As suggested under 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	Blooms Taxonomy Level
CO 1	define properties of food and various ingredients	BT 1
CO 2	explain the role of food ingredients in food product	BT 2
CO 3	apply knowledge with the additives relevant to the processed food industry for shelf-life extension, processing support and sensory appeal	BT 3
CO 4	categorize the microbial, chemical and natural toxicants and allergens indigenously present and developed during food processing	BT 4

Course Outline

Modules	Topics (if applicable) & Course Contents	Periods
I	Introduction to Food Ingredients: Food Additives and its importance, 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	15
II	Food Preservatives: Different categories of food preservatives, its 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	15
III	Colours and flavours: Different types of food colours, its importance and toxicity, classification (Natural and synthetic colours), permitted and non-permitted, synthetic colours Flavouring agents and its importance in the food industry	15
IV	Uses and Toxicity: Antioxidants, emulsifiers, stabilizers, chelating agents, hydrocolloids, thickeners, acidulants, curing agents, government rules and regulations on food additives	15
	TOTAL	60
	PEDAGOGY: Lectures, Assignments and Seminars	

Experiential Learning:

- 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	apply 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
I	Introduction to Bakery , History, Cookery terms, Bakery equipment's, Ingredients	20
II	Yeast products: different methods and steps in bread making. Role of ingredients used in bread	25
III	Pastry and cakes: role of ingredients, basic techniques and preparation of different varieties of pastry and cakes, factors affecting qualities of pastry and cakes.	20
IV	Biscuits and cookies: role of ingredients, basic techniques and preparation of different varieties of biscuits and cookies, factors affecting qualities of biscuits and cookies.	25
TOTAL		90

Recommended Texts: - As suggested under the theory papers

Level: Semester IV

Course: Major

Scheme of Evaluation: (T)

**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, processing of pulses and oilseeds. To gain knowledge on 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	define 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	explain the processing of pulses, milling procedures and antinutritional factors	BT 3
CO 4	apply the knowledge of processing of oilseeds (Soyabean, Coconut), refining of 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

II.	Rice and other cereal crop technology – Physicochemical properties, milling (mechanical & solvent extraction), parboiling, ageing of rice, utilization of byproducts. Corn–Milling (wet & dry), cornflakes, corn flour. Barley- Milling (pearl barley, barley flakes & flour) Oats–Milling (oatmeal, oat flour & oat flakes) Sorghum and millets – Traditional & commercial milling (dry & wet)	15
III	Pulse technology: Processing- Soaking, Germination, Decortication, Cooking and Fermentation. Changes during germination, Milling- decortication and splitting (dry and wet milling). Antinutritional factors, Factors affecting cooking time	15
IV	Oilseeds technology: Sources, Composition, Processing of oil seeds – Soya bean, coconut. Hydrogenation. Refining of fats & oils, bleaching, de-odorizing, hydroxylation, Protein isolates, Sources of protein (defatted flour, protein concentrates and isolates), properties and uses, protein texturization, fibre spinning	15
TOTAL		60
Pedagogy: Lectures, Assignments, Seminars		

Experiential Learning:

- 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 Principles. 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

Level: Semester IV

Course: Major

Scheme of Evaluation: (T)

Title of the Paper: Food

Microbiology

Subject Code: FTC152M402

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

Total credits: 4

Course Objectives

To gain knowledge about genera of microorganisms associated with food and their characteristics, to understand the role of microbes in fermentation, spoilage and food borne diseases

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	Course Outcome	Blooms Taxonomy Level
CO 1	define the types of microorganisms, their characteristics, association with food, their growth pattern and parameters	BT 2
CO 2	explain the role of microorganisms in spoilage of food and methods for their control	BT 3
CO 3	identify about the beneficial role of microorganisms in fermented food products and their health benefits	BT 3
CO 4	examine the various food borne infections, intoxication, with their methods of isolation and cultivation	BT 4

Course Outline:

Modules	Topics (if applicable) & Course Contents	Periods
I.	History and Development of Food Microbiology: Definition and Scope of food microbiology, Types of microorganisms associated with food, their morphology and structure, Significance of spores in food microbiology, Factors affecting the growth of micro-organisms in food	15
II.	Bacterial growth curve and microbial growth in food: Sources of Microorganisms in foods, Some important food spoilage microorganisms, Spoilage of specific food groups- Milk and dairy products, Meat, poultry and seafoods, Cereal and cereal products, Fruits and vegetables and Canned products	15

III	Fermentation: Definition and types, Microorganisms used in food fermentations, Dairy Fermentations-starter cultures and their types , concept of probiotics, Lactic acid and aroma compounds production, Health benefits of LAB, probiotics, prebiotics and symbiotic, Fermented Foods-types, methods of manufacture for vinegar, sauerkraut, tempeh, miso , soya sauce, beer, wine and traditional Indian foods Alcoholic beverages: classification- wine, beer, spirit, liqueurs, cocktails, Production process- fermentation, distillation and Storage.	15
IV	Food borne illness: Foodborne infections, foodborne intoxications and toxin infections, Pure culture technique, Methods of isolation and cultivation, Enumeration of Microorganisms- qualitative and quantitative	15
TOTAL		60
Pedagogy: Lectures, Assignments, Seminars		

Experiential Learning:

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

Texts:

1. Frazier William C and Westhoff, Dennis C. Food Microbiology, TMH, New Delhi, 2004
2. Jay, James M. Modern Food Microbiology, CBS Publication, New Delhi, 2000

References:

1. Garbutt, John. Essentials of Food Microbiology, Arnold, London, latest edition
2. Pelczar MJ, Chan E.C.S and Krieg, Noel R. Microbiology, 5th Ed., TMH, New Delhi

Credit Distribution		
Theory	Practical	Experimental Learning
60	-	30

Level: Semester IV

Course: Major

Scheme of Evaluation: (P)

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

Microbiology

Subject Code: FTC152M411

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	Blooms Taxonomy Level
CO 1	define the basic microbiological laboratory practices and equipments with their functioning.	BT 1
CO 2	explain 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	analyse the proximate and cooking characteristics of wheat and rice	BT 4

Course Outline

Modules	Topics (if applicable) & Course Contents	Periods
I.	1. Introduction to the basic Microbiology laboratory Practices and Equipment's 2. Functioning and use of compound microscope 3. Cleaning and sterilization of glassware	20
II.	1. Morphological study of bacteria and fungi using permanent slides 2. Simple staining 3. Gram staining	25

III.	<ol style="list-style-type: none"> 1. Physical parameters of wheat 2. Determination of moisture content of the given sample of wheat flour. 3. Determination of gluten percentage in wheat flour 4. Determination of ash content of wheat flour 	20
IV	<ol style="list-style-type: none"> 1. Measurement of Physical parameters of rice 2. Determination of Milling quality of rice (head rice yield, broken rice yield) 3. Determination of cooking quality of rice (alkali test, cooking time/glass slide method) 4. Preparation of malt from cereals 	25
	TOTAL	90
Pedagogy: Lectures, Assignments, 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	define 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	Explain the scope of new product development and modification of traditional methods.	BT 2
CO 3	develop the design for production and sensory evaluation.	BT 3
CO 4	analyse the development of food products from commercially available ingredients.	BT 4

Course Outline

Modules	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
II.	Designing new products: 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.	Standardization & large-scale production: Process design; Sensory evaluation; Food testing lab requirements, different techniques and tests; statistical quality control; • comparison of market samples	15
IV	New Food product development using locally available ingredients. 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.	15
	TOTAL	60
Pedagogy: Lectures, Assignments, Seminars		

Experiential Learning:

- 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 .

References:

1. Gordon W Fuller, “New Food Product Development: From Concept to Marketplace”, 3rd Edition, CRC press, Taylor and Francis Group, UK, 2016.
2. Catherine Side., “Food Product Development: Based on Experience”, 2nd 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	define the basic principles of bakery and introduction of the tools and equipment's with their uses .	BT 1
CO 2	explain. knowledge of Principles of Confectionery its manufacture. and their Role	BT 2
CO 3	develop the ability to understand chemistry of dough chemistry and rheological testing	BT 3
CO 4	analyse the chocolate manufacturing, chewing gum and pan coating basics	BT 4

Course Outline

Modules	Topics (if applicable) & Course Contents	Periods
I.	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 Fillings.	15
II.	Principles of Confectionery Manufacture. Raw Material and their Role – interfering agents, inversion of sugars, etc. Types of Confectionery Products and Technology for their Manufacture. Quality Parameters of Confectionery Products. Nutrient and other Losses in Confectionery Products. Sanitation and Hygiene in a Confectionery Unit. Equipment used in the Confectionery Industry.	15

III.	Sugar- Manufacturing of sugar, types of sugar, byproducts, jaggery, honey. Additional ingredients: colours, flavors, gums, pectin and gelatin, chocolate processing. Types: imitation chocolate, milk chocolate. Crystalline and non-crystalline candies.	15
IV	Chocolate – raw material, types, and manufacture, Ingredients of chocolate-sucrose, invert sugars, corn syrup, non-nutritive sweeteners, sugar substitutes. Chewing Gum - raw material, types, and manufacture	15
	Pan Coating – hard and soft panning; problems in coating; glazing, polishing, and tableting Nutritional Value, Quality Parameters	
	TOTAL	60
Pedagogy: Lectures, Assignments, Seminars		

Experiential Learning:

- 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

3. Pomeranz, Y. (1993) “*Advances in Cereal Science and Technology*”, Am. AssocCereal Chemists St.Paul, MN, USA

Credit Distribution		
Theory	Practical	Experimental Learning
60	-	30

