HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST

HICET

HINDUSTHAN

COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore – 641032

DEPARTMENT OF FOOD TECHNOLOGY

Curriculum and ODD Semesters Syllabus for the Batch

2024 – 2028 (R2022)

2023 – 2027 (R2022)

2022 – 2026 (R2022)

2021 – 2025 (R2019 with Amendments)

(Board of Studies held on 13.05.2024

(Academic Council Meeting held on 21.06.2024)

Curriculum under R2022

(for the batch admitted during 2024 – 2025)

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.TECH. FOOD TECHNOLOGY (UG)

FIRST YEAR

REGULATION-2022

For the students admitted during the academic year 2024-2025 and onwards

SEMESTER I

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	**22MA1101**	Matrices and Calculus	BSC	3	1	0	4	4	40	60	100
2.	**22ME1201**	Engineering Drawing	ESC	1	2	0	3	5	40	60	100
3.	**22FT1101**	Principles of Food Science	BSC	2	0	0	2	3	40	60	100
THEORY WITH LAB COMPONENT											
4.	**22PH1151**	Physics for Non-Circuit Engineering	BSC	2	0	2	3	4	50	50	100
5.	**22HE1151**	English for Engineers	HSC	2	0	2	3	4	50	50	100
EEC COURSES (SE/AE)											
6.	**22HE1072**	Entrepreneurship & Innovation	AEC	1	0	0	1	1	100	0	100
7.	**22HE1073**	Introduction to Soft Skills	SEC	2	0	0	1	1	100	0	100
MANDATORY COURSE											
8.	**22MC1093/ 22MC1094**	தமிழர்மரபு /Heritage of Tamil	MC	2	0	0	1	2	40	60	100
9.	**22MC1095**	Universal Human values	AEC	2	0	0	0	2	100	0	100
		TOTAL		17	3	4	18	24	560	340	900

SEMESTER II

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	**22MA2105**	Partial Differential Equations, Fourier Series and Transforms (BME, Civil & FT)	BSC	3	1	0	4	4	40	60	100
2.	**22CY2101**	Environmental Studies	BSC	2	0	0	2	3	40	60	100
3.	**22EE2231**	Fundamentals of Electrical Engineering	ESC	3	0	0	3	3	40	60	100
4.	**22FT2201**	Fundamentals of Food Processing	ESC	2	0	0	2	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	**22IT2251**	Python Programming and practices	ESC	2	0	2	3	4	50	50	100
6.	**22HE2151**	Effective Technical Communication	HSC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	**22ME2001**	Engineering Practices	ESC	0	0	4	2	2	60	40	100
EEC COURSES (SE/AE)											
8.	**22HE2071**	Design Thinking	AEC	2	0	0	2	2	100	0	100
9.	**22HE2072**	Soft Skills and Aptitude	SEC	1	0	0	1	1	100	0	100
MANDATORY COURSE											
10.	**22MC2094/ 22MC2095**	தமிழரும் தொழில்நுட்பமும்/ Tamils and Technology	MC	2	0	0	1	2	100	0	100
11.	**22MC2093**	NCC */NSS / YRC / Sports / Clubs / Society Service - Enrollment (Common)	MC	All students shall enroll, on admission, in anyone of the personality and character development programmes and undergo training for about 80 hours							
				19	**1**	**8**	23	**26**	**620**	**380**	**1000**

SEMESTER III

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	**22MA3107**	Numerical Methods	BSC	3	1	0	4	4	40	60	100
2.	**22FT3201**	Food Microbiology	PCC	3	0	0	3	3	40	60	100
3.	**22FT3203**	Fluid Mechanics	PCC	3	1	0	4	4	40	60	100
4.	22FT3204	Principles of Thermodynamics	PCC	3	1	0	4	3	40	60	100
5.	22FT3205	Food Chemistry	PCC	3	0	0	3	3	40	60	100
PRACTICAL											
6.	**22FT3001**	Unit Operations Laboratory	ESC	0	0	4	2	2	60	40	100
7.	**22FT3002**	Food Microbiology Laboratory	PCC	0	0	4	2	3	60	40	100
EEC COURSES (SE/AE)											
8.	**22HE3071**	Soft Skills -2	SEC	1	0	0	1	1	100	0	100
9.	22FT3003	Food Chemistry Laboratory	AEC	0	0	4	2	3	60	40	100
MANDATORY COURSE											
10.	**22MC3191**	Essence of Indian tradition knowledge/Value Education	MC	2	0	0	0	2	100	0	100
			TOTAL	**17**	**3**	**12**	**25**	**29**	**580**	**420**	**1000**

SEMESTER IV

S. No.	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	**22HE4101**	IPR and Start-ups	HSC	2	0	0	2	2	40	60	100
2.	**22MA4104**	Probability and Operation Research	BSC	3	0	0	3	3	40	60	100
3.	22FT420X	Fundamentals of Heat and Mass Transfer	PCC	3	1	0	4	3	40	60	100
4.	**22FT4202**	Refrigeration and Cold Chain Management	PCC	3	1	0	4	4	40	60	100
5.	**22FT4203**	Unit operations in Food Processing	PCC	3	0	0	3	4	40	60	100
6.	22FT4205	Baking and Confectionery Technology	PCC	3	0	0	3	4	50	50	100
PRACTICAL											
7.	**22FT4002**	Unit Operations in Food Processing Laboratory	PCC	0	0	4	2	4	60	40	100
8.	22FT4003	Baking and Confectionery Technology Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	**22HE4071**	Soft Skills -III	SEC	1	0	0	1	1	100	0	100
			TOTAL	**18**	**2**	**8**	**24**	**29**	**470**	**430**	**900**

* Two weeks internship carries 1 credit and it will be done during Semester III summer vacation and same will be evaluated in Semester IV.
If students unable to undergo in semester III, then the Internship I offered in the semester IV can be clubbed with Internship II (Total: 4 weeks-2 credits)

SEMESTER V

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	**22FT5201**	Fruits and Vegetable Processing Technology	PCC	3	0	0	3	4	40	60	100
2.	**22FT5202**	Poultry, Meat and Fish Process Technology	PCC	3	0	0	3	3	40	60	100
3.	**22FT53XX**	Professional Elective-1	PEC	3	0	0	3	3	40	60	100
4.	**22FT53XX**	Professional Elective-2	PEC	3	0	0	3	3	40	60	100
5.	**22FT53XX**	Professional Elective-3	PEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
6.	22FT5252	Food Analysis and Quality Control	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	**22FT5001**	Fruits and Vegetable Processing Technology Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	**22HE5071**	Soft Skills -4/Foreign languages	SEC	1	0	0	1	1	100	0	100
			TOTAL	**18**	**0**	**6**	**21**	**26**	**410**	**390**	**800**

SEMESTER VI

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	**22FT6201**	Dairy Engineering	PCC	3	0	0	3	3	40	60	100
2.	**22HS6101**	Professional Ethics (Common)	HSC	3	0	0	3	3	40	60	100
3.	**22FT63XX**	Professional Elective-4	PEC	3	0	0	3	3	40	60	100
4.	**22FT63XX**	Professional Elective-5	PEC	3	0	0	3	3	40	60	100
5.	**22XX64XX**	Open Elective – 1*	OEC	3	0	0	3	3	40	60	100
6.	**22XX64XX**	Open Elective – 2*	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
7.	**22FT6001**	Dairy Engineering Laboratory	PCC	0	0	4	2	4	60	40	100
8.	**22FT6002**	Food Process Equipment Design Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	**22HE6071**	Soft Skills – 5	SEC	2	0	0	2	2	100	0	100
			TOTAL	**20**	**0**	**8**	**24**	**28**	**460**	**440**	**900**

SEMESTER VII

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	**22FT7201**	Food Packaging	PCC	3	0	0	3	3	40	60	100
2.	**22FT7202**	Food Plant Layout and Management	PCC	3	1	0	4	4	40	60	100
3.	**22FT730X**	Professional Elective-6	PEC	3	0	0	3	3	40	60	100
4.	**22FT740X**	Open Elective – 3*	OEC	3	0	0	3	3	40	60	100
5.	**22FT740X**	Open Elective – 4*	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
6.	**22FT7001**	Food Packaging Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
7.	**22FT7701**	Internship - II*	SEC	-	-	-	2	1	100	0	100
			TOTAL	**15**	**1**	**4**	**20**	**21**	**360**	**340**	**700**

* - Two weeks internship carries 1 credit and it will be done during Semester VI summer vacation/placement training and same will be evaluated in Semester VII.

SEMESTER VIII

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
EEC COURSES (SE/AE)											
1.	**22FT8901**	Project Work/Granted Patent	SEC9	0	0	20	10	20	100	100	200
			TOTAL	**0**	**0**	**20**	**10**	**20**	**100**	**100**	**200**

Note:

1. *As per the AICTE guideline, in Semesters I, II, III & IV NCC one credit subject is added as Value Added Course with Extra Credit. Further, the students who enrolled his/her name in HICET NCC and Air Wing are eligible to undergo this subject. The earned extra credits printed in the Consolidated Mark sheet as per the regulation.
2. NCC course level 1 & Level 2 will be added in the list of open elective subjects in the appropriate semester. Further, the students' who have opted NCC subjects in Semester I, II, III & IV are eligible to undergo NCC Open Elective Subjects.
3. The above-mentioned NCC Courses will be offered to the students who are going to be admitted in the Academic Year 2021 – 22.

OPEN ELECTIVE I AND II (EMERGING TECHNOLOGIES)

To be offered for the students other than CSE, IT, AI&ML, ECE & BIOMEDICAL

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22AI6451	Artificial Intelligence and Machine Learning Fundamentals	OEC	2	0	2	4	3
2	22CS6451	Blockchain Technology	OEC	2	0	2	4	3
3	22EC6451	Cyber security	OEC	2	0	2	4	3
4	22EC6452	IoT Concepts and Applications	OEC	2	0	2	4	3
5	22IT6451	Data Science and Analytics	OEC	2	0	2	4	3
6	22BM6451	Augmented and Virtual Reality	OEC	2	0	2	4	3

OPEN ELECTIVE I AND II

To be offered for the students other than AUTO, AERO, AGRI, MECH, MCTS, CIVIL, EEE, CHEMICAL, FOOD TECH, E&I

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22AE6401	Space Science	OEC	3	0	0	3	3
2	22MT6401	Introduction to Industrial Engineering	OEC	3	0	0	3	3
3	22MT6402	Industrial Safety and Environment	OEC	3	0	0	3	3
4	22CE6401	Climate Change and its Impact	OEC	3	0	0	3	3
5	22CE6402	Environment and Social Impact Assessment	OEC	3	0	0	3	3
6	22ME6401	Renewable Energy System	OEC	3	0	0	3	3
7	22ME6402	Additive Manufacturing systems	OEC	3	0	0	3	3
8	22EI6401	Introduction to Industrial Instrumentation and Control	OEC	3	0	0	3	3
9	22EI6402	Graphical Programming using Virtual Instrumentation	OEC	3	0	0	3	3
10	22AU6401	Fundamentals of Automobile Engineering	OEC	3	0	0	3	3
11	22AU6402	Automotive Vehicle Safety	OEC	3	0	0	3	3
12	22EE6401	Digital Marketing	OEC	3	0	0	3	3
13	22EE6402	Research Methodology	OEC	3	0	0	3	3
14	22FT6401	Traditional Foods	OEC	3	0	0	3	3
15	22FT6402	Post Harvest Technology of Fruits and Vegetables	OEC	3	0	0	3	3
16	22AG6401	Urban Agriculture and Organic Farming	OEC	3	0	0	3	3
17	22CH6401	Biomass and Biorefinery	OEC	3	0	0	3	3

Note: Non-Circuit Departments can add one Open Elective course in the above list to offer for the circuit branches

OPEN ELECTIVE III

Students shall choose any one of the open elective courses such that the course content or title not belong to their own programme.

(Note: Each programme in our institution is expected to provide one course only)

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	**22EE7401**	Fundamentals of Solar Energy & its applications	OEC	3	0	0	3	3

OPEN ELECTIVE IV

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	**22LS7401**	General studies for competitive examinations	OEC	3	0	0	3	3
2	**22LS7402**	Human Rights, Women Rights and Gender equity	OEC	3	0	0	3	3
3	**22LS7403**	Indian ethos and Human values	OEC	3	0	0	3	3
4	**22LS7404**	Financial independence and management	OEC	3	0	0	3	3
5	**22LS7405**	Yoga for Human Excellence	OEC	3	0	0	3	3
6	**22LS7406**	Democracy and Good Governance	OEC	3	0	0	3	3
7	**22LS7407**	NCC Level - II	OEC	3	0	0	3	3

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical I Processing of Cereals, Pulses and Grain Technology	**Vertical II Spices and Plantation Technology**	**Vertical III Food Safety Management System**	**Vertical IV Entrepreneurship and Management**	**Vertical V Food Colors, & Flavors**	**Vertical VI Food Processing and Preservation Techniques**
22FT5301 Technology of Fats and Oils	22FT5304 Processing of Spices & Plantation Crops	22FT5307 Introduction to food safety Analysis and Quality Risk Management	22FT5310 Entrepreneurship Opportunities for Food Technologist	22FT5313 Food additives	22FT5316 Principles of Food Processing
22FT5302 Cereal Technology	22FT5305 Blending and Value Addition	22FT5308 HACCP in Food Processing and Preservation	22FT5311 Total Quality Management	22FT5314 Food colors and flavor Technology	22FT5317 Post Harvest Engineering
22FT5303 Processing of Legumes and Oilseeds	22FT5306 Processing of Coffee	22FT5309 FSMS & Food Product and Supply Chain	22FT5312 Enterprise for Resource Planning	22FT5315 Biology and Chemistry of Food Flavors	22FT5318 Radiation Preservation and Processing of Food

		Management			Products
22FT6301 Milling Technology for Food Materials	22FT6303 Processing of Tea	22FT6305 Food laws – Indian and International	22FT6307 Consumer Acceptance and Market survey in Food Processing	22FT6309 Functional Foods and Nutraceuticals	22FT6311 Beverage Technology
22FT6302 Technology of Malting and Brewing	22FT6304 Processing of cocoa and Chocolate	22FT6306 Food Safety in Hospitality Industry & GLP in Food Industries	22FT6308 Energy Audit in Food Processing Industry	22FT6310 Food Toxicology and Allergy	22FT6312 Emerging Non-Thermal Processing of Foods
22FT7301 By Products Management	22FT7302 Packaging of Spices and Plantation products	22FT7303 Food Analysis, Testing & Microbial Safety Analysis	22FT7304 Food Process Economics & Industrial Management	22FT7305 Genetically Modified Foods	22FT7306 Emerging Technologies in Food Processing
22FT7307 Quality, Laws and Regulations in Grain Processing Industries	22FT7308 Spice Processing and Products Laws, Quality Standards and Regulations	22FT7309 Food quality, Assurance and Quality Control	22FT7310 Supply Chain and Retail Management	22FT7311 Waste Management and By-Product Utilization in Food Industries	22FT7312 Technology of Snack and Extruded Foods

Students are permitted to choose all Professional Electives from a particular vertical or from different verticals.

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Details of Vertical I: Processing of Cereals, Pulses and Grain Technology

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	**22FT5301**	Technology of Fats and Oils	PEC	3	0	0	3	3
2.	**22FT5302**	Cereal Technology	PEC	3	0	0	3	3
3.	**22FT5303**	Processing of Legumes and Oilseeds	PEC	3	0	0	3	3
4.	**22FT6301**	Milling Technology for Food Materials	PEC	3	0	0	3	3
5.	**22FT6302**	Technology of Malting and Brewing	PEC	3	0	0	3	3
6.	**22FT7301**	By Products Management	PEC	3	0	0	3	3
7.	**22FT7307**	Quality, Laws and Regulations in grain processing Industries	PEC	3	0	0	3	3

Details of Vertical II: Spices and Plantation Technology

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		

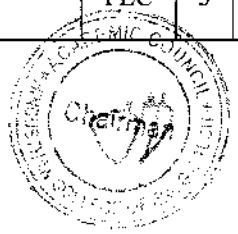
1.	22FT5304	Processing of Spices & Plantation Crops	PEC	3	0	0	3	3
2.	22FT5305	Blending and Value Addition	PEC	3	0	0	3	3
3.	22FT5306	Processing of Coffee	PEC	3	0	0	3	3
4.	22FT6303	Processing of Tea	PEC	3	0	0	3	3
5.	22FT6304	Processing of cocoa and chocolate	PEC	3	0	0	3	3
6.	22FT7302	Packaging of Spices and Plantation products	PEC	3	0	0	3	3
7.	22FT7308	Spice Processing and Products laws, Quality Standards and Regulations	PEC	3	0	0	3	3

Details of Vertical III: Food Safety Management System

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22FT5307	Introduction to Food Safety Analysis and Quality Risk Management	PEC	3	0	0	3	3
2.	22FT5308	HACCP in Food Processing and Preservation	PEC	3	0	0	3	3
3.	22FT5309	FSMS & Food Product and Supply Chain Management	PEC	3	0	0	3	3
4.	22FT6305	Food laws – Indian and International	PEC	3	0	0	3	3
5.	22FT6306	Food Safety in Hospitality industry & GLP in Food Industries	PEC	3	0	0	3	3
6.	22FT7303	Food Analysis, Testing & Microbial Safety Analysis	PEC	3	0	0	3	3
7.	22FT7309	Food quality, Assurance and Quality Control	PEC	3	0	0	3	3

Details of Vertical IV: Entrepreneurship and Management

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22FT5310	Entrepreneurship Opportunities for Food Technologist	PEC	3	0	0	3	3
2.	22FT5311	Total Quality Management	PEC	3	0	0	3	3
3.	22FT5312	Enterprise for Resource Planning	PEC	3	0	0	3	3
4.	22FT6307	Consumer Acceptance and Market Survey in Food Processing	PEC	3	0	0	3	3
5.	22FT6308	Energy Audit in Food Processing Industry	PEC	3	0	0	3	3
6.	22FT7304	Food Process Economics & Industrial Management	PEC	3	0	0	3	3



7.	22FT7310	Supply Chain and Retail Management	PEC	3	0	0	3	3

Details of Vertical V: Food Colors & Flavors

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22FT5313	Food Additives	PEC	3	0	0	3	3
2.	22FT5314	Food Colors and Flavor Technology	PEC	3	0	0	3	3
3.	22FT5315	Biology and Chemistry of Food Flavors	PEC	3	0	0	3	3
4.	22FT6309	Functional Foods and Nutraceuticals	PEC	3	0	0	3	3
5.	22FT6310	Food Toxicology and Allergy	PEC	3	0	0	3	3
6.	22FT7305	Genetically Modified Foods	PEC	3	0	0	3	3
7.	22FT7311	Waste Management and By-Product Utilization in Food Industries	PEC	3	0	0	3	3

Details of Vertical VI: Food Processing and Preservation Techniques

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22FT5316	Principles of Food Processing	PEC	3	0	0	3	3
2.	22FT5317	Post Harvest Engineering	PEC	3	0	0	3	3
3.	22FT5318	Radiation Preservation and Processing of Food Products	PEC	3	0	0	3	3
4.	22FT6311	Beverage Technology	PEC	3	0	0	3	3
5.	22FT6312	Emerging Non-Thermal Processing of Foods	PEC	3	0	0	3	3
6.	22FT7306	Emerging Technologies in Food Processing	PEC	3	0	0	3	3
7.	22FT7312	Technology of Snack and Extruded Foods	PEC	3	0	0	3	3

Enrollment for B.E. / B. TECH. (HONOURS) / Minor Degree (optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.

Clause 4.10 of Regulation 2022 is applicable for the Enrolment of B.E. / B. TECH. (HONOURS) / Minor Degree (Optional).

VERTICALS FOR MINOR DEGREE

- Heads are requested to provide one vertical from their program to offer for other program students to register for additional courses (18 Credits) to become eligible for the B.E./B.Tech. Minor Degree.

Note: Each programme should provide verticals for minor degree

VERTICALS FOR MINOR DEGREE

- Heads are requested to provide one vertical from their program to offer for other program students to register for additional courses (18 Credits) to become eligible for the B.E./B.Tech. Minor Degree.
Note: Each programme should provide verticals for minor degree

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22FT5601	Sem 5: Food Quality Analysis	MDC	3	0	0	3	3
2.	22FT6601	Sem 6: Technology of Fruits and Vegetable Processing	MDC	3	0	0	3	3
3.	22FT6602	Sem6: Meat Processing Technology	MDC	3	0	0	3	3
4.	22FT7601	Sem 7: Processing of milk and milk products	MDC	3	0	0	3	3
5.	22FT7602	Sem 7: Technology of Baking and Confectionery	MDC	3	0	0	3	3
6.	22FT8601	Sem 8: Food Packaging Technology	MDC	3	0	0	3	3

*MDC – Minor Degree Course

In addition to the above the following additional courses for Minor Degree can also be given to the student's common to all the branches.

Vertical I Fintech and Block Chain	Vertical II Entrepreneurship	Vertical III Environment and Sustainability
Financial Management	22BA5601 Foundation of Entrepreneurship	Sustainable infrastructure Development
Fundamentals of Investment	22BA6601 Introduction to Business Venture	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	22BA6602 Team Building & 22BA7601 Leadership Management for Business	Sustainable Bio Materials
Introduction to Blockchain and its Applications	22BA7602 Creativity & Innovation in Entrepreneurship	Materials for Energy Sustainability
Fintech Personal Finance and Payments	22BA8601 Principles of Marketing Management for Business	Green Technology
Introduction to Fintech	22BA8602 Human Resource Management for Entrepreneurs	Environmental Quality Monitoring and Analysis

B Tech (Hons) Food Technology in Machine Learning Applications

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	22FT5XXX	Basics of AI in Food	PC	3	0	0	3	3	40	60	100
2.	22FT6XXX	Computer Applications in Food Processing	PC	3	0	0	3	3	40	60	100
3.	22FT6XXX	IoT Applications in Food Industry	PC	3	0	0	3	3	40	60	100
4.	22FT7XXX	Computer Simulation and Modelling in Food Processing	PC	3	0	0	3	3	40	60	100
5.	22FT7XXX	Instrumentation and Process Control in Food Processing	PC	3	0	0	3	3	40	60	100
6.	22FT8XXX	Image Processing for the Food Industry	PC	3	0	0	3	3	40	60	100

B Tech (Hons) Food Technology in Processing and Value Addition

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	22FT5XXX	Technology of Milk and Milk Products	PC	3	0	0	3	3	40	60	100
2.	22FT6XXX	Ready to Eat Foods	PC	3	0	0	3	3	40	60	100
3.	22FT6XXX	Cane Sugar Technology	PC	3	0	0	3	3	40	60	100
4.	22FT7XXX	Beverage Technology	PC	3	0	0	3	3	40	60	100
Theory with Lab Component											
5.	22FT7XXX	Processing and Value Addition of Tuber Crops	PC	2	0	2	3	4	40	60	100
6.	22FT8XXX	Mushroom Processing Technology	PC	2	0	2	3	4	40	60	100

B Tech (Hons) Food Technology in Food Science and Biotechnology

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	22FT5XXX	Food Nutrition and Dietics	PC	3	0	0	3	3	40	60	100
2.	22FT6XXX	Food Biotechnology	PC	3	0	0	3	3	40	60	100
3.	22FT6XXX	Downstream Process Engineering	PC	3	0	0	3	3	40	60	100
4.	22FT7XXX	Chemical reaction Engineering	PC	3	0	0	3	3	40	60	100
Theory with Lab Component											
5.	22FT7XXX	Fermentation Technology	PC	2	0	2	3	4	40	60	100
6.	22FT8XXX	Enzymes in Food Processing	PC	2	0	2	3	4	40	60	100

Note: Each programme should provide verticals for Honours degree

SEMESTER-WISE CREDIT DISTRIBUTION

B.E. / B.TECH. PROGRAMMES										
S.No.	Course Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VII*	
1	HSC	3	3	-	2	-	3	-	-	**11**
2	BSC	10	6	4	3	-	-	-	-	**23**
3	ESC	3	10	2	-	-	-	-	-	**15**
4	PCC	-	-	16	18	11	7	9	-	**61**
5	PEC	-	-	-	-	9	6	3	-	**18**
6	OEC	-	-	-	-	-	6	6	-	**12**
7	EEC	1	3	3	1	1	2	2	10	**23**
8	MCC	1	1	✓	-	-	-	-	-	**2**
Total		**18**	**23**	**25**	**24**	**21**	**24**	**20**	**10**	**165**

Credit Distribution R2022

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	18	23	25	24	21	24	20	10	**165**

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Chairman

SEMESTER I

Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	22MA1101	MATRICES AND CALCULUS (Common to all Branches)	3	1	0	4

Course Objective

The learner should be able to

1. Construct the characteristic polynomial of a matrix and use it to identify eigen values and Eigenvectors.
2. Impart the knowledge of sequences and series.
3. Analyseanddiscussthemaximaandminimaofthefunctionsofseveralvariables.
4. Evaluate the multiple integrals and apply in solving problems.
5. Apply vector differential operator for vector function and theorems to solve engineering problems.

Unit	Description	Instructional Hours
I	**Matrices** Eigen values and Eigen vectors – Properties of Eigen values and Eigen vectors (without proof) -Cayley - Hamilton Theorem (excluding proof) - Reduction of a quadratic form to canonical form by orthogonal transformation.	12
II	**Single Variate Calculus** Rolle's Theorem–Lagrange's Mean Value Theorem-Maxima and Minima–Taylor's and Maclaurin's Series.	12
III	**Functions of Several Variables** Partial derivatives-Total derivative, Jacobian, Maxima, minima and saddle points; Method of Lagrange multipliers	12
IV	**Integral Calculus** Double integrals in Cartesian coordinates–Area enclosed by plane curves (excluding surface area)– Triple integrals in Cartesian co-ordinates – Volume of solids (Sphere, Ellipsoid, Tetrahedron) using Cartesian co-ordinates.	12
V	**Vector Calculus** Gradient, divergence and curl; Green's theorem, Stoke's and Gauss divergence theorem (statement only) for cubes only.	12
	Total Instructional Hours	**60**

Course Outcome

At the end of the course, the learner will be able to

CO1	Compute Eigen values and Eigen vectors of the given matrix and transform given quadratic form into canonical form.
CO2	Apply the concept of differentiation to identify the maximum and minimum values of curve.
CO3	Compute partial derivatives of function of several variables and write Taylor's series for functions with two variables.
CO4	Evaluate multiple integral and its applications in finding area, volume.
CO5	Apply the concept of vector calculus in two- and three-dimensional spaces.

TEXTBOOKS

T1 G.B. Thomas and R. L. Finney, "Calculus and Analytical Geometry", 9th Edition Addison Wesley Publishing Company,2016.

T2 Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 2019.

T3 K. P. Umaand S. Padma, "Engineering Mathematics I(Matrices and Calculus), "Pearson Ltd, 2022.

REFERENCEBOOKS

R1 JerroldE. Marsden, Anthony Tromba, "Vector Calculus", W. H. Freeman, 2003.

R2 Strauss M. J, G. L. Bradley and K. J. Smith, "Multi variable calculus", Prentice Hall, 2002.

R3 Veerarajan T, "Engineering Mathematics", Mc Graw Hill Education (India) Pvt Ltd. New Delhi, 2016.

CO - PO & PSO MAPPING

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	-	-	-	-	2	2	1
CO2	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO3	3	3	3	2	3	-	-	-	-	-	-	2	2	2
CO4	3	3	3	3	3	-	-	-	-	-	-	2	2	3
CO5	3	3	3	3	3	-	-	-	-	-	-	2	1	2
AVG	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	22ME1201	ENGINEERING DRAWING	1	4	0	3

Course Objective

The learner should be able

1. To gain the knowledge of Engineer's language of expressing complete details about objects and construction of conics and special curves.
2. To learn about the orthogonal projections of straight lines and planes.
3. To acquire the knowledge of projections of simple solid objects in plan and elevation.
4. To learn about the projection of sections of solids and development of surfaces.
5. To study the isometric projections of different objects.

Unit	Description	Instructional Hours
	PLANE CURVES	
I	Importance of engineering drawing; drafting instruments; drawing sheets – layout and folding; Lettering and dimensioning, BIS standards, scales. Geometrical constructions, Engineering Curves Conic sections –Construction of ellipse, parabola and hyperbola by eccentricity method. Construction of cycloids and involutes of square and circle – Drawing of tangents and normal to the above curves.	12
	PROJECTIONS OF POINTS, LINES AND PLANE SURFACES	
II	Introduction to Orthographic projections- Projection of points. Projection of straight lines inclined to both the planes, Determination of true lengths and true inclinations by rotating line method. Projection of planes (polygonal and circular surfaces) inclined to both the planes by rotating object method (First angle projections only).	12
	PROJECTIONS OF SOLIDS	
III	Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is perpendicular and inclined to one plane by rotating object method.	12
	SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES	
IV	Sectioning of simple solids with their axis in vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other – Obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinder and cone. Development of lateral surfaces of truncated solids.	12
	ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS	
V	Isometric views and projections simple and truncated solids such as - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions. Free hand sketching of multiple views from a pictorial drawing. Basics of drafting using AutoCAD software.	12
	Total Instructional Hours	**60**

Course Outcome

At the end of the course, the learner will be able to

CO1	Understand and interpret the engineering drawings in order to visualize the objects and draw the conics and special curves.
CO2	Draw the orthogonal projections of straight lines and planes.
CO3	Interpret the projections of simple solid objects in plan and elevation.
CO4	Draw the projections of section of solids and development of surfaces of solids.

CO5 Draw the isometric projections and the perspective views of different objects.

TEXT BOOK

T1 K.Venugopal, V.Prabu Raja, "Engineering Drawing, AutoCAD, Building Drawings", 5thedition New Age International Publishers, New Delhi 2016.

T2 K.V.Natarajan, "A textbook of Engineering Graphics", Dhanlaksmi Publishers, Chennai 2016.

REFERENCES

R1 BasantAgrawal and C.M.Agrawal, "Engineering Drawing", Tata McGraw Hill Publishing company Limited, New Delhi,2013.

R2 N.S. Parthasarathy, Vela Murali, "Engineering Drawing", Oxford University PRESS, India 2015.

CO - PO & PSO MAPPING

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	2	-	-	1	2	2		
CO2	3	3	3	3	2	2	2	-	-	1	2	2		
CO3	3	3	3	3	2	2	2	-	-	1	2	2		
CO4	3	3	3	3	2	2	2	-	-	1	2	2		
CO5	3	3	3	3	2	2	2	-	-	1	2	2		
AVG	3	3	3	3	2.2	2	2			1	2	2		

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22FT1101	**Principles of Food Science**	2	0	0	2

Course Objective

The student should be able to

1. To obtain knowledge on different food groups and their contribution to nutrition
2. To provide understanding about composition and nutritive value of food and knowledge relevant to processing, shelf-life extension and reduction of toxins
3. To gain knowledge on food safety, hazards and designing of new food products

Unit	Description	Instructional Hours
I	**Classification of Food** Definition of food, classification of foods- based on origin, pH, nutritive value, functions of food, Health food, ethnic food, organic food, functional food, nutraceuticals, fabricated foods, convenience foods, GM food and space foods	9
II	**Introduction to Food Science and Cereals, Millets and their Products** Cereals, Millets and their products -Structure and nutrient composition rice and wheat • Processed products of wheat and rice. Millets and its food uses- Germination and Malting of Grains – process, characteristics, Nutritional benefits and uses Fermented foods (brief), Mechanism of fermentation and changes occurring during fermentation, Indian fermented foods (idly, dosa, dhokla, and bread), Beverages – Types (Alcoholic & Non-alcoholic).	9
III	**Legumes, Nuts and oilseeds** Legumes - Structure and nutrient compositions of legumes. Factors affecting the cooking quality of legumes (soaking, fermentation, extrusion, germination and puffing), Anti-nutritional factors Nuts and oilseeds, Oilseeds – Composition, Processing and Food uses.	9
IV	**Vegetables, Fruits, Sweetening Agents** Vegetables and fruits, Classification and nutrient composition of fruits and vegetables. Pigments – Types, Effects of cooking media on color, texture and acceptability. Browning reaction and its prevention. Sweetening Agents (Brief) Sugar, Jaggary, Honey etc. Crystallization of sugar and its application in food preparations. Fortifying Sugars and Candies, Artificial Sweetening agents – Composition and Uses.	9
V	**Animal Sources** Milk and milk products , Composition of milk. Factors affecting the quality, Different types of milk and products. Eggs, Structure, composition, Grading, Factors affecting the quality. Effect of cooking on eggs and role of egg in different preparations Meat, poultry and fish, Structure of muscles and meat quality, Post-mortem changes, Factors to be considered in selection and preparation of meat, poultry and fish.	9
	Total Instructional Hours	45

Course Outcome

After completion of the course the learner will be able to

CO1	Gain the basic knowledge of Food Science
CO2	Relate the structure of common food commodities
CO3	Understand the structure and functions of food commodities in Indian cookery
CO4	Understand the nutrition composition and functions of fruits, vegetables and sweetening agents.
CO5	Understand the basic biochemical changes occurring during processing of foods from animal sources.

REFERENCE BOOKS

R1 Food Processing Technology by P.J. Fellows, Woodhead publishing ltd.

R2 Food Science by N.N. Potter, CBS publishing.

R3 Physical principles of Food Preservation. Vol. II by M. Karel, O.R. Fenema and D.B. Lurd, Marcel, Dekker Inc. New

CO - PO & PSO MAPPING

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	1	1	-	-	-	-	1	1	1
CO2	2	-	-	-	-	1	1	-	-	-	-	1	1	1
CO3	2	-	-	-	-	1	1	-	-	-	-	1	1	1
CO4	2	-	-	-	-	1	1	-	-	-	-	1	1	1
CO5	2	-	-	-	-	1	1	-	-	-	-	1	1	1
AVG	2	-	-	-	-	1	1	-	-	-	-	1	1	1

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22PH1151	PHYSICS FOR NON- CIRCUIT ENGINEERING	2	0	2	3

Course Objective

The student should be able to

1. Gain knowledge about laser, their applications, become Conversant with principles of optical fiber, types and applications of optical fiber.
2. Enhance his fundamental knowledge about properties of matter.
3. Understand the concept of Wave optics.
4. Gain knowledge about Quantum Physics.
5. Acquire fundamental knowledge of thermal physics which is related to the engineering program.

Unit	Description	Instructional Hours
I	**LASER AND FIBRE OPTICS** Spontaneous emission and stimulated emission –Type of lasers – Nd:YAG laser - Laser Applications – Holography – Construction and reconstruction of images. Principle and propagation of light through optical fibers – Derivation of numerical aperture and acceptance angle – Classification of optical fibers (based on refractive index and modes) – Fiber optical communication link. **Determination of Wavelength and particle size using Laser**	6
II	**PROPERTIES OF MATTER** Elasticity – Hooke's law – Poisson's ratio – Bending moment – Depression of a cantilever – Determination of Young's modulus of the material of the beam by Uniform bending theory and experiment. Twisting couple - torsion pendulum: theory and experiment **Determination of Young's modulus by uniform bending method** **Determination of Rigidity modulus – Torsion pendulum**	6
III	**WAVE OPTICS** Interference of light – air wedge –Thickness of thin paper -Testing of thickness of surface- Michelson interferometer. Diffraction of light –Fraunhofer diffraction at single slit –Diffraction grating – Rayleigh's criterion of resolution power - resolving power of grating. **Determination of wavelength of mercury spectrum – spectrometer grating** **Determination of thickness of a thin wire – Air wedge method**	6
IV	**QUANTUM PHYSICS** Black body radiation –Compton effect: theory and experimental verification – wave particle duality –concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box.	6
V	**THERMAL PHYSICS** Transfer of heat energy –thermal conduction, convection and radiation – thermal conductivity Lee's disc method: theory and experiment - conduction through compound media (series and parallel) – applications: solar water heaters.	6
	Total Instructional Hours	**30**
	Total Lab Instructional Hours	**30**

Course Outcome

After completion of the course the learner will be able to

CO1	Understand the advanced technology of LASER and optical communication in the field of Engineering.
CO2	Illustrate the fundamental properties of matter.
CO3	Discuss the Oscillatory motions of particles.
CO4	Understand the advanced technology of Quantum Physics in the field of Engineering.
CO5	Develop the technology of thermal physics in engineering field.

TEXT BOOKS

T1 Rajendran V, Applied Physics, Tata McGraw Hill Publishing Company Limited, New Delhi, 2017.

T2 Gaur R.K. and Gupta S.L., Engineering Physics, 8th edition, Dhanpat Rai Publications (P) Ltd., New Delhi, 2015.

REFERENCE BOOKS

R1 M.N Avadhanulu and PG Kshirsagar "A Text Book of Engineering physics" S. Chand and Company ltd., New Delhi 2016.

R2 Dr. G. Senthilkumar "Engineering Physics – I" VRB publishers Pvt Ltd., 2021.

CO - PO & PSO MAPPING

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	2	-	3	2	1		
CO2	-	-	-	-	2	3	2	3	1	3	1	-		
CO3	-	-	-	3		2	-	2	2	3	2	2		
CO4	-	-	-	-	-	2	-	2	1	3	1	1		
CO5	-	-	-	2	-	-	-	2	3	3	3	1		
AVG	-	-	-	2.5	2	2.3	2	2.2	1.8	3	1.8	1.3		

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Programme/Sem	Course Code	Name of the Course	L	T	P	C
B.TECH/I	22HE1072	ENTREPRENUERSHIP AND INNOVATION	1	0	0	1

The student should be made

Course Objectives

1. To acquire the knowledge and skills needed to manage the development of innovation.
2. To recognize and evaluate potential opportunities to monetize these innovations.
3. To plan specific and detailed method to exploit these opportunities.
4. To acquire the resources necessary to implement these plans.
5. To make students understand organizational performance and its importance.

Module	Description
1	**Entrepreneurial Thinking**
2	**Innovation Management**
3	**Design Thinking**
4	**Opportunity Spotting / Opportunity Evaluation**
5	**Industry and Market Research**
6	**Innovation Strategy and Business Models**
7	**Financial Forecasting**
8	**Business Plans/ Business Model Canvas**
9	**Entrepreneurial Finance**
10	**Pitching to Resources Providers / Pitch Deck**
11	**Negotiating Deals**
12	**New Venture Creation**
13	**Lean Start-ups**
14	**Entrepreneurial Ecosystem**
15	**Velocity Venture**

TOTAL INSTRUCTIONAL HOURS 15

At the end of the course, the learner will be able to

Course Outcome

CO1	Understand the nature of business opportunities, resources, and industries in critical and creative aspects.
CO2	Understand the processes by which innovation is fostered, managed, and commercialized.
CO3	Remember effectively and efficiently the potential of new business opportunities.
CO4	Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness.
CO5	Develop a business model for a new venture, including revenue. Margins, operations, Working capital, and investment.

TEXTBOOKS

T1 Arya Kumar "Entrepreneurship–CreatingandleadinganEntrepreneurialOrganization", Pearson, Second Edition (2012).

T2 Emrah Yayici "Design Thinking Methodology", Artbiztech, First Edition (2016).

REFERENCE BOOKS

R1 Christopher Golis "Enterprise & Venture Capital", Allen &Unwin Publication, Fourth Edition (2007).

R2 Thomas Lock Wood & Edger Papke "Innovation by Design", Career Press. com, Second Edition (2017).

R3 Jonathan Wilson "Essentials of Business Research", Sage Publication, First Edition (2010).

WEB RESOURCES

W1 https://blof.forgeforward.in/tagged/startup-lessons

W2 https://blof.forgeforward.in/tagged/entrepreurship

W3 https://blof.forgeforward.in/tagged/minimum-viable-product

W4 https://blof.forgeforward.in/tagged/minimum-viable-product

W5 https://blof.forgeforward.in/tagged/innovation

CO - PO & PSO MAPPING

CO PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	-	-	-	-	2	2	1
CO2	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO3	3	3	3	2	3	-	-	-	-	-	-	2	2	2
CO4	3	3	3	3	3	-	-	-	-	-	-	2	2	3
CO5	3	3	3	3	3	-	-	-	-	-	-	2	1	2
AVG	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2

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Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	22HE1073	INTRODUCTION TO SOFT SKILLS	2	0	0	0

Course Objectives:

1. To develop and nurture the soft skills of the students through instruction, knowledge acquisition, demonstration and practice.
2. To enhance the student's ability to deal with numerical and quantitative skills.
3. To identify the core skills associated with critical thinking.
4. To develop and integrate the use of English language skills.

Unit	Description	Instructional Hours
I	**Lessons on excellence** Skill introspection, Skill acquisition, consistent practice	2
II	**Logical Reasoning** Problem Solving - Critical Thinking- Lateral Thinking - Coding and Decoding – Series – Analogy - Odd Man Out - Visual Reasoning - Sudoku puzzles - Attention to detail	11
III	**Quantitative Aptitude** Addition and Subtraction of bigger numbers - Square and square roots - Cubes and cube roots - Vedic maths techniques - Multiplication Shortcuts - Multiplication of 3 and higher digit numbers – Simplifications - Comparing fractions - Shortcuts to find HCF and LCM - Divisibility tests shortcuts - Algebra and functions	11
IV	**Recruitment Essentials** Resume Building - Impression Management	2
V	**Verbal Ability** Nouns and Pronouns - Verbs - Subject-Verb Agreement - Pronoun-Antecedent – Agreement - Punctuations	4
	Total Instructional Hours	30

Course Outcome:

CO1: Students will analyze interpersonal communication skills. public speaking skills.
CO2: Students will exemplify tautology, contradiction and contingency by logical thinking.
CO3: Students will be able to develop an appropriate integral form to solve all sorts of quantitative problems.
CO4: Students can produce a resume that describes their education, skills, experiences and measurable achievements with proper grammar, format and brevity.
CO5: Students will be developed to acquire the ability to use English language with an error while making optimum use of grammar.

CO - PO & PSO MAPPING

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	-	-	-	-	-	2			2
CO2	2	3	3	-	-	-	-	-	2			2
CO3	2	3	3	-	-	-	-	-	2			2
CO4	2	3	-	-	-	-	-	-	2			2
CO5	2	3	-	-	-	-	-	-	2			2
AVG	2	3	1.8	-	-	-	-	-	2			2

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Programme/	Course Code	Name of the Course	L	T	P	C
B.Tech	22MC1093	தமிழர்மரபு	2	0	0	1

Unit	Description	Instructional Hours
I	அலகு I மொழி மற்றும் இலக்கியம்: 3 இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.	3
II	அலகு II மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை: 3 நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள்- பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.	3
III	அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்: 3 தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.	3
IV	அலகு IV தமிழர்களின் திணைக் கோட்பாடுகள்: 3 தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறை முகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.	3
V	அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு: 3 இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.	3
	Total Instructional Hours	15

EXT CUM REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆறறங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

Chairman BoS

Chairman - BoS
- HiCET

Dean Academics

Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22MC1094	HERITAGE OF TAMIL	2	0	0	1

Course Objective

The learner should be able to

Introduce students to the great History of Tamil literature.
Establish the heritage of various forms of Rock art and Sculpture art.
To study and understand the various folk and Martial arts of Tamil culture
Introduce students to Ancient Tamil concepts to understand the richness of Tamil literature.
To learn about the various influences or impacts of Tamil language in Indian culture.

Unit	Description	Instructional Hours
I	**Language and Literature** Language families in India – Dravidian Languages – Tamil as a classical language – Classical Literature in Tamil- Secular nature of Sangam Literature – Distributive justice in Sangam Literature – Management principles in Thirukural – Tamil epics and impacts of Buddhism & Jainism in Tamil and Bakthi literature of Azhwars and Nayanmars – Forms of minor poetry _ Development of Modern literature in Tamil – Contribution of Bharathiyar and Bharathidasan.	6
II	**Heritage _ Rock Art Paintings to Modern Art – Sculpture** Hero Stone to Modern Sculpture – Bronze icons – Tribes and their handcrafts - Art of temple car making – Massive Terracotta sculptures, Village deities, Thiruvalluvar statue at Kanyakumari, Making of musical instruments – Mridangam, Parai, Yazh and Nadhaswaram - Role of Temple in social and economic life of Tamils.	6
III	**Folk and Martial Arts** Therukoothu, Karagattem, Villupattu, Kaniyan koothu, Oyilattam, Leather puppertry, Silambattam., Valari Tiger dance – Sports and Games of Tamils.	6
IV	**Thinai Concept of Tamils** Flora and Fauna of Tamils – Aham and Puram Concept from Tholkappiyam and Sangam Literature – Aram concept of Tamils – Education and Literacy during Sangam Age - Ancient cities and ports of Sangam age – Exporot and Import during Sangam age – Overseas conquest of Cholas.	6
V	**Contribution of Tamils to Indian National Movement and Indian Culture** Contribution of Tamils to Indian freedom struggle – The cultural influence of Tamils over the other parts of India – Self-respect movement – Role of Siddha Medicine in indigenous systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil books.	6
	Total Instructional Hours	**30**

Course Outcome

At the end of the course, the learner will be able to

CO1: Learn about the works pertaining to Sangam age
CO2: Aware of our Heritage in art from Stone sculpture to Modern Sculpture.
CO3Appreciate the role of Folk arts in preserving, sustaining and evolution of Tamil culture.
CO4: Appreciate the intricacies of Tamil literature that had existed in the past.
CO5: Understand the contribution of Tamil Literature to Indian Culture

TEXTBOOKS:

T1: Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
T2: Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
T3: Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu)(Published by: International Institute of Tamil Studies).

REFERENCEBOOKS:

R1-The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies
R2- Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
R3-Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Chairman BoS
Chairman - BoS
FT - HiCET

ACADEMIC COUNCIL Chairman HINDUSTHAN INSTITUTIONS

Dean Academics
Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	22HE1095	UNIVERSAL HUMAN VALUES (COMMON TO ALL BRANCHES)	2	0	0	0

Course Objectives

The students should be made

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. TofacilitatethedevelopmentofaHolisticperspectiveamongstudentstowardslifeandprofession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding Interms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

Unit	Description	Instructional Hours
I	**Introduction to Value Education** Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)-Understanding Value Education - Self-exploration as the Process for Value Education - Continuous Happiness and Prosperity – the Basic Human Aspirations - Happiness and Prosperity – Current Scenario - Method to Fulfill the Basic Human Aspirations	6
II	**Harmony in the Human Being and Harmony in the Family** Understanding Human being as the Co-existence of the Self and the Body - Distinguishing between the Needs of the Self and the Body - The Body as an Instrument of the Self - Understanding Harmony in the Self- Harmony of the Self with the Body - Programme to ensure self-regulation and Health	6
III	**Harmony in the Family and Society** Harmony in the Family – the Basic Unit of Human Interaction.Values in Human to Human Relationship'Trust' – the Foundational Value in Relationship Values in Human to Human Relationship'Respect' – as the RightEvaluation Understanding Harmony in the Society	6
IV	**Harmony in the Nature / Existence** Understanding Harmony in the Nature.Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature- Understanding Existence as Co-existence of mutually interacting units in all pervasivespace Realizing Existence as Co-existence at All Levels The Holistic Perception of Harmony in Existence. Vision for the Universal Human Order	6
V	**Implications of the Holistic Understanding – a Look at Professional Ethics** Natural Acceptance of Human Values Definitiveness of (Ethical) Human Conduct A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order-Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical CaseStudiesStrategies for Transition towards Value-based Life and Profession	6
	Total Instructional Hours	**30**

Course Outcome

At the end of the course, the learner will be able

CO1: To become more aware of holistic vision of life - themselves and their surroundings.

CO2: To become more responsible in life, in the Society and in handling problems with sustainable Solutions.

CO3: To sensitive towards their commitment towards what they understood towards environment and Socially responsible behavior.

CO4: To able to apply what have learnt to their own self in different day-to-day settings in real life and In handling problems with sustainable solutions.

CO5: To develop competence and capabilities for maintaining Health and Hygiene.

Reference Books:

R1.A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

R2.Teachers'ManualforAFoundationCourseinHumanValuesandProfessionalEthics,RRGaur, R Asthana,G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-53-2

R3.JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak,1999.

R4.Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

Chairman BoS

Dean Academics

NEW COURSES INTRODUCED DETAILS FOR THE REGULATION 2022 – SEMESTER I & II					
S.NO	**Course Code**	**Course NAME**	**Suggestions presented by the Experts**	**Action Taken**	**Percentage (%) of Change**
1	22FT1101	Principles of Food Science	New course introduced in the semester II	Introduction	100
2	22FT2201	Fundamentals of Food Processing	New course introduced in the semester I	Introduction	100

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CURRICULUM R2022

(for the batch admitted during 2024 – 2025)

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.TECH. FOOD TECHNOLOGY (UG)

FIRST YEAR

REGULATION-2022

For the students admitted during the academic year 2023-2024 and onwards

SEMESTER I

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	**22MA1101**	Matrices and Calculus	BSC	3	1	0	4	4	40	60	100
2.	**22ME1201**	Engineering Drawing	ESC	1	4	0	3	5	40	60	100
THEORY WITH LAB COMPONENT											
3.	**22PH1151**	Physics for Non-Circuit Engineering	BSC	2	0	2	3	4	50	50	100
4.	**22HE1151**	English for Engineers	HSC	2	0	2	3	4	50	50	100
5.	**22IT1151**	Python Programming and practices	ESC	2	0	2	3	4	50	50	100
EEC COURSES (SE/AE)											
6.	**22MC1095**	Universal Human Values	AEC	2	0	0	2	3	40	60	100
7.	**22HE1072**	Entrepreneurship and Innovation	AEC	1	0	0	1	1	100	0	100
MANDATORY COURSE											
8.	**22MC1091/ 22MC1092**	தமிழரும் தொழில் நுட்பமும் / Indian Constitution	MC	2	0	0	0	2	0	0	**0**
			TOTAL	**15**	**5**	**6**	**19**	**27**	**370**	**330**	**700**

SEMESTER II

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	**22MA2105**	Partial differential equations, Fourier series and transforms (BME, Civil & FT)	BSC	3	1	0	4	4	40	60	100
2.	**22CY2101**	Environmental Studies	ESC	2	0	0	2	3	40	60	100
3.	**22PH2101**	BASICS OF MATERIAL SCIENCE (Common to all branches except Mechatronics)	BSC	2	0	0	2	3	40	60	100
4.	**22EE2231**	Basics of Electrical Engineering	ESC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	**22FT2152**	Food Biochemistry and Nutrition	BSC	2	0	2	3	4	50	50	100
6.	**22HE2151**	Effective Technical Communication	HSC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	**22ME2001**	Engineering Practices	ESC	0	0	4	2	2	60	40	100
EEC COURSES (SE/AE)											
8.	**22HE2071**	Design Thinking	AEC	2	0	0	2	2	100	0	100
9.	**22HE2072**	Soft Skills and Aptitude - I	AEC	1	0	0	1	1	100	0	100
MANDATORY COURSE											
10.	**22MC2094/ 22MC2095**	தமிழரும் தொழில்நுட்பமும்/ Tamil and Technology	MC	2	0	0	0	1	0	0	0
11.	**22MC2093**	NCC */NSS / YRC / Sports / Clubs / Society Services Enrollment (Common)	MC	All students shall enroll, on admission, in anyone of the personality and character development programmes and undergo training for about 80 hours							-
			TOTAL	**19**	**1**	**8**	**22**	**27**	**520**	**380**	**900**

SEMESTER III

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	**22MA3107**	Numerical Methods	BSC	3	1	0	4	4	40	60	100
2.	**22FT3201**	Food Microbiology	PCC	3	0	0	3	3	40	60	100
3.	**22FT3203**	Fluid Mechanics	PCC	3	1	0	4	4	40	60	100
4.	22FT3204	Principles of Thermodynamics	PCC	3	1	0	4	3	40	60	100
5.	22FT3205	Food Chemistry	PCC	3	0	0	3	3	40	60	100
PRACTICAL											
6.	**22FT3001**	Unit Operations Laboratory	ESC	0	0	4	2	2	60	40	100
7.	**22FT3002**	Food Microbiology Laboratory	PCC	0	0	4	2	3	60	40	100
EEC COURSES (SE/AE)											
8.	**22HE3071**	Soft Skills -2	SEC	1	0	0	1	1	100	0	100
9.	22FT3003	Food Chemistry Laboratory	AEC	0	0	4	2	3	60	40	100
MANDATORY COURSE											
10.	**22MC3191**	Essence of Indian tradition knowledge/Value Education	MC	2	0	0	0	2	100	0	100
			TOTAL	**17**	**3**	**12**	**25**	**29**	**580**	**420**	**1000**

SEMESTER IV

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	**22HE4101**	IPR and Start-ups	HSC	2	0	0	2	2	40	60	100
2.	**22MA4104**	Probability and Operation Research	BSC	3	0	0	3	3	40	60	100
3.	22FT420X	Fundamentals of Heat and Mass Transfer	PCC	3	1	0	4	3	40	60	100
4.	**22FT4202**	Refrigeration and Cold Chain Management	PCC	3	1	0	4	4	40	60	100
5.	**22FT4203**	Unit operations in Food Processing	PCC	3	0	0	3	4	40	60	100
6.	22FT4205	Baking and Confectionery Technology	PCC	3	0	0	3	4	50	50	100
PRACTICAL											
7.	**22FT4002**	Unit Operations in Food Processing Laboratory	PCC	0	0	4	2	4	60	40	100
8.	22FT4003	Baking and Confectionery Technology Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	**22HE4071**	Soft Skills -III	SEC	1	0	0	1	1	100	0	100
			TOTAL	**18**	**2**	**8**	**24**	**29**	**470**	**430**	**900**

* Two weeks internship carries 1 credit and it will be done during Semester III summer vacation and same will be evaluated in Semester IV.
If students unable to undergo in semester III, then the Internship I offered in the semester IV can be clubbed with Internship II (Total: 4 weeks-2 credits)

SEMESTER V

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	**22FT5201**	Fruits and Vegetable Processing Technology	PCC	3	0	0	3	4	40	60	100
2.	**22FT5202**	Poultry, Meat and Fish Process Technology	PCC	3	0	0	3	3	40	60	100
3.	**22FT53XX**	Professional Elective-1	PEC	3	0	0	3	3	40	60	100
4.	**22FT53XX**	Professional Elective-2	PEC	3	0	0	3	3	40	60	100
5.	**22FT53XX**	Professional Elective-3	PEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
6.	22FT5252	Food Analysis and Quality Control	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	**22FT5001**	Fruits and Vegetable Processing Technology Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	**22HE5071**	Soft Skills -4/Foreign languages	SEC	1	0	0	1	1	100	0	100
			TOTAL	**18**	**0**	**6**	**21**	**26**	**410**	**390**	**800**

SEMESTER VI

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	**22FT6201**	Dairy Engineering	PCC	3	0	0	3	3	40	60	100
2.	**22HS6101**	Professional Ethics (Common)	HSC	3	0	0	3	3	40	60	100
3.	**22FT63XX**	Professional Elective-4	PEC	3	0	0	3	3	40	60	100
4.	**22FT63XX**	Professional Elective-5	PEC	3	0	0	3	3	40	60	100
5.	**22XX64XX**	Open Elective – 1*	OEC	3	0	0	3	3	40	60	100
6.	**22XX64XX**	Open Elective – 2*	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
7.	**22FT6001**	Dairy Engineering Laboratory	PCC	0	0	4	2	4	60	40	100
8.	**22FT6002**	Food Process Equipment Design Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	**22HE6071**	Soft Skills – 5	SEC	2	0	0	2	2	100	0	100
			TOTAL	**20**	**0**	**8**	**24**	**28**	**460**	**440**	**900**

SEMESTER VII

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	**22FT7201**	Food Packaging	PCC	3	0	0	3	3	40	60	100
2.	**22FT7202**	Food Plant Layout and Management	PCC	3	1	0	4	4	40	60	100
3.	**22FT730X**	Professional Elective-6	PEC	3	0	0	3	3	40	60	100
4.	**22FT740X**	Open Elective – 3*	OEC	3	0	0	3	3	40	60	100
5.	**22FT740X**	Open Elective – 4*	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
6.	**22FT7001**	Food Packaging Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
7.	**22FT7701**	Internship - II*	SEC	-	-	-	2	1	100	0	100
			TOTAL	**15**	**1**	**4**	**20**	**21**	**360**	**340**	**700**

* - Two weeks internship carries 1 credit and it will be done during Semester VI summer vacation/placement training and same will be evaluated in Semester VII.

SEMESTER VIII

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
EEC COURSES (SE/AE)											
1.	**22FT8901**	Project Work/Granted Patent	SEC9	0	0	20	10	20	100	100	200
			TOTAL	**0**	**0**	**20**	**10**	**20**	**100**	**100**	**200**

Note:

4. *As per the AICTE guideline, in Semesters I, II, III & IV NCC one credit subject is added as Value Added Course with Extra Credit. Further, the students who enrolled his/her name in HICET NCC and Air Wing are eligible to undergo this subject. The earned extra credits printed in the Consolidated Mark sheet as per the regulation.
5. NCC course level 1 & Level 2 will be added in the list of open elective subjects in the appropriate semester. Further, the students' who have opted NCC subjects in Semester I, II, III & IV are eligible to undergo NCC Open Elective Subjects.
6. The above-mentioned NCC Courses will be offered to the students who are going to be admitted in the Academic Year 2021 – 22.

OPEN ELECTIVE I AND II (EMERGING TECHNOLOGIES)

To be offered for the students other than CSE, IT, AI&ML, ECE & BIOMEDICAL

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22AI6451	Artificial Intelligence and Machine Learning Fundamentals	OEC	2	0	2	4	3
2	22CS6451	Blockchain Technology	OEC	2	0	2	4	3
3	22EC6451	Cyber security	OEC	2	0	2	4	3
4	22EC6452	IoT Concepts and Applications	OEC	2	0	2	4	3
5	22IT6451	Data Science and Analytics	OEC	2	0	2	4	3
6	22BM6451	Augmented and Virtual Reality	OEC	2	0	2	4	3

OPEN ELECTIVE I AND II

To be offered for the students other than AUTO, AERO, AGRI, MECH, MCTS, CIVIL, EEE, CHEMICAL, FOOD TECH, E&I

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22AE6401	Space Science	OEC	3	0	0	3	3
2	22MT6401	Introduction to Industrial Engineering	OEC	3	0	0	3	3
3	22MT6402	Industrial Safety and Environment	OEC	3	0	0	3	3
4	22CE6401	Climate Change and its Impact	OEC	3	0	0	3	3
5	22CE6402	Environment and Social Impact Assessment	OEC	3	0	0	3	3
6	22ME6401	Renewable Energy System	OEC	3	0	0	3	3
7	22ME64[illegible]	Additive Manufacturing systems	OEC	3	0	0	3	3
8	22EI6401	Introduction to Industrial Instrumentation and Control	OEC	3	0	0	3	3
9	22EI6402	Graphical Programming using Virtual Instrumentation	OEC	3	0	0	3	3
10	22AU6401	Fundamentals of Automobile Engineering	OEC	3	0	0	3	3
11	22AU6402	Automotive Vehicle Safety	OEC	3	0	0	3	3
12	22EE6401	Digital Marketing	OEC	3	0	0	3	3
13	22EE6402	Research Methodology	OEC	3	0	0	3	3
14	22FT6401	Traditional Foods	OEC	3	0	0	3	3
15	22FT6402	Post Harvest Technology of Fruits and Vegetables	OEC	3	0	0	3	3
16	22AG6401	Urban Agriculture and Organic Farming	OEC	3	0	0	3	3
17	22CH6401	Biomass and Biorefinery	OEC	3	0	0	3	3

Note: Non-Circuit Departments can add one Open Elective course in the above list to offer for the circuit branches

OPEN ELECTIVE III

Students shall choose any one of the open elective courses such that the course content or title not belong to their own programme.

(Note: Each programme in our institution is expected to provide one course only)

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22EE7401	Fundamentals of Solar Energy & its applications	OEC	3	0	0	3	3

OPEN ELECTIVE IV

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22LS7401	General studies for competitive examinations	OEC	3	0	0	3	3
2	22LS7402	Human Rights, Women Rights and Gender equity	OEC	3	0	0	3	3
3	22LS7403	Indian ethos and Human values	OEC	3	0	0	3	3
4	22LS7404	Financial independence and management	OEC	3	0	0	3	3
5	22LS7405	Yoga for Human Excellence	OEC	3	0	0	3	3
6	22LS7406	Democracy and Good Governance	OEC	3	0	0	3	3
7	22LS7407	NCC Level - II	OEC	3	0	0	3	3

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical I Processing of Cereals, Pulses and Grain Technology	Vertical II Spices and Plantation Technology	Vertical III Food Safety Management System	Vertical IV Entrepreneurship and Management	Vertical V Food Colors, & Flavors	Vertical VI Food Processing and Preservation Techniques
22FT5301 Technology of Fats and Oils	22FT5304 Processing of Spices & Plantation Crops	22FT5307 Introduction to food safety Analysis and Quality Risk Management	22FT5310 Entrepreneurship Opportunities for Food Technologist	22FT5313 Food additives	22FT5316 Principles of Food Processing
22FT5302 Cereal Technology	22FT5305 Blending and Value Addition	22FT5308 HACCP in Food Processing and Preservation	22FT5311 Total Quality Management	22FT5314 Food colors and flavor Technology	22FT5317 Post-Harvest Engineering
22FT5303 Processing of Legumes and Oilseeds	22FT5306 Processing of Coffee	22FT5309 FSMS & Food Product and Supply Chain Management	22FT5312 Enterprise for resource planning	22FT5315 Biology and Chemistry of Food Flavors	22FT5318 Radiation Preservation and Processing of Food Products

22FT6301 Milling Technology for Food Materials	22FT6303 Processing of Tea	22FT6305 Food laws – Indian and International	22FT6307 Consumer acceptance and Market survey in Food Processing	22FT6309 Functional Foods and Nutraceuticals	22FT6311 Beverage Technology
22FT6302 Technology of Malting and Brewing	22FT6304 Processing of cocoa and Chocolate	22FT6306 Food Safety in Hospitality Industry & GLP in Food Industries	22FT6308 Energy Audit in Food Processing Industry	22FT6310 Food Toxicology and Allergy	22FT6312 Emerging Non-Thermal Processing of Foods
22FT7301 By Products Management	22FT7302 Packaging of Spices, Plantation products	22FT7303 Food Analysis, Testing & Microbial Safety Analysis	22FT7304 Food Process Economics & Industrial Management	22FT7305 Genetically Modified Foods	22FT7306 Emerging Technologies in Food Processing
22FT7307 Quality, Laws and Regulations in Grain Processing Industries	22FT7308 Spice Processing and Products Laws, Quality Standards and Regulations	22FT7309 Food quality, Assurance and Quality Control	22FT7310 Supply Chain and Retail Management	22FT7311 Waste Management and By-Product Utilization in Food Industries	22FT7312 Technology of Snack and Extruded Foods

Students are permitted to choose all Professional Electives from a particular vertical or from different verticals.

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Details of Vertical I: Processing of Cereals, Pulses and Grain Technology

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22FT5301	Technology of Fats and Oils	PEC	3	0	0	3	3
2.	22FT5302	Cereal Technology	PEC	3	0	0	3	3
3.	22FT530_	Processing of Legumes and Oilseeds	PEC	3	0	0	3	3
4.	22FT6301	Milling Technology for Food Materials	PEC	3	0	0	3	3
5.	22FT6302	Technology of Malting and Brewing	PEC	3	0	0	3	3
6.	22FT7301	By Products Management	PEC	3	0	0	3	3
7.	22FT7307	Quality, Laws and Regulations in grain processing Industries	PEC	3	0	0	3	3

Details of Vertical II: Spices and Plantation Technology

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22FT5304	Processing of Spices & Plantation Crops	PEC	3	0	0	3	3

2.	22FT5305	Blending and Value Addition	PEC	3	0	0	3	3
3.	22FT5306	Processing of Coffee	PEC	3	0	0	3	3
4.	22FT6303	Processing of Tea	PEC	3	0	0	3	3
5.	22FT6304	Processing of cocoa and chocolate	PEC	3	0	0	3	3
6.	22FT7302	Packaging of Spices and Plantation products	PEC	3	0	0	3	3
7.	22FT7308	Spice Processing and Products laws, Quality Standards and Regulations	PEC	3	0	0	3	3

Details of Vertical III: Food Safety Management System

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22FT5307	Introduction to Food Safety Analysis and Quality Risk Management	PEC	3	0	0	3	3
2.	22FT5308	HACCP in Food Processing and Preservation	PEC	3	0	0	3	3
3.	22FT5309	FSMS & Food Product and Supply Chain Management	PEC	3	0	0	3	3
4.	22FT6305	Food laws – Indian and International	PEC	3	0	0	3	3
5.	22FT6306	Food Safety in Hospitality industry & GLP in Food Industries	PEC	3	0	0	3	3
6.	22FT7303	Food Analysis, Testing & Microbial Safety Analysis	PEC	3	0	0	3	3
7.	22FT7309	Food quality, Assurance and Quality Control	PEC	3	0	0	3	3

Details of Vertical IV: Entrepreneurship and Management

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22FT5310	Entrepreneurship Opportunities for Food Technologist	PEC	3	0	0	3	3
2.	22FT5311	Total Quality Management	PEC	3	0	0	3	3
3.	22FT5312	Enterprise for resource planning	PEC	3	0	0	3	3
4.	22FT6307	Consumer acceptance and Market survey in Food Processing	PEC	3	0	0	3	3
5.	22FT6308	Energy audit in food processing industry	PEC	3	0	0	3	3
6.	22FT7304	Food Process Economics & Industrial Management	PEC	3	0	0	3	3
7.	22FT7310	Supply Chain and Retail Management	PEC	3	0	0	3	3

Details of Vertical V: Food Colors & Flavors

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22FT5313	Food additives	PEC	3	0	0	3	3
2.	22FT5314	Food colors and flavor Technology	PEC	3	0	0	3	3
3.	22FT5315	Biology and Chemistry of Food Flavors	PEC	3	0	0	3	3
4.	22FT6309	Functional foods and Nutraceuticals	PEC	3	0	0	3	3
5.	22FT6310	Food Toxicology and Allergy	PEC	3	0	0	3	3
6.	22FT7305	Genetically Modified Foods	PEC	3	0	0	3	3
7.	22FT7311	Waste Management and By-Product Utilization in Food Industries	PEC	3	0	0	3	3

Details of Vertical VI: Food Processing and Preservation Techniques

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22FT5316	Principles of Food Processing	PEC	3	0	0	3	3
2.	22FT5317	Post Harvest Engineering	PEC	3	0	0	3	3
3.	22FT5318	Radiation Preservation and Processing of Food Products	PEC	3	0	0	3	3
4.	22FT6311	Beverage Technology	PEC	3	0	0	3	3
5.	22FT6312	Emerging Non-Thermal Processing of Foods	PEC	3	0	0	3	3
6.	22FT7306	Emerging Technologies in Food Processing	PEC	3	0	0	3	3
7.	22FT7312	Technology of Snack and Extruded Foods	PEC	3	0	0	3	3

Enrollment for B.E. / B. TECH. (HONOURS) / Minor Degree (optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.

Clause 4.10 of Regulation 2022 is applicable for the Enrolment of B.E. / B. TECH. (HONOURS) / Minor Degree (Optional).

VERTICALS FOR MINOR DEGREE

- Heads are requested to provide one vertical from their program to offer for other program students to register for additional courses (18 Credits) to become eligible for the B.E./B.Tech. Minor Degree.

Note: Each programme should provide verticals for minor degree

VERTICALS FOR MINOR DEGREE

- Heads are requested to provide one vertical from their program to offer for other program students to register for additional courses (18 Credits) to become eligible for the B.E./B.Tech. Minor Degree.
  Note: Each programme should provide verticals for minor degree

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22FT5601	Sem 5: Food Quality Analysis	MDC	3	0	0	3	3
2.	22FT6601	Sem 6: Technology of Fruits and Vegetable Processing	MDC	3	0	0	3	3
3.	22FT6602	Sem6: Meat Processing Technology	MDC	3	0	0	3	3
4.	22FT7601	Sem 7: Processing of milk and milk products	MDC	3	0	0	3	3
5.	22FT7602	Sem 7: Technology of Baking and Confectionery	MDC	3	0	0	3	3
6.	22FT8601	Sem 8: Food Packaging Technology	MDC	3	0	0	3	3

*MDC – Minor Degree Course

In addition to the above the following additional courses for Minor Degree can also be given to the student's common to all the branches.

Vertical I Fintech and Block Chain	Vertical II Entrepreneurship	Vertical III Environment and Sustainability
Financial Management	22BA5601 Foundation of Entrepreneurship	Sustainable infrastructure Development
Fundamentals of Investment	22BA6601 Introduction to Business Venture	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	22BA6602 Team Building & 22BA7601 Leadership Management for Business	Sustainable Bio Materials
Introduction to Blockchain and its Applications	22BA7602 Creativity & Innovation in Entrepreneurship	Materials for Energy Sustainability
Fintech Personal Finance and Payments	22BA8601 Principles of Marketing Management for Business	Green Technology
Introduction to Fintech	22BA8602 Human Resource Management for Entrepreneurs	Environmental Quality Monitoring and Analysis

B Tech (Hons) Food Technology in Machine Learning Applications

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	22FT5XXX	Basics of AI in Food	PC	3	0	0	3	3	40	60	100
2.	22FT6XXX	Computer Applications in Food Processing	PC	3	0	0	3	3	40	60	100
3.	22FT6XXX	IoT Applications in	PC	3	0	0	3	3	40	60	100

Chairman

		Food Industry									
4.	22FT7XXX	Computer simulation and modelling in food processing	PC	3	0	0	3	3	40	60	100
5.	22FT7XXX	Instrumentation and process control in food processing	PC	3	0	0	3	3	40	60	100
6.	22FT8XXX	Image Processing for the Food Industry	PC	3	0	0	3	3	40	60	100

B Tech (Hons) Food Technology in Processing and Value Addition

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	22FT5XXX	Technology of milk and milk products	PC	3	0	0	3	3	40	60	100
2.	22FT6XXX	Ready to Eat foods	PC	3	0	0	3	3	40	60	100
3.	22FT6XXX	Cane sugar Technology	PC	3	0	0	3	3	40	60	100
4.	22FT7XXX	Beverage Technology	PC	3	0	0	3	3	40	60	100
Theory with Lab Component											
5.	22FT7XXX	Processing and Value addition of Tuber crops	PC	2	0	2	3	4	40	60	100
6.	22FT8XXX	Mushroom Processing Technology	PC	2	0	2	3	4	40	60	100

B Tech (Hons) Food Technology in Food Science and Biotechnology

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	22FT5XXX	Food nutrition and dietics	PC	3	0	0	3	3	40	60	100
2.	22FT6XXX	Food Biotechnology	PC	3	0	0	3	3	40	60	100
3.	22FT6XXX	Downstream Process Engineering	PC	3	0	0	3	3	40	60	100
4.	22FT7XXX	Chemical reaction Engineering	PC	3	0	0	3	3	40	60	100
Theory with Lab Component											
5.	22FT7XXX	Fermentation	PC	2	0	2	3	4	40	60	100

		Technology									
6.	22FT8XXX	Enzymes in Food Processing	PC	2	0	2	3	4	40	60	100

Note: Each programme should provide verticals for Honours degree

SEMESTER-WISE CREDIT DISTRIBUTION

B.E. / B.TECH. PROGRAMMES									
S.No.	Course Area	Credits per Semester							Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSC	3	3	-	2	-	3	-	-	**11**
2	BSC	10	6	4	3	-	-	-	-	**23**
3	ESC	3	10	2	-	-	-	-	-	**15**
4	PCC	-	-	16	18	11	7	9	-	**61**
5	PEC	-	-	-	-	9	6	3	-	**18**
6	OEC	-	-	-	-	-	6	6	-	**12**
7	EEC	1	3	3	1	1	2	2	10	**23**
8	MCC	1	1	✓	-	-	-	-	-	**2**
	Total	**18**	**23**	**25**	**24**	**21**	**24**	**20**	**10**	**165**

Credit Distribution R2022

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	18	23	25	24	21	24	20	10	165

Chairman BoS

Chairman - BoS
FT - HiCET

Dean Academics

Dean (Academics)
HiCET

Principal

SYLLABUS

SEMESTER III

Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	22MA3107	NUMERICAL METHODS (CHEM, FT)	3	1	0	4

Course Objective

The learner should be able to

1. Solve algebraic, transcendental and system of linear equations by using various techniques.
2. Analyze various methods to find the intermediate values for the given data.
3. Explain concepts of numerical differentiation and numerical integration of the unknown functions.
4. Explain single and multi-step methods to solve Ordinary differential equations
5. Describe various methods to solve ordinary differential equations and partial differential equations.

Unit	Description	Instructional Hours
I	**SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS** Solution of Algebraic and Transcendental equations: Newton Raphsonmethod . Solution of linear system: Gauss Elimination - Gauss Jordan method -Gauss Seidel method. Matrix inversion by Gauss Jordan method.	12
II	**INTERPOLATION** Interpolation - Newton's forward and backward difference formulae – Newton's divided difference formula and Lagrangian interpolation for unequal intervals.	12
III	**NUMERICAL DIFFERENTIATION AND INTEGRATION** Numerical Differentiation: Newton's forward and backward interpolation formulae for equal intervals –Newton's divided difference formula for unequal intervals. Numerical integration: Trapezoidal and Simpson's 1/3 rule	12
IV	**INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS** Single step methods for solving first order equations: Taylor's series method – Euler and Modified Euler methods – Fourth order Runge-kutta method -Multi step method: Milne's predictor and corrector method.	12
V	**BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS** Solution of second order ordinary differential equation by Finite difference method – Solution of partial differential equation: one dimensional heat equation by Bender schmidt method – One dimensional Wave equation by Explicit method– Two dimensional heat equation - Laplace Equation and Poisson Equations	12
	Total Instructional Hours	60

Course Outcome

At the end of the course, the learner will be able to

CO1: Solve the system of linear algebraic equations which extends its applications in the field of engineering.

CO2: Apply various methods to find the intermediate values for the given data.

CO3: Identify various methods to perfrom numerical differentiation and integration

CO4: Classify and solve ordinary differential equations by using single and multi step methods.

CO5: Illustrate various methods to find the solution of ordinary and partial differential equations.

TEXT BOOKS:

T1 - Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India Private Ltd., New Delhi, 2018.

T2 - Grewal.B.S. " Higher Engineering Mathematics", 44th Edition, Khanna Publications, New Delhi, 2012.

REFERENCE BOOKS :

R1 - M.K.Jain,S.R.K.Iyengar, R.K.Jain "Numerical methods for Scientific and Engineering Computation", Fifth Edition, New Age International publishers 2010.

R2 - Grewal B.S. and Grewal J.S. " Numerical Methods in Engineering and Science ", 6th Edition , Khanna publishers, New Delhi 2015.

R3 - S.K.Gupta, Numerical Methods for Engineers" , New Age International Pvt.Ltd Publishers,2015.

CO - PO & PSO MAPPING

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO2	3	3	3	2	3	-	-	-	-	-	-	2	2	2
CO3	3	3	3	3	3	-	-	-	-	-	-	2	2	2
CO4	3	3	3	3	3	-	-	-	-	-	-	2	2	3
CO5	3	3	3	3	3	-	-	-	-	-	-	2	2	2
Avg	3	3	3	2.6	2.8							2	2	2.2

Chairman, Board of Studies

Chairman - BoS
FT - HiCET

Dean – Academics

Dean (Academi...
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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22FT3201	FOOD MICROBIOLOGY	3	0	0	3

COURSE OBJECTIVES

The Students will be able to

1. Recognize the significance of microorganisms in food.
2. Learn and apply various sampling methods to assess microbial load in food.
3. Comprehend the basics of fermentation processes including batch, fed-batch, and continuous fermentation.
4. Understand the principles and types of microbial spoilage.
5. Learn about food sanitation indicators and coliform bacteria as measures of food safety.

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
I	**Microorganisms in Food:** Introduction -Importance of microorganisms in food - primary sources of microorganisms in food - Intrinsic and Extrinsic parameters of food affecting / influencing microbial growth - Types of microorganisms in foods like meats, poultry, seafood, vegetables, dairy products, fruits and vegetables.	9
II	**Microbial Spoilage of Foods:** Spoilage of foods - principles and types of spoilage – microbial spoilage of foods - Microbial spoilage of Fruits- Vegetables- Grains and grain products- Meat- Poultry- Fish- Factors influencing the spoilage and control- Spoilage of Milk and Dairy products- Psychrotropic spoilage - Assessing microbial load in foods - microscopic, cultural, physical, chemical and immunological methods.	9
III	**Preservation of Foods:** Factors affecting preservation - Control of microorganism in foods using temperature - low temperature – characteristics of psychrotrophs – high temperature - characteristics of thermophiles. Control of microorganism in foods by drying - chemicals and radiation – limitations - commercial applications. Bio preservatives- Bacteriocins- role and importance in food applications.	9
IV	**Fermented and Microbial Foods:** Food Fermentations- Role and importance of microorganism in food fermentation - Lactic acid Bacteria and their fermentation products- Fermented Dairy products- Yoghurt, Cheese - Starter cultures in fermentation and their importance. Vegetable Fermentation- sauerkraut and pickle products – Meat fermentation- Yeast based and other fermentations – Bread, Beer and Wine; Fermented Cereal Products - Single Cell Production– Production and drawbacks. - Scope and trends in SCP. Probiotics- Characteristic features of probiotic microorganism- prebiotics for symbiotic foods formulation.	9
V	**Food Borne Diseases and Quality Control:** Food borne infections and intoxication – food poisoning – botulism – salmonellosis – gastroenteritis, food borne pathogens – Clostridium, Bacillus ceres, Staphylococcus aureus, Vibrio, Campyloacter, Yersinia etc., Viruses – food borne Illness- Bacteriophages in the Dairy Industry- Beneficial uses of Viruses. Food sanitation – indicators of food safety – coliform bacteria- food processing plant sanitation – microbiological standards and guidelines – HACCP – microbial quality	9

control and food laws.

TOTAL INSTRUCTIONAL HOURS **45**

COURSE OUTCOMES

CO1 - Recognize the sources and factors influencing the microbial growth

CO2 - Identify the techniques used to assess the microbial load and

CO3 - Interpret microbial spoilage of different foods

CO4 - Apply the knowledge of microorganism in fermentation process

CO5 - Distinguish food borne diseases and intoxication caused by microorganisms

TEXT BOOKS

1. Frazier W.C., Westhoff D.C. and Vanitha N.M., —Food Microbiologyl, 5th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2014.

2. Jay J.M., —Modern Food Microbiologyl, 6th Edition, Aspen Publications, Maryland, USA, 2000.

REFERENCE BOOKS

1. Adams M.R. and Moss M.O., —Food Microbiologyll, RSC Publishing, 2008.

2. Ray B. and Bhunia A., —Fundamental Food Microbiologyll, 5thEdition, CRC Press, 2013.

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	**PSO-1**	**PSO-2**
CO1	1	1	-	2	-	1	1	1	-	-	-	1	1	1
CO2	1	1	-	2	-	1	1	1	-	-	-	1	1	1
CO3	1	1	-	2	-	1	2	2	-	-	-	1	1	1
CO4	1	1	-	2	-	1	2	2	-	-	-	2	1	1
CO5	1	1	-	2	-	2	2	2	-	-	-	2	2	2
AVG	1	1.2	1.25	1.8	-	1.6	1.6	1.6	3	1	-	1.4	1.8	1.6

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22FT3204	PRINCIPLES OF THERMODYNAMICS	3	1	0	4

COURSE OBJECTIVES

- Understand the basic concepts.
- Understand the principles of thermodynamics law.
- Understand the concepts of pure substances.
- Understand the properties of steam.
- **Understand the mechanism of boiler.**
- **Understand the concepts of psychrometry.**

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
I	**Basic Concepts and First Law:** Fundamental concepts of thermodynamics- microscopic and macroscopic approach – systems, properties, process, **path and point** functions, units, energy, heat and work, zeroth law. First law - statement of first law for flow and non - flow process, internal energy, enthalpy, heat capacities (CV and CP) -- steady state flow processes with reference to various thermal equipment - nozzle, throat, throttling process and compressors.	12
II	**Second Law:** Second Law of thermodynamics: Kelvin-Plank, Clausius statements and its equivalence, reversible cycle – Carnot cycle and theorem – thermodynamic temperature scale. Entropy, Clausius theorem, Clausius inequality, Entropy changes during processes – **available and unavailable energies. Exergy analysis, Application of exergy analysis for design of thermal food processing equipments.**	12
III	**PVT Behavior of Pure Fluids:** PVT surfaces: P-V, P-T, T-S and H-S Diagrams. Equation of state and the concept of ideal gas - Process involving ideal gases: constant volume, constant pressure, and constant temperature, adiabatic and polytrophic process. Equation of state for real gases – Vander Waals equation, Redllich Kwong equation, Virial equation of state. Principle of corresponding states – generalized compressibility charts.	12
IV	**Steam Properties:** Properties of steam, usage of steam tables. Determination of dryness fraction of steam. Calorimeters – Tank or barrel type, throttling, separating, separating and throttling. Steam distribution systems. Types of steam traps and their characteristics. Application of steam in food process industries.	12
V	**Boilers: Types and classification of boilers - Cochran Boiler, Lancashire boiler, Locomotive Boiler, Fluidized Bed Boiler. Boiler mountings and Accessories. Performance and energy efficiency of boilers. Simple calculation of Boiler efficiency. Importance of boiler water treatment and blow down.**	12
	Psychrometry-Properties of air, psychrometric chart, psychometric processes- adiabatic saturation, sensible heating and cooling, humidification, dehumidification, evaporative cooling and adiabatic mixing, Application of psychometric for design of driers.	
	TOTAL INSTRUCTIONAL HOURS	60

COURSE OUTCOMES

CO1 - Outline the basic concepts and apply the first law of thermodynamics in selected processes

CO2 - Understand the principle of second law of thermodynamics and concepts of Carnot cycle

CO3 - Interpret the second law of thermodynamics and relate the properties of pure substance

CO4 - Estimate the properties of steam and measurement of quality of steam using calorimeters

CO5 - Integrate the use of simple calculation in gaining the working knowledge of psychrometry.

TEXT BOOKS

T1 Y. Cengel and M. Boles, Thermodynamics – An Engineering Approach, Tata McGraw Hill, 7th Edition, 2011.

T2 Nag P. K. Thermodynamics, 2005. 5th edition, Tata Mc Graw Hill, New Delhi. 2001.

REFERENCE BOOKS

R1 Narayanan K.V., —A Text Book of Chemical Engineering Thermodynamic, 2nd revised edition, Prentice Hall of India, New Delhi, 2013.
Reeve Sidney Armor., —"Thermodynamics of Heat Engines", Wentworth press 2019.

R2 Smith J.M., Van Ness H.C. and Abbott M.M., —Introduction to Chemical Engineering Thermodynamics, 7th Edition, McGraw Hill, New York, 2005.

R3 Rao Y.V.C., —An Introduction to Thermodynamics, Universities Press, 2004.

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	2	2	3	-	-	-	-	-	-	-	-	-	-
CO2	3	2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	3	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	3	3	-	-	-	-	-	-	-	-	-	-
AVG	3	2.4	2.8	2.4	-	-	-	-	-	-	-	-	-	-

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22FT3203	FLUID MECHANICS	3	1	0	4

COURSE OBJECTIVES

1. Understand the classification of fluids.
2. Understand the statements regarding fluid flow.
3. Understand the fluid flow through pores.
4. Understand the performance of pumps.
5. Understand the flow measuring devices and valves.

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
I	**Fluid Statics and Dimensional Analysis:** Nature of fluids – physical properties of fluids, Compressible and incompressible. Types of fluids – Newtonian and Non – Newtonian fluids. Fluid static: Hydrostatic equilibrium. Application of fluid statics: manometers, continuous gravity decanter. Basics of dimensional analysis: Rayleigh's method and Buckingham's method.	12
II	**Basic Equations of Fluid Flow:** Bernoulli equation. Correction of Bernoulli equation for fluid friction. Application of Bernoulli equation for pump work. Shear stress and skin friction in pipes. Laminar and turbulent flow of fluids through closed conduits. Velocity profiles and friction factor for smooth and rough pipes. Friction loss due to sudden enlargement, contraction. Friction loss in fittings valves and coils.	12
III	**Flow Past Immersed Bodies:** Pressure drop for flow of liquids through porous media. Motion of particles through fluids: Equation for one dimensional motion of spherical particle through fluid, terminal velocity, Hindered settling. **Agitation of liquids:** Types of impellers, Flow pattern in agitated vessel. Power consumption in agitated vessels, blending and mixing.	12
IV	**Transportation of Fluids**: Fluid moving machinery. Performance – selection and specification. Positive displacement, centrifugal pump - characteristics. Gear pump, diaphragm pumps, vacuum pump, metering pump, peristaltic pump –working principle and application. Fans, blowers and compressors – Selection, types and applications.	12
V	**Metering of Fluids:** Variable head meter: Orifice meter, Venturimeter, Pitot tube. Variable area meter: Rota meter. Calibration of flow meters. Principles and applications of Doppler Effect in flow measurement. Principle of Magnetic flow meters, V-Notch, Turbine flow meters, and Thermal flow meters. Valves – Types, applications.	12
	TOTAL INSTRUCTIONAL HOURS	**60**

COURSE OUTCOMES

CO1 - Classify fluids, apply hydrostatic equilibrium and dimensional analysis in fluid flow behaviour.

CO2 - Derive and apply basic equations of fluid flow.

CO3 - Analyze fluid flow through porous media and select suitable mixing equipment used in food industries.

CO4 - Select and evaluate the performance of pumps.

CO5 - Illustrate the principle and application of different flow measuring devices and valves.

TEXT BOOKS

T1 McCabe W.L., Smith J.C. and Harriot P., —Unit Operations of Chemical Engineering‖, 7th Edition, McGraw Hill, New York, 2017.

T2 Gavhane K.A., —Unit Operations – I, 8th Edition, Nirali Prakashan Publications, Pune, 2017.

REFERENCE BOOKS

R1 Coulson & Richardson's Chemical Engineering. 5th edition, vol. 2. Elsevier, 2006.

R2 Mott, Robert L., and Joseph A. Untener. Applied fluid mechanics. Pearson, 2015.
Coulson & Richardson's Chemical Engineering. 5th edition, vol. 2. Elsevier, 2006.

R3 Cengel, Yunus and Cimbala John M., —Fluid Mechanics Fundamentals and Applicationsl, 4th Edition, Tata McGraw Hill Publishing Company, 2017.

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	2	3	-	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	2	2	-	-	-	-	-	-	-	-	-	-
AVG	2.8	2.6	2	2.5	-	-	-	-	-	-	-	-	-	-

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22FT3205	FOOD CHEMISTRY	3	0	0	3

The student should be able

Course Objective

1. To interpret the nutritional importance of foods and water.
2. To summarize the nutritional importance of vitamins and minerals.
3. To recognize the changes in food components during cooking, processing and storage.
4. To modify the carbohydrates, proteins and fats based on its functional properties.
5. To apply the different methods of food preservation.

Unit	DESCRIPTION	Instructional Hours
I	**Water** Nature Scope and development of food chemistry; Moisture in foods, role and type of water in foods, functional properties of water, water activity and sorption isotherm, molecular mobility and foods stability; Dispersed systems of foods: Physicochemical aspects of food dispersion system (Sol,gel, foam, emulsion).	9
II	**Carbohydrates** Carbohydrates in foods- occurrence, classification, structure and properties of monosaccharaides, oligosaccharides and polysaccharides. Changes of carbohydrates on cooking, modification of carbohydrates, dietary fibers and carbohydrates digestibility; Enzymatic and chemical reactions of carbohydrates.	7
III	**Lipids in foods** - occurrence, classification, structure of simple, compound and derived lipids. Role and use of lipids/fat, crystallization and consistency, chemical aspects of lipids, lipolysis, auto-oxidation, thermal decomposition; Rancidity and its types **Vitamins**: Classification, structure and functions of fat-soluble vitamins, Classification and functions of water-soluble vitamins; Requirements, allowances, enrichment, restorations, fortifications, losses of vitamins.	11
IV	**Proteins** Proteins in foods - classification, structure and properties of amino acids; Essential amino acids. Classification and structure of proteins. Proteins in foods: Processing induced, physical, chemical and nutritional changes in protein, chemical and enzymatic modification of protein. **Minerals** Classification, structure and functions of macro and micro minerals; Requirements, allowances, enrichment, restorations, fortifications, losses of minerals; optimization and retention of minerals.	11
V	**Important Phytochemicals in Foods** Technology to preserve degradation of chlorophyll – Color and stability of carotenoids and anthocyanins –ants - Natural and synthetic flavorings – Threshold value, Food Allergens - Chemistry of antioxidants and antinutrients.	7
	Total Instructional Hours	**45**

Course

CO1 Interpret the nutritional importance of foods and water.

Outcome

CO2 Apply the structural changes in carbohydrates during processing.

CO3 Evaluate the properties and physico-chemical changes of fats and oil during processing and their industrial importance.

CO4 Analyze the functional and nutritional properties of proteins.

CO5 Assess the colorants, Flavorants and other phytochemicals in food matrices.

TEXT BOOK:

T1 Belitz H.D., Grosch W. and Schieberle P., —Food Chemistryl, 3rd Edition, Springer-Verley, Berlin, 2004.

T2 Sivasankar B., —Food Processing and Preservationl, Prentice Hall of India, New Delhi, 2005.

REFERENCES:

R1 Fennema, Owen R., Srinivasan Damodaran, and Kirk L. Parkin. "Introduction to food chemistry." In Fennema's Food Chemistry, Fifth Edition, pp. 1-16. CRC Press, 2017.

R2 Srilakshmi B., —Nutrition Sciencel, 3rd Edition, New Age International Ltd., New Delhi, 2011.

R3 Damodaran, Srinivasan, and Kirk L. Parkin. Fennema's food chemistry. CRC press, 2017.

R4 Fennema, Owen R., Srinivasan Damodaran, and Kirk L. Parkin. "Introduction to food chemistry." In Fennema's Food Chemistry, Fifth Edition, pp. 1-16. CRC Press, 2017.

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	2	-	-	-	-	-	-	-	-	-	3	3	3
CO2	3	3	-	-	-	-	-	-	-	-	-	3	3	2
CO3	3	3	-	-	2	-	-	-	3	-	-	2	3	2
CO4	3	3	-	-	2	-	-	-	3	-	-	2	3	3
CO5	3	2	-	-	2	-	-	-	3	-	-	3	3	3
AVG	3	2.6	-	-	2	-	-	-	3	-	-	2.6	3	2.6

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Programme	Course Code	Name of the course	L	T	P	C
B.TECH.	22FT3001	UNIT OPERATIONS LABORATORY	0	0	4	2

Course Objectives

- To impart the knowledge on heat and mass transfer phenomena
- To provide the knowledge on performance of pipes, valves and other accessories
- To demonstrate the principles of free and forced convection

Experiments:

1. Flow measurement a) Orifice meter b) Venturimeter c) Coils
2. Flow through square duct, annular and circular pipes
3. Pressure drop studies in packed bed
4. Flow through fluidized bed, valves and pipe fittings
5. Calibration of V-notch
6. Solving problems on single and multiple effect evaporator
7. Determination of efficiency of heat transfer in agitated vessel.
8. Determination of efficiency of liquid solid separation by filtration.
9. Determination of absorption efficiency in a packing tower
10. Heat transfer in natural convection/ forced convection
11. Determination of the activity coefficients by vapor liquid equilibrium
12. Determination of vaporization efficiency (Ev) and thermal efficiency (Et) of the given system using steam distillation setup. Also verify with Raleigh's equation
13. Studying the theoretical and actual recovery of solvent using leaching

COURSE OUTCOMES

CO1 Evaluate the process/performance parameters for mass transfer operations (distillation column, leaching).
CO2 Determine diffusivity and Stefan Boltzman constant using fundamental principles.
CO3 Calculate the individual and overall heat transfer coefficient of heat exchangers.
CO4 Determine the discharge coefficient using variable area flow meters and variable head flow meters.
CO5 Assess the flow of fluids through closed conduits, open channels, valves and pipe fitting.

REFERENCES:

R1. McCabe W.L., Smith J.C. and Harriot P., —Unit Operations of Chemical Engineering‖, 7th Edition, McGraw Hill, New York, 2005.
R2. Perry Robert, —Perry's Chemical Engineers Hand Book‖, 8th Edition, McGraw Hill, New York, 2007.
R3. Treybal R.E., —Mass Transfer Operations‖, 3rd Edition, McGraw Hill, New York, 1981.

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	2	3	-	-	-	-	-	3	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	3	-	-	-	-	-
CO3	3	3	3	-	-	-	-	-	3	-	-	-	-	-
CO4	3	3	3	-	-	-	-	-	3	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	3	-	-	-	-	-
AVG	3	2.8	2.6	-	-	-	-	-	3	-	-	-	-	-

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22FT3002	FOOD MICROBIOLOGY LABORATORY	0	0	3	1.5

COURSE OBJECTIVES

1. Expose various microbial aspects of Food Processing
2. Impart knowledge on identification of microbes using different technique and its enumeration methods
3. Recognize the role of microbes in Food spoilage and preservation

EXPERIMENTS

I Introduction, Laboratory Safety, Use of Equipment; Sterilization Techniques; Culture Media-Types and Use; Preparation of Nutrient broth and agar

II Plating Techniques: Pour plate, Spread plate and Streak plate methods for the Isolation and Counting of Viable Microorganisms in Food samples

III Microscopy – Working and Care of Microscope; Microscopic Methods in the Study of Microorganisms;

IV Staining Techniques - Simple, Differential- Gram's Staining methods

V Determination and Enumeration of Pathogenic and Indicator Organisms in Foods (MPN Method)

VI Experiment on Microbial Quality of Milk

VII Enumeration of Lactic acid bacteria from Fermented Foods

VIII Microbial examination of Fruits and Vegetable products for Yeasts and Molds

IX Microbial Examination of Spices for Spores

X Inhibitory effect of Spices on microbial load in Fish & Flesh foods

XI Enumeration & Isolation of *E. coli* from Processed Chicken Meat

XII Determination of Thermal Death Time

XIII Detection of *Staphylococcus aureus* from food sample

XIV Effect of Cleaning and Disinfection on Microbial Load

TOTAL WORKING HOURS: 45

COURSE OUTCOMES

CO1 - Complete understanding of isolation, characterization of various microbes associated with foods and food groups.

CO2 - Familiarize with microbiological techniques for the study of foods.

CO3 - Better understanding of methods to detect pathogens in foods.

CO4 - Inoculate, isolate and identify the microorganism from both liquid and solid samples.

CO5 - Select the appropriate equipment for Microbiological works.

REFERENCES

1. Yousef A.E. and Carlstrom C., —Food Microbiology: A Laboratory Manuall, Wiley Interscience Publications, 2003.
2. McLandsborough L., —Food Microbiology Laboratoryll, CRC Press, 2004.

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	3	-	-	-	-	-	-	3	-	-	-	3	-
CO2	3	2	-	-	2	-	-	-	3	-	-	-	3	-
CO3	3	2	-	-	3	-	-	-	3	-	-	-	3	-
CO4	3	3	-	-	2	-	-	-	3	-	-	-	3	-
CO5	3	3	-	-	3	-	-	-	3	-	-	-	3	-
AVG	3	2.6	-	-	2.5	-	-	-	3	-	-	-	3	-

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22FT3003	FOOD CHEMISTRY LABORATORY	0	0	2	2

COURSE OBJECTIVES

The Students will be able to

1. Understand and perform extraction and estimation techniques for various bioactive compounds in foods.
2. Develop skills in assessing quality parameters of food, including non-enzymatic browning and free fatty acids in lipids.
3. Gain practical experience in isolating proteins from different food sources.
4. Gain practical experience in isolating and quantifying proteins from different food sources.

EXPERIMENTS

1. Extraction and estimation of polyphenols.
2. Extraction and estimation of flavonoids.
3. Estimation of non-enzymatic browning in foods.
4. Isolation of protein from milk and egg.
5. Determination of FFA value of lipids and oils.
6. Extraction and estimation of chlorophyll.
7. Extraction and estimation of carotenoids and lycopene.
8. Determination of ascorbic acid by dye method.
9. Preparation of mineral solution using ash and tri acid method.
10. Estimation of calcium.
11. Estimation of Iron

TOTAL WORKING HOURS: 45

COURSE OUTCOMES

CO1 - Perform chemical analyses to determine the quality parameters of food, including non-enzymatic browning, free fatty acids in lipids, and ascorbic acid content.
CO2 - Isolating proteins from various food sources such as milk and eggs, and understand the principles of protein precipitation and quantification.
CO3 - prepare mineral solutions and estimate the content of essential minerals
CO4 - Acquire practical skills in the extraction and quantification of bioactive compound.
CO5 - Determine the free fatty acid (FFA) value of lipids and oils, understanding its relevance to food quality and shelf life.

TEXT BOOKS

1 Owen R. Fennema, 2010, Food Chemistry, CRC Press.

REFERENCES

1 S. Suzanne Nielsen, 2017, Food Analysis, Springer.
2 Dennis D. Miller, 2014, "Food Chemistry: A Laboratory Manual", Wiley.
3 Benjamin K. Simpson, 2012, Food Biochemistry and Food Processing, Wiley-Blackwell.

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	-	-	-	3	-	-	-	3	3	-	2	3	-
CO2	3	-	-	-	3	-	-	-	3	3	-	2	3	-
CO3	3	-	-	-	3	-	-	-	2	3	-	2	3	-
CO4	3	-	-	-	3	-	-	-	3	3	-	2	3	-
CO5	3	-	-	-	3	-	-	-	-	3	-	2	3	-
AVG	3	-	-	-	3	-	-	-	2.75	3	-	2	3	-

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SYLLABUS REVISION DETAILS FOR THE REGULATION 2022 – SEMESTER III						
S.NO	**COURSE CODE/ COURSE NAME**	**SUGGESTION BY EXPERTS**	**EXISTING CONTENT (IN THE AY 2023-24 ODD)**	**REVISED CONTENT(FOR AY 2024-25 ODD)**	**TYPE OF REVISION DELETION/ INSERTION/ MODIFICATION**	**% REVISION**
	22FT3201 Food Microbiology	**Suggested changes in the second, third and fourth unit of Food Microbiology III semester**			**Revision**	**50%**
			UNIT II Load Assessment Sampling methods, SPC, MPN, spiral platter, DEFT, microcolony HGMF, DMC, Dye reduction, swab/swab-rinse method, impedance, microcalorimetry, flow cytometry, ATP measurement, PCR, Fluorescent antibody, RIA, ELISA. foods	UNIT II: **Microbial Spoilage of Foods** Spoilage of foods - principles and types of spoilage – microbial spoilage of foods - Microbial spoilage of Fruits- Vegetables- Grains and grain products- Meat- Poultry- Fish- Factors influencing the spoilage and control- Spoilage of Milk and Dairy products- Psychrotropic spoilage - Assessing microbial load in foods - microscopic, cultural, physical, chemical and immunological methods		
			UNIT IV **Microbial Spoilage:** principles and types of spoilage, microbial spoilage of different types of foods–fruits and vegetables, meat, poultry, sea foods, cereals products, bakery products, dairy products, fermented foods and canned	**UNIT III** **Preservation of Foods:** Factors affecting preservation - Control of microorganism in foods using temperature - low temperature – characteristics of psychrotrophs – high temperature - characteristics of thermophiles. Control of microorganism in foods by drying - chemicals and radiation – limitations - commercial applications. Bio preservatives- Bacteriocins- role and		

				importance in food applications.			
			UNIT III Fermentation– Introduction, batch, fed batch and continuous fermentation. Fermented foods – Sauerkraut, Cheese, Beer, Vinegar and Tempeh. Single cell protein – Introduction, nutritive value, advantages over plant and animal proteins. Production process – BEL, SYMBA, PEKILO, BIOPROTEIN, QUORN and PRUTEEN process. Probiotics.	**UNIT IV** **Fermented and Microbial Foods** Food Fermentations- Role and importance of microorganism in food fermentation– Lactic acid Bacteria and their fermentation products- Fermented Dairy products- Yoghurt, Cheese - Starter cultures in fermentation and their importance. Vegetable Fermentation- sauerkraut and pickle products – Meat fermentation- Yeast based and other fermentations – Bread, Beer and Wine; Fermented Cereal Products - Single Cell Production– Production and drawbacks. - Scope and trends in SCP. Probiotics- Characteristic features of probiotic microorganism-prebiotics for symbiotic foods formulation.		
			Food Borne Diseases and Quality Control: Gastroenteritis, Listeriosis, Salmonellosis, Shigellosis, Vibriosis, Campylobacteriosis. Food toxins – Aflatoxin and Botulin. Food sanitation – indicators of food safety, Coliform bacteria. Food processing plant sanitation. Microbiological standards and guidelines –Microbiological criteria for foods, Enforcement and control agencies.	**Food Borne Diseases and Quality Control:** Food borne infections and intoxication – food poisoning – botulism – salmonellosis – gastroenteritis, Food borne pathogens – Clostridium, Bacillus ceres, Staphylococcus aureus, Vibrio, Campyloacter, Yersinia etc., Viruses – food borne Illness-Bacteriophages in the Dairy		

				Industry- Beneficial uses of Viruses. Food sanitation – indicators of food safety – coliform bacteria- food processing plant sanitation – microbiological standards and guidelines – HACCP – microbial quality control and food laws.		
1	**22FT2251 Food Biochemistry & Nutrition**	**Suggested to merge with the course 22FT3251 - Food Chemistry (TWL) in the III semester**	**UNIT I** **Food Groups** - Definition. Major food groups (basic 4, 5, 7) and their characterization. Food as a source of energy, Energy value of foods, energy requirement of the body - estimation. Water – water activity and food stability, water binding, drinking water – production – classification – quality – structure of water	**Water** Nature Scope and development of food chemistry; Moisture in foods, role and type of water in foods, functional properties of water, water activity and sorption isotherm, molecular mobility and foods stability; Dispersed systems of foods: Physicochemical aspects of food dispersion system (Sol,gel, foam, emulsion).	**Revision**	**20%**
			UNIT II **Vitamins:** Classification: Water and Fat soluble – sources – functional role – general causes of variations and losses of vitamins in food: **Minerals:** Classification: Major and minor – functions and properties, content of minerals in food and changes during processing. **Extraction and estimation of polyphenols Extraction and estimation of flavonoids**.	**Carbohydrates** Carbohydrates in foods- occurrence, classification, structure and properties of monosaccharaides,oligosaccharides and polysaccharides. Changes of carbohydrates on cooking, modification of carbohydrates, dietary fibers and carbohydrates digestibility; Enzymatic and chemical reactions of carbohydrates.		
			UNIT III Changes during Cooking: Cooking – objectives, methods – moist heat, dry heat and combination. Loss of nutrients and prevention, biochemical changes in carbohydrates - Gelatinization and retrogradation of starch, proteins and lipids-changes during frying; parboiling of rice; enzymatic browning reactions; nonenzymatic browning reactions - caramelization, Maillard reaction. **Estimation of non-enzymatic browning in**	**Lipids in foods** - occurrence, classification, structure of simple, compound and derived lipids. Role and use of lipids/fat, crystallization and consistency, chemical aspects of lipids, lipolysis, auto-oxidation, thermal decomposition, Rancidity and its types. **Vitamins**: Classification, structure and functions of fat-soluble vitamins, Classification and functions of water-		

			foods. Isolation of protein from milk and egg.	soluble vitamins; Requirements, allowances, enrichment, restorations, fortifications, losses of vitamins.		
			UNIT IV **Modification of Biomolecules:** Modified starches, resistant starch. Starch hydrolysates –Maltodextrins and dextrins. Modification of proteins – chemical and enzymatic methods. Modification of fats - Hydrogenation - cis and trans isomers, interesterification, winterization. **Determination of free fatty acids (FFA) of oil. Determination of TBA value of oil.** **Determination of FFA value of lipids and oils**	**Proteins** Proteins in foods - classification, structure and properties of amino acids; Essential amino acids. Classification and structure of proteins. Proteins in foods: Processing induced, physical, chemical and nutritional changes in protein, chemical and enzymatic modification of protein. **Minerals** Classification, structure and functions of macro and micro minerals; Requirements, allowances, enrichment, restorations, fortifications, losses of minerals; optimization and retention of minerals.		
			UNIT V **Colorants and Flavorants:** Technology to preserve degradation of chlorophyll – Color and stability of carotenoids and anthocyanins – microbial colorants – Approved colorants - Natural and synthetic flavorings – Food allergens and antinutrients **Extraction and estimation of chlorophyll. Extraction and estimation of carotenoids and lycopene**	Important Phytochemicals in foods : Technology to preserve degradation of chlorophyll – stability of carotenoids and anthocyanins - Natural and synthetic flavorings –Threshold values Food allergens, Chemistry of antioxidants and antinutrients.		

	22FT3204 **Principles of Thermodynamics**	**Suggestion in change of topics**	**UNIT I** Basic Concepts and First Law: Fundamental concepts of thermodynamics- microscopic and macroscopic approach – systems, properties, process, functions, units, energy, heat and work, zeroth law. First law - statement of first law for flow and non - flow process, internal energy, enthalpy, heat capacities (CV and CP) – steady state flow processes with reference to various thermal equipment - nozzle, throat, throttling process and compressors	**UNIT I** Basic Concepts and First Law: Fundamental concepts of thermodynamics- microscopic and macroscopic approach – systems, properties, process, path and point functions, units, energy, heat and work, zeroth law. First law - statement of first law for flow and non - flow process, internal energy, enthalpy, heat capacities (CV and CP) – steady state flow processes with reference to various thermal equipment - nozzle, throat, throttling process and compressors.	**Revsion**	**25%**
			UNIT II **Second Law**: Second Law of thermodynamics: Kelvin-Plank, Clausius statements and its equivalence, reversible cycle – Carnot cycle and theorem – thermodynamic temperature scale. Entropy, Clausius theorem, Clausius inequality, Entropy changes during processes	**UNIT II** **Second Law**: Second Law of thermodynamics: Kelvin-Plank, Clausius statements and its equivalence, reversible cycle – Carnot cycle and theorem – thermodynamic temperature scale. Entropy, Clausius theorem, Clausius inequality, Entropy changes during processes – available and unavailable energies. Exergy analysis, Application of exergy analysis for design of thermal food processing equipments.		
			UNIT V Boilers: Types and classification of boilers - Cochran Boiler, Lancashire boiler, Locomotive Boiler, Fluidized Bed Boiler. Boiler mountings and Accessories. Performance and energy efficiency of boilers. Simple	**UNIT V** Boilers: Types and classification of boilers - Cochran Boiler, Lancashire boiler, Locomotive Boiler, Fluidized Bed Boiler. Boiler mountings and Accessories. Performance and energy efficiency		

			calculation of Boiler efficiency. Importance of boiler water treatment and blow down	of boilers. Simple calculation of Boiler efficiency. Importance of boiler water treatment and blow down. Psychrometry-Properties of air, psychrometric chart, psychometric processes- adiabatic saturation, sensible heating and cooling, humidification, dehumidification, evaporative cooling and adiabatic mixing, Application of psychometric for design of driers.		

NEW COURSES INTRODUCED DETAILS FOR THE REGULATION 2022 – SEMESTER III					
S.NO	**Course Code**	**Course NAME**	**Suggestions presented by the Experts**	**Action Taken**	**Percentage (%) of Change**
1	22FT3003	Food Chemistry Laboratory	Suggested to introduce Food Chemistry Laboratory in the IIIrd semester.	Included as per suggestion	100

Chairman BOS

Chairman - BoS
HiCET

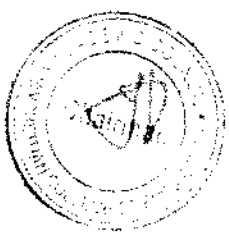
Chairman

Dean Academics

Dean (Academics)
HiCET

CURRICULUM R2022

(for the batch admitted during 2022 – 2023)



DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.TECH. FOOD TECHNOLOGY (UG)

REGULATION-2022

For the students admitted during the academic year 2022-2023 and onwards

SEMESTER I

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	**22MA1101**	Matrices and Calculus	BSC	3	1	0	4	4	40	60	100
2.	**22ME1201**	Engineering Drawing	ESC	1	4	0	3	5	40	60	100
THEORY WITH LAB COMPONENT											
3.	**22PH1151**	Physics for Non-Circuit Engineering	BSC	2	0	2	3	4	50	50	100
4.	**22HE1151**	English for Engineers	HSC	2	0	2	3	4	50	50	100
5.	**22IT1151**	Python Programming and practices	ESC	2	0	2	3	4	50	50	100
EEC COURSES (SE/AE)											
6.	**22HE1071**	Universal Human Values	AEC	2	0	0	2	3	40	60	100
7.	**22HE1072**	Entrepreneurship & Innovation	AEC	1	0	0	1	1	100	0	100
MANDATORY COURSE											
8.	**22MC1091/ 22MC1092**	தமிழரும் தொழில் நுட்பமும் / Indian Constitution	MC	2	0	0	0	2	0	0	0
			TOTAL	**15**	**5**	**6**	**19**	**27**	**370**	**330**	**700**

SEMESTER II

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	**22MA2105**	Partial differential equations, Fourier series and transforms (BME, Civil & FT)	BSC	3	1	0	4	4	40	60	100
2.	**22CY2101**	Environmental Studies	ESC	2	0	0	2	3	40	60	100
3.	**22PH2101**	BASICS OF MATERIAL SCIENCE (Common to all branches except Mechatronics)	BSC	2	0	0	2	3	40	60	100
4.	**22EE2231**	Basics of Electrical Engineering	ESC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	**22FT2151**	Biochemistry	BSC	2	0	2	3	4	50	50	100
6.	**22HE2151**	Effective Technical Communication	HSC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	**22ME2001**	Engineering Practices	ESC	0	0	4	2	2	60	40	100
EEC COURSES (SE/AE)											
8.	**22HE2071**	Design Thinking	AEC	2	0	0	2	2	100	0	100
9.	**22HE2072**	Soft Skills and Aptitude -I	AEC	1	0	0	1	1	100	0	100
MANDATORY COURSE											
10.	**22MC2091/ 22MC2092**	**தமிழர் மரபு / Heritage of Tamil**	MC	2	0	0	0	1	0	0	0
11.	**22MC2093**	**NCC */NSS / YRC / Sports / Clubs / Society Service - Enrollment (Common)**	MC	All students shall enroll, on admission, in anyone of the personality and character development programmes and undergo training for about 80 hours							-
			TOTAL	**19**	**1**	**8**	**22**	**27**	**520**	**380**	**900**

SEMESTER III

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22MA3107	Transforms and Partial Differential Equations	BSC	3	1	0	4	4	40	60	100
2.	22FT3201	Food Microbiology	PCC	3	0	0	3	3	40	60	100
3.	22FT3202	Fundamentals of Heat and Mass Transfer	PCC	3	1	0	4	3	40	60	100
4.	22FT3203	Fluid Mechanics	PCC	3	1	0	4	4	40	60	100
THEORY WITH LAB COMPONENT											
5.	22FT3251	Food Chemistry	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
6.	22FT3001	Unit Operations Laboratory	ESC	0	0	4	2	4	60	40	100
7.	22FT3002	Food Microbiology Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	22HE3071	Soft Skills -2	SEC	1	0	0	1	1	100	0	100
9.	22HE3072	Ideation Skills	AEC	2	0	0	2	2	40	60	100
		TOTAL		**17**	**3**	**10**	**25**	**29**	**470**	**430**	**900**

SEMESTER IV

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22HE4101	IPR and Start-ups	HSC	2	0	0	2	2	40	60	100
2.	22MA4104	Probability and Operations Research	BSC	3	0	0	3	3	40	60	100
3.	22FT4201	Principles of Thermodynamics	PCC	3	1	0	4	3	40	60	100
4.	22FT4202	Refrigeration and Cold Chain Management	PCC	3	1	0	4	4	40	60	100
5.	22FT4203	Unit operations in Food Processing	PCC	3	0	0	3	4	40	60	100
6.	22FT4204	Food Analysis and Quality Control	PCC	3	0	0	3	4	40	60	100
PRACTICAL											
7.	22FT4001	Food Analysis and Quality Control Laboratory	PCC	0	0	4	2	4	60	40	100
8.	22FT4002	Unit Operations in Food Processing Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	22HE4071	Soft Skills -III	SEC	1	0	0	1	1	100	0	100
		TOTAL		**18**	**2**	**8**	**24**	**29**	**460**	**440**	**900**

* Two weeks internship carries 1 credit and it will be done during Semester III summer vacation and same will be evaluated in Semester IV.

If students unable to undergo in semester III, then the Internship I offered in the semester IV can be clubbed with Internship II (Total: 4 weeks-2 credits)

SEMESTER V

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	**22FT5201**	Fruits and Vegetable Processing Technology	PCC	3	0	0	3	4	40	60	100
2.	**22FT5202**	Poultry, Meat and Fish Process Technology	PCC	3	0	0	3	3	40	60	100
3.	**22FT53XX**	Professional Elective-1	PEC	3	0	0	3	3	40	60	100
4.	**22FT53XX**	Professional Elective-2	PEC	3	0	0	3	3	40	60	100
5.	**22FT53XX**	Professional Elective-3	PEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
6.	**22FT5251**	Baking and Confectionery Technology	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	**22FT5001**	Fruits and Vegetable Processing Technology Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	**22HE5071**	Soft Skills -4/Foreign languages	SEC	1	0	0	1	1	100	0	100
			TOTAL	**18**	**0**	**6**	**21**	**25**	**410**	**390**	**800**

SEMESTER VI

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	**22FT6201**	Dairy Engineering	PCC	3	0	0	3	3	40	60	100
2.	**22HS6101**	Professional Ethics (Common)	HSC	3	0	0	3	3	40	60	100
3.	**22FT63XX**	Professional Elective-4	PEC	3	0	0	3	3	40	60	100
4.	**22FT63XX**	Professional Elective-5	PEC	3	0	0	3	3	40	60	100
5.	**22XX64XX**	Open Elective – 1*	OEC	3	0	0	3	3	40	60	100
6.	**22XX64XX**	Open Elective – 2*	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
7.	**22FT6001**	Dairy Engineering Laboratory	PCC	0	0	4	2	4	60	40	100
8.	**22FT6002**	Food Process Equipment Design Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	**22HE6071**	Soft Skills – 5	SEC	2	0	0	2	2	100	0	100
			TOTAL	**20**	**0**	**8**	**24**	**28**	**460**	**440**	**900**

SEMESTER VII

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	**22FT7201**	Food Packaging	PCC	3	0	0	3	3	40	60	100
2.	**22FT7202**	Food Plant Layout and Management	PCC	3	1	0	4	4	40	60	100
3.	**22FT730X**	Professional Elective-6	PEC	3	0	0	3	3	40	60	100
4.	**22FT740X**	Open Elective – 3*	OEC	3	0	0	3	3	40	60	100
5.	**22FT740X**	Open Elective – 4*	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
6.	**22FT7001**	Food Packaging Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
7.	**22FT7701**	Internship - II*	SEC	-	-	-	2	1	100	0	100
			TOTAL	**15**	**1**	**4**	**20**	**21**	**360**	**340**	**700**

* - Two weeks internship carries 1 credit and it will be done during Semester VI summer vacation/placement training and same will be evaluated in Semester VII.

SEMESTER VIII

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
EEC COURSES (SE/AE)											
1.	**22FT8901**	Project Work/Granted Patent	SEC9	0	0	20	10	20	100	100	200
			TOTAL	**0**	**0**	**20**	**10**	**20**	**100**	**100**	**200**

Note:

7. *As per the AICTE guideline, in Semesters I, II, III & IV NCC one credit subject is added as Value Added Course with Extra Credit. Further, the students who enrolled his/her name in HICET NCC and Air Wing are eligible to undergo this subject. The earned extra credits printed in the Consolidated Mark sheet as per the regulation.
8. NCC course level 1 & Level 2 will be added in the list of open elective subjects in the appropriate semester. Further, the students' who have opted NCC subjects in Semester I, II, III & IV are eligible to undergo NCC Open Elective Subjects.
9. The above-mentioned NCC Courses will be offered to the students who are going to be admitted in the Academic Year 2021 – 22.

OPEN ELECTIVE I AND II (EMERGING TECHNOLOGIES)

To be offered for the students other than CSE, IT, AI&ML, ECE & BIOMEDICAL

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22AI6451	Artificial Intelligence and Machine Learning Fundamentals	OEC	2	0	2	4	3
2	22CS6451	Blockchain Technology	OEC	2	0	2	4	3
3	22EC6451	Cyber security	OEC	2	0	2	4	3
4	22EC6452	IoT Concepts and Applications	OEC	2	0	2	4	3
5	22IT6451	Data Science and Analytics	OEC	2	0	2	4	3
6	22BM6451	Augmented and Virtual Reality	OEC	2	0	2	4	3

OPEN ELECTIVE I AND II

To be offered for the students other than AUTO, AERO, AGRI, MECH, MCTS, CIVIL, EEE, CHEMICAL, FOOD TECH, E&I

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22AE6401	Space Science	OEC	3	0	0	3	3
2	22MT6401	Introduction to Industrial Engineering	OEC	3	0	0	3	3
3	22MT6402	Industrial Safety and Environment	OEC	3	0	0	3	3
4	22CE6401	Climate Change and its Impact	OEC	3	0	0	3	3
5	22CE6402	Environment and Social Impact Assessment	OEC	3	0	0	3	3
6	22ME6401	Renewable Energy System	OEC	3	0	0	3	3
7	22ME6402	Additive Manufacturing systems	OEC	3	0	0	3	3
8	22EI6401	Introduction to Industrial Instrumentation and Control	OEC	3	0	0	3	3
9	22EI6402	Graphical Programming using Virtual Instrumentation	OEC	3	0	0	3	3
10	22AU6401	Fundamentals of Automobile Engineering	OEC	3	0	0	3	3
11	22AU6402	Automotive Vehicle Safety	OEC	3	0	0	3	3
12	22EE6401	Digital Marketing	OEC	3	0	0	3	3
13	22EE6402	Research Methodology	OEC	3	0	0	3	3
14	22FT6401	Traditional Foods	OEC	3	0	0	3	3
15	22FT6402	Post Harvest Technology of Fruits and Vegetables	OEC	3	0	0	3	3
16	22AG6401	Urban Agriculture and Organic Farming	OEC	3	0	0	3	3
17	22CH6401	Biomass and Biorefinery	OEC	3	0	0	3	3

Note: Non-Circuit Departments can add one Open Elective course in the above list to offer for the circuit branches

OPEN ELECTIVE III

Students shall choose any one of the open elective courses such that the course content or title not belong to their own programme.

(Note: Each programme in our institution is expected to provide one course only)

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22EE7401	Fundamentals of Solar Energy & its applications	OEC	3	0	0	3	3

OPEN ELECTIVE IV

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22LS7401	General studies for competitive examinations	OEC	3	0	0	3	3
2	22LS7402	Human Rights, Women Rights and Gender equity	OEC	3	0	0	3	3
3	22LS7403	Indian ethos and Human values	OEC	3	0	0	3	3
4	22LS7404	Financial independence and management	OEC	3	0	0	3	3
5	22LS7405	Yoga for Human Excellence	OEC	3	0	0	3	3
6	22LS7406	Democracy and Good Governance	OEC	3	0	0	3	3
7	22LS7407	NCC Level - II	OEC	3	0	0	3	3

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical I Processing of Cereals, Pulses and Grain Technology	Vertical II Spices and Plantation Technology	Vertical III Food Safety Management System	Vertical IV Entrepreneurship and Management	Vertical V Food Colors, & Flavors	Vertical VI Food Processing and Preservation Technology
22FT5301 Technology of Fats and Oils	22FT5304 Processing of Spices & Plantation Crops	22FT5307 Introduction to food safety Analysis and Quality Risk Management	22FT5310 Entrepreneurship Opportunities for Food Technologist	22FT5313 Food additives	22FT5316 Principles of Food Processing
22FT5302 Cereal Technology	22FT5305 Blending and Value Addition	22FT5308 HACCP in Food Processing and Preservation	22FT5311 Total Quality Management	22FT5314 Food colors and flavor Technology	22FT5317 Post-Harvest Engineering
22FT5303 Processing of Legumes and Oilseeds	22FT5306 Processing of Coffee	22FT5309 FSMS & Food Product and Supply Chain Management	22FT5312 Enterprise for resource planning	22FT5315 Biology and Chemistry of Food Flavors	22FT5318 Radiation Preservation and Processing of Food Products
22FT6301 Milling Technology for Food Materials	22FT6303 Processing of Tea	22FT6305 Food laws – Indian and International	22FT6307 Consumer acceptance and Market survey in Food Processing	22FT6309 Functional Foods and Nutraceuticals	22FT6311 Beverage Technology

22FT6302 Technology of Malting and Brewing	22FT6304 Processing of cocoa and Chocolate	22FT6306 Food Safety in Hospitality Industry & GLP in Food Industries	22FT6308 Energy Audit in Food Processing Industry	22FT6310 Food Toxicology and Allergy	22FT6312 Emerging Non-Thermal Processing of Foods
22FT7301 By Products Management	22FT7302 Packaging of Spices, Plantation products	22FT7303 Food Analysis, Testing & Microbial Safety Analysis	22FT7304 Food Process Economics & Industrial Management	22FT7305 Genetically Modified Foods	22FT7306 Emerging Technologies in Food Processing
22FT7307 Quality, Laws and Regulations in Grain Processing Industries	22FT7308 Spice Processing and Products Laws, Quality Standards and Regulations	22FT7309 Food quality, Assurance and Quality Control	22FT7310 Supply Chain and Retail Management	22FT7311 Waste Management and By-Product Utilization in Food Industries	22FT7312 Technology of Snack and Extruded Foods

Students are permitted to choose all Professional Electives from a particular vertical or from different verticals.

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Details of Vertical I: Processing of Cereals, Pulses and Grain Technology

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	**22FT5301**	Technology of Fats and Oils	PEC	3	0	0	3	3
2.	**22FT5302**	Cereal Technology	PEC	3	0	0	3	3
3.	**22FT5303**	Processing of Legumes and Oilseeds	PEC	3	0	0	3	3
4.	**22FT6301**	Milling Technology for Food Materials	PEC	3	0	0	3	3
5.	**22FT6302**	Technology of Malting and Brewing	PEC	3	0	0	3	3
6.	**22FT7301**	By Products Management	PEC	3	0	0	3	3
7.	**22FT7307**	Quality, Laws and Regulations in grain processing Industries	PEC	3	0	0	3	3

Details of Vertical II: Spices and Plantation Technology

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	**22FT5304**	Processing of Spices & Plantation Crops	PEC	3	0	0	3	3
2.	**22FT5305**	Blending and Value Addition	PEC	3	0	0	3	3
3.	**22FT5306**	Processing of Coffee	PEC	3	0	0	3	3
4.	**22FT6303**	Processing of Tea	PEC	3	0	0	3	3

5.	22FT6304	Processing of cocoa and chocolate	PEC	3	0	0	3	3
6.	22FT7302	Packaging of Spices and Plantation products	PEC	3	0	0	3	3
7.	22FT7308	Spice Processing and Products laws, Quality Standards and Regulations	PEC	3	0	0	3	3

Details of Vertical III: Food Safety Management System

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22FT5307	Introduction to Food Safety Analysis and Quality Risk Management	PEC	3	0	0	3	3
2.	22FT5308	HACCP in Food Processing and Preservation	PEC	3	0	0	3	3
3.	22FT5309	FSMS & Food Product and Supply Chain Management	PEC	3	0	0	3	3
4.	22FT6305	Food laws – Indian and International	PEC	3	0	0	3	3
5.	22FT6306	Food Safety in Hospitality industry & GLP in Food Industries	PEC	3	0	0	3	3
6.	22FT7303	Food Analysis, Testing & Microbial Safety Analysis	PEC	3	0	0	3	3
7.	22FT7309	Food quality, Assurance and Quality Control	PEC	3	0	0	3	3

Details of Vertical IV: Entrepreneurship and Management

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22FT5310	Entrepreneurship Opportunities for Food Technologist	PEC	3	0	0	3	3
2.	22FT5311	Total Quality Management	PEC	3	0	0	3	3
3.	22FT5312	Enterprise for resource planning	PEC	3	0	0	3	3
4.	22FT6307	Consumer acceptance and Market survey in Food Processing	PEC	3	0	0	3	3
5.	22FT6308	Energy audit in food processing industry	PEC	3	0	0	3	3
6.	22FT7304	Food Process Economics & Industrial Management	PEC	3	0	0	3	3
7.	22FT7310	Supply Chain and Retail Management	PEC	3	0	0	3	3

Details of Vertical V: Food Colors & Flavors

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22FT5313	Food additives	PEC	3	0	0	3	3
2.	22FT5314	Food colors and flavor Technology	PEC	3	0	0	3	3
3.	22FT5315	Biology and Chemistry of Food Flavors	PEC	3	0	0	3	3
4.	22FT6309	Functional foods and Nutraceuticals	PEC	3	0	0	3	3
5.	22FT6310	Food Toxicology and Allergy	PEC	3	0	0	3	3
6.	22FT7305	Genetically Modified Foods	PEC	3	0	0	3	3
7.	22FT7311	Waste Management and By-Product Utilization in Food Industries	PEC	3	0	0	3	3

Details of Vertical VI: Food Processing and Preservation Technology

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22FT5316	Principles of Food Processing	PEC	3	0	0	3	3
2.	22FT5317	Post Harvest Engineering	PEC	3	0	0	3	3
3.	22FT5318	Radiation Preservation and Processing of Food Products	PEC	3	0	0	3	3
4.	22FT6311	Beverage Technology	PEC	3	0	0	3	3
5.	22FT6312	Emerging Non-Thermal Processing of Foods	PEC	3	0	0	3	3
6.	22FT7306	Emerging Technologies in Food Processing	PEC	3	0	0	3	3
7.	22FT7312	Technology of Snack and Extruded Foods	PEC	3	0	0	3	3

Enrollment for B.E. / B. TECH. (HONOURS) / Minor Degree (optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.

Clause 4.10 of Regulation 2022 is applicable for the Enrolment of B.E. / B. TECH. (HONOURS) / Minor Degree (Optional).

VERTICALS FOR MINOR DEGREE

- Heads are requested to provide one vertical from their program to offer for other program students to register for additional courses (18 Credits) to become eligible for the B.E./B.Tech. Minor Degree.
  Note: Each programme should provide verticals for minor degree

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22FT5601	Sem 5: Food Quality Analysis	MDC	3	0	0	3	3
2.	22FT6601	Sem 6: Technology of Fruits and Vegetable Processing	MDC	3	0	0	3	3
3.	22FT6602	Sem6: Meat Processing Technology	MDC	3	0	0	3	3
4.	22FT7601	Sem 7: Processing of milk and milk products	MDC	3	0	0	3	3
5.	22FT7602	Sem 7: Technology of Baking and Confectionery	MDC	3	0	0	3	3
6.	22FT8601	Sem 8: Food Packaging Technology	MDC	3	0	0	3	3

*MDC – Minor Degree Course

In addition to the above the following additional courses for Minor Degree can also be given to the student's common to all the branches.

Vertical I Fintech and Block Chain	Vertical II Entrepreneurship	Vertical III Environment and Sustainability
Financial Management	Foundations of Entrepreneurship	Sustainable infrastructure Development
Fundamentals of Investment	Team Building & Leadership Management for Business	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	Creativity & Innovation in Entrepreneurship	Sustainable Bio Materials
Introduction to Blockchain and its Applications	Principles of Marketing Management for Business	Materials for Energy Sustainability
Fintech Personal Finance and Payments	Human Resource Management for Entrepreneurs	Green Technology
Introduction to Fintech	Financing New Business Ventures	Environmental Quality Monitoring and Analysis

B Tech (Hons) Food Technology in Machine Learning Applications

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	22FT5XXX	Basics of AI in Food	PC	3	0	0	3	3	40	60	100
2.	22FT6XXX	Computer Applications in Food Processing	PC	3	0	0	3	3	40	60	100
3.	22FT6XXX	IoT Applications in Food Industry	PC	3	0	0	3	3	40	60	100
4.	22FT7XXX	Computer simulation and modelling in food processing	PC	3	0	0	3	3	40	60	100
5.	22FT7XXX	Instrumentation and process control in food processing	PC	3	0	0	3	3	40	60	100

6.	22FT8XXX	Image Processing for the Food Industry	PC	3	0	0	3	3	40	60	100

B Tech (Hons) Food Technology in Processing and Value Addition

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	22FT5XXX	Technology of milk and milk products	PC	3	0	0	3	3	40	60	100
2.	22FT6XXX	Ready to Eat foods	PC	3	0	0	3	3	40	60	100
3.	22FT6XXX	Cane sugar Technology	PC	3	0	0	3	3	40	60	100
4.	22FT7XXX	Beverage Technology	PC	3	0	0	3	3	40	60	100
Theory with Lab Component											
5.	22FT7XXX	Processing and Value addition of Tuber crops	PC	2	0	2	3	4	40	60	100
6.	22FT8XXX	Mushroom Processing Technology	PC	2	0	2	3	4	40	60	100

B Tech (Hons) Food Technology in Food Science and Biotechnology

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	22FT5XXX	Food nutrition and dietics	PC	3	0	0	3	3	40	60	100
2.	22FT6XXX	Food Biotechnology	PC	3	0	0	3	3	40	60	100
3.	22FT6XXX	Downstream Process Engineering	PC	3	0	0	3	3	40	60	100
4.	22FT7XXX	Chemical reaction Engineering	PC	3	0	0	3	3	40	60	100
Theory with Lab Component											
5.	22FT7XXX	Fermentation Technology	PC	2	0	2	3	4	40	60	100
6.	22FT8XXX	Enzymes in Food Processing	PC	2	0	2	3	4	40	60	100

Note: Each programme should provide verticals for Honours degree

SEMESTER-WISE CREDIT DISTRIBUTION

B.E. / B.TECH. PROGRAMMES										
S.No.	Course Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSC	3	3	-	2	-	3	-	-	**11**
2	BSC	7	9	4	3	-	-	-	-	**23**
3	ESC	6	5	2	-	-	-	-	-	**15**
4	PCC	-	-	16	18	11	7	9	-	**61**
5	PEC	-	-	-	-	9	6	3	-	**18**
6	OEC	-	-	-	-	-	6	6	-	**12**
7	EEC	3	3	3	1	1	2	2	10	**25**
8	MCC	✓	✓	-	-	-	-	-	-	-
	Total	**19**	**22**	**25**	**24**	**21**	**24**	**20**	**10**	**165**

Credit Distribution R2022

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	19	22	25	24	21	24	20	10	**165**

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SYLLABUS

SEMESTER V

SEMESTER V

Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22FT5201	FRUITS AND VEGETABLE PROCESSING TECHNOLOGY	3	0	0	3

The student should be able to

Course Objective

1. Understand the maturity standards of fruits and vegetables.
2. Learn post-harvest handling of fruits and vegetables.
3. Understand the technology of processing fruits and vegetable products.

Unit	Description	Instructional Hours
I	**PHYSIOLOGY AND HARVESTING OF FRESH FRUITS AND VEGETABLES:** Scope of Fruits and Vegetables Processing Industry in India and World-present status. Physical, Textural characteristics, structure and composition. Harvesting of important fruits and vegetables. Maturity standards; Importance, methods of Maturity determinations maturity indices for selected fruits and vegetables. Fruit ripening- physiological changes, regulations, methods. Factors leading to deterioration of fruits and vegetables. Methods to reduce post-harvest losses	9
II	**POST HARVEST STORAGE AND PRE- PROCESSING OF FRUITS & VEGETABLES:** Storage practices: Control atmospheric, hypobaric storage, cool store, zero energy cool chamber. Pre-processing of fruits and vegetables: Precooling, Cleaning, washing, sorting, grading, peeling, blanching. Freezing- General preprocessing. Dehydration – General preprocessing; problems associated with specific fruits and vegetables. Indian Food Regulation and Quality assurance.	9
III	**MINIMAL PROCESSING AND CANNING:** Primary processing: Peeling, slicing, cubing, cutting and other size reduction operations for fruits and vegetables. Minimal Processing of Fruits and Vegetables. Canning - principles, types of cans - preparation of canned products - packing of canned products - spoilage of canned foods. Bottling of fruit and vegetable. Precautions in canning operations. General considerations in establishing a commercial fruit and vegetable cannery, machineries involved in canning and bottling unit.	9
IV	**FRUIT AND VEGETABLE PRODUCTS I:** Fruit Juice / pulp/ Nectar/Drinks, concentrates – General and specific processing, packaging. Vegetable Purees/ pastes - General and specific processing, packaging. Ready to eat fruit and vegetable products, Jams/Marmalades, Squashes/cordials, Ketchup/sauces, Chutneys, Fruit Bar, Soup powders, Candied Fruits- General and specific processing, packaging. Indian Food Regulation and Quality assurance.	9
V	**FRUIT AND VEGETABLE PRODUCTS II:** Natural colors, Fruit and Vegetable Fibres- General and specific processing, packaging. Onion: Dried, Powder. Garlic: Dried Garlic, Powder, Oil. Potato: Wafer; starch, Papad, Carrot: Preserve, candy, Pickle, Jam. Cauliflower and cabbage: Dried cauliflower and cabbage, Sauerkraut, Pickle Leafy vegetables; Dried Leafy Vegetables. (Spinach, Fenugreek, Coriander leaves, Curry leaves). Bitter gourd: Pickle, Dried bitter gourd. Indian Food Regulation and Quality assurance.	9
	Total Instructional Hours	45

Course Outcome

CO1 Remember and understand the physiological aspects of fruits and vegetables and analyze the physical and chemical components

CO2 Understand the basic pre- processing operations and its applications for fresh fruits and vegetables

CO3 Apply the pre-treatments and canning principle to process fruit and vegetable products

CO4 Understand the Indian standards and apply the techniques for preparation of different products and value addition

CO5 Apply different processing methods to prepare fruits and vegetable products as per regulations and standards

TEXT BOOK:

T1 Fellows, P J. "Food Processing Technology: Principles and Practice". 2nd Edition, CRC/ Woodhead, 1997

T2 Salunke,D. K and S. S Kadam "Hand Book of Fruit Science and Technology: Production, Composition, Storage and Processing". Marcel Dekker, 1995.

REFERENCES:

R1 "Food P. cessing & Preservation", Prentice Hall of India, 2002.

R2 Wim Jongen, -Fruit and Vegetable Processing- Improving Quality‖, Wood Head Publishing Ltd, England, 2002

R3 Thompson A . K . , -Fruits and Vegetable - Harvesting, Handling and Storage‖, Blackwell Publishing, USA, 2003.

R4 Lal G., Siddappa G. and Tondon G.L., -Preservation of Fruits and Vegetables‖, Indian Council of Agricultural Research, New Delhi, 1986.

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	2	3	3	2	-	-	-	-	-	-	3	3	3
CO2	3	3	3	3	-	-	3	-	-	-	-	2	3	3
CO3	3	3	3	2	-	3	-	-	-	-	-	2	2	3
CO4	3	3	2	2	-	3	-	-	-	-	-	3	3	3
CO5	3	2	2	2	-	-	-	-	-	-	-	3	3	3
AVG	**3**	**2..**	**2.6**	**2.4**	**2**	**3**	**3**	**-**	**-**	**-**	**-**	**2.6**	**2.8**	**3**

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SEMESTER V

Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22FT5201	FRUITS AND VEGETABLE PROCESSING TECHNOLOGY	3	0	0	3

The student should be able to

Course Objective

1. Understand the maturity standards of fruits and vegetables.
2. Learn post-harvest handling of fruits and vegetables.
3. Understand the technology of processing fruits and vegetable products.

Unit	Description	Instructional Hours
I	**PHYSIOLOGY AND HARVESTING OF FRESH FRUITS AND VEGETABLES:** Scope of Fruits and Vegetables Processing Industry in India and World-present status. Physical, Textural characteristics, structure and composition. Harvesting of important fruits and vegetables. Maturity standards; Importance, methods of Maturity determinations maturity indices for selected fruits and vegetables. Fruit ripening- physiological changes, regulations, methods. Factors leading to deterioration of fruits and vegetables. Methods to reduce post-harvest losses	9
II	**POST HARVEST STORAGE AND PRE- PROCESSING OF FRUITS & VEGETABLES:** Storage practices: Control atmospheric, hypobaric storage, cool store, zero energy cool chamber. Pre-processing of fruits and vegetables: Precooling, Cleaning, washing, sorting, grading, peeling, blanching. Freezing- General preprocessing. Dehydration – General preprocessing; problems associated with specific fruits and vegetables. Indian Food Regulation and Quality assurance.	9
III	**MINIMAL PROCESSING AND CANNING:** Primary processing: Peeling, slicing, cubing, cutting and other size reduction operations for fruits and vegetables. Minimal Processing of Fruits and Vegetables. Canning - principles, types of cans - preparation of canned products - packing of canned products - spoilage of canned foods. Bottling of fruit and vegetable. Precautions in canning operations. General considerations in establishing a commercial fruit and vegetable cannery, machineries involved in canning and bottling unit.	9
IV	**FRUIT AND VEGETABLE PRODUCTS I:** Fruit Juice / pulp/ Nectar/Drinks, concentrates – General and specific processing, packaging. Vegetable Purees/ pastes - General and specific processing, packaging. Ready to eat fruit and vegetable products, Jams/Marmalades, Squashes/cordials, Ketchup/sauces, Chutneys, Fruit Bar, Soup powders, Candied Fruits- General and specific processing, packaging. Indian Food Regulation and Quality assurance.	9
V	**FRUIT AND VEGETABLE PRODUCTS II:** Natural colors, Fruit and Vegetable Fibres- General and specific processing, packaging. Onion: Dried, Powder. Garlic: Dried Garlic, Powder, Oil. Potato: Wafer; starch, Papad, Carrot: Preserve, candy, Pickle, Jam. Cauliflower and cabbage: Dried cauliflower and cabbage, Sauerkraut, Pickle Leafy vegetables; Dried Leafy Vegetables. (Spinach, Fenugreek, Coriander leaves, Curry leaves). Bitter gourd: Pickle, Dried bitter gourd. Indian Food Regulation and Quality assurance.	9
	Total Instructional Hours	45

Course Outcome

CO1	Remember and understand the physiological aspects of fruits and vegetables and analyze the physical and chemical components
CO2	Understand the basic pre- processing operations and its applications for fresh fruits and vegetables

Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	22FT5202	POULTRY, MEAT AND FISH PROCESSING TECHNOLOGY	3	0	0	3

The Student will be able to

Course Objectives

1. Understand Classification and Characteristics of Poultry, Meat, and Fish Products
2. Comprehend Unit Operations and Processing Techniques
3. Gain knowledge of international and national meat processing regulations and their implications for processing plants.

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
I	**POULTRY PROCESSING:** Poultry classification – chicken, Turkey, goose, duck, Guinea fowl and pigeon. Types and characteristics of poultry products. Unit operation in poultry processing. Pre-slaughter factors affecting poultry meat quality. Slaughter through chilling, Types of poultry cuts. Factors affecting the shelf-life of poultry meat. Sensory quality of poultry meat- color, texture and flavor. Eating quality tests-Warner_ Bratzler Shearing blade and the Volodkevich method, Electronic nose Indian standards for dressed chicken. The Kosher and halal market – dietary laws, Kosher poultry and halal poultry. Preservation techniques: chemical treatments, heating, drying and irradiation.	9
II	**EGG PROCESSING:** Formation of egg, Structure, composition, nutritive value of egg. Functional properties of eggs, Factors affecting egg quality and evaluation of egg quality. Preservation and maintenance of egg – cleaning, oil treatment, cold storage, thermostabilization, immersion in liquids. Microbial spoilage of eggs, Egg powder processing-spray drying, Foam mat drying. Packaging of Eggs and Egg Products - Low Cholesterol-cum-Designer Eggs.	9
III	**MEAT PROCESSING:** Types of Meat and its sources, composition, structure of meat. Pre-slaughter care, handling and transportation. Ante mortem handling, slaughtering and dressing of animals, Post-mortem inspection and grading of meat, biochemical changes in meat muscle, microbiology and spoilage factors, Introduction to Halal. Post-mortem changes of meat. Meat -Tenderization, Aging. Meat quality evaluation. Mechanically deboned meat. Wholesale and retail cuts. Preservation of meat- curing, smoking, drying, freezing, canning and irradiation. Meat adulteration Processed meat products- Hamburgers, sausages and meat balls.	9
IV	**FISH PROCESSING:** Classification of fisheries, Types of fish, composition and nutritive value of fish. Fishing techniques, Handling of fishes, Transportation, Harvesting of fish. Spoilage factors of fish. Bacteriology of fish, Post-mortem changes in fish. Preservation- Freezing and Individual quick freezing, Canning and smoking operations, Salting and drying of fish, pickling. Value added products	9
V	**MEAT PLANT HYGIENE AND REGULATION:** Modern abattoirs and its features Handling and maintenance of tools and core equipment. Meat plant layout. Agents used in sanitation, properties and classification of sanitizing agents – sanitizers and disinfectants, SSOP's, Organization of cleaning schedule, Manual cleaning, Specialized cleaning techniques, Automated cleaning systems. Meat regulations – International level – FAO, WHO, OIE, CEC, ICMSF, ISO and National level – APEDA, AGMARK, PFA, MFPO, BIS, state and local self-government and MOU's. Meat processing hygiene. Cleaning and sanitation in meat plants. Food safety measures –GMP and GHP, Safety standards in meat, poultry and egg industry: HACCP/ISO/MFPO/FSSAI/Kosher/Halal.	9
	Total Instructional Hours	**45**

Course Outcomes

Upon completion of the course, students can be able to

CO1- Understand the process parameters poultry processing

CO2- Understand the structure and processing of egg

CO3- Understand the processing of meat and meat products

CO4- Understand the different processing and preservation operations of fish

CO5- Remember safety measures and hygienic conditions

TEXT BOOKS:

1.Panada P.C., —Text book on Egg and Poultry Technology‖, 1st Edition, Vikas Publishing House Pvt. Ltd., New Delhi, 1996.

2.Gunter Heinz and Peter Hautzinger, —Meat Processing Technology‖, 1st Edition, Rap Publication, Monteplier, 2007.

REFERENCES BOOKS:

1.Ionnis S. Boziaris, —Seafood Handbook: Technology, Quality and Safety‖, Wiley Blackwell, UK, 2014.

2.Mead G.C., —Poultry Meat Processing and Quality‖, 1st Edition, CRC Press, London, 2004.

3.Alan R. Sams, —Poultry Meat Processing‖, 1st Edition, CRC Press, London, 2001.

4.Joseph Kerry, John Kerry and David Ledwood, —Meat Processing‖, Woodhead Publishing Limited, England (CRC Press), 2002.

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	2	3	-	-	-	-	-	-	-	-	-	3	3
CO2	2	3	3	-	-	-	-	-	-	-	-	-	3	3
CO3	3	2	2	-	-	-	-	-	-	-	-	-	2	2
CO4	2	3	3	-	-	-	-	-	-	-	-	-	3	3
CO5	3	2	3	-	-	3	-	-	-	-	-	-	3	2
AVG	2.6	2.4	2.8	-	-	3	-	-	-	-	-	-	2.8	2.6

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	22FT5251	BAKING AND CONFECTIONERY TECHNOLOGY	2	0	2	3

Course Objectives

- To understand and remember the technology of baking and confectionery
- To understand the important role of essential ingredients in baking
- To analyze the different uses of bakery equipments
- To understand the production process of bakery products
- To apply and analyze the different methods of confectionery production

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
I	**INTRODUCTION TO BAKING:-** Bakery ingredients and their functions-Essential ingredients: Flour, yeast and sour dough, water, salt- Other ingredients: Sugar, color, flavor, fat, milk, milk powder and bread improvers. Leaveners and yeast foods. Shortenings, emulsifiers and antioxidants.	9
	Estimation of wet and dry gluten content of wheat flour, Determination of sedimentation value of wheat flour	
II	**EQUIPMENTS IN BAKERY TECHNOLOGY:** Introduction to and equipments used in bakery industry with their purpose. Bulk handling of ingredients-Fermentation enclosures and brew equipment - Ovens and Slicers; Extrusion. Rheology of dough-Farinograph, Amylograph, Alveograph and Extensiograph.	9
	Determination of dough rising capacity of wet and dry yeast, Estimation of quality parameters of bakery ingredients	
III	**BAKERY PRODUCT PREPARATION I:** The Chemistry of dough Development. Bread making methods- Straight dough/bulk fermentation - Sponge and dough-Activated dough development- Chorley wood bread process- Dough retarding and freezing. Characteristics of good bread: Internal characters; external characters. Bread defects/faults and remedies. Spoilage of bread-Causes, detection and prevention.	9
	Experiment on leavening power of baking powder, sodium-bicarbonate and ammonium- bicarbonate	
IV	**BAKERY PRODUCT PREPARATION II:** Production of cakes and cookies/biscuits. Types of biscuit dough's --Developed dough, short dough's, semi-sweet, enzyme modified dough's and batters. Cake making: Ingredients and their function Structure builders. Tenderizers, moisteners and flavor enhancers. Production process for Other miscellaneous products- Wafers, puff pastry, chemically leavened products.	9
	Preparation and analysis of bread, Preparation and analysis of biscuits / cookies	
V	**CONFECTIONERY PRODUCTS:** Definition, importance of sugar confectionery. Types of confectionery products- Hard candy, Caramel, Toffee and Fudge and other confections-:- ingredients - Formulation Processing method- Quality control-Aerated confectionery- Methods of aeration- Manufacturing process- Chemistry of Hydrocolloids, Hydrocolloid pre-treatment Processes -product quality parameters, faults and corrective measures. Spoilage of confectionery products	9
	Preparation and analysis of toffee / candy, Preparation and analysis of chocolates	
	Total Instructional Hours	45

Course Outcomes

Upon completion of the course, students can be able to

CO1- Apply the principles of baking and analyze the role of ingredients in baking

CO2- Illustrate and analyze the processing parameters of baking machineries

CO3- Understand the processing of bread and applying on the production process

CO4 - Understand the role of ingredients in bakery products

CO5 - Apply the production process for different types of confectionery products

TEXT BOOKS:

1. Matz, Samuel A., "Bakery Technology and Engineering", III Edition, Chapman & Hall, London.

2. Cauvain, Stanley P, and Young, Linda S., "Technology of Bread Making", II Edition Aspen publication. Maryland, 1999

REFERENCES BOOKS:

1. Edwards W.P. "Science of bakery products", RSC, UK.2007

2. Samuel A. Matz., "Equipment for Bakers", Pan Tech International Publication, 1988.

3. Sugar Confectionery manufacture-(Ed) E.B.Jackson, II edition, Blackie Academic and professional, Glasgow,1995.

4. Bernard. W. Minifie., PhD "Chocolate, Cocoa, and confectionery" (Science and Technology), 3rd edition,CBS publishers and Distributors, New Delhi

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	2	2	2	2	-	1	1	1	-	2	-	1	2	2
CO2	3	2	2	2	1	2	1	1	-	2	-	3	3	3
CO3	2	1	2	1	-	1	-	1	-	2	-	3	3	3
CO4	1	1	1	1	-	1	1	1	-	2	-	1	1	1
CO5	2	2	2	1	-	1	1	1	-	2	-	3	3	3
AVG	2	1.6	1.8	1.4	1	1.2	1	1	-	2	-	2.2	2.4	2.4

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PROFESSIONAL ELECTIVE

VERTICAL I PROCESSING OF CEREALS, PULSES AND GRAIN TECHNOLOGY

VERTICAL V – FOOD COLORS AND FLAVORS

Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	21FT5202	FOOD ADDITIVES	3	0	0	3

Course Objectives

- To expose the students to the use of different chemical additives in foods during food processing and preservation

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
I	**INTRODUCTION:** Definition, role of food additives, classification of food additives based on their role, dual role of certain additives, INS numbering system of food additives, safety requirements of food additives, Acceptable daily intake of food additives, JECFA and Food Chemical Codex standards for food additives, status of food additives with respect to Indian laws, GMP and permissible upper levels of food additives under Indian food laws.	9
II	**ACIDITY REGULATORS AND PRESERVATIVES:** Acidity Regulators – definition, chemical structure, role and importance, pH modulation and taste, acidity profile, permitted acidity regulators, levels of usage and food applications. Preservatives of chemical and microbial origin; mode of action on spoilage organisms and pathogens, factors affecting the performance of preservatives, active forms of preservatives, necessity in a food and levels of usage; permitted preservatives and food applications. Case studies / illustrations	9
III	**EMULSIFIERS, STABILIZERS AND THICKENERS:** Emulsion, surface tension, oil in water and water in oil emulsion, Hydrophilic and Lipophilic balance (HLB), role of emulsifiers, different classes of emulsifiers and their chemical structure, their HLB values and role in emulsion stabilization; role of different stabilizers and other substances in emulsion stability; emulsion formation process and equipment; measurement of emulsion stability; permitted emulsifiers and stabilizers and food applications. Thickeners – definition, chemical structure, role in food processing and product end characteristics, list of permitted thickeners and food applications	9
IV	**ANTIOXIDANTS AND ANTI-CAKING AGENTS:** Antioxidants - Chemistry of oxidative deterioration of food and its constituents and its effect on the quality; defining antioxidant; water soluble and oil soluble antioxidants and their chemical structure, permitted antioxidants; mechanism of action, permitted levels and food application. Anti-foaming and propellants, Anti-caking agents – definition, role in preventing spoilage, mode of action, permitted list of anti-caking agents and food application.	9
V	**COLOR AND ARTIFICIAL SWEETENERS:** Color - Natural and synthetic food colors, their chemical structure, shades imparted, stability, list of colors, usage levels and food application. Artificial Sweeteners – list, structure, taste profile, permitted list, usage levels and food applications.	9
	Total Instructional Hours	**45**

Course Outcomes

Upon completion of the course, students can be able to

CO1- To understand the principles of chemical preservation of foods

CO2- To understand the role of different food additives in the processing of different foods

CO3- To know the specific functions of different food additives in improving the shelf life, quality, texture and other physical and sensory characteristics of foods

CO4- To expose the different food additives in improving the physical and sensory characteristics of foods

CO5- To know the regulations and the monitoring agencies involved in controlling the safer use of additives in foods

TEXT BOOKS:

1.Lal and Siddappa., "*Fruit and Vegetable preservation*", ICMR 1986.

2. ManoranjanKalia and Sangita,"*Food preservation and processing*". Kalyani Publishers. Ludhiana 1996.

REFERENCES BOOKS:

1.Fellows, P.J, "*Food Processing Technology*" 2001.

2.Leninger, H.A. and Beverlod, W.A. "*Food Process Engineering*", D.Reicle Pub. Corp.

3.Srivastha R.P. and Sanjeev kumar, "*Fruit and vegetable Preservation*" 1998.

4.Titus A. M. Msagati. "The Chemistry of Food Additives and Preservatives", Wiley-Blackwell, 2013.

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	2	2	1	2	-	1	1	2	-	-	-	2	3	3
CO2	2	2	1	2	-	1	1	2	2	-	-	2	3	2
CO3	2	2	1	2	-	1	1	2	2	-	-	2	3	3
CO4	2	2	1	2	2	1	1	2	2	-	-	2	3	3
CO5	2	2	1	2	2	1	1	2	1	-	-	2	2	3
AVG	2	2	1	2	2	1	1	2	1.75	-	-	2	2.8	2.8

Chairman, Board of Studies

Chairman - BoS
FT - HiCET

Dean - Academics

Dean (Academics)
HiCET

VERTICAL VI

FOOD PROCESSING AND PRESERVATION TECHNOLOGY

Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	22FT5317	PRINCIPLES OF FOOD PROCESSING	3	0	0	3

Course Objectives

- To understand the principles of food processing and their impact on the shelf life and quality of food materials and products
- To learn various methods of food processing viz., drying, milling, freezing, thermal treatments etc.
- To introduce novel food processing techniques

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
I	**HIGH AND LOW TEMPERATURE PROCESSING OF FOODS:** Methods of applying heat to food - Blanching, Pasteurization, Sterilization - thermo bacteriology, commercial sterility, calculation of process time - General method- Ball's formula method- methods of sterilization - equipment. Methods of low temperature preservation - Chilling, Freezing, freeze drying and freeze concentration - theory and principles.	12
II	**DRYING, DEHYDRATION AND EVAPORATION:** Drying - principles, theory of drying, equilibrium moisture content, methods of moisture determination and source of heat. Drying - types of dryers. Dehydration-Osmotic dehydration-theory and principles. Water activity - sorption behaviour of foods - water activity and food stability - Relationship between water activity and moisture - Equilibrium moisture content. Evaporation - definition - single and multiple effect evaporation-types, application and performances of evaporators and boiling point elevation - steam economy, mass and heat balance.	12
III	**PROCESSING AND PRESERVATION OF FOODS BY CHEMICALS:** Food preservation by sugar, salt, acid - Principles - mechanism- antimicrobial activity. Preservation by chemicals- type of chemical preservatives- sulphur dioxide, benzoic acid, etc; use of other chemicals like acidulants, antioxidants, mold inhibitors, antibodies, etc. Factors affecting antimicrobial activity of preservatives.	6
IV	**NON-THERMAL PROCESSING:** Food Irradiation - High Pressure Processing- Pulsed electric field processing, pulsed light treatment and Ultrasound - Theory and Principles - effect on microorganisms- Application in Processing of foods.	9
V	**NOVEL METHODS OF FOOD PROCESSING:** UV treatment, Ozone treatment, dielectric heating- microwave, radio frequency, ohmic and infrared heating theory, equipment, applications and effect on foods. Hurdle technology and Nano-technology - principle - application in food processing.	9
	Total Instructional Hours	**45**

Course Outcomes

Upon completion of the course, students can be able to

CO1- Apply different methods of high and low temperature processing techniques over raw foods and analyze the process time of that food properties of food

CO2- Understand and apply the suitable dryers to different food to increase the shelf life and analyse the performance of the evaporators and their features.

CO3-Analyze the shelf life of foods processed and preserved by natural and chemical agents.

CO4-Understand the operations and features of different non-thermal processing techniques and applying

to improve the shelf life of product.

CO5- Apply the principle of advanced novel techniques in food processing industries.

TEXT BOOKS:

1. Fellows P.J., —Food processing Technology: Principles and Practicell, 3rd Edition, Woodhead Publishing Ltd., New Delhi, 2009

2. Da-Wen Sun, Emerging Technologies for food processing, 2nd Edition, Academic Press, 2014.

3. Earle R.L., —Unit Operations in Food Processingl, Web Edition, Pergamon Press, UK, 2004.

4. G.W. Gould. New methods of Food Preservation, Springer, Boston, MA, 1995.

REFERENCES BOOKS:

1. James G Brennan, —Food Processing Handbookl, 2nd Edition, Wiley VCH, Weinheim, 2011.

2. Paul Singh R and Dennis R. Heldman, —Introduction to Food Process Engineeringl, 5th Edition, Academic Press, USA, 2014

3. Sahay K.M. and Singh K.K., —Unit Operations of Agricultural Processingl, 2nd Edition, Vikas Publishing House Pvt. Ltd., New Delhi, 2012.

4. Albert Ibarz and Gustavo V. Barbosa-Cánovas. Unit Operations in Food Engineering. CRC Press, Boca Raton, FL, USA.2003

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	2	2	1	2	-	1	1	2	-	-	-	2	3	3
CO2	2	2	1	2	-	1	1	2	2	-	-	2	3	2
CO3	2	2	1	2	-	1	1	2	2	-	-	2	3	3
CO4	2	2	1	2	2	1	1	2	2	-	-	2	3	3
CO5	2	2	1	2	2	1	1	2	1	-	-	2	2	3
AVG	2	2	1	2	2	1	1	2	1.75	-	-	2	2.8	2.8

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Dean – Academics

Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	22FT5318	POST HARVEST ENGINEERING	3	0	0	3

Course Objectives

- To understand and identify the specific processing technologies used for different foods and the various products derived from these materials.
- To understand the application of scientific principles in the processing technologies specific to the materials.

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
I	**OVERVIEW OF POST HARVEST TECHNOLOGY:** Overview of post harvest technology - Concept and science, production and post harvest losses, reasons for losses, importance of loss reduction - Water activity, water binding and its effect on enzymatic and non enzymatic reactions and food texture, control of water activity and moisture.	9
II	**CLEANING:** Post Harvest Handling operations - Cleaning of grains, washing of fruits and vegetables, types of cleaners, screens, types of screens, rotary screens, vibrating screens, machinery for cleaning of fruits and vegetables (air cleaners, washers), cleaning efficiency, care and maintenance – Sorting and grading- methods of grading - Size grading, colour grading, specific gravity grading - screening, equipment for grading of fruits and vegetables, grading efficiency, care and maintenance.	9
III	**SEPARATION:** Separation - Magnetic separator, destoners, electrostatic separators, pneumatic separator - Decorticating and shelling - Principles of working, design and constructional details, operating parameters - maintenance of various decorticators / dehullers/ shellers, description of groundnut decorticators, maize shellers.	9
IV	**MOISTURE CONTENT AND GRAIN DRYING:** Moisture content, measurement, direct and indirect methods, moisture meters - Equilibrium moisture content, equilibrium relative humidity, relationship and isotherm models, methods of determination - Grain drying theory, principles, types, thin layer heat sources, performance of dryers, grain dryers.	9
V	**MATERIALS HANDLING:** Materials handling - Introduction to different conveying equipments used for handling of grains, fruits and vegetables - Scope and importance of material handling devices; Study of different material handling systems - Classification, principles of operation, conveyor system selection/design - Belt conveyor - Principle, characteristics, design, relationship between belt speed and width, capacity, inclined belt conveyors, idler spacing, belt tension, drive tension, belt tripper - Chain conveyor - Principle of operation, advantages, disadvantages, capacity and speed, conveying chain – Screw conveyor - Principle of operation, capacity, power, troughs, loading and discharge, inclined and vertical screw conveyors - Bucket elevator - Principle, classification, operation, advantages, disadvantages, capacity, speed, bucket pickup, bucket discharge, relationship between belt speed, pickup and bucket discharge, buckets types - Pneumatic conveying system - Capacity and power requirement, types, air/product separators - Gravity conveyor design considerations, capacity and power requirement.	9
	Total Instructional Hours	**45**

Course Outcomes

Upon completion of the course, students can be able to

CO1- Understand the principles and significance of post harvest technology, including factors influencing production and post harvest losses.

CO2- Demonstrate proficiency in cleaning grains and washing fruits/vegetables, and applying sorting and grading methods effectively to enhance food quality.

CO3- Explain the principles of separation technologies and perform maintenance procedures for decorticators, dehullers, and shellers to optimize post harvest processing.

CO4- Measure moisture content using various methods, apply grain drying theory to select appropriate drying methods, and evaluate dryer performance for efficient moisture control.

CO5- Evaluate different conveying equipment, design conveyor systems based on operational principles, and calculate capacity and power requirements to optimize materials handling in post harvest operations.

TEXT BOOKS:

1. Chakraverty,A. 2000. Third Edition. Post Harvest Technology of cereals, pulses and oilseeds. Oxford & IBH publishing & Co. Pvt. Ltd., New Delhi.
2. Sahay. K.M. and Singh,K.K. 1994. Unit operations of Agricultural Processing. Vikas Publishing House Pvt. Ltd. New Delhi.

REFERENCES BOOKS:

1. Chakraverty,A and R. Paul Singh. 2014. Post Harvest Technology and Food Process Engineering. CRC Press, Boca Raton, FL, USA.
2. James G. Brennan. 2006. Food Processing Handbook. Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany.
3. R.L. Earle. 1983. Unit operations in Food Processing. Pergamon Press, New York, USA.
4. Carl W. Hall and Denny C. Davis. 1979. Processing Equipment for Agricultural Products. The AVI Publishing Company, Inc., Connecticut,
MA, USA.

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	1	1	1	2	2	1	-	-	-	-	2	1	1
CO2	3	2	1	2	-	-	-	-	-	-	-	2	2	1
CO3	3	1	1	2	-	-	-	-	-	-	-	2	2	1
CO4	3	2	2	2	-	-	-	-	-	-	-	2	2	1
CO5	3	2	2	2	-	-	-	-	-	-	-	2	2	1
AVG	**3**	**1.6**	**1.4**	**1.8**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**2**	**1.8**	**1**

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22FT5319	RADIATION PRESERVATION AND PROCESSING OF FOOD PRODUCTS	3	0	0	3

The student should be able to

Course Objective

- Identify the importance of non-thermal methods like irradiation as an alternative to the conventional methods of processing
- Understand the effect of radiation as a processing and preservation method
- Learn the importance and safety issues of the irradiated foods

Unit	Description	Instructional Hours
	BASICS OF RADIATION CHEMISTRY	
I	Electromagnetic energy, ionizing radiation, Concept of radiation, dielectric properties, ionization and excitation, Radiation chemistry basics - primary chemical effects and secondary effects on food, G value, irradiation parameters, instruments for measuring radiation, effect of food irradiation and potentialities for radiation processing of foods	9
	RADIATION CHEMISTRY OF FOOD COMPONENTS	
II	Basics-carbohydrates, proteins, lipids, vitamins etc. Radiation effect on contaminating microorganisms like bacteria, viruses, yeasts and molds - Dosages of radiation for various plant foods and animal foods-meat and poultry, fruits, vegetables, spices, dairy products; Radiation equipment, salient features; Packaging of irradiated foods and safety issues	9
	MICROWAVES IN FOOD PROCESSING	
III	Microwave heating, nature of energy, batch and continuous ovens, microwave generators, wave guides, brief description of oven construction, application of microwave radiation and safety measures	9
	INFRA RED RADIATION	
IV	Absorption and scattering characteristics of various food materials, Polarization characteristics of IR radiation, Propagation of IR radiation in food stuffs. IR generators, applications, Relative merits and demerits	9
	RADIO FREQUENCY HEATING PRINCIPLES	
V	RF heating equipment, Advantages of Radio frequency heating of foods - Ultra violet radiation and its effect on microorganisms in foods - UV treatment application and equipment.	9
	Total Instructional Hours	45

Course Outcome

CO1	Understand the role of ingredients used in beverage processing
CO2	Understand the processing of beer and wine processing
CO3	Understand the procedure of carbonated beverages
CO4	Understand the procedure of non-carbonated beverages
CO5	Understand the steps for quality control

TEXT BOOK:

T1 Welter M. Urbain: Food Irradiation Academic Press, New York, 1986.

T2 Ohlsson and Bengtson, Microwave Processing Technologies Woodhead Publishing, Cambridge, UK, 2002

REFERENCES:

R1 Gould G.W., New Methods of Food Preservation, Aspen Publishers Inc., Maryland, 1999.

R2 S.G.Llyasor and V.V. Krasnikov, Physical Principles of Infra Red Irradiation of Food Stuffs: Hemisphere Publishing Corporation, London, 1991.

R3 Philip Richardson, Thermal Technologies for Food Processing, Wood head Publishing Limited, CRC Press, 2001.

R4 Robert V. Decareau, Microwave Foods, New Product Development Food & Nutrition Press Inc., USA, 1992.

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	2	2	2	2	-	1	1	1	-	-	-	3	2	3
CO2	2	2	2	2	1	1	1	1	-	-	-	2	3	3
CO3	2	2	2	2	-	1	1	1	-	-	-	2	2	3
CO4	2	2	2	2	-	1	1	1	-	-	-	2	2	3
CO5	3	2	3	2	-	1	1	1	-	-	-	3	2	3
AVG	2.2	2	2.2	2	1	1	1	1	-	-	-	2.4	2.2	3

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	22FT5001	FRUITS & VEGETABLE PROCESSING LABORATORY	0	0	4	2

The student should be able to

Course Objective

1. Understand the knowledge on extraction, pulping, dehydration, and preparing fruit/vegetable-based products
2. Understand different methods of fruits and vegetable processing
3. Understand quality evaluation of fruit and vegetable products

Unit	Description
1.	Estimate the maximum % yield efficiency of the prepared fruit pulp
2.	Experiment on osmotic dehydration of fruits and vegetables and also calculate its effect on drying kinetics
3.	Demonstration on minimal processing of fruits and vegetables viz. blanching, CAS, MAP, and vacuum packaging
4.	Experiment on preparation of jam/jelly (Plain or mixed fruits), sauce and its estimation of total soluble solids (TSS) Experiment on preparation of squash and its estimation of total soluble solids (TSS) with sensory analysis of the prepared sample
5.	Experiment on Ready to Serve (RTS) beverages preparation and its sensory analysis
6.	Experiment on canning of fruits and vegetables and its analysis on shelf life of the end product
7.	Experiment on preparation of fruit preserve, marmalade and candy and its sensory analysis
8.	Experiment on tomato puree and ketchup preparation and its sensory analysis
9.	Determination of pectin content from fruit and vegetable waste and its estimation of active compounds
10.	Estimation of ascorbic acid content in the given fruit samples using quantitative analysis
11.	Experiment on drying characteristics of curry leaves using Fluidized bed dryer and quality analysis of the end product
12.	Determination of drying rate of fruits and vegetables using Tray dryer
13.	Estimate the maximum % yield efficiency of the prepared fruit pulp
	Total Instructional Hours **45**

Course Outcome

CO1	Understand the knowledge on extraction, pulping, dehydration and prepare fruit/vegetable-based products.
CO2	Impart knowledge on value addition of food products.
CO3	Demonstrate methods to prevent or reduce deterioration and loss of nutritional quality of vegetables and fruits.
CO4	Understand the knowledge on extraction, pulping, dehydration and prepare fruit/vegetable-based products
CO5	Impart knowledge on value addition of food products

REFERENCES:

R1 Ranganna S., —Handbook of Analysis and Quality Control for Fruit and Vegetablel, Tata McGraw-Hill, 2001.

R2 Gordon L. Robertson, —Food Packaging and Shelf Life: A Practical Guidel, CRC Press, USA, 2009.

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	2	2	-	-	-	-	-	3	-	-	3	2	2
CO2	3	3	2	-	-	-	-	-	3	-	-	2	2	3
CO3	3	2	3	-	-	-	-	-	3	-	-	3	2	3
CO4	3	2	3	-	-	-	-	-	3	-	-	3	2	3
CO5	2	3	3	-	-	-	-	-	3	-	-	3	2	3
AVG	2.8	2.4	2.6	-	-	-	-	-	3	-	-	2.8	2	2.8

Chairman, Board of Studies

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Dean Academics

NEW COURSES INTRODUCED DETAILS FOR THE REGULATION 2022 – SEMESTER V					
S.NO	**Course Code**	**Course NAME**	**Suggestions presented by the Experts**	**Action Taken**	**Percentage (%) of Change**
1	22FT5251	Baking and Confectionery Technology	suggested to move Baking and Confectionery Technology to IVth Semester with Laboratory as theory with lab component.	Included as per suggestion	100
2	22FT5318	Radiation Preservation and Processing of Food Products	Academic Expert suggested to include Radiation Preservation and Processing of Food Products course in the Food Processing and Preservation Technology vertical	Introduced	100

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CURRICULUM
R2019

(for the batch admitted during 2021 – 2022)

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.TECH. FOOD TECHNOLOGY (UG)

REGULATION-2022

For the students admitted during the academic year 2021-2022 and onwards

The course code 21 indicates that the students joined in the academic year 2021

SEMESTER I

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	**21HE1101**	Technical English	HS	2	1	0	3	40	60	100
2.	**21MA1102**	Calculus and Linear Algebra	BS	3	1	0	4	40	60	100
3.	**21ME1101**	Basics of Civil and Mechanical Engineering	ES	3	0	0	3	40	60	100
THEORY & LAB COMPONENT										
4.	**21PH1151**	Applied Physics	BS	2	0	2	3	50	50	100
5.	**21CY1151**	Chemistry for Engineers	BS	2	0	2	3	50	50	100
6.	**21CS1151**	Python Programming and Practices	ES	2	0	2	3	50	50	100
PRACTICAL										
7.	**21HE1071**	Language Competency Enhancement Course-1	HS	0	0	2	1	100	0	100
MANDATORY COURSES										
8.	**21HE1072**	**Career Guidance Level – 1** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
			Total:	**16**	**2**	**8**	**20**	**470**	**330**	**800**
As Per AICTE Norms 3 Weeks Induction Programme is Added in The First Semester as an Audit Course										

SEMESTER II

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	**21HE2101**	Business English for Engineers	HS	2	1	0	3	40	60	100
2.	**21MA2101**	Differential Equations and Complex Variables	BS	3	1	0	4	40	60	100
3.	**21FT2105**	Principles of Microbiology	ES	3	0	0	3	40	60	100
THEORY & LAB COMPONENT										
4.	**21IT2151**	Programming in C	ES	2	0	2	3	50	50	100
5.	**21PH2151**	Material Science	BS	2	0	2	3	50	50	100
6.	**21CY2151**	Environmental Studies	BS	2	0	2	3	50	50	100
PRACTICALS										
7.	**21ME2001**	Engineering Practices Lab	ES	0	0	4	2	60	40	100
8.	**21HE2071**	Language Competency	HS	0	0	2	1	100	0	100

		Enhancement Course-II								
MANDATORY COURSES										
9.	**21HE2072**	**Career Guidance Level – II** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
10.	**21HE2073**	Entrepreneurship & Innovation	EEC	1	0	0	0	100	0	100
			Total:	**17**	**2**	**12**	**22**	**630**	**370**	**1000**

SEMESTER III

S.No	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	**21MA3102**	Fourier Analysis and Transforms	BS	3	1	0	4	40	60	100
2.	**21FT3201**	Fluid Mechanics	PC	3	1	0	4	40	60	100
3.	**21FT3101**	Principles of Thermodynamics	PC	3	0	0	3	40	60	100
4.	**21FT3202**	Food Microbiology	PC	3	0	0	3	40	60	100
THEORY AND LAB COMPONENT										
5.	**21FT3251**	Bio Chemistry	PC	2	0	2	3	50	50	100
PRACTICALS										
6.	**21FT3001**	Food Microbiology Laboratory	PC	0	0	3	1.5	60	40	100
7.	**21FT3002**	Food Production Analysis Laboratory	PC	0	0	3	1.5	60	40	100
MANDATORY COURSES										
8.	**21MC3191**	Indian Constitution	MC	2	0	0	0	100	0	0
9.	**21HE3072**	**Career Guidance Level – III** Personality, Aptitude and CareerDevelopment	EEC	2	0	0	0	100	0	100
10.	**21HE3073**	Leadership Management Skills	EEC	1	0	0	0	100	0	100
			Total	**19**	**2**	**8**	**20**	**630**	**370**	**1000**

SEMESTER IV

S.No	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	**21FT4201**	Fundamentals of Heat and MassTransfer	PC	3	1	0	4	40	60	100
2.	**21FT4203**	Engineering properties of food materials	PC	3	0	0	3	40	60	100
3.	**21FT4204**	Refrigeration and Cold ChainManagement	PC	3	1	0	4	40	60	100
THEORY AND LAB COMPONENT										

4.	21FT4251	Food Chemistry	PC	2	0	2	3	50	50	100
5.	21MA4152	Statistics and Numerical Methods	BS	3	0	2	4	50	50	100
PRACTICALS										
6.	21FT4001	Unit Operations Laboratory	PC	0	0	3	1.5	60	40	100
7.	21FT4002	Food Process Equipment Design Laboratory	PC	0	0	3	1.5	60	40	100
MANDATORY COURSES										
8.	21MC4191	Essence of Indian tradition knowledge/Value Education	MC	2	0	0	0	100	0	100
9.	21HE4072	**Career Guidance Level – IV** Personality, Aptitude andCareer Development	EEC	2	0	0	0	100	0	100
10.	21HE4073	Ideation Skills	EEC	2	0	0	0	100	0	100
			Total	**20**	**2**	**10**	**21**	**640**	**360**	**1000**

SEMESTER V

S. No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	Total
1.	21FT5201	Baking and ConfectioneryTechnology	PC	3	0	0	3	40	60	100
2.	21FT5202	Food Additives	PC	3	0	0	3	40	60	100
3.	21FT5203	Poultry, Meat and FishProcess Technology	PC	3	0	0	3	40	60	100
4.	21FT5204	Principles of Food Processing	PC	3	0	0	3	40	60	100
5.	21FT5205	Unit Operations in FoodProcessing	PC	3	0	0	3	40	60	100
6.	21FT53XX	Professional Elective -1	PE	3	0	0	3	40	60	100
PRACTICALS										
7.	21FT5001	Baking and Confectionery Technology Laboratory	PC	0	0	4	2	50	50	100
8.	21FT5002	Unit Operations in Food Processing Laboratory	PC	0	0	4	2	50	50	100
MANDATORY COURSES										
9.	21HE5071	Soft Skills - 1	EEC	1	0	0	1	100	0	100
10.	21HE5072	Design Thinking	EEC	1	0	0	1	100	0	100
			TOTAL	**20**	**0**	**8**	**24**	**540**	**460**	**1000**

SEMESTER VI

S. No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	Total
THEORY										

1.	**21FT6201**	Dairy Engineering	PC	3	0	0	3	40	60	100
2.	**21FT6202**	Plantation crops and SpicesProducts Technology	PC	3	0	0	3	40	60	100
3.	**21FT6203**	Fruits and Vegetable Processing Technology	PC	3	0	0	3	40	60	100
4.	**21FT6181**	Professional Ethics inEngineering	HS	3	0	0	3	40	60	100
5.	**21FT63XX**	**Professional Elective - II**	PE	3	0	0	3	40	60	100
6.	**21XX64XX**	**Open Elective– I**	OE	3	0	0	3	40	60	100
PRACTICALS										
7.	**21FT6001**	Dairy Engineering Laboratory	PC	0	0	3	1.5	50	50	100
8.	**21FT6002**	Fruits and Vegetable Processing Technology Laboratory	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
9.	**21FT6701**	Industrial Training	EEC	0	0	0	1	0	100	100
10.	**21HE6071**	Soft Skills - II	EEC	1	0	0	1	100	0	100
11.	**21HE6072**	Intellectual Property Rights(IPR)	EEC	1	0	0	1	100	0	100
			TOTAL	**20**	**0**	**6**	**24**	**540**	**560**	**1100**

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
PROFESSIONAL ELECTIVE I										
1	**21FT5301**	Technology of Fats andOils	PE	3	0	0	3	40	60	100
2	**21FT5302**	Food Storage and Infestation Control	PE	3	0	0	3	40	60	100
3	**21FT5303**	Food Process Calculations	PE	3	0	0	3	40	60	100
4	**21FT5304**	Post-Harvest Technology	PE	3	0	0	3	40	60	100
5	**21FT5305**	Cane sugar Technology	PE	3	0	0	3	40	60	100
6	**21FT5306**	Milling Technology forFood Materials	PE	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE II										
1	~~**21FT6301**~~	~~Beverage Technology~~	~~PE~~	~~3~~	~~0~~	~~0~~	~~3~~	~~40~~	~~60~~	~~100~~
2	**21FT6302**	Technology of Snack and Extruded Foods	PE	3	0	0	3	40	60	100
3	**21FT6303**	Food Biotechnology	PE	3	0	0	3	40	60	100
4	**21FT6304**	Bioprocess Engineering	PE	3	0	0	3	40	60	100
5	**21FT6305**	Enzyme Technology	PE	3	0	0	3	40	60	100
6	**21FT6306**	Crop Process Engineering	PE	3	0	0	3	40	60	100
7	**21FT6307**	Radiation Preservation and Processing of Food Products	PE	3	0	0	3	40	60	100

OPEN ELECTIVE

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
1.	21FT6401	Traditional Foods	OE	3	0	0	3	40	60	100

SEMESTER VII

S. No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	Total
THEORY										
1.	21FT7201	Food Analysis and Quality Control	PC	3	0	0	3	40	60	100
2.	21FT7202	Food Packaging	PC	3	0	0	3	40	60	100
3.	21FT7203	Food Plant Layout and Management	PC	3	0	0	3	40	60	100
4.	21FT73XX	**Professional Elective-III**	PE	3	0	0	3	40	60	100
5.	21XX74XX	**Open Elective – II**	OE	3	0	0	3	40	60	100
PRACTICALS										
6.	21FT7001	Food Packaging Laboratory	PC	0	0	3	1.5	50	50	100
7.	21FT7002	Food Analysis and Quality Control Laboratory	PC	0	0	3	1.5	50	50	100
PROJECT WORK										
8.	21FT7901	Project Phase I	EEC	0	0	4	2	50	50	100
			TOTAL	**15**	**0**	**10**	**20**	**350**	**450**	**800**

SEMESTER VIII

S.No	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	21FT83XX	**Professional Elective –IV**	PE	3	0	0	3	40	60	100
2.	21FT83XX	**Professional Elective- V**	PE	3	0	0	3	40	60	100
PRACTICAL										
3.	21FT8901	Project Work – Phase II	EEC	0	0	16	8	100	100	200
			TOTAL	**6**	**0**	**16**	**14**	**180**	**220**	**400**

PROFESSIONAL ELECTIVE III

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
1.	21FT7301	Functional foods and Nutraceuticals	PE	3	0	0	3	40	60	100
2.	21FT7302	Biology and Chemistry of Food Flavors	PE	3	0	0	3	40	60	100
3.	21FT7303	Food Toxicology and Allergy	PE	3	0	0	3	40	60	100
4.	21FT7304	Advanced Drying Technology	PE	3	0	0	3	40	60	100

5.	21FT7305	Cereal Technology	PE	3	0	0	3	40	60	100
6.	21FT7306	Processing Technology of Legumes and Oilseeds	PE	3	0	0	3	40	60	100
7.	21FT7307	Emerging Non-Thermal Processing of Foods	PE	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE IV										
1.	21FT8301	Food Process Economics and Industrial Management	PE	3	0	0	3	40	60	100
2.	21FT8302	Food Laws and Safety	PE	3	0	0	3	40	60	100
3.	21FT8303	Waste Management and By-Product Utilization in Food Industries	PE	3	0	0	3	40	60	100
4.	21FT8304	Instrumentation and Process Control	PE	3	0	0	3	40	60	100
5.	21FT8305	Economics and Management	PE	3	0	0	3	40	60	100
6.	21FT8312	Total Quality Management	PE	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE V										
S.No.	**Course Code**	**Course Title**	**Type**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
1.	21FT8306	Food process plant layout and safety	PE	3	0	0	3	40	60	100
2.	21FT8307	Energy Management in Process Industries	PE	3	0	0	3	40	60	100
3.	21FT8308	Emerging Technologies in Food Processing	PE	3	0	0	3	40	60	100
4.	21FT8309	Separation Techniques in Food Processing	PE	3	0	0	3	40	60	100
5.	21FT8310	Analytical Instruments in Food Industries	PE	3	0	0	3	40	60	100
6.	21FT8311	Entrepreneurship Opportunities for Food Technologists	PE	3	0	0	3	40	60	100
7.	21FT8313	Application of Nanotechnology and Cryogenics in Food Processing	PE	3	0	0	3	40	60	100

LIST OF OPEN ELECTIVES - FOOD TECHNOLOGY

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
1.	21FT7401	Post Harvest Technology of Fruits and Vegetables	OE	3	0	0	3	40	60	100
	LIFE SKILL COURSES									
1.	21LSZ401	General Studies for Competitive Examinations	OE	3	0	0	3	40	60	100
2.	21LSZ402	Human Rights, Women's Rights and Gender Equality	OE	3	0	0	3	40	60	100
3.	21LSZ403	Indian Ethos and Human Values	OE	3	0	0	3	40	60	100
4.	21LSZ404	Indian Constitution and Political System	OE	3	0	0	3	40	60	100

5.	21LSZ405	Yoga for Human Excellence	OE	3	0	0	3	40	60	100

Enrollment for B.E. / B. TECH. (HONOURS) / Minor Degree (optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.

Clause 4.10 of Regulation 2022 is applicable for the Enrolment of B.E. / B. TECH. (HONOURS) / Minor Degree (Optional).

VERTICALS FOR MINOR DEGREE

- Heads are requested to provide one vertical from their program to offer for other program students to register for additional courses (18 Credits) to become eligible for the B.E./B.Tech. Minor Degree.
  Note: Each programme should provide verticals for minor degree

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	21FT5601	Sem 5: Food Analysis and Quality Control	MDC	3	0	0	3	3
2.	21FT6601	Sem 6: Fruits and Vegetable Processing Technology	MDC	3	0	0	3	3
3.	21FT6602	Sem6: Poultry, Meat, and Fish Processing Technology	MDC	3	0	0	3	3
4.	21FT7601	Sem 7: Dairy Engineering	MDC	3	0	0	3	3
5.	21FT7602	Sem 7: Baking and Confectionery Technology	MDC	3	0	0	3	3
6.	21FT8601	Sem 8: Food Packaging	MDC	3	0	0	3	3

*MDC – Minor Degree Course

In addition to the above the following additional courses for Minor Degree can also be given to the student's common to all the branches.

Vertical I Fintech and Block Chain	Vertical II Entrepreneurship	Vertical III Environment and Sustainability
Financial Management	Foundations of Entrepreneurship	Sustainable infrastructure Development
Fundamentals of Investment	Team Building & Leadership Management for Business	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	Creativity & Innovation in Entrepreneurship	Sustainable Bio Materials
Introduction to Blockchain and its Applications	Principles of Marketing Management for Business	Materials for Energy Sustainability
Fintech Personal Finance and Payments	Human Resource Management for Entrepreneurs	Green Technology
Introduction to Fintech	Financing New Business Ventures	Environmental Quality Monitoring and Analysis

B Tech (Hons) Food Technology in Machine Learning Applications

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	21FT5XXX	Basics of AI in Food	PC	3	0	0	3	3	40	60	100
2.	21FT6XXX	Computer Applications in Food Processing	PC	3	0	0	3	3	40	60	100
3.	21FT6XXX	IoT Applications in Food Industry	PC	3	0	0	3	3	40	60	100
4.	21FT7XXX	Computer simulation and modelling in food processing	PC	3	0	0	3	3	40	60	100
5.	21FT7XXX	Instrumentation and process control in food processing	PC	3	0	0	3	3	40	60	100
6.	21FT8XXX	Image Processing for the Food Industry	PC	3	0	0	3	3	40	60	100

B Tech (Hons) Food Technology in Processing and Value Addition

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	21FT5XXX	Technology of milk and milk products	PC	3	0	0	3	3	40	60	100
2.	21FT6XXX	Ready to Eat foods	PC	3	0	0	3	3	40	60	100
3.	21FT6XXX	Cane sugar Technology	PC	3	0	0	3	3	40	60	100
4.	21FT7XXX	Beverage Technology	PC	3	0	0	3	3	40	60	100
Theory with Lab Component											
5.	21FT7XXX	Processing and Value addition of Tuber crops	PC	2	0	2	3	4	40	60	100
6.	21FT8XXX	Mushroom Processing Technology	PC	2	0	2	3	4	40	60	100

B Tech (Hons) Food Technology in Food Science and Biotechnology

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	21FT5XXX	Food nutrition and	PC	3	0	0	3	3	40	60	100

		dietics									
2.	21FT6XXX	Food Biotechnology	PC	3	0	0	3	3	40	60	100
3.	21FT6XXX	Downstream Process Engineering	PC	3	0	0	3	3	40	60	100
4.	21FT7XXX	Chemical reaction Engineering	PC	3	0	0	3	3	40	60	100
Theory with Lab Component											
5.	21FT7XXX	Fermentation Technology	PC	2	0	2	3	4	40	60	100
6.	21FT8XXX	Enzymes in Food Processing	PC	2	0	2	3	4	40	60	100

Note: Each programme should provide verticals for Honours degree

SEMESTER-WISE CREDIT DISTRIBUTION

B.E. / B.TECH. PROGRAMMES									
S.No.	**Course Area**	**Credits per Semester**							**Total Credits**
		I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**
1	HS	04	04	-	-	-	03	-	-	11
2	BS	10	10	04	04	-	-	-	-	28
3	ES	06	05	-	-	-	-	-	-	11
4	PC	-	03	16	17	19	12	12		79
5	PE	-	-	-	-	03	03	03	06	15
6	OE	-	-	-	-	-	03	03	-	06
7	EEC	-	-	-	-	02	03	02	08	15
	Total	**20**	**22**	**20**	**21**	**24**	**24**	**20**	**14**	**165**

Credit Distribution R2019

Semester	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**Total**
Credits	20	22	20	21	24	24	20	14	**165**

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SYLLABUS
SEMESTER VII

Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	21FT7201	FOOD ANALYSIS AND QUALITY CONTROL	3	0	0	3

Course Objectives

- Remember the quality analysis procedures
- Remember the procedure for lipid and protein analysis
- Understand the concepts of food quality standards
- Remember the concepts of food quality assurance in industry
- Remember the regulations for food business operator

UNIT	DESCRIPTION	INSTRUCTIONAL HOUR
1	**GENERAL AND CARBOHYDRATE ANALYSIS** Proximate analysis of foods- Moisture in foods, - determination by different methods; Titratable Acidity in foods, Determination of dietary fibre and crude fibre, Carbohydrate analysis- Colorimetric Quantification methods of Mono and Di-Saccharides, HPLC of Mono and Di-Saccharides using refractive index detection; Starch- Enzymatic quantification and Determination of Total amylose content; Analysis of Artificial Sweeteners	9
2	**LIPIDS AND MINERAL ANALYSIS** Determination of Total fat in foods by different methods (classification: Direct and Indirect); Analysis of oils and fats for physical and chemical parameters, Instrumental methods; GCMS, Instrumentation, FAMES, Injection types, oven and coloum, Detectors; Quality standards, and adulterants. MINERALS: Sample Prepration: Methods of ashing; Dry ashing and wet ashing, AAS, ICP, OES	9
3	**PROTEINS ANALYSIS** Determination of Proteins Concentration- Colorimetric and methods, Determination of Total nitrogen,; Protein Characterization- Isoelectric focussing; Analysis of Protein quality – Protein Efficiency Ratio (PER), Net Protein Utilization (NPU), Biological Value, Protein Digestibility- Corrected Amino acid Score (PDCAAS), *In vitro* Protein digestibility for C-PER; Analysis of Functional properties of proteins- Water absorption, fat absorption, solubility, gelling and foaming.	9
4	**QUALITY ASSURANCE IN FOOD INDUSTRY:** Objectives, importance and functions of quality control, Concept of Quality Assurance and Quality Control, Quality Control procedures, Quality Assurance procedures, international organizations: ISO, CAC, WTO, USFDA, Codex, EIC. National organizations: BIS, CCFS, Agmark, MMPO and APEDA, Good Laboratory Practices.	9
5	**FOOD SAFETY AND STANDARDS**: Food adulteration and food safety, Food laws - Food Safety and Standards Act (FSSAI), Prevention of Food Adulteration Act, Packaged Commodities Rules, - Genetically Modified Foods, Fortification, Pesticide Residues, Organic Foods, , Quality of Foods, Quality Standards - mandatory and optional standards, Food Safety Systems - ISO 9000, ISO 14000, ISO 22000, Mechanism of developing and fixing food standards, Good Manufacturing Practice, HACCP, Standards of Weights and Measures	9
	TOTAL	45

Course Outcomes

Upon completion of the course, students can be able to

CO1- Summarize the techniques for analyzing specific components in carbohydrates

CO2- Outline the various analytical methods and properties of lipids and proteins

CO3- Explain the food quality and standards ensuring the quality of food

CO4- Discuss the concepts of quality assurance at national and international level

CO5- Explain the regulations and standards mandated for food safety

TEXT BOOKS:

1. Pomsseranz, Yeshajahu. "Food Analysis Theory and Practice". 3rd Edition. Aspen Publishers / Springer, 2000.
2. Intcaz Alli, —Food Quality Assurance: Principles and Practicesl, 2nd Edition, Taylor and Francis, UK, 2014.

REFERENCES BOOKS:

1. David Kilcast, —Sensory Analysis for Food and Beverage Quality Control: A Practial Guidel, Woodhead Publishing Ltd, Cambridge, 2010.
2. Singh, S. P., —Food Safety, Quality Assurance, and Global Trade: Concerns and Strategiesl, International Book Distributing Company, Lucknow, 2009.
3. Manuals of Food Quality Control: Quality Assurance in Food Control Chemical Laboratoryl, FAO, Itlay, 1993.
4. Ronald E. Wrolstad, "Handbook of Food Analytical Chemistry" Vol I, John Wiley & sons, 2005

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
CO1	3	3	-	3	1	1	1	-	3	-	-	2	3	2
CO2	3	3	-	3	3	1	1	-	3	-	-	2	3	2
CO3	3	3	-	3	3	1	1	-	3	-	-	2	3	2
CO4	3	3	-	3	-	1	1	-	3	-	-	2	3	2
CO5	3	3	-	3	-	1	1	-	3	-	-	2	3	2
AVG	3	3	-	3	2.3	1	1	-	3	-	-	2	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	21FT7202	FOOD PACKAGING	3	0	0	3

Course Objectives

- To understand the concepts of packaging for various food products
- To select suitable packaging material for food packaging applications
- To show the recent trends in food packaging

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
I	**BASICS IN FOOD PACKAGING:** Definitions and basic functions of a food package. Food package design and development. Packaged product quality and shelf life. Current status of food packaging in India. Package standards and regulation. Labeling, Bar coding.	9
II	**PAPER AND PAPERBOARD PACKAGING:** Paper and paperboard manufacture - SBB, SUB, FBB, WLC. Properties and types of paper and paperboard. Package types – cartons, boxes, molded pulp containers, corrugated board, sacks, bags. Application of paper and paperboards for food packaging.	9
III	**PLASTIC PACKAGING:** Types of plastics used in packaging - PE, PP, PET, PVC, EVOH, PVA. Secondary conversion techniques – extrusion, coating and laminating, injection and blow molding. Printing of plastic films and rigid plastic containers. Food contact and barrier properties. Sealability and closure. Application of plastics for food packaging.	9
IV	**METAL CANS:** Raw materials for can making – steel, aluminum. Can making processes - three-piece cans, two-piece cans- DWI, DRD – end making processes – coating. Film laminates and inks, metal packages – corrosion and Sulphur staining. Application of metal containers in food industries. **Glass containers:** Definition and composition. Glass container manufacture – melting, forming, surface treatments. Closure for glass containers. Glass container design. Application of glass containers in food industries.	9
V	**TRENDS IN FOOD PACKAGING**: Active and intelligent packaging. Data carriers (barcode, RFID), modified atmosphere packaging - vacuum and Inert gas Packaging, Biodegradable and edible packaging, Aseptic packaging, Shrink wrapping, Nano packaging, Antimicrobial packaging, self-heating and cooling cans. **Types of inks**	9
	Total Instructional Hours	**45**

Course Outcomes

Upon completion of the course, students can be able to

CO1- Understand basic concepts in food packaging

CO2- Explain the types and properties of paper and paperboard for food packaging

CO3- Illustrate the classification of plastics and elaborate their properties

CO4- Summarize the food packaging applications of metal cans and glass containers

CO5- Utilize the recent trends in food packaging for packaging applications

TEXT BOOKS:

1. Robertson Gordon L., -Food Packaging: Principles and Practicell, 3rd Edition, Marcel Dekker Inc, USA, 2012.

2. Richard Coles and Mark J. Kirwan, -Food and Beverage Packaging Technology‖, 2nd Edition, Blackwell Publishing Asia Pty Ltd, CRC press, USA, 2011.

REFERENCES BOOKS:

1. Han Jung H., -Innovations in Food Packaging‖, 2nd Edition, Academic Press, USA 2013.

2. Dong Sun Lee , Kit L. Yam and Luciano Piergiovanni, -Food Packaging Science and Technology‖, CRC press, USA, 2008.

3. Otto G. Piringer and A.L. Baner, -Plastic Packaging Materials for Food‖, 1st Edition, Wiley- VCH, Germany, 2008.

4.Mathlouthi, M. "Food packaging and Preservation". Aspen Publications, 2013

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	2	-	1	-	2	2	-	-	-	-	2	2	1
CO2	3	2	-	1	1	2	2	-	-	-	-	2	2	3
CO3	3	2	-	1	1	2	2	-	-	-	-	2	2	3
CO4	3	2	-	1	1	2	2	-	-	-	-	2	2	3
CO5	3	2	-	1	-	2	2	-	-	-	-	2	2	1
AVG	3	2	-	1	1	2	2	-	-	-	-	2	2	2.2

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	21FT7203	FOOD PLANT LAYOUT AND MANAGEMENT	3	0	0	3

Course Objectives

- Impart basic knowledge in selecting a location as well as plant layout with respect to material handling, space utilization, future expansion etc.
- Understand the importance of availability of raw material and facilities for production of goods
- Integrate man, materials and machinery for optimum production

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
I	**PLANT LOCATION AND LAYOUTS:** Introduction to food plant design - special features of food and agricultural process industry - plant location - location factors, site selection, location theory and models - layout - objectives, classical and practical layout - preparation of process chart and machinery layout - product layout and process layout - plant layout for size reduction machinery, evaporation plant, drying plant, bake ovens and frying plant, heat exchanger plant, refrigeration and air conditioning plant, boiler, packaging plant and ancillary equipments plant.	9
II	**PROJECT PROFILE ANALYSIS:** Project profile, key aspects to consider in preparing a project profile and DPR (Detailed Project Report), Describing Project Operations, Categorizing Costs, Environmental Sustainability, completing and interpreting the profile, Project Profile Formats, Preparing model project report on fruit and vegetable processing unit.	9
III	**ELECTRICAL AND WATER SUPPLY:** Estimation of services - peak and critical load - preparation of electrical layout - selection of fittings and accessories for electrical and water supply - provision of water supply - design of water storage system - selection of pipe, valves and safety devices - drainage - systems, pipeline, traps, safety devices - illumination and ventilation - materials, mounting, operation and maintenance - layout for effluent treatment plant - safe disposal of effluent.	9
IV	**PRODUCTION PLANNING AND CONTROL:** Production planning and control - continuous and intermittent production - scheduling - routing and dispatching - activity chart and Gantt chart - network planning methods - PERT and CPM - applications - method study - work study - methods - man-machine chart - time study - standard time of a job - inventory control - economic ordering quantity - inventory models.	9
V	**REPAIR AND MAINTENANCE OF EQUIPMENT**: Repair and maintenance of equipment - preventive maintenance and breakdown maintenance - replacement of equipment - alternative methods and analysis - method of annual equivalence, present worth method and internal rate of returns.	9
	Total Instructional Hours	**45**

Course Outcomes

Upon completion of the course, students can be able to

CO1- Design layout for various types of food processing industries.

CO2- Construct project profile analysis and prepare project report

CO3- Design water storage systems and prepare electrical layout

CO4- Apply different methods for production planning

CO5- Demonstrate the repair and maintenance of equipment

TEXT BOOKS:

1. O.P.Kanna, Industrial Engineering and Management, DhanpatRai Publication (P) Ltd., New Delhi, 2003.

2. S.P. Arora and S.P. Bindra, A Text Book of Building Construction, 5th edition, Dhanpat Rai Publications (p) Ltd., New Delhi, 2014.

REFERENCES BOOKS:

1. Zacharias B. Maroulis and George D. Saravacos, Food Process Design, Marcel Dekker, Inc. U.S.A., 2003.

2. Antonio Lopez-Gomez and Gustavo V. Barbosa-Canovas, Food Plant Design, CRC, London, 2005.

3. C.S.Rao, Environmental Pollution Control Engineering, New age International (P) Ltd., New Delhi, 1999.

4. G.K. Agarwal, Plant layout and materials handling, Jain brothers, New Delhi, 2008.

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO2	3	2	2	-	-	-	2	-	-	-	2	-	2	3
CO3	3	-	3	-	-	3	-	-	-	-	-	-	2	3
CO4	3	2	3	3	-	-	-	-	-	-	3	-	3	3
CO5	2	2	2	-	-	-	-	-	-	-	3	-	3	3
AVG	2.8	2.25	2.6	3	-	3	2	-	-	-	2.6	-	2.6	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	21FT7001	FOOD PACKAGING LABORATORY	0	0	3	1.5

Course Objectives

- Understand the properties and uses of various packaging materials
- Impart skills related to food packaging technology
- Become familiar with different forms of packaging box, bottle, tetra, pouch, vacuum, gas, CAP, MAP, asceptic etc.

S.No.	DESCRIPTION
1.	Measuring GSM of various paper and flexible film based packaging materials.
2.	Measuring water absorption by different paper and paper boards using Cobb tester.
3.	Measuring tensile strength of flexible films using UTM.
4.	Measuring compressive strength of carton boxes using UTM.
5.	Measuring drop strength of packaged food material using drop tester
6.	Measuring compressive strength of oil packaged in flexible pouches using Pouch burst tester.
7.	Measuring bursting strength of different paper board-based packaging materials.
8.	Study on estimation of food additives present in the given food sample
9.	Experiment on opening and closing torques of foods packed in bottles/Jars using torque tester.
10.	Isolation and estimation of synthetic food colors
	Total Practical Hours **45**

Course Outcomes

Upon completion of the course, students can be able to

- Understand and apply fundamental requirement for packed foods
- Select a suitable packaging material for perishable and non-perishable foods
- Demonstrate a testing and properties of packaging materials for its regulatory requirements for raw and processed foods
- Analyze the textural properties of packaging material and food packed inside the packaging materials
- Evaluate the quality of packing materials using latest machineries

REFERENCE BOOKS:

1."Manual of methods for the Analysis of Foods", Ministry of Health and Family Welfare, Government of India, New Delhi, 2005.

2. NIIR Board, Food Packaging Technology Handbook (2nd Revised Edition), NIIR Project Consultancy Services, 2012.

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	2	2	2	2	-	-	-	-	3	-	-	2	2	2
CO2	3	2	2	3	-	-	-	-	3	-	-	3	3	3
CO3	3	3	3	3	3	-	-	-	3	-	-	3	3	3
CO4	3	3	2	3	3	-	-	-	3	-	-	2	2	3
CO5	3	3	3	3	3	-	-	-	3	-	-	2	2	3
AVG	2.8	2.6	2.4	2.8	1.8	-	-	-	3	-	-	2.4	2.4	2.8

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	21FT7002	FOOD ANALYSIS AND QUALITY CONTROL LABORATORY	0	0	3	1.5

Course Objectives

The students will able to

- Understand the method to estimate viscosity, specific gravity and preservatives in food materials
- Determine the amount of fat and analyze the cooking quality parameters
- Select the suitable sensory analysis method to find the quality of food materials
- Examine the level of food additives present in the various food products
- Assess the level of synthetic food colors, total sugars, polyphenols in food commodities

S.No.	DESCRIPTION
1.	Estimation of consistency, viscosity and Specific gravity for given food samples
2.	Detection and estimation of salt in pickle in food materials.
3.	Extraction and estimation of fat content in fried food samples
4.	Swellling capactity and extract release volume of meat
5.	Flavour profile comparison of the given food materials by ranking scale method
6.	Sensory analysis of food materials by overall difference test
7.	Quality evaluation of egg
8.	Estimation of food additives present in the given food sample
9.	Estimation of total Polyphenols in tea/coffee extract
10.	Determination of soluble and insoluble fibre in foods.
11.	Estimation of total sugar content in fruits
	Total Practical Hours **45**

Upon completion of the course, students can be able to

Course Outcomes

CO1- Estimate and report viscosity, specific gravity and preservatives in the given samples
CO2 – Extract and analyze the fat content in fried foods and cooking quality parameters
CO3 – Recommend and apply suitable sensory method to analyze the quality attributes of food
CO4 – Measure and quantify the food additives present in the various food products
CO5 – Identify and test the level of synthetic colors, total sugars and polyphenols in food products

REFERENCE BOOKS:

1."Manual of methods for the Analysis of Foods", Ministry of Health and Family Welfare, Government of India, New Delhi, 2005.

2. Morris B. Jacobs., "The chemical Analysis of Foods and Food products" Third edition, CBS publishers & distributors, New Delhi, 2005

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	2	2	2	2	-	-	-	-	3	-	-	2	2	2
CO2	3	2	2	3	-	-	-	-	3	-	-	3	3	3
CO3	3	3	3	3	3	-	-	-	3	-	-	3	3	3
CO4	3	3	2	3	2	-	-	-	3	-	-	2	2	3
CO5	3	3	3	3	3	-	-	-	3	-	-	2	2	3
AVG	2.8	2.6	2.4	2.8	2.6	-	-	-	3	-	-	2.4	2.4	2.8

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PROFESSIONAL ELECTIVE III

Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	21FT7301	FUNCTIONAL FOODS AND NUTRACEUTICALS	3	0	0	3

Course Objectives

- To understand the basic concepts of Nutraceuticals and functional food, their chemical nature and methods of extraction.
- To understand the role of Nutraceuticals and functional food in health and disease

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
I	**INTRODUCTION AND SIGNIFICANCE:** Introduction to Nutraceuticals and functional foods; importance, history, definition, classification, list of functional foods and their benefits, Phytochemicals, zoo chemicals and microbes in food, plants, animals and microbes	9
II	**ANALYSIS OF PHYTOCHEMICALS:** Qualitative and quantitative methods: phytoestrogens in plants; isoflavones; flavonols, polyphenols, tannins, saponins, lignans, Chitin; Carotenoids - Factors affecting bioavailability, chemical and histochemical characterization of cell wall polysaccharides in almond seed in relation to lipid bioavailability.	10
III	**ASSESSMENT OF ANTIOXIDANT ACTIVITY:** In vitro and In vivo methods for the assessment of antioxidant activity, Comparison of different In Vitro methods to evaluate the antioxidant, Prediction of the antioxidant activity of natural phenolics from electrotopological state indices, Optimising phytochemical release by process technology; Variation of Antioxidant Activity during technological treatments, new food grade peptidases from plant sources	11
IV	**ROLE IN HEALTH AND DISEASE:** Nutraceuticals and Functional foods in Gastrointestinal disorder, Cancer, CVD, Diabetic Mellitus, HIV and Dental disease; Importance and function of probiotic, prebiotic and symbiotic and their applications, Functional foods and immune competence; role and use in obesity and nervous system disorders.	9
V	**SAFETY ISSUES:** Health Claims, regulations and safety issues- International and national	6
	Total Instructional Hours	**45**

Course Outcomes

Upon completion of the course, students can be able to

CO1- Identify and list various functional foods and describe their health benefits

CO2- Apply qualitative and quantitative methods to analyze phytochemicals

CO3- compare different in vitro methods, and predict antioxidant activity from electrotopological state indice

CO4- Understand the role of nutraceuticals in health and disease

CO5- Understand the safety issues

TEXT BOOKS:

1.Bisset, Normal Grainger and Max Wich H "Herbal Drugs and Phytopharmaceuticals", II Edition, CRC, 2001.

2.Wildman, Robert "Handbook of Nutraceuticals and Functional Foods". CRC, 2006.

REFERENCES BOOKS:

1.Shi, John, FereidoonShahidi and Chi-Tang Ho "Asian Functional Foods". CRC/Taylor &Francis, 2007.

2.Watson, Robald Ross "Functional Foods and Nutraceuticals in Cancer Prevention". Blackwell Publishing, 2007.

3.Gibson, G.R. and C.M.Willams. "Functional Foods: Concept to Product". Woodhead, 2000.

4. Hanson, James R. "Natural Products: The Secondary Metabolites", Royal Society of Chemistry, 2003.

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	2	2	-	1	-	1	-	-	-	-	-	2	2	-
CO2	2	2	-	2	-	1	-	-	-	-	-	1	2	-
CO3	2	2	-	2	1	1	-	-	-	-	-	1	2	-
CO4	2	2	-	2	1	1	1	-	-	-	-	1	2	-
CO5	1	2	-	2	-	1	1	-	-	-	-	2	2	-
AVG	1.8	2	-	1.8	1	1	1	-	-	-	-	1.4	2	-

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	21FT7302	BIOLOGY AND CHEMISTRY OF FOOD FLAVOURS	3	0	0	3

Course Objectives

- To understand the flavour compounds involved in development of flavor
- To understand the analytical techniques involved in flavor analysis

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
I	**INTRODUCTION:** Problems in flavour research – classification of food flavours; chemical compounds responsible for flavor	9
II	**FLAVOUR COMPOUNDS:** Chemical compound classes and their flavour responses; flavour development during biogenesis, flavour development during food processing; use of biotechnology to develop flavours.	9
III	**THE CHEMICAL SENSES:** Anatomy of the chemical senses; neural development of the chemical senses; receptor mechanisms, neural coding; the control of eating.	9
IV	**FLAVOUR ANALYSIS:** Subjective versus Objective methods of analysis; psychophysics and sensory evaluation and its types, ENOSE, ETONGUE; Instrumental analysis; sample handling and artifacts; data handling	9
V	**TEACHING FLAVOUR CONCEPTS:** Problem based learning; tongue and nose; Onion-Beverage-Maillard reaction-Thio-stench	9
	Total Instructional Hours	**45**

Course Outcomes

Upon completion of the course, students can be able to

CO1- Understand the problems in flavor research

CO2- Understand the compounds responsible for flavours

CO3- Understand the chemical senses

CO4- Understand the flavor analysis procedures

CO5- Understand the flavor concepts and applications

TEXT BOOKS:

1. Fisher, Carolyn and Thomas R. Scott. "Food Flavours: Biology and Chemistry". The Royal Society of Chemistry, 1997.

2. Heath, H.B. and G. Reineccius. " Flavor Chemistry and Technology". CBS Publishers, 1996.

REFERENCES BOOKS:

1. Hofmann, Thomas. "Challenges in Taste Chemistry and Biology". American Chemical Society Publications, 2004.

2. Charalambous, G. "Food Flavors: Generation, Analysis and Process Influence". Elsevier, 1995.

3. Reinecci. , Gary. "Flavor Chemistry and Technology". II Edition, Taylor & Francis, 2006.

4. Shahidi, Fereidoon and Chi-Tang Ho. "Flavor Chemistry of Ethnic Foods". Kluwer Academic / Plenum, 1999.

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	2	2	2	2	-	-	-	-	3	-	-	2	2	2
CO2	3	2	2	3	-	-	-	-	3	-	-	3	3	3
CO3	3	3	3	3	3	-	-	-	3	-	-	3	3	3
CO4	3	3	2	3	2	-	-	-	3	-	-	2	2	3
CO5	3	3	3	3	3	-	-	-	3	-	-	2	2	3
AVG	2.8	2.6	2.4	2.8	2.6	-	-	-	3	-	-	2.4	2.4	2.8

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	21FT7303	FOOD TOXICOLOGY AND ALLERGY	3	0	0	3

Course Objectives

- To study various food laws, importance and functions of food safety management systems, to impart knowledge on food laws and safety in food processing.

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
I	**INTRODUCTION TO FOOD TOXICOLOGY:** Definition and need for understanding food toxicology; Hazards -Microbiological, nutritional and environmental. Basics of immune response - humoral and cell mediated response. Allergen and mechanism of allergic response.	9
II	**NATURAL TOXINS, FOOD ALLERGY AND SENSITIVITY:** Toxins – Natural toxin and poison, difference between toxin, poison and natural toxin, toxin foods, unsafe food, bio-toxin, toxin characteristics, classification of natural toxin. Chemistry of food allergens, food disorders associated with metabolism, biotransformation and Elimination of Toxicants, lactose intolerance, celiac disease and asthma.	9
III	**TOXICANTS FORMED DURING FOOD PROCESSING:** Intentional direct additives, preservatives, nitrate, nitrite, and N- nitroso compound flavour enhancers, food colors, indirect additives, residues and contaminants, heavy metals, other organic residues and packaging materials. Toxicity of heated and processed foods, food carcinogens and mutagens - Polycyclic aromatic hydrocarbons, N - nitrosamines, Acrylamide and their mode of action.	9
IV	**ASSESSMENT OF TOXICANTS IN FOOD SAMPLING:** Quantitative and qualitative analysis of toxicants in foods; Biological determination of toxicants. Assessment of food safety – Risk assessment and risk benefit indices of human exposure, acute toxicity, mutagenicity and carcinogenicity, reproductive and developmental toxicity, neurotoxicity and behavioural effect, immunotoxicity.	9
V	**INSTRUMENTATION TECHNIQUES TO DETECT TOXINS:** Chromatography, Principles, procedure and applications of Thin layer chromatography, Gas chromatography column chromatography, Ion exchange chromatography and High performance liquid chromatography, PCR Techniques, ELISA. Spectrophotometry, Principles, instrumentation and applications of atomic absorption spectrophotometry (AAS) and atomic emission spectrophotometry (AES), Centrifugation; Principles, instrumentation and applications of preparative and ultracentrifuge.	9
	Total Instructional Hours	**45**

Course Outcomes

Upon completion of the course, students can be able to

CO1- Understand the concepts of food toxicology

CO2- Understand the reactions of natural toxins

CO3- Remember the toxicants during food processing

CO4- Understand the procedures of sampling

CO5- Understand the instrumentation techniques to detect toxins

TEXT BOOKS:

1.Helferich, William and Carl K.Winter "Food Toxicology" CRC Press, 2001.

2. Alluwalia, Vikas "Food Hygiene and Toxicology" Paragon International Publishers, 2007

REFERENCES BOOKS:

1.Labbe, Ronald G. and Santos Garcia "Guide to Food Borne Pathogens" John Wiley & Sons, 2001.

2.Cliver, Dean O. and Hans P.Riemann "Food Borne Diseases" 2nd Edition., Academic Press / Elsevier, 2002.

3.Riemann, Hans P. and Dean O. Cliver "Food Borne Infections and Intoxications" 3rd Edition., Academic Press/Elsevier, 2006.

4. Shibamoto, Taka yuki and Leonard F.Bjeldanzes "Introduction to Food Toxicology" 2nd Edition.Academic Press, 2009.

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	2	2	-	1	-	-	-	-	3	-	-	2	2	-
CO2	2	2	-	1	-	-	-	-	3	-	-	3	2	-
CO3	2	2	-	1	-	-	-	-	3	-	-	3	2	-
CO4	2	2	-	1	-	-	-	-	3	-	-	2	2	-
CO5	2	2	-	1	-	-	-	-	3	-	-	2	2	-
AVG	2	2	-	1	-	-	-	-	3	-	-	2.4	2	-

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	21FT7304	ADVANCED DRYING TECHNOLOGY	3	0	0	3

Course Objectives

- To study the advanced drying technologies used for specific food material according to its nature

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
I	**Introduction to Drying:** Drying and dehydration - principles - Mechanism of drying. Drying curves - Internal and external conditions of drying -Drying rate characteristic curve. Diffusion theories of drying - Effective Fickian diffusivity, Alternative effective diffusion theories. Water activity – Hysteresis, water activity predictive models, Determination of sorption isotherms – Gravimetric method, Manometric method and Hygroscopic methods.	9
II	**Spray and Freeze drying:** Spray drying – concept, components of spray drier, mechanism of atomization – drop size and drop distribution. Drying of droplets – Fundamentals, drying kinetics, residence time. Heat and mass balance. New developments in Spray drying. Freeze drying- principle - types - heat and mass transfer, design consideration. Freeze drying – Concept. Stages in freeze drying. Industrial freeze dryers. Advances in freeze drying.	9
III	**Drying on inert particles**: Mechanism and process considerations. Pneumatic and flash drying – principles and its applications. Fluidized bed drying (FBD) - principles of fluidization, Components of fluidized bed system, Classification of fluidized bed dryers – conventional and modified FBD.	9
IV	**Superheated steam drying:** Principles, classification, selection, applications. Heat pump drying (HPD) – principle, low temperature HPD, chemical HPD, Developments and trends. Contact-Sorption drying- Mechanism, Characteristics of sorbents/carriers. Airless drying. Fry drying. Conveyor dryers.	9
V	**Microwave and dielectric drying**: basic concept, Generators, applicators and other control devices, industrial applications. Infra red drying – principles, industrial dryers, applications. Sonic drying. Impingement drying. Slush drying. Refractance Window drying.	9
	Total Instructional Hours	**45**

Course Outcomes

Upon completion of the course, students can be able to

CO1- Understand the mechanism of drying and various dehydration techniques

CO2- Remember the knowledge on freeze and spray drying

CO3- Understand the concepts of drying on inert particles, fluidized and pneumatic drying

CO4- Understand the insight on superheated steam drying, heat pump drying and other novel drying techniques

CO5- Understand the knowledge on microwave, infra-red and sonic drying techniques

TEXT BOOKS:

1. A.S.Mujumdar. Handbook of Industrial drying – Third edition, CRC press, Taylor and Francis

group.UK.2007.

2.Potter, N. N. and Hotchkiss, J. H.., —Food Science. Fifth Edition, CBS Publishers and

Distributors, New Delhi. 1996.

REFERENCES BOOKS:

1.Kudra, T and A.S. Mujumdar. Advanced Drying Technologies. Second Edition, CRC press, Taylor and Francis Grou" UK. 2009.

2.Rao, M. A. and Rizvi, S.S.H., —Engineering Properties of Foods, Marcel Dekker, Inc. New York. 1986.

3. Sahay K.M. and Singh K.K., —Unit Operations of Agricultural Processing‖, 2nd Edition, Vikas Publishing House Pvt. Ltd., New Delhi, 2012.

4. Albert Ibarz and Gustavo V. Barbosa-Cánovas. Unit Operations in Food Engineering. CRC Press, Boca Raton, FL. USA.2003

CO PO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	3	-	2	2	-	-	-	-	-	-	2	2	2
CO2	3	3	-	2	2	-	-	-	-	-	-	3	3	2
CO3	3	3	-	2	2	-	-	-	-	-	-	3	3	2
CO4	3	3	-	2	2	-	-	-	-	-	-	2	2	2
CO5	3	3	-	2	2	-	-	-	-	-	-	2	2	2
AVG	3	3	-	2	2	-	-	-	-	-	-	2.4	2.4	1

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	21FT7305	CEREAL TECHNOLOGY	3	0	0	3

Course Objectives

- To develop the knowledge of students in the area of Cereal processing and technology.

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
I	**PRODUCTION, STRUCTURE AND COMPOSITION:** Status, major growing areas and production of cereals and millets in India and the world, structure, Physical properties; Density, Bulk density, Angle of repose, Hardness, asperity, porosity, stack of milling and moisture on physical properties. Chemical composition, Distribution of nutrients and Aroma of cereals and millets; anti-nutritional factors	9
II	**WHEAT AND RICE :** Wheat: Morphology, Physicochemical properties, Wheat Quality, Wheat Milling, quality aspects of flour, wheat proteins and their function, rheology of flour; wheat based baked products – Bread, Biscuit, Cakes, Extruded products, Pizza, Chapatis, malting and malt products; Milling of rice: Conventional Milling, Modern milling, Advantages and disadvantages of milling machineries, By products of rice milling, Parboiling of rice: Aging of rice: Enrichment: - Need of Enrichment, Methods of enrichment, Enrichment levels, fortification of amino acids. -Processed Foods from rice: Breakfast cereals, flakes, puffing, canning and instant rice.	9
III	**OTHER CEREALS:** Corn - Morphology, Physico-chemical properties, Corn milling - Wet and dry milling, Milling fractions and modify starches Corn Products – Corn flakes, Corn starch, canned corn products, puffed product; HFCS; Oats-Milling, Oat Products – Steel cut, rolled oats, quick cooking; Rye bread; Traditional and Fermented cereal products	9
IV	**MILLETS:** Sorghum, Pearl Millet, Finger millet, Foxtail millet, Kodo Millet - storage, insect control; processing - Pearling, Milling, Malting, Malt based foods, flaked and fermented products; Traditional and Nutritional products based on finger millet.	9
V	**BAKED AND EXTRUDED PRODUCTS:** Baked foods - chemical dough development, mechanical dough development, sheeting extrusion other rapid methods; Bread staling – theory, manifestation, retardation measures; Indian Confectionery. Extrusion processing – methods and products	9
	Total Instructional Hours	**45**

Course Outcomes

Upon completion of the course, students can be able to

CO1- Understand and identify the specific processing technologies used for cereals

CO2- Understand the application of scientific principles in the processing technologies specific to the materials.

CO3 –Understand the processing of millet

CO4 –Understand the importance of baked and extruded product

CO5 – Understand the processing of wheat

TEXT BOOKS:

1.Matz, Samuel A. " The Chemistry and Technology of Cereals as Food and Feed" II Edition, CBS, 1996

2. Delcour, Jan A. and R. Carl Hoseney. "Principles of Cereal Science and Technology". III Edition, American Association of Cereal Chemists, 2010.

REFERENCES BOOKS:

1.Kulp, Karel "Handbook of Cereal Science and Technology". IIEdition,CRC Press, 2000.

2. Morris, Peter C. and James H Bryce "Cereal Biotechnology". CRC / Woodhead, 2000

3. Chakraverty A. Post-harvest Technology of Cereals. Pulses and Oilseeds. Oxford & IBH.2006

4.Araullo, E.V., dePadna, D.B. and Graham, Michael. Rice Post Harvest Technology. International Development Res. Centre, Ottawa, Canada. 1976.

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	2	2	2	2	-	-	-	-	3	-	-	2	2	2
CO2	3	2	2	3	-	-	-	-	3	-	-	3	3	3
CO3	3	3	3	3	3	-	-	-	3	-	-	3	3	3
CO4	3	3	2	3	2	-	-	-	3	-	-	2	2	3
CO5	3	3	3	3	3	-	-	-	3	-	-	2	2	3
AVG	2.8	2.6	2.4	2.8	2.6	-	-	-	3	-	-	2.4	2.4	2.8

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	21FT7306	PROCESSING TECHNOLOGY OF LEGUMES AND OILSEEDS	3	0	0	3

Course Objectives

- To develop the knowledge of students in the area of pulse and oil seeds processing and technology.

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
I	**COMPOSITION OF LEGUMES:** Present status and future prospects of legumes - Morphology of legumes - Classification and types of legumes - Chemical composition, nutritional value and anti-nutritional compounds in legumes - Methods of removal of anti- nutritional compounds – changes during cooking.	9
II	**MILLING OF LEGUMES:** Pulse milling – unit operations- Home scale, cottage scale and modern milling methods, machines and milling efficiency - factors affecting milling quality and quantity- Problems in dhal milling industry.	9
III	**VALUE ADDITION OF LEGUMES:** Nutritional changes during soaking and sprouting of pulses- Cooking quality of dhal, methods, factors affecting cooking of dhal - Quick cooking dhal- instant dhal - Fermented products of legumes.	9
IV	**COMPOSITION AND EXTRACTION METHODS OF OIL SEEDS:** Oil seeds – physical and chemical properties –milling- Ghanis, hydraulic presses, expellers, machines, milling quality- factors affecting milling quality and quantity; Problems in oil milling industry- solvent extraction - Refining of oils: Degumming, neutralization, bleaching, filtration, deodorization, their principles and process controls- Hydrogenation of oils;	9
V	**PROCESSING AND VALUE ADDITION OF OIL SEEDS:** Technology Processing for cottonseed, groundnut, rapeseed, mustard and soyabean- linseed, castor -New technologies in oilseed processing; Utilization of oil seed meals for different food uses- High protein products like protein concentrates and isolates- By-products of oil milling and their value addition.	9
	Total Instructional Hours	**45**

Course Outcomes

Upon completion of the course, students can be able to

CO1- Understanding the composition of legumes

CO2- Understand the application of scientific principles in the processing technologies specific to the pulse processing.

CO3 –Understand the value addition of pulses and its products

CO4 –Understand the importance of oilseed extraction

CO5 – Understand the processing of oilseed and value addition

TEXT BOOKS:

1. 1. Chakraverty,A. 2000. Post-Harvest Technology of cereals, pulses and oilseeds. Third Edition.Oxford & IBH publishing & Co. Pvt. Ltd., New Delhi.
2. Sahay, K.M. and K.K. Singh. 1994. Unit operations in Agricultural Processing, Vikas Publishing House Pvt. Ltd., New Delhi

REFERENCES BOOKS:

1. Henderson, S.M. and R.L.Perry. 1995. Agricultural process engineering, John Willey and Sons, New York.

p.234.

2. Pande, P.H. 1994. Principles of agricultural processing, Kalyani Publishers, Ludhiana, p.278.

3. Chakraverty A. Post-harvest Technology of Cereals, Pulses and Oilseeds. Oxford & IBH.2006

4. McCabe, W.L. and J.C.Smith. 2001. Unit operations in chemical engineering. McGraw Hill Kogakusha Ltd., Tokyo. p.1028.

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	1	-	-	-	-	-	-	-	-	-	-	-	2	1
CO2	1	-	-	-	-	-	-	-	-	-	-	-	2	1
CO3	2	-	-	2	-	-	-	-	-	-	-	-	2	1
CO4	2	-	-	2	1	-	-	-	-	-	-	-	2	1
CO5	2	-	-	2	1	-	-	-	-	-	-	-	2	1
AVG	1.6	-	-	2	1								2	1

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OPEN ELECTIVE – II

Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	21FT7401	POST HARVEST TECHNOLOGY OF FRUITS AND VEGETABLES	3	0	0	3

Course Objectives

- To understand and identify the specific processing technologies used for different foods and the various products derived from fruits and vegetables
- To understand the application of scientific principles in the processing technologies specific to fruits and vegetables.

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
I	**POSTHARVEST PRACTICES AND PROCESSING:** Maturity indices for harvesting; pathological spoilage's during storage, ripening and control measures, post-harvest handling, sorting and grading, packaging, storage, transportation. Methods of pre-cooking, post-harvest treatments to hasten and delay ripening; Methods of storage at farm level – cold storage, controlled / modified atmosphere storage, quality management, export requirements, nutritive value, nutraceutical properties.	9
II	**PRESERVATION AND VALUE ADDITION:** General principles and methods of fruit and vegetable preservation. Definition and need for value addition, requirements of a food processing unit. Preservation using sugar: principle and preparation of jam, jelly, marmalade, squash, RTS, carbonated beverages, crush, nectar, cordial, fruit bar, preserves, candies and carbonated fruit beverages. Processing using salt: principle – brining, preparation of pickles, chutney and sauces, ketchup. Machineries involved in processing of fruits and vegetable products. Drying and dehydration: definition, principle, types of driers: solar, cabinet, spray drier, drum drier, fluidized bed drier, preparation of product for dehydration. Dehydration principles and equipment. Preparation of fruits – powder production. Problems related to storage of dehydrated products.	9
III	**PRESERVATION BY LOW REMPERATURE AND IRRADIATION:** Preservation by low temperature: definition, principle, methods -refrigeration, freezing. Methods of freezing – changes during freezing. Preparation of frozen foods. Minimal processing of fruits and vegetables – techniques involved – preservation by irradiation: definition, principle, application, irradiation unit.	9
IV	**PRESERVATION BY CONCENTRATION AND FERMENTATION:** Preservation by concentration – methods, changes during concentration. Preservation by fermentation – sauerkraut and pickles. Utilization of fruit and vegetable waste.	9
V	**PRESERVATION BY CANNING:** Canning: principles, types of cans, packing of canned products – preparation of canned products, general considerations in establishing a commercial fruit and vegetable cannery, machineries involved in canning and bottling unit – spoilage of canned foods. Bottling of fruit and vegetable. Precautions in canning operations.	9
	Total Instructional Hours	**45**

Course Outcomes

Upon completion of the course, students can be able to

CO1- Understand Postharvest Practices and Processing of fruits and vegetables
CO2- Apply Preservation and Value Addition Techniques
CO3- Analyze Preservation by Low Temperature and Irradiation
CO4- Explore Preservation by Concentration and Fermentation
CO5- Understand Canning and Bottling Techniques

TEXT BOOKS:

1. Arora, N.J., —Food Preservation Techniques‖, 1st Edition, Blackwell Publishing, 2013.

REFERENCES BOOKS:

1. Kader, A.A., —Postharvest Technology of Horticultural Crops‖, 3rd Edition, University of California, Agriculture and Natural Resources, 2002.
2. Sinha, N., Sidhu, J., Barta, J., Wu, J., Cano, M.P. (Eds.), —Handbook of Vegetables and Vegetable Processing‖, 1st Edition, Wiley-Blackwell, 2010.
3. Barrett, D.M., Somogyi, L.P., Ramaswamy, H.S. (Eds.), Processing Fruits: Science and Technology‖, 2nd Edition, CRC Press, 2004.
4. Singh, R.P., Heldman, D.R., —Introduction to Food Engineering‖, 5th Edition, Academic Press (Elsevier), 2013.

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.TECH. FOOD TECHNOLOGY (UG)

REGULATION-2019

For the students admitted during the academic year 2021-2022 and onwards

B Tech (Hons) Food Technology in Processing and Value Addition

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	21FT5206	Technology of milk and milk products	PC	3	0	0	3	3	40	60	100
2.	21FT6204	Ready to Eat foods	PC	3	0	0	3	3	40	60	100
3.	21FT6205	Cane sugar Technology	PC	3	0	0	3	3	40	60	100
4.	21FT7204	Beverage Technology	PC	3	0	0	3	3	40	60	100
Theory with Lab Component											
5.	21FT7205	Processing and Value addition of Tuber crops	PC	2	0	2	3	4	40	60	100
6.	21FT8201	Mushroom Processing Technology	PC	2	0	2	3	4	40	60	100

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	2	2	2	-	-	1	-	-	-	-	1	2	1
CO2	3	2	2	3	-	-	1	-	-	-	-	1	2	1
CO3	3	3	3	3	-	-	1	-	-	-	-	1	2	1
CO4	3	3	2	3	-	-	1	-	-	-	-	1	2	1
CO5	3	3	3	3	-	-	1	-	-	-	-	1	2	1
AVG	**3**	**2.6**	**2.4**	**2.8**	**2.6**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**2**	**2.8**

Chairman, Board of Studies

Dean – Academics

SYLLABUS

Programme	Course code	Name of the course	L	T	P	C
B.TECH.	21FT7204	BEVERAGE TECHNOLOGY	3	0	0	3

Course Objective

The student should be able to

1 To gain knowledge on machinery and process involved in beverage technology and fermentation process involved in making beverage process.

Unit	Description	Instructional Hours
I	**BASIC INGREDIENTS IN BEVERAGES:** Beverage-definition-why we drink beverages-ingredients- water, carbon dioxide, bulk and intense sweeteners, water miscible and water dispersible flavouring agents, colours – natural and artificial, Micro and nanoemulsions of flavors and colors in beverages, preservatives, emulsifiers and stabilizers.	9
II	**BEER AND WINE MANUFACTURE:** Ingredients- Malt- hops- adjuncts- water, yeast. Beer manufacturing process, distillation, malting, preparation of sweet wort, brewing, fermentation, pasteurization and packaging. Beer defects and Spoilage.Wine-fermentation-types –red and white. Wine defects and spoilage	9
III	**CARBONATED BEVERAGES:** Procedures- carbonation equipment-ingredients-preparation of syrups-Filling system-packaging containers and closures	9
IV	**NON-CARBONATED BEVERAGE:** Coffee bean preparation-processing-brewing-decaffeination- instant coffee-Tea types- black, green and oolong- fruit juices, nectars, quash, RTS beverages, isotonic Beverages. Flash pasteurization, Canning and Aseptic Packaging of beverages	9
V	**QUALITY CONTROL:** Effective application of quality controls, brix, acidity to brix ratio, single strength of juice- sanitation and hygiene in beverage industry-Quality of water used in beverages - threshold limits of various ingredients according to PFA, EFSA and FDA – Absolute requirements of Soluble solids and titrable acidity in beverages.	9
	Total Instructional Hours	45

Course Outcome

CO1	Understand the role of ingredients used in beverage processing
CO2	Understand the processing of beer and wine processing
CO3	Understand the procedure of carbonated beverages
CO4	Understand the procedure of non-carbonated beverages
CO5	Understand the steps for quality control

TEXT BOOK:

T1 Ashurst, P.R, "Chemistry and technology of Soft drink and fruit juices", 2ndedition, Blackwell Publishing Ltd. 2005.

T2 Steen, D.P and Ashurst, P.R, "Carbonated soft drinks – Formulation and manufacture",Blackwell Publishing Ltd. 2000.

REFERENCES:

R1 Amalendu Chakraverty et al, "Handbook of Post Harvest Technology", Ed:.,Marcel Dekker Inc. (Special Indian edition) 2000.

R2 Robert.W.Hutkins, "Microbiology and Technology of Fermented foods", IFT Press, Blackwell Publishing Ltd. 2006.

R3 Shankunthala Manay, N. and Shadakdharaswamy, M, "Foods – Facts and Principles", New Age International Pvt. Ltd, 3rd revised edition 2000.

R4 Charles, W.Bamforth, "Food, fermentation and microorganisms", Blackwell Science Publishing Ltd. 2005

CO - PO & PSO M..'PING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	2	2	-	2	-	1	2	2	-	-	1	-	2	-
CO2	2	2	-	2	-	1	2	2	-	-	1	2	2	3
CO3	2	2	-	2	-	1	2	2	-	-	1	2	-	3
CO4	2	2	-	-	-	1	2	2	-	-	1	2	2	3
CO5	2	2	-	2	-	1	2	2	-	-	1	2	2	3
AVG	2	2	-	2	-	1	2	2	-	-	1	2	2	3

Chairman, Board of Studies

Chairman - BOS
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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	21FT7251	PROCESSING AND VALUE ADDITION OF TUBER CROPS	3	0	0	3

The student should be able to

Course Objective

- To understand the scope, importance, and physiology of tuber crops
- To know the processing technologies, various unit operations involved to produce products and valorization & converting the waste into different by products

Unit	Description	Instructional Hours
I	**INTRODUCTION TO TUBER CROPS:** About tuber crops – Scope and Importance of tuber crops in India and Globe – Different types and varieties of crops - Area, cultivation, production and yield of crops. Composition - Nutritional importance of tuber crops.	9
II	**PHYSIOLOGY OF TUBER CROPS:** Post-harvest Physiology of tuber crop, curing in tropical tuber crops, Curing Systems, Postharvest Looses – factors affecting, Damages: Mechanical damage, Physiological damage, Pathological damage. Spoilage – Types and occurrence – prevention methods.	9
III	**POST-HARVEST HANDLING OF TUBER CROPS:** Importance of Market, Equipment's involved in post-harvest handling - Grading, Sorting, Packaging Material, Transportation and marketing of tuber crops, Storage methods of tropical tuber crops. New technologies – Applications, advantages, and disadvantages.	9
IV	**VALUE ADDITION OF TUBER CROPS:** Cassava and other tuber crops – Fried snack foods, Functional foods, extruded foods, baked products, starch modification, dried products, intermediate foods, fermented products, and other types. Entrepreneurship opportunities for tuber crops.	9
V	**BY PRODUCT UTILIZATION OF TUBER CROPS:** Utilization of stem and leaves of tuber crops, Extraction of natural colours from leaves, ethanol production, by product from Cassava starch industry (fibrous waste/thippi from starch or sago industries), utilization of thippi in animal feed production and other by products from tuber industry.	9
	Total Instructional Hours	45

Course Outcome	CO1	Understand the composition and importance of tuber crops
	CO2	Recall the post-harvest physiology of tuber crops
	CO3	Analyze the post-harvest handling of tuber crops
	CO4	Apply the processing methods for production of different products
	CO5	Apply the concepts in valorization of waste from tuber crops

TEXT BOOK:

1 Surajit Mitra. Post harvest management of horticultural crops. Jaya publishing house, New Delhi, 2021.

WEBLINK

1 https://cbp.icar.gov.in/ebook22.aspx?trainingApprovedId=QVT7DnjAExo4c4RF SFC/Uq5r7CU5S00k1zG3JgLB+I=&trainingTitle=5+iXlIDzpHLa2BTkRW5S+GM7b5FvpjWFizIvhewfRGwiyzjPo9jwZp4eI5kAJOCFybmzFysR82XQ6fJhZdApw7c5CHoCg/kIMW0E84MjiVjfxqvXm9CT9aR2FPqOHP8cb62hp8Bhowc31piRNKOHgg73QQJLRKkF2NH1+HBwwebI5YarKd3r1n36CkTI7T29sA561Vnm9qPTex7ZnS9PIH9Y6OMOw2GPSqaSX0MF6vMYLc/59T90HtbzxD0Czc1mmVUDqacjn/5pUF20j7/ZsEQ==

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	-	2	-	2	-	1	2	2	-	-	1	-	2	2
CO2	2	2	-	2	-	1	2	2	-	-	1	2	2	2
CO3	2	2	-	2	-	1	2	2	-	-	1	2	2	2
CO4	2	2	-	2	-	1	2	2	-	-	1	2	2	2
CO5	2	2	-	2	-	1	2	2	-	-	1	2	2	2
AVG	2	2	-	2	-	1	2	2	-	-	1	2	2	2

Chairman, Board of Studies

Chairman - BoS
FT - HiCET

Dean – Academics

Dean (Academics)
HiCET

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.TECH. FOOD TECHNOLOGY (UG)

REGULATION-2019

For the students admitted during the academic year 2021-2022 and onwards

MINOR DEGREE PROGRAM

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTAC PERIODS	CREDITS
				L	T	P		
1.	21FT5601	Sem 5: Food Quality Analysis	MDC	3	0	0	3	3
2.	21FT6601	Sem 6: Technology of Fruits and Vegetable Processing	MDC	3	0	0	3	3
3.	21FT6602	Sem6: Meat Processing Technology	MDC	3	0	0	3	3
4.	21FT7601	Sem 7: Processing of milk and milk products	MDC	3	0	0	3	3
5.	21FT7602	Sem 7: Technology of Baking and Confectionery	MDC	3	0	0	3	3
6.	21FT8601	Sem 8: Food Packaging Technology	MDC	3	0	0	3	3

Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	21FT7601	PROCESSING OF MILK AND MILK PRODUCTS	3	0	0	3

Course Objective

- Know the need and importance of dairy industry
- Understand the processing methods technological aspects of milk and its products
- Study the composition and quality of processed milk and its value-added products

Unit	Description	Instructional Hours
	INTRODUCTION	
I	Milk production and consumption- India and Worldwide -Status and scope of dairy industry in India - Fluid Milk - Definition of milk, composition, factors affecting composition of milk, types of milk and nutritive value of milk- Basis for pricing of milk- Good hygienic practice in milk processing: Principal hazards, cleaning and disinfection in a dairy industry, definitions, cleaning and disinfection agents and processes.	9
	QUALITY ANALYSIS AND EVALUATION	
II	Testing the authenticity of milk and milk products: Detection of foreign fats, milk of other species, water, non-milk proteins. Methods of examination and Quality evaluation, Adulteration and its detection. Microbiology of milk: Milk as a substrate for bacteria, spoilage microorganisms, pathogenic micro-organisms, sources of contamination, hygienic measures.	9
	TYPES OF MILK AND ITS PROPERTIES	
III	Milk processing- Concentrated milk, condensed milk, evaporated milk, UHT processed milk, flavored, sterilized milk, dried milk, Soy milk, Imitation milk, whole and skimmed milk powder - Method of manufacture, packaging and storage, defects and their control. Instantization of milk and milk products, flow ability, dustiness, reconstituability, dispersability, wet ability, sink ability and appearance of milk powders. Judging and grading of milk and its products.	9
	FAT RICH DAIRY PRODUCTS	
IV	Frozen da. , products- Ice-cream- Kulfi- manufacture, packing and storage. Fat rich dairy products - Cream, ghee and margarine- Method of manufacture, packaging and storage. Cheese byproducts- Casein and its derivatives- Whey powder, protein concentrates and isolate- utilization, Infant milk-production.	9
	FERMENTED AND INDIGENOUS MILK PRODUCTS	
V	Fermented milk - principles- Processing- practices of manufacture, packaging- storage and marketing Fermented milk products- dahi, cultured butter milk, acidophilus milk, yoghurt, shrikhand and probiotic milk-based products. Technology of Indigenous dairy products - Present status, method of manufacture of khoa, burfi, kalakand, gulabjamun, rosogolla, chhana, paneer, lassi etc.	9
	Total Instructional Hours	**45**

Course Outcome

1. Apply the technological interventions in of processing of milk
2. Determine the physico-chemical and compositional aspects of milk
3. Evaluate the manufacture of different dairy products and the equipment's used.
4. Analyze the importance Fat rich dairy product and its properties
5. Identify fermented dairy products and its quality evaluation

Reference(s)

1. De Sukumar., Outlines of Dairy Technology, Oxford University Press, 2007.
2. Smit, G., Dairy processing - improving quality, Woodhead Publishing, 2003.
3. Walstra P., Geuits T.J., Noomen A., Jellema A. and Van Boekel M.A.J.S., Dairy technology- Principles of milk properties and processe , Marcel Dekker Inc., 1999.
4. Spreer E. Milk and dairy product technology. Marcel Dekker Inc.,1998.
5. J M Warner, Principles of Dairy Processing: Wiley Eastern Ltd. New Delhi, 1976.
6. Robinson R.K. Modern dairy Technology, Vol I Advances in Milk processing

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	2	2	-	2	-	1	1	2	-	-	1	-	2	2
CO2	2	2	-	2	-	1	1	2	-	-	1	2	2	2
CO3	2	2	-	2	-	1	1	2	-	-	1	2	2	2
CO4	2	2	-	2	-	1	1	2	-	-	1	2	2	2
CO5	2	2	-	2	-	1	1	2	-	-	1	2	2	2
AVG	2	2	-	2	-	1	1	2	-	-	1	2	2	2

Chairman, Board of Studies

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	21FT7602	TECHNOLOGY OF BAKING AND CONFECTIONERY	3	0	0	3

Course Objectives

To understand and remember the technology of baking and confectionery
To understand the important role of essential ingredients in baking
To analyze the different uses of bakery equipments
To understand the production process of bakery products
To apply and analyze the different methods of confectionery production

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
I	**INTRODUCTION TO BAKING:** Classification of bakery products. Bakery ingredients and their functions-Essential ingredients: Flour, yeast and sour dough, water, salt- Other ingredients: Sugar, color, flavor, fat, milk, milk powder and bread improvers. Leaveners and yeast foods. Shortenings, emulsifiers and antioxidants.	9
II	**EQUIPMENTS IN BAKERY TECHNOLOGY:** Introduction to utensils and equipments used in bakery industry with their purpose. Bulk handling of ingredients-Dough mixing and mixers, Dividing, rounding, sheeting, and laminating-Fermentation enclosures and brew equipment - Ovens and Slicers: Extrusion. Rheology of dough-Farinograph, Amylograph, Alveograph and Extensiograph.	9
III	**BAKERY PRODUCT PREPARATION I:** The Chemistry of dough Development. Bread making methods- Straight dough/bulk fermentation - Sponge and dough-Activated dough development- Chorley wood bread process- Dough retarding and freezing-emergency No time process. Advantages and disadvantages of various methods of bread-making. Characteristics of good bread: Internal characters; external characters. Bread defects/faults and remedies. Spoilage of bread-Causes, detection and prevention. Estimation of wet and dry gluten content of wheat flour/ Estimation of water absorption power of wheat flour/ Experiment on leavening power of baking powder, sodium-bicarbonate and ammonium- bicarbonate	9
IV	**BAKERY PRODUCT PREPARATION II:** Production of cakes and cookies/biscuits. Types of biscuit dough's –Developed dough, short dough's, semi-sweet, enzyme modified dough's and batters. Cake making: Ingredients and their function Structure builders. Tenderizers, moisteners and flavor enhancers. Production process for Wafers- type of flour, raising agents and maturing. Other miscellaneous products- puff pastry, chemically leavened. Problems of baking. Determination of sedimentation value of wheat flour/ Determination of dough rising capacity of wet and dry yeast	9
V	**CONFECTIONERY PRODUCTS:** Definition, importance of sugar confectionery. General technical aspects of industrial sugar confectionery manufacture - compositional effects. Manufacture methods of high boiled sweets: - Ingredients - prevention of recrystallization and stickiness Types of confectionery products-Caramel, Toffee and Fudge and other confections-:- ingredients - Formulation – Processing method- Quality control- Aerated confectionery- Methods of aeration-Manufacturing process- Chemistry of Hydrocolloids, Hydrocolloid pretreatment Processes -product quality parameters, faults and corrective measures. Spoilage of confectionery products	9
	Total Instructional Hours	45

Course Outcomes

Upon completion of the course, students can be able to

CO1- Apply the principles of baking and analyze the role of ingredients in baking
CO2- Illustrate and analyze the processing parameters of baking machineries
CO3- Understand the processing of bread and applying on the production process
CO4 - Understand the role of ingredients in bakery products
CO5 - Apply the production process for different types of confectionery products

TEXT BOOKS:

1. Matz, Samuel A., "Bakery Technology and Engineering", III Edition, Chapman & Hall, London.
2. Cauvain, Stanley P, and Young, Linda S., "Technology of Bread Making", II Edition Aspen publication. Maryland, 1999

REFERENCES BOOKS:

1. Edwards W.P. "Science of bakery products", RSC, UK,2007
2. Samuel A. Matz., "Equipment for Bakers", Pan Tech International Publication. 1988.
3. Sugar Confectionery manufacture-(Ed) E.B.Jackson, II edition, Blackie Academic and professional, Glasgow,1995.
4. Bernard. W. Minifie., PhD "Chocolate, Cocoa, and confectionery" (Science and Technology), 3rd edition,CBS publishers and Distributors, New Delhi

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	2	2	-	2	-	1	2	2	-	-	1	2	2	3
CO2	2	2	-	2	-	1	2	2	-	-	1	2	2	3
CO3	2	2	-	2	-	1	2	2	-	-	1	2	2	3
CO4	2	2	-	2	-	1	2	2	-	-	1	2	2	3
CO5	2	2	-	2	-	1	2	2	-	-	1	2	2	3
AVG	2	2	-	2	-	1	2	2	-	-	1	2	2	3

Chairman, Board of Studies

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Dean – Academics

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.TECH. FOOD TECHNOLOGY (UG)

REGULATION-2022

For the students admitted during the academic year 2022-2023 and onwards

B Tech (Hons) Food Technology in Processing and Value Addition

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	22FT5203	Technology of milk and milk products	PC	3	0	0	3	3	40	60	100
2.	22FT6202	Ready to Eat foods	PC	3	0	0	3	3	40	60	100
3.	22FT6203	Cane sugar Technology	PC	3	0	0	3	3	40	60	100
4.	22FT7203	Beverage Technology	PC	3	0	0	3	3	40	60	100
Theory with Lab Component											
5.	22FT7204	Processing and Value addition of Tuber crops	PC	2	0	2	3	4	40	60	100
6.	22FT8201	Mushroom Processing Technology	PC	2	0	2	3	4	40	60	100

SYLLABUS

Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	22FT5203	TECHNOLOGY OF MILK AND MILK PRODUCTS	3	0	0	3

Course Objective

- Know the need and importance of dairy industry
- Understand the processing methods technological aspects of milk and its products
- Study the composition and quality of processed milk and its value-added products

Unit	Description	Instructional Hours
I	**INTRODUCTION** Milk production and consumption- India and Worldwide -Status and scope of dairy industry in India - Fluid Milk - Definition of milk, composition, factors affecting composition of milk, types of milk and nutritive value of milk- Basis for pricing of milk- Good hygienic practice in milk processing: Principal hazards, cleaning and disinfection in a dairy industry, definitions, cleaning and disinfection agents and processes.	9
II	**QUALITY ANALYSIS AND EVALUATION** Testing the authenticity of milk and milk products: Detection of foreign fats, milk of other species, water, non-milk proteins. Methods of examination and Quality evaluation, Adulteration and its detection. Microbiology of milk: Milk as a substrate for bacteria, spoilage microorganisms, pathogenic micro-organisms, sources of contamination, hygienic measures.	9
III	**TYPES OF MILK AND ITS PROPERTIES** Milk processing- Concentrated milk, condensed milk, evaporated milk, UHT processed milk, flavored, sterilized milk, dried milk, Soy milk, Imitation milk, whole and skimmed milk powder - Method of manufacture, packaging and storage, defects and their contr'. Instantization of milk and milk products, flow ability, dustiness, reconstituability, dispersability, wet ability, sink ability and appearance of milk powders. Judging and grading of milk and its products.	9
IV	**FAT RICH DAIRY PRODUCTS** Frozen dairy products- Ice-cream- Kulfi- manufacture, packing and storage. Fat rich dairy products - Cream, ghee and margarine- Method of manufacture, packaging and storage. Cheese byproducts- Casein and its derivatives- Whey powder, protein concentrates and isolate- utilization, Infant milk-production.	9
V	**FERMENTED AND INDIGENOUS MILK PRODUCTS** Fermented milk - principles- Processing- practices of manufacture, packaging- storage and marketing Fermented milk products- dahi, cultured butter milk, acidophilus milk, yoghurt, shrikhand and probiotic milk-based products. Technology of Indigenous dairy products - Present status, method of manufacture of khoa, burfi, kalakand, gulabjamun, rosogolla, chhana, paneer, lassi etc.	9
	Total Instructional Hours	**45**

Course Outcome

1. Apply the technological interventions in of processing of milk
2. Determine the physico-chemical and compositional aspects of milk
3. Evaluate the manufacture of different dairy products and the equipment's used.
4. Analyze the importance Fat rich dairy product and its properties
5. Identify fermented dairy products and its quality evaluation

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1. De Sukumar., Outlines of Dairy Technology, Oxford University Press, 2007.
2. Smit, G., Dairy processing - improving quality, Woodhead Publishing, 2003.
3. Walstra P., Geuits T.J., Noomen A., Jellema A. and Van Boekel M.A.J.S., Dairy technology- Principles of milk properties and processes, Marcel Dekker Inc., 1999.
4. Spreer E. Milk and dairy product technology. Marcel Dekker Inc.,1998.
5. J M Warner, Principles of Dairy Processing: Wiley Eastern Ltd. New Delhi, 1976.
6. Robinson R.K. Modern dairy Technology, Vol I Advances in Milk processing

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	2	2	-	2	-	1	2	2	-	-	1	2	2	3
CO2	2	2	-	2	-	1	2	2	-	-	1	2	2	3
CO3	2	2	-	2	-	1	2	2	-	-	1	2	2	3
CO4	2	2	-	2	-	1	2	2	-	-	1	2	2	3
CO5	2	2	-	2	-	1	2	2	-	-	1	2	2	3
AVG	2	2	-	2	-	1	2	2	-	-	1	2	2	3

Chairman, Board of Studies

Chairman - BoS
FT - HiCET

Dean – Academics

Dean (Academics)
HiCET

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.TECH. FOOD TECHNOLOGY (UG)

REGULATION-2022

For the students admitted during the academic year 2022-2023 and onwards

MINOR DEGREE PROGRAM

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22FT5601	Sem 5: Food Quality Analysis	MDC	3	0	0	3	3
2.	22FT6601	Sem 6: Technology of Fruits and Vegetable Processing	MDC	3	0	0	3	3
3.	22FT6602	Sem6: Meat Processing Technology	MDC	3	0	0	3	3
4.	22FT7601	Sem 7: Processing of milk and milk products	MDC	3	0	0	3	3
5.	22FT7602	Sem 7: Technology of Baking and Confectionery	MDC	3	0	0	3	3
6.	22FT8601	Sem 8: Food Packaging Technology	MDC	3	0	0	3	3

Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	21FT5601	FOOD QUALITY ANALYSIS	3	0	0	3

Course Objectives

- The students will be able to
- Understand the quality analysis procedures
- Infer the procedure for lipid and protein analysis
- Ensure food quality standards in the food industry

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
1	**SAMPLING METHODS FOR FOOD ANALYSIS** Introduction, Food Regulations and Standards - Sampling methods - Sample preparation and preservation- Extraction methods and Separation process of food components; Statistical evaluation of analytical data - Official Methods of Food Analysis. Proximate analysis of Foods-Moisture in foods, Ash content of foods - determination by different methods; Titratable Acidity in foods, Determination of dietary fibre and crude fibre.	9
2	**CARBOHYDRATE ANALYSIS, REFRACTOMETRY AND POLARIMETRY** Refractometry- Basic Principles and Instrumentation, and Applications-Brix Value of Fruit juices, Total soluble solids in fruit products. Carbohydrate analysis- Colorimetric Quantification methods of Mono and Di-Saccharides, HPLC of Mono and Di-Saccharides using refractive index detection; Starch Enzymatic quantification and Determination of total amylose content; Polarimetry- Basic principles, Instrumentation and Applications-Determination of specific rotations of sugars; Estimation of simple sugars and disaccharides.	9
3	**LIPIDS AND MINERAL ANALYSIS** Determination of Total fat in foods by different methods (classification: Direct and Indirect); Analysis of oils and fats for physical and chemical parameters, Instrumental methods; GCMS, Instrumentation, FAMES, Injection types, oven and coloum, Detectors; Quality standards, and adulterants. MINERALS: Sample Prepration: Methods of ashing: Dry ashing and wet ashing, AAS, ICP, OES.	9
4	**PROTEINS ANALYSIS** Determination of Proteins Concentration- Colorimetric and methods, Determination of Total nitrogen. Protein Characterization- Isoelectric focussing; Analysis of Protein quality – Protein Efficiency Ratio (PER), Net Protein Utilization (NPU), Biological Value, Protein Digestibility. Corrected Amino acid Score (PDCAAS), *In vitro* Protein digestibility for C-PER; Analysis of Functional properties of proteins- Water absorption, fat absorption, solubility, gelling and foaming.	9
5	**FOOD SAFETY AND STANDARDS**: Food adulteration and food safety, Food laws - Food Safety and Standards Act (FSSAI), Prevention of Food Adulteration Act, Packaged Commodities Rules - Genetically Modified Foods, Fortification, Pesticide Residues, Organic Foods, Quality of Foods, Quality Standards - mandatory and optional standards, Food Safety Systems - ISO 9000, ISO 14000, ISO 22000, Mechanism of developing and fixing food standards, Good Manufacturing Practice, HACCP, Standards of Weights and Measures.	9
	Total Instructional Hours	45

Course

Upon completion of the course, students can be able to

CO1- Summarize the techniques for sample preparation of food components.

Outcomes
CO2- Discuss the methods for analyzing specific components in carbohydrates
CO3- Outline the various analytical methods and properties of lipids and minerals
CO4- Interpret the various analytical methods and properties of proteins
CO5- Explain the regulations and standards mandated for food safety

TEXT BOOKS:

3. Pomsseranz, Yeshajahu. "Food Analysis Theory and Practice". 3rd Edition. Aspen Publishers / Springer, 2000.
4. Inteaz Alli, —Food Quality Assurance: Principles and Practices‖, 2nd Edition, Taylor and Francis, UK, 2014.

REFERENCES BOOKS:

5. David Kilcast, —Sensory Analysis for Food and Beverage Quality Control: A Practial Guide‖, Woodhead Publishing Ltd, Cambridge, 2010.
6. Singh, S. P., —Food Safety, Quality Assurance, and Global Trade: Concerns and Strategies‖, International Book Distributing Company, Lucknow, 2009.
7. Manuals of Food Quality Control: Quality Assurance in Food Control Chemical Laboratory‖, FAO, Itlay, 1993.
8. Ronald E. Wrolstad. "Handbook of Food Analytical Chemistry" Vol I, John Wiley & sons, 2005

CO - PO & PSO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	2	2	2	2	3	3	-	-	-	1	2	2	1
CO2	3	3	3	3	3	3	3	-	-	-	1	3	2	1
CO3	3	3	3	2	3	2	2	-	-	-	1	3	3	1
CO4	3	3	3	2	3	2	2	-	-	-	1	2	2	1
CO5	3	3	3	3	3	3	3	-	-	-	2	3	2	1
AVG	3	2.8	2.8	2.4	2.8	2.6	2.6	-	-	-	1.2	2.6	2.2	1

Chairman, Board of Studies

Dean – Academics