HINDUSTAN
INSTITUTE OF TECHNOLOGY & SCIENCE
(DEEMED TO BE UNIVERSITY)

B. Sc. FOOD TECHNOLOGY

(Duration: 3 Years)

CURRICULUM and SYLLABUS

(Applicable for Students admitted from Academic Year 2021-22)

DEPARTMENT OF FOOD TECHNOLOGY

SCHOOL OF LIBERAL ARTS AND APPLIED SCIENCES

HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE

HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE

Motto:

To Make Every Man *a* Success *and* No Man *a* Failure

Vision:

To be an International Institute of Excellence, providing a conducive environment for education with a strong emphasis on innovation, quality, research and strategic partnership blended with values and commitment to society.

Mission:

- *To create an ecosystem that promotes learning and world class research.*
- *To nurture creativity and innovation.*
- *To instill highest ethical standards and values.*
- *To pursue activities for the development of the Society.*
- *To develop national and international collaborations with institutes and industries of eminence.*
- *To enable graduates to become future leaders and innovators.*

Value Statement:

Integrity, Innovation, Internationalization.

DEPARTMENT OF FOOD TECHNOLOGY

Vision:
To excel in innovation and collaborative research, promoting technical and entrepreneurial skills

Mission:

- *To impart high quality education to build the students ability and enhancing their skills to make them globally competitive Food Technologist.*
- *To develop state of the art research facilities to provide collaborative environment that stimulates the opportunities to create, analyze, apply and disseminate knowledge.*

PROGRAM EDUCATIONAL OBJECTIVES (PEO'S):

PEO 1: *Graduates will apply fundamental technical knowledge and skills to find workable solutions to technological challenges and problems in diversified areas of Food Processing.*

PEO 2: *Graduates will possess professional and ethical responsibilities with effective communication and managerial skills to prove as a responsible leader in government and private sectors.*

PEO 3: *Graduates will become entrepreneurs to tackle business challenges or will continue their professional advancement through lifelong learning.*

PEO 4: *To produce competent graduates who shall pursue careers in the field of food technology, food processing and food regulation*

PROGRAMME'S OUTCOMES (PO'S):

PO1
Food Technology Knowledge: *Apply the knowledge of technology and its fundamentals, to the solution of complex scientific problems in food science, nutrition and dietetics.*

P02

Problem Analysis: *Identify, formulate, research literature, and analyse complex scientific problems reaching substantiated conclusions using first principles of food and nutritional sciences.*

PO3

Design/development of Solutions: *Design solutions for complex scientific problems and design system components or processes that meet t h e specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations*

PO4

Conduct Investigations of Complex Problems: *Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.*

PROGRAM SPECIFIC OUTCOMES (PSO'S):

A graduate of the Food Technology program will demonstrate:

PSO1

Professional Skills: *The ability to understand, evaluate and prepare ways to process, preserve, package, or store food, according to industrial requirements.*

PSO2

Problem Solving Skills: *The ability to apply standard practices and regulation in developing the food and allied products.*

PSO3

Career and Entrepreneurship: *The ability to employ modern technologies to produce new or value added products in the area of Food Technology.*

SEMESTER – I									
SL. NO	**COURSE CATEGORY**	**COURSE CODE**	**NAME OF THE COURSE**	**L**	**T**	**P**	**C**	**S**	**TCH**
1	SH	ELA4104	English-I	3	0	0	3	0	3
2	BS	CYA1105	Applied Chemistry	3	1	0	4	0	4
3	BS	MAA1112	Applied Mathematics	3	1	0	4	0	4
4	BS	CYA1106	Environmental Chemistry	3	0	0	3	0	3
PRACTICAL									
5	BS	CYA1141	Applied Chemistry Lab	0	0	4	2	0	4
6	PC	FTB1131	Food Chemistry Lab-I	0	0	4	2	0	4
Total				**12**	**2**	**8**	**18**	**0**	**22**
L – Lecture ; T – Tutorial ; P – Practical ; C – Credit; S- Self Study; TCH- Total Contact Hours									

SEMESTER – II									
SL. NO	**COURSE CATEGORY**	**COURSE CODE**	**NAME OF THE COURSE**	**L**	**T**	**P**	**C**	**S**	**TCH**
1	SH	ELA4116	English-II	3	0	0	3	0	3
2	PC	FTB1201	Food Analysis Techniques	3	1	0	4	0	4
3	PC	FTB1202	Principles of Food Science	3	0	0	3	0	3
4	BS	FTA1203	Introduction to Biochemistry	3	1	0	4	0	4
PRACTICAL									
5	PC	FTB1231	Food Chemistry Lab-II	0	0	4	2	0	4
6	BS	FTA1232	Basics of Biochemistry Lab	0	0	4	2	0	4
				12	**2**	**8**	**18**	**0**	**22**
L – Lecture ; T – Tutorial ; P – Practical ; C – Credit; S- Self Study; TCH- Total Contact Hours									

SEMESTER – III									
SL. NO	**COURSE CATEGORY**	**COURSE CODE**	**NAME OF THE COURSE**	**L**	**T**	**P**	**C**	**S**	**TCH**
1	PC	FTB1301	Food Microbiology, Contamination and Spoilage of Food	3	1	0	4	0	4
2	PC	FTB1302	Processing of Cereals, Fruits, Vegetables & Beverages	3	0	0	3	0	3
3	PC	FTB1303	Food and Nutrition	3	1	0	4	0	4
4	PC	FTB1304	Food Additives	3	1	0	4	0	4
PRACTICAL									
5	PC	FTB1331	Food Microbiology Lab	0	0	4	2	0	4
6	PC	FTB1332	Food Chemistry Lab-III	0	0	4	2	0	4
Total				**12**	**3**	**8**	**19**	**0**	**23**
L – Lecture ; T – Tutorial ; P – Practical ; C – Credit; S- Self Study; TCH- Total Contact Hours									

SEMESTER – IV									
SL. NO	**COURSE CATEGORY**	**COURSE CODE**	**NAME OF THE COURSE**	**L**	**T**	**P**	**C**	**S**	**TCH**
1	PC	FTB1401	Technology of processing Fish, Meat & Poultry	3	0	0	3	0	3
2	PC	FTB1402	Food Preservation Technology	3	0	0	3	0	3
3	PC	FTB1403	Food Waste Management	3	0	0	3	0	3
4	PE	FTC17**	Elective-I	3	0	0	3	0	3
5	PE	FTC17**	Elective-II	3	0	0	3	0	3
PRACTICAL									
6	PC	FTB1431	Food Analysis Lab-I	0	0	4	2	0	4
7	PC	FTB1432	Food Processing Lab-I	0	0	4	2	0	4
8	PC	FTB1433	Internship (minimum 40 hours)	-	-	-	4	0	-
Total				**15**	**0**	**8**	**23**	**0**	**23**
L – Lecture ; T – Tutorial ; P – Practical ; C – Credit; S- Self Study; TCH- Total Contact Hours									

SEMESTER – V									
SL. NO	**COURSE CATEGORY**	**COURSE CODE**	**NAME OF THE COURSE**	**L**	**T**	**P**	**C**	**S**	**TCH**
1	PC	FTB1501	Food Process Technology - Milk and Dairy Products	3	0	0	3	0	3
2	PC	FTB1502	Bakery, Confectionary and Miscellaneous products	3	0	0	3	0	3
3	PC	FTB1503	Food Adulteration and Food Toxicology	3	0	0	3	0	3
4	PE	FTC17**	Elective-III	3	0	0	3	0	3
5	PE	FTC17**	Elective-IV	3	0	0	3	0	3
PRACTICAL									
6	PC	FTB1531	Food Analysis Lab-II	0	0	4	2	0	4
7	PC	FTB1532	Food Processing Lab-II	0	0	4	2	0	4
Total				**15**	**0**	**8**	**19**	**0**	**23**
L – Lecture ; T – Tutorial ; P – Practical ; C – Credit; S- Self Study; TCH- Total Contact Hours									

SEMESTER – VI									
SL. NO	**COURSE CATEGORY**	**COURSE CODE**	**NAME OF THE COURSE**	**L**	**T**	**P**	**C**	**S**	**TCH**
1	PC	FTB1601	Processing of Oils and Fats	3	0	0	3	0	3
2	PC	FTB1602	Fermented Food	3	0	0	3	0	3
3	PE	FTC17**	Elective-V	3	0	0	3	0	3
4	PC	FTB1631	Project Work	0	0	16	8	0	16
Total				**9**	**0**	**16**	**17**	**0**	**25**
L – Lecture ; T – Tutorial ; P – Practical ; C – Credit; S- Self Study; TCH- Total Contact Hours									

TOTAL CREDITS: 114

LIST OF PROFESSIONAL ELECTIVES WITH GROUPING – SEMESTER WISE

SEM	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
4	PE	FTC1701	Food information and Regulations	3	0	0	3	0	3
4	PE	FTC1702	Value Addition to Food Industry Refuse	3	0	0	3	0	3
4	PE	FTC1703	Food Safety	3	0	0	3	0	3
4	PE	FTC1704	Fast Foods and Catering Services	3	0	0	3	0	3
5	PE	FTC1705	Entrepreneurship Development	3	0	0	3	0	3
5	PE	FTC1706	Food Quality Testing and Evaluation	3	0	0	3	0	3
5	PE	FTC1707	Food Packaging Technology	3	0	0	3	0	3
6	PE	FTC1708	Quality Control and Management	3	0	0	3	0	3

COURSE TITLE	ENGLISH – I			CREDITS	3
COURSE CODE	ELA4104	COURSE CATEGORY	SH	L-T-P-S	3-0-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments / Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course enables student to communicate effectively and fluently with others. It aids them to write for magazines, newspaper columns in a well-disciplined manner. This course also help student master his conversational grammar
Course Objective	To enable the students 1 To enhance the communication skills by giving adequate exposure in listening, speaking, reading and writing skills 2 To help them recognize and operate in various styles and registers in English. 3 To make them to get rid of their present flaws and mistakes in pronunciation and grammar. 4 To understand them to learn, identify and repair the voids in their present vocabulary and pronunciation targeting those specific arrays of words To impart better writing skills by sensitizing the learners to the dynamics of effective writing.
Course Outcome	Upon completion of this course, the students will 1. Acquire the basic knowledge of grammar and develop the knowledge of forming sentences in English 2. Discern technical communication and business communication 3. Comprehend from the visual observation and pictorial representations 4. Voice out their opinions and reacting to differentcircumstances 5. Lay a strong foundation on the vocabulary part of technical English skills.

Prerequisites: PLUS TWO ENGLISH

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	1	-	1	-	1	1	2
CO-2	2	-	1	-	-	-	1
CO-3	1	1	-	1	1	1	2
CO-4	-	1	1	1	2	2	1
CO-5	-	1	1	2	1	2	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: EXTENSIVE READING (9L)

Reading short meaningful extracts from literary and non-literary texts and identifying various types of connections among statements such as reason- result, statement-illustration, cause-effect, result-reason, addition, contradiction/opposite, introduction, furthering, adding, summing up, conclusion - Tracing the texture of texts — Referencing -- Anaphoric and cataphoric references — Identifying relationships between topic sentences and subordinate sentences **Suggested Activities:** Reading leading to making notes—Random note making—Systematizing conventions	**CO-1** **BTL-2**
MODULE 2: INTENSI VE READING **(9 L)**	
Matching discourse functions with corresponding linguistic structures — one function carried out through several structures — one structure fulfilling several functions - Cohesion and cohesive markers — Coherence and grammatical linkers -Reading newspapers at breakfast table — Reading publicity materials – Skimming – Reading quickly for grasping the main idea or point — Scanning — Reading carefully, looking for specific information — Railway timetable — medical prescription — textbooks — cover letters accompanying important documents - Reading and Note making — Purposes of note making -- Various formats of making notes — Short forms and abbreviations — commonly used and personal conventions **Suggested activities**: Non-literary texts for comparison and contrast -- Identifying words, phrases, idioms, phatic communion phrases, formulaic expressions etc. (which suits day to day communication) from reading materials and using them appropriately in one's own use	**CO-2** **BTL-2**
MODULE 3: CRITICAL THINKING **(9 L)**	
Identifying differences and similarities between pairs of pictures, illustrations, diagrams etc. and talking about them by working in pairs and small groups - Defining 'argument' — Components of an argument: reason and conclusion —illustrating arguments — Identifying arguments from a set of statements and identifying their components **Suggested Activities**: Developing critical thinking skills through visuals (print and electronic), Choose the best responses from the statements, Group activities, task based activities, responses to hypothetical Situations	**CO-3** **BTL-3**
MODULE4: ORAL COMMUNICATION SKILLS **(9 L)**	
Functions in clusters: Cluster 1**.** Inviting, responding with thanks, accepting invitation/declining - invitation with a valid reason, promising to meet on a later occasion, taking leave & bidding farewell 2. Apologizing, explaining reason, promising not to repeat the mistake, reassuring, taking leave - 3. Correcting someone, defending the right point or stance, convincing the other etc - 4. Greeting, Appreciating something good, illustrating the point further, Complimenting - 5. Complaining, defending logically, demanding things to be set right, and producing proof or evidence - Examples in the form of short recorded extracts of direct interactions as well as telephone conversations from various walks of life such as office work, business, advertisement, law court, police, various service providers such as gas agency, door delivery agency and so on.	**CO-4** **BTL-2**
Suggested activities: Listening to small meaningful chunks of day to day communication and responding to them naturally -- Greetings, formulaic expressions etc. Identifying and listing natural ways of functioning in contexts, based on short extracts taken from plays, or dialogues from fiction.	
MODULE 5: FUNCTIONAL GRAMMAR **(9 L)**	

Sentence – Parts of Speech – Comparative Adjectives - Pronouns – prepositions – conjunctions – Articles – Non-finite Verbs - tenses – conditionals – question tags – modal verbs – common errors – concord – Reported speech – Active & Passive voice. Suggested Activities: Exercises related to grammatical aspects and its function in functional English (day to day conversations)	**CO-5** **BTL-2**
TEXT BOOK	
1.	Richa Misra and Ratna Rao (2015), A Textbook of English and Communication Skills, Macmillan Education.
REFERENCE BOOK	
1	Michaela Denison-George (2014) English Language & Communication Skills: A Reference Guide for First Year College Students. Independent Publish.

COURSE TITLE	APPLIED CHEMISTRY			CREDITS	3
COURSE CODE	CYA 1105	COURSE CATEGORY	BS	L-T-P-S	3-1-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments / Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	To make the students understand the basic concepts of chemistry and their applications.
Course Objective	1. To impart basic knowledge related to chemical bonding and periodic properties of elements. 2. To impart knowledge of organic reactions and its applications. 3. To explain the kinetic theory of gases. 4. To describe condition required for liquefaction of gases. 5. To impart knowledge of chemical kinetics, electro- and photochemistry to solve various industrial problems.
Course Outcome	Upon completion of this course, the students will be able to 1. Identify and demonstrate the different types of chemical bonds 2. Name the organic compounds and understand the importance of functional groups. 3. Describe the Kinetic Molecular Theory of gases. 4. Determine the order of a reaction. 5. Evaluate electrodes and cells and understand the concepts of photochemistry.

Prerequisites: Basic knowledge in chemistry in the 12th level.

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	1	2	1	2	-	-	-
CO-2	1	2	1	2	-	-	-
CO-3	-	2	1	1	-	-	-
CO-4	1	2	1	2	-	-	-
CO-5	-	2	1	1	-	-	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: CHEMICAL BONDING AND PERIODIC TABLE (7 L+ 2T=9)

Characteristics of covalent bond – ionic bond – coordinate bond – Van der Waals – hydrogen bond – metallic bond – factors affecting the formation of ionic/covalent compounds – Born Haber cycle – Fajan's rule – shapes of molecules – bond length – bond order – bond angle – concept of resonance – valence bond theory (hybridization) – VSEPR concept – structure of water. Modern periodic table – classification of elements in periodic table – general properties of s, p, d and f-block elements – periodicity in properties of elements – atomic radii – ionic and covalent radii – ionization energy – electronegativity – electron affinity – Lanthanide contraction – inert pair effect.	**CO-1** **BTL-2**
MODULE 2: PRINCPLES AND TYPES OF ORGANIC REACTIONS	**(7 L+ 2T=9)**
Concept of functional group – nomenclature and isomerism – hemolytic and heterolytic fission – types of reactions – addition – elimination – substitution – rearrangement – examples – resonance Vs. tautomerism. Aldol condensation – Hoffman bromamide rearrangement – Cannizzaro reaction – Friedel Craft reaction – Pinacol-pinacolone rearrangement – Beckman rearrangement – Orientation in benzene (distribution) - reactive intermediates – carbonium ion, carbanion, free radical, carbenes.	**CO-2** **BTL-2**
MODULE 3: GASES	**(7 L+ 2T=9)**
Kinetic theory of gases – derivation of the kinetics gas equation – mean free path collision number and frequency (no derivation) – problems – ideal gas, causes of deviation – Van der Waal's equation, significance of Van der Waals constants – critical state, critical constants (their relations) – continuity of state, law of corresponding state – Van der Waals equation and critical phenomena – reduced equation of state – liquefaction of gases – methods of liquefaction – intermolecular forces.	**CO-3** **BTL-3**
MODULE4: CHEMICAL KINETICS	**(7 L+ 2T=9)**
Basic terminology – rate – order – molecularity – determination of rate constants for first and second order reactions – general methods to determine the order of a reaction – problems – effect of temperature, pressure, catalyst, activated complex – collision theory of bimolecular reactions – composite reactions – competitive, parallel and consecutive reactions – definition and examples.	**CO-4** **BTL-3**
MODULE 5: ELECTROCHEMISTRY AND PHOTOCHEMISTRY	**(7 L+ 2T=9)**
EMF of a cell – galvanic cell – standard electrode potential – types of electrodes – pH & its measurements – acid base titration curve – electrochemical series – buffer solutions. Lambert Beer's law – law of photochemical equivalence – quantum efficiency – high and low quantum yields – reason for high and low quantum yields – phosphorescence and fluorescence.	**CO-5** **BTL-2**

TEXT BOOK	
1.	F.A. Cotton, G. Wilkinson and P. Gans, (2018). *Basic Inorganic Chemistry*, 3rd Edition, John Wiley & Sons.
REFERENCE BOOK	
1.	Arun Bahl, B. S. Bahl and G. D. Tuli, (2020). *Essential of Physical Chemistry*, S. Chand & Co. Ltd., New Delhi.
E BOOK	
1.	Applied Chemistry Notes and Study Material PDF Free Download – BTech Geeks
MOOC	
1.	Advanced Chemistry | Coursera
2.	Functional Polymeric Materials | edX
3.	Basic Analytical Chemistry | edX

COURSE TITLE	APPLIED MATHEMATICS			CREDITS	4
COURSE CODE	MAA1112	COURSE CATEGORY	BS	L-T-P-S	3-1-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course includes the basic methods of analysis methods. It also deals with the sampling distributions and operational research.
Course Objective	To enable the students 1. To describe the central tendency 2. To decipher the Correlation 3. To demonstrate the ability to use Sampling distribution 4. To develop skills to conduct Analysis of variance 5. To be able to answer questions concerning the application of mathematics in food science field.
Course Outcome	Upon completion of this course, the students will be able to 1. Measure central tendency methods 2. Define Correlation and coefficient methods 3. Suggest use sampling distribution methods 4. correlate the graphical methods for operational research 5. Understand the operational strategies towards research methods.

Prerequisites: BASIC MATHEMATICS

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	1	2	1	1	1	2	1
CO-2	1	2	1	2	2	2	2
CO-3	1	1	-	-	1	1	1
CO-4	-	2	2	1	1	1	0
CO-5	-	1	1	2	2	2	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1	**(9L+3T=9)**
Measure of central tendency – mean, median, mode – Dispersion, Range, Quartile, Deviation, Mean Deviation, Standard Deviation.	**CO-1** **BTL-2**
MODULE 2	**(9L+3T=9)**
Correlation- Karl Pearson's coefficient of correlation- Spearman's Rank Correlation- Regression lines and coefficients.	**CO-2** **BTL-2**
MODULE 3	**(9L+3T=9)**
Sampling distributions – Testing of Hypothesis for mean, Variance, Proportions and differences using normal, t, Chi-square and F distribution – Tests for Independence of attributes and goodness of fit	**CO-3** **BTL-3**
MODULE 4	**(9L+3T=9)**
Analysis of variance one-way classification CRD – Two-way classification RBD – Latin square.	**CO-4** **BTL-2**
MODULE 5	**(9L+3T=9)**
Introduction to operations research- objective- scope of OR- Limitations of OR- Introduction and formulation of linear programming- Solving LPP using Graphical method.	**CO-5** **BTL-2**

TEXT BOOK	
1.	V. Venkateswara Rao, B.V.S.S. Sarma, N. Krishnamurthy, S. Anjaneya (2014) A Textbook of B.Sc. Mathematics. S. Chand Publishing
REFERENCE BOOK	
1	Daniel Z, Vladimir D (2012) Handbook of DifferentialEquations. Chapman and Hall/CRC publishers.
E BOOK	
1.	https://www.springer.com/gp/book/9783030336448

COURSE TITLE	ENVIRONMENTAL CHEMISTRY			CREDITS	3
COURSE CODE	CYA1106	COURSE CATEGORY	BS	L-T-P-S	3-0-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5 %	50%

Course Description	Environmental chemistry is a multidisciplinary academic field which systematically studies human interaction with the environment. Environmental studies connect principles from the physical sciences, commerce/economics, the humanities, andsocial sciences to address complex contemporary environmental issues
Course Objective	To enable students 1. To articulate the interconnected and interdisciplinary nature of environmental studies 2. To demonstrate an integrative approach to environmental issues with a focus on sustainability 3. To use critical thinking, problem-solving, and the methodological approaches of the food sciences, nutrition, and dietetics in environmental problem solving 4. To communicate complex environmental information to both technical and non-technical audiences 5. To understand and evaluate the global scale of environmental problems
Course Outcome	Upon completion of this course, the students able to 1. Understand environmental pollution and status 2. Assess pollution in air, water and soil 3. Analyze the ethical issues and Human Rights associated with it 4. Study of natural environmental factors 5. Elucidate the applications of chemical and microbial substances along with their impact on the environment

Prerequisites: BASIC CHEMISTRY

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	1	1	1	-	2	2	1
CO-2	1	0	2	-	1	2	2

CO-3	**1**	**-**	**-**	**1**	**1**	**-**	**1**
CO-4	**2**	**-**	**1**	**1**	**2**	**1**	**1**
CO-5	**2**	**1**	**-**	**2**	**2**	**1**	**-**

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – BASICS OF ENVIRONMENTAL CHEMISTRY	**(9L)**
Definition and explanation - Weighing and preparation of standard solutions, definition of concentration terms – Chemical kinetics - stoichiometric reactions, chemical equilibria, order of reaction – Types of reactions – neutralization, redox, complex – Solubility product.	**CO-1 BTL-2**
MODULE 2 – ATMOSPHERIC AND AQUATIC CHEMISTRY	**(9L)**
Different layers of atmosphere – Components and classification of atmosphere – Chemistry of particulate matter in atmosphere.Chemistry of water – Physical properties, chemical properties – Aquatic chemicals reactions – Properties of aquatic water - DO, BOD, COD; TDS, pH,conductivity – Basics of Colloidal chemistry – Hydrological cycle.	**CO-2 BTL-2**
MODULE 3 – SOIL CHEMISTRY AND NATURAL RESOURCES	**(9L)**
Chemical composition of earth, metals, minerals, fossil fuels and soils - Physico-chemical characteristics of soil, soil air, soil clays, organic carbon, soil humus and mineralization, cation exchange capacity, soil water solution, Nitrogen cycle, soil acidity and salinity. Forest resources: Use and over-exploitation, deforestation, mining, dams and their effects on forests – Water resources: Use and over-utilization of surface and ground water, floods, drought. Food resources: overgrazing,effects of modern agriculture, fertilizer-pesticide problems.	**CO-3 BTL-3**
MODULE 4 – POLLUTANT CHEMISTRY	**(9L)**
Chemistry of hydrocarbon decay, environmental effects, effects on macro and microorganisms - Pesticides: Classification, degradation, analysis, pollution due to pesticides – DDT and Endosulphan Heavy metals: Toxic effects of Cd, Pb& Hg. Fertilizers: micro and macro nutrients	**CO-4 BTL-2**
MODULE 5 – ENVIRONMENT POLLUTION	**(9L)**
Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – Solid waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution –Disaster management	**CO-5 BTL-2**

TEXT BOOK

1. Balaram Pani (2012) Textbook of Environmental Chemistry, 2ed. Dreamtech Press. ISBN 9789389698640

REFERENCE BOOK

Anil Kumar (2013) Environmental Chemistry. New Age publishers

COURSE TITLE	APPLIED CHEMISTRY LAB			CREDITS	2
COURSE CODE	CYA1141	COURSE CATEGORY	BS	L-T-P-S	0-1-1-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	To enable the students 1. To prepare students for their future careers in industry or research. 2. To help prepare for future careers in laboratories in industrial and other areas 3. To increase students' practical or laboratory experience/exposure/confidence. 4. To provide practical experience in the governing fields of chemistry. 5. To enhance students' practical laboratory skills and equipment/instrument use
Course Objective	Upon completion of the course the students will be able to: 1. Understand the properties of water based on their chemical and physical nature. 2. Apply the knowledge of acidity and alkalinity in various aspects of water constituents 3. Determine the factors associated with the water activities 4. Learn the analytical skills pertaining to color and texture analysis 5. Perform various mineral and chemical reaction experiments
Course Outcome	Upon completion of this course, the students able to 1. Understand basic concept of chemistry 2. Explain principles behind on quality of water such as hardness, alkalinity, acidity. 3. Describe molecular mechanisms of chemical reactions 4. Learn the concepts pertaining to Surface chemistry & colloidal applications 5. Brief out the methodology adopted for metal extraction from their ores and thereby about their applications

Prerequisites: CYA 1105 APPLIED CHEMISTRY

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	1	2	1	2	2	1	2
CO-2	-	2	2	2	2	2	2
CO-3	1	-	-	1	1	2	1
CO-4	2	-	1	1	1	1	1
CO-5	2	2	-	-	1	2	2

1: Weakly related, 2: Moderately related and 3: Strongly related

LIST OF EXPERIMENTS **(2L+4P)**

1.	Estimation of Hardness in water Estimation of	**CO -1, BTL-2**
2.	Alkalinity in water Estimation of Acidity in water	**CO-1, BTL-2**
3.	Determination of Viscosity of Polymer Estimation of	**CO-2, BTL-2**
4.	Nickel in the given solution Estimation of iron by spectrophotometry	**CO-3, BTL-2**
5.	Estimation of Dissolved oxygen by Winkler's method	**CO-4, BTL-2**
6.	Determination of COD	**CO-5, BTL-2**

TEXT BOOK

1.	J.Mendham, R.C. Denney, J.D. Barnes and N.J.K. Thomas (2014) Vogel's Textbook of Quantitative Chemical Analysis, 8th Edition, Pearson Education.

REFERENCE BOOK

1	https://chem.libretexts.org/Ancillary_Materials/Laboratory_Experiments/Wet_Lab_Experiments/General_Chemistry_Labs/Online_Chemistry_Lab_Manual

E BOOK

1.	https://mymission.lamission.edu/userdata/paziras/Chem101/Lab_Manual.pdf

COURSE TITLE	FOOD CHEMISTRY LAB-I			CREDITS	2
COURSE CODE	FTB1131	COURSE CATEGORY	PC	L-T-P-S	0-1-1-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course includes estimation of sugar, salt, fat content in the foods samples. It also includes the methods to estimate the acidity and alkalinity levels.
Course Objective	To enable students 1. To learn basic principles of sugar analysis. 2. To learn and practice estimation of salt by titration 3. To be able to assess the level of starch in food samples 4. To analyze the various nutrients qualitatively as well as quantitatively 5. To become familiar with methods of nutrient analysis
Course Outcome	Upon completion of this course, the students will 1. Evaluate nutritional qualities of foods 2. Estimate the calorie values of food 3. Perform qualitative and quantitative experiments to identify the constituents of food 4. Implement the pH and indicator analysis on food samples. 5. Avail the instrumental analysis for various food processing samples

Prerequisites: BASIC CHEMISTRY IN PLUS TWO

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	1	1	2	2	3	-
CO-2	1	2	2	-	-	-	1
CO-3	2	1	-	1	1	-	1
CO-4	1	2	-	1	1	2	2
CO-5	-	1	2	2	2	1	-

1: Weakly related, 2: Moderately related and 3: Strongly related

LIST OF EXPERIMENTS	**(2L+4P)**
1. Estimation of reducing sugars	**CO -1, BTL-2**
2. Estimation of salt content in brine	**CO-2, BTL-2**
3. Estimation of salt content in butter	**CO-2, BTL-2**
4. Estimation of starch content	**CO-3, BTL-2**
5. To determine detection limit of taste	**CO-4, BTL-2**
6. To determine effect of temperature on taste	**CO-5, BTL-2**

TEXT BOOK	
1.	Dennis D Miller (2013) Food Chemistry: A Laboratory Manual. Wiley; 2nd edition.

REFERENCE BOOK	
1	Kan, Jianquan, Chen, Kewei (2012) Essentials of Food Chemistry, Springer Publications

E BOOK	
1.	https://www.springer.com/gp/book/9783319441252

COURSE TITLE	ENGLISH – II			CREDITS	3
COURSE CODE	ELA4116	COURSE CATEGORY	SH	L-T-P-S	3-0-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments / Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course enables student to communicate effectively and fluently with others. It aids him to write for magazines, newspaper columns in a well-disciplined manner. This course also help student master his conversational grammar
Course Objective	1. To enhance the learner's communication skills by giving adequate exposure in listening, speaking, reading and writing skills 2. To help the learners recognize and operate in various styles and registers in English. 3. To help the learner get rid of his present flaws and mistakes in pronunciation and grammar. 4. To help the learner identify and repair the voids in his present vocabulary and pronunciation targeting those specific arrays of words which create a barrier in his thought process. 5. To impart better writing skills by sensitizing the learners to the dynamics of effective writing.
Course Outcome	Upon completion of this course, the students will be able to 1. Acquire the basic knowledge of grammar and develop the knowledge of forming sentences in English 2. Discern technical communication and business communication 3. Comprehend from the visual observation and pictorial representations 3. Voice out their opinions and reacting to different circumstances 5. Lay a strong foundation on the vocabulary part of technical English skills

Prerequisites: ELA4104 ENGLISH – I

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
O-1	2	2	1	2	1	2	1
CO-2	1	2	2	2	1	2	-
CO-3	1	1	1	1	-	1	1
CO-4	2	1	-	1	-	2	-
CO-5	2	1	-	2	1	2	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – COMMUNICATIVE WRITING (9L)	
Messages (informal, formal) - Memos - Formal letters of invitation - personal letters of invitation - Writing formal letters (a) business (b) official - Short paragraphs - Describing objects, places, landscapes, people, natural processes, describing processes (man-made) - Expanding short aphorisms, proverbs, quotes, idioms etc. into short paragraphs - Making posters for various occasions such as World Wildlife Day, AIDS Awareness, Anti-Ragging etc. Suggested Activities: Writing (a)Short publicity materials, (b) Brochures (c) user manuals, (d)warranty cards (e) captions	**CO-1** **BTL-2**
MODULE 2 – SKILLS FOR ACADEMIC PURPOSES (9L)	
Enriching word power -- Language in use -- Listening comprehension -- Group discussion -- Note making -- Intensive reading -- Interpretation -- Interview skills – E mail writing -- Synthesizing information from various sources -- Expanding quotes - Job applications — Preparing CV – Preparing the profiles of organizations and institutions — Presentation skills – Effective seminar participation **Suggested activities**: Preparation and Writing of Slides, Embellishments - Oral presentation - Self Evaluation - Listening and note taking, Identifying hard spots, Framing questions & Raising doubts / Seeking clarifications (Seminar)	**CO-2** **BTL-2**
MODULE 3 - BUSINESS COMMUNICATION (WRITTEN) (9L)	
Writing project proposals (pre-project stage) — writing project proceedings (while-project stage) —writing project reports (post-project stage) — writing project evaluation — Writing reviews of journal articles — Business correspondence for various purposes such as placing orders, reminding, complaining, notifying damage of consignment and demanding replacement, sales promotion **Suggested Activities**: writing gist of articles for putting them together in an edited form — Writing transcripts of lectures and speeches on academic interest	**CO-3** **BTL-3**
MODULE 4 - WRITING FOR MEDIA: PRACTICE (9L)	
From events to news story — the various stages of development of news reporting – Editing — Basics of editing; (i) At the level of contents & (ii) at the level of language – Advertisements - Electronic media and their advantages and limitations - Proof reading **Suggested activities:** Identifying and listing natural ways of functioning in contexts, based on short extracts taken from news reading, advertisements, plays, or dialogues from media	**CO-4** **BTL-2**
MODULE 5 - COMPREHENSION STRATEGIES (9L)	
Silent reading and testing comprehension skills — Reading aloud and accuracy in pronunciation — Making short speeches before small groups to check fluency — Writing small pieces of discourse meant for day-to-day communication — Writing short academic pieces for exam purposes — Doing self-check grammar tests to improve grammatical accuracy **Suggested Activities:** Reading primary sources—reading secondary sources and supporting the points already gathered from the primary sources	**CO-5** **BTL-2**
TEXT BOOK	
1.	Richa Misra and Ratna Rao (2019), A Textbook of English and Communication Skills, Macmillan Education.

REFERENCE BOOK	
1	Michaela Denison-George (2012) English Language & Communication Skills: A Reference Guide for First Year College Students. Independent Publish
E BOOK	
1.	http://www.bbc.co.uk/learningenglish/english/features/pronunciation

COURSE TITLE	FOOD ANALYSIS TECHNIQUES			CREDITS	4
COURSE CODE	FTB1201	COURSE CATEGORY	PC	L-T-P-S	3-1-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	Food analysis techniques deals with examination of the food quality and various parameters. It also deals with analysis of major elements present in the food stuffs.
Course Objective	To enable the students 1. To present sampling techniques 2. To analyze macro and micro elements 3. To establish the basic principles of food analysis 4. To examine food using spectrophotometry method 5. To explore the specific nutrients by chromatography method
Course Outcome	Upon completion of this course, the students able to 1. Examine macro molecules level in foods-structure 2. Understand properties of macro molecules 3. Describe available nutritional factors 4. Elucidate the major components 5. To implement the learned concepts towards research and development in the field of food analysis.

Prerequisites: CY1105 Applied Chemistry

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	1	2	2	1	2	-
CO-2	1	2	2	2	2	2	-
CO-3	2	2	1	-	1	1	1
CO-4	-	1	1	-	1	1	1
CO-5	2	1	1	2	1	2	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – SAMPLING AND SAMPLING TECHNIQUES	**(9L+3T=12)**
Statistical tests and Error Analysis: Accuracy, precision, classification of errors- minimization of errors – Sampling and sample treatment– different methods of sampling – factors involved in effective sampling - representative and homogeneous - pre-concentration and pre-dilution.	**CO-1** **BTL-2**
MODULE 2 – COMPOSITION ANALYSIS OF FOOD	**(9L+3T=12)**
Principles of - Moisture and total solids analysis - Ash analysis - Fat analysis - Protein analysis - Carbohydrate analysis - Vitamin analysis - Traditional method of mineral analysis	**CO-2** **BTL-2**
MODULE 3 – PHYSICAL ANALYSIS OF FOOD	**(9L+3T=12)**
Rheological analysis - thermal analysis (TGA, DTA, DSC) – colour analysis.	**CO-3** **BTL-3**
MODULE 4 – SPECTROSCOPIC ANALYSIS OF FOOD	**(9L+3T=12)**
Interaction of radiation with matter – Beer-Lambert's Law – Estimation of iron, nickel by spectrophotometer – Principle and basic applications of – UV- Visible, Infrared, Mass spectroscopy	**CO-4** **BTL-2**
MODULE 5 – SEPARATION TECHNIQUES	**(9L+3T=12)**
Basic principles of chromatography – TLC – Column chromatography – HPLC - Gas chromatography – Electrophoresis.	**CO-5** **BTL-2**

TEXT BOOK	
1.	Rovina Kobun (2015) Advanced Food Analysis Tools .1st Edition, Elsevier publisher.
REFERENCE BOOK	
1	Charis M. Galanakis (2016) Innovative Food analysis. Academic Press.
E BOOK	
1.	https://www.routledge.com/Food-Analysis-Principles-and-Techniques-In-4-Volumes/ruenwedel/p/book/9780824771829

COURSE TITLE	PRINCIPLES OF FOOD SCIENCE			CREDITS	4
COURSE CODE	FTB1202	COURSE CATEGORY	PC	L-T-P-S	3-1-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments / Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	Food Science is the study of the nature of foods, components of various food groups, their nutritional value, effect of processing on the nutrients , the causes of deterioration, the principles underlying food processing, and the improvement of foods for the consuming public.
Course Objective	To enable the students 1. To enter a career in the food industry as scientists capable of ensuring the production and marketing of safe and quality foods. 2. Provide a broadly based scientific education whose graduates can also enter into employment in other sectors of the food chain or related scientific sectors where they can apply their scientific skills. 3. To allow individuals to develop their capacity to undertake research into the science of foods. 4. To provide undergraduates with opportunities to develop their inter- personal and communication skills. 5. To create a knowledge based skill towards research oriented aspiration.
Course Outcome	Upon completion of this course, the students will be able to 1. Knowledge on different types of nutritional foods 2. Examine on nutritional qualities of different foods 3. Elucidate the properties and processing of the derived products 4. Analyze the features and modifications during the processing of food products 5. Understand the essential and non-essential purposes of food Additives

Prerequisites: FTB 1131 Food Chemistry Lab-I

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3

CO-1	**2**	**1**	**1**	**2**	**1**	**1**	**2**
CO-2	**-**	**-**	**2**	**2**	**2**	**-**	**2**
CO-3	**2**	**3**	**2**	**1**	**3**	**-**	**-**
CO-4	**2**	**2**	**1**	**1**	**1**	**1**	**2**
CO-5	**2**	**1**	**-**	**-**	**3**	**2**	**1**

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – COMPOSITION AND NUTRITIVE VALUE OF PLANT FOODS	**(9L+3T=12)**
Introduction to Nutrients - Carbohydrates, Protein, Lipids, Vitamins, Minerals. Cereals: General outline, Composition & Nutritive value, Structure of wheat and Rice. Millets – ragi, sorghum, maize, finger millet	**CO-1** **BTL-2**
MODULE 2 – PULSES & LEGUMES	**(9L+3T=12)**
Composition, Nutritive value, Anti-nutritional factors. Changes during cooking, Factors affecting cooking time. Germination - Changes during germination. Nuts & Oilseeds**:** Composition, sources of proteins and oil, Processing of oil seeds - Soya bean, coconut, ground nut and sesame.Protein concentrates and isolates, Texturised vegetable protein.	**CO-2** **BTL-2**
MODULE 3 – FRUITS & VEGETABLES	**(9L+3T=12)**
Composition, Classification, Nutritive value, Vegetable Cookery, Changes during cooking, Ripening, Changes during ripening. Pigments and colors. Browning reaction.Sprouting, Microgreens, Beverages - classification, function, coffee, tea, carbonated beverages	**CO-3** **BTL-3**
MODULE 4 – COMPOSITION AND NUTRITIVE VALUE OF ANIMAL FOODS	**(9L+3T=12)**
Eggs: Structure, Composition, Nutritive value, Grading Changes during storage. Fish: Composition, Nutritive value. Meat: Structure, Composition,Nutritive value. Poultry-classification, composition and nutritive value	**CO-4** **BTL-2**
MODULE 5 – Spices and condiments , Food laws	**(9L+3T=12)**
Composition, Major spices of India, Minor spices of india.Food laws – FSSAI, Agmark, BIS, Codex alimentarius, Haccp	**CO-5** **BTL-2**

TEXT BOOK	
1.	Shakuntala manay (2014) Foods Facts and principles. New age publishers
REFERENCE BOOK	
1	Janet D. Ward, Larry Ward, Jodi Songer Riedel (2012) Principles of food science, 5th Edison, The Goodheart-Willcox Company, Inc.
E BOOK	
1.	https://www.pdfdrive.com/food-science-and-technology-d41395460.html

COURSE TITLE	INTRODUCTION TO BIOCHEMISTRY			CREDITS	4
COURSE CODE	FTA1203	COURSE CATEGORY	BS	L-T-P-S	3-1-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments / Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	Biochemistry provides the basic understanding on organic chemistry. It deals with the structure of biomolecules and their metabolism. It also provides information of energy production from the macromolecules.
Course Objective	To Enable the students 1. To understand basic biochemistry in regular life 2. To introduce students to structure of macromolecules 3. To make them to understand nutritional metabolism 4. To initiate a research-based approach in the field of biochemistry. 5. To correlate the concepts in the field of Food Science.
Course Outcome	Upon completion of this course, the students will be able to 1. Know the major chemical reactions that limit shelf life of foods. 2. Know the key biochemical principles food. 3. Explain the structure of macromolecules. 4. Elucidate the metabolic pathway of major elements 5. Illustrate energy production pathway

Prerequisites: CYA1141 Applied Chemistry Lab-I

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	1	1	2	1	1	2
CO-2	2	2	2	2	2	3	2
CO-3	2	3	3	1	3	2	3
CO-4	2	2	1	1	1	2	3
CO-5	3	1	3	2	3	2	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – INTRODUCTION TO BIOMOLECULES	**(9L+3T=12)**
Types of Biomolecules. Biological role. Enzymes, classification, nomenclature. Role of enzymes in metabolism, mechanism of action of enzymes	**CO-1 BTL-2**
MODULE 2 – STRUCTURES & PROPERTIES OF CARBOHYDRATES, PROTEINS	**(9L+3T=12)**

Carbohydrates (Mono, Di, Oligo)- forms of Isomerism, Physiological importance, Polysaccharides - Starch- glycogen- Cellulose and their derivatives- Chitin-Peptidoglycan – Glycoaminoglycans - Test for Carbohydrates. Classification of Amino acids and Proteins, Structure of Proteins- Primary-Secondary- Tertiary and Quaternary - Myoglobin &Hemoglobin, Test for Proteins	**CO-2 BTL-2**
MODULE 3 – STRUCTURES & PROPERTIES OF LIPIDS, NUCLEIC ACIDS	**(9L+3T=12)**
Lipid - Classification (Fatty acids, Glycerolipids, Phospholipids, Glycolipids, Sphingolipids, Steroids) - Physiological importance, Significance of Cholesterol, Nucleic Acids - Structure of Purines - Pyrimidines - Nucleosides - Nucleotides - Ribonucleic acids - Deoxyribonucleic acids - Nucleoprotein complexes, Synthetic Nucleotide analogs, Functions of Nucleotides - Carrier of Chemical energy of cell- Enzyme Cofactor -Regulatory Molecules.	**CO-3 BTL-3**
MODULE 4 – NUTRITION & METABOLISM	**(9L+3T=12)**
Nutrition, Digestion and absorption of Carbohydrates - Lipids - Proteins - Vitamins - Minerals, Vitamins - Biomedical importance - Classifications - Deficiency diseases, Introduction to Biocatalysis by Enzymes and Pathways, Introduction to Biosynthesis and Breakdown of Carbohydrates- Lipids- Proteins and Nucleic Acids.	**CO-4 BTL-2**
MODULE 5 – INTERMEDIARY METABOLISM & BIOENERGETICS	**(9L+3T=12)**
TCA cycle - Glycolysis - Glyconeogenesis - Pentose phosphate shunt - Urea cycle – beta oxidation of fatty acids, Synthesis of cholesterol. Interconnection of Pathways, Respiratory Chains- ATP cycle-Calculation of ATP production during Glycolysis and TCA cycle,	**CO-5 BTL-2**

TEXT BOOK	
1.	Randhawa S.S.(2014) A Text Book of Biochemistry. Vikas And Company
REFERENCE BOOK	
1	https://www.pdfdrive.com/medical-biochemistry-4th-edition-medial-biochemistry-e194558015.html
E BOOK	
1.	https://ia802907.us.archive.org/29/items/BiochemistryByU.satyanarayana/Biochemistry_satyanarayana_chakrapani_cbbxch.pdf

COURSE TITLE	FOOD CHEMISTRY LAB - II			CREDITS	2
COURSE CODE	FTB1231	COURSE CATEGORY	PC	L-T-P-S	0-0-4-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments / Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Objective	To enable the students 1. Apply and incorporate the principles of food chemistry in practical, real- world situations and problems. 2. Demonstrate ability to identify the adulteration in oil. 3. Understand the shelf life of the oil products 4. Analyze the food products for their quality parameters 5. Explain the basic principles of sensory analysis.
Course Outcome	Upon completion of this course, the students will 1. Learn and understand the properties and reactions of various food components 2. Have sufficient knowledge of food chemistry to control reactions in foods. 3. Perform qualitative and quantitative experiments to identify food quality 4. Involve in creation of an innovative strategy in formation of new products

Prerequisites: FT1131 FOOD CHEMISTRY LAB – I

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	2	-	2	1	2	1
CO-2	1	1	2	2	-	2	-
CO-3	1	2	-	2	1	1	-
CO-4	2	2	1	1	-	1	1
CO-5	3	1	1	2	1	1	1

1: Weakly related, 2: Moderately related and 3: Strongly related

LIST OF EXPERIMENTS (2L+4P)

1. Estimation of total sugar (colorimetry)	**CO-1, BTL-2**
2. Saponification value of oil	**CO-2, BTL-2**
3. Acid value of oil	**CO-3, BTL-2**
4. Iodine value of oil	**CO-3, BTL-2**
5. Estimation of total fat content in oil	**CO-4, BTL-2**
6. Determination of acetic acid content in vinegar.	**CO-5, BTL-2**

TEXT BOOK

1.	Dennis D Miller (2013) Food Chemistry: A Laboratory Manual. Wiley; 2nd edition. ISBN 978-0470639313
REFERENCE BOOK	
1	Kan, Jianquan, Chen, Kewei (Eds.) (2014) Essentials of Food Chemistry, Springer, ISBN 9789811606106
E BOOK	
1.	https://www.springer.com/gp/book/9783319441252

COURSE TITLE	BASICS OF BIOCHEMISTRY LAB			CREDITS	2
COURSE CODE	FTA1232	COURSE CATEGORY	BS	L-T-P-S	0-0-4-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments / Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Objective	To Enable students 1. To develop skills of performing basic biochemical tests for clinical investigations 2. To develop familiarity with biochemical laboratory techniques 3. To introduce students, enzymology and their correlation in disease conditions. 4. To make them analyze and plan a nutritional chart accordingly. 5. To initiate a research based approach in the field of nutritional biochemistry.
Course Outcome	Upon completion of this course, the students will 1. Become aware of the chemical reactions that limit shelf life of foods. 2. Know the principles behind analytical techniques associated with food. 3. Demonstrate practical proficiency in a food analysis laboratory. 4. Learn how to standardize various biomolecules. 5. Separate carbohydrates by paper chromatography

Prerequisites: FTA1203 Introduction to Biochemistry

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	1	1	-	1	-	-
CO-2	1	2	2	-	1	1	2
CO-3	1	-	1	1	2	-	1
CO-4	1	1	1	1	2	1	2
CO-5	1	1	-	-	1	1	1

1: Weakly related, 2: Moderately related and 3: Strongly related

LIST OF EXPERIMENTS (2L+4P)

1. Qualitative tests for carbohydrates – distinguishing reducing from non- reducing	**CO-1, BTL-2**
2.Quantitative method for amino acid estimation using ninhydrin	**CO-2, BTL-2**
3. Protein estimation by Biuret and Lowry's methods.	**CO-2, BTL-2**
4. Protein estimation by Bradford and spectroscopic methods.	**CO-3, BTL-2**
5. Extraction of lipids and analysis by TLC.	**CO-3, BTL-2**
6. Estimation of nucleic acids by absorbance at 260 nm and hyperchromic effect (demo).	**CO-4, BTL-2**
7. Enzymatic assay: phosphatase from potato.	**CO-5, BTL-2**
8. Enzymatic assay: estimation of glucose by TGO method after hydrolysis	**CO-5, BTL-2**

of starch with acid and specificity of the enzymatic method.	
TEXT BOOK	
1.	Al Bulushi and Al-maliki (2015). Biochemistry lab manual for students. Vikasa Publications
REFERENCE BOOK	
1	Benjamin FL (2013) Biochemistry in the Lab. A manual for undergraduates. CRC Press. ISBN 9781138589964
E BOOK	
1.	http://rims.ruforum.org/12690A/chemistry-422-biochemistry-laboratory-manual.pdf

COURSE TITLE	FOOD MICROBIOLOGY, CONTAMINATION AND SPOILAGE OF FOODS			CREDITS	4
COURSE CODE	FTB1301	COURSE CATEGORY	PC	L-T-P-S	3-1-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course will provide theoretical knowledge about foods that are into the stage of contamination and the causative organisms preferable microbes and to elucidate on the study of it in the form of Food Microbiology. Furthermore, students will learn the spoilage patterns and the mechanism of action of their functionality.
Course Objective	To enable the students 1. To understand about the physical and chemical properties of food samples. 2. To gain knowledge about microbiology of the spoilage organisms 3. To learn about the various types of contamination organisms. 4. To detect the analytical microbial method for deducing the food spoilage 5. To study on the mechanism of contamination with specified microorganisms.
Course Outcome	Upon completion of this course, the students will be able to 1. Describe the history and study of microbes in food science and technology. 2. Identify different microbial structure and their multiplicative patterns 3. Write down the requirement for the nutrient media for the growth and development such as to study the levels of microbial environment. 4. Classify different types of food poisoning and the control methods 5. Discuss about the various storage and control methods from contamination and spoilage.

Prerequisites: FTB 1202 PRINCIPLES OF FOOD SCIENCE

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	2	-	-	2	-	-
CO-2	2	1	1	-	-	-	1
CO-3	1	1	2	-	2	2	2
CO-4	1	2	-	1	3	1	-
CO-5	3	2	-	1	1	-	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – INTRODUCTION	**(9L+3T=12)**
Basic of microbial existence; history of microbiology, classification and nomenclature of microorganism, microscopic examination of microorganisms, light and electron microscopy; principles of different staining techniques like gram staining, acid fast,	**CO-1 BTL-2**

capsular staining, flagellar staining.	
MODULE 2 – MICROBIAL STRUCTURE AND METABOLISM	**(9L+3T=12)**
Structural organization and multiplication of bacteria, viruses, algae and fungi with a special mention of life history of actinomycetes, yeast, mycoplasma and bacteriophage.	**CO-2** **BTL-2**
MODULE 3 – MICROBIAL GROWTH ,NUTRITION AND METABOLISM	**(9L+3T=12)**
Nutritional requirements of bacteria and different media used for bacterial culture; growth curve and different methods to quantitate bacterial growth, aerobic and anaerobic bioenergetics and utilization of energy for biosynthesis of important molecules	**CO-3** **BTL-3**
MODULE 4 – FOOD SPOILAGE AND CONTROL METHODS	**(9L+3T=12)**
Microbial food poisoning by Staphylococci, Salmonella of food poisoning group and Clostridium botulinum (Botulism). Measures to present microbial food poisoning. Food infections - food home diseases - Dysentery, Diarrhoea, Typhoid, Cholera. Physical and chemical control of microorganisms	**CO-4** **BTL-2**
MODULE 5 – CONTAMINATION AND SPOILAGE OF FOOD	**(9L+3T=12)**
Principles of food spoilage by micro-biological, Physical and biological factors. Contamination and spoilage of cereals, meat, fish, poultry, eggs, milk and fermented products	**CO-5** **BTL-2**
TEXT BOOK	
1.	Talaron K, Talaron A, Casita, PelczarAnd Reid.(2014) Foundations In Microbiology, W.C.Brown Publishers.
REFERENCE BOOK	
1	Pelczar MJ, Chan ECS and Krein NR.(2015) Microbiology Tata McGraw-Hill Edition, New Delhi, India
E Books	
1	http://nuristianah.lecture.ub.ac.id/files/2014/09/fundamental-food-microbiology.pdf
MOOC	
1	https://www.coursera.org/learn/onehealth

COURSE TITLE	PROCESSING OF CEREALS, FRUITS, VEGETABLES AND BEVERAGES			CREDITS	4
COURSE CODE	FTB1302	COURSE CATEGORY	PC	L-T-P-S	3-1-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course will provide theoretical knowledge about the processing of foods that are falling into the category cereals, fruits and vegetables along with the beverages. The technology concerned has a vital role in these products as they are of daily requirements in food with greater bifurcation of ingredient mixture uses.
Course Objective	To enable the students 1. To develop the knowledge on processing and technologies concerned about it. 2. To learn the internal structural and modifications of the cereals and beverages 3. To elucidate the nutritional status of the processed substances. 4. To learn about the industrial applications of processing foods 5. To become familiar with various food processing technology.
Course Outcome	Upon completion of this course, the students will be able to 1. Describe the history and study of microbes in food science and technology. 2. Identify different microbial structure and their multiplicative patterns 3. Analyze about the byproducts of cereals, fruits and vegetables 4. Classify different types of food poisoning and the control methods 5. Discuss about the various storage and control methods of contamination

Prerequisites: FTB1202 PRINCIPLES OF FOOD SCIENCE

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	2	-	-	2	-	-
CO-2	2	1	1	-	-	-	1
CO-3	1	1	2	-	2	2	2
CO-4	1	2	-	1	3	1	-
CO-5	-	2	-	1	1	-	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – PROCESSING WHEAT AND RICE	**(9L+3T=12)**
Wheat -Types, milling, flour grade, flour treatments -bleaching, maturing, types of flour for baking, technology of dough development, Macroni products. Rice -Physicochemical properties, milling - mechanical & solvent extraction, parboiling, Rice products and utilization of by-products	**CO-1** **BTL-2**
MODULE 2 – PROCESSING OF CEREALS	**(9L+3=12T)**

Corn - Milling (wet and dry), cornflakes. Barley- Milling, Malting, Processing of beer. Oats - Milling (oatmeal, oatflour& oat flakes). Sorghum, Pearl Millet, finger millet – Milling	**CO-2** **BTL-2**
MODULE 3 – TECHNOLOGY OF PULSES	**(9L+3T=12)**
Red gram, Green gram, Black gram - Milling (Dry & wet), Improved milling method.Anti nutritional factors in pulses.	**CO-3** **BTL-3**
MODULE 4 – STORAGE AND HANDLING	**(9L+3T=12)**
Storage and handling of fresh fruits and vegetables, preservation of fruits and vegetables by heat treatment, production and preservation of fruits and vegetable juices, preservation of fruit juice by hurdle technology, preparation of jam, jelly and marmalade, pickles, vinegar and tomato products	**CO-4** **BTL-2**
MODULE 5 – BEVERAGES	**(9L+3T=12)**
Non-alcoholic beverages, food laws, food rules and standards, statistical quality control, types of packaging, Processing of tea, coffee and cocoa.	**CO-5** **BTL-2**
TEXT BOOK	
1.	Kent. (2016). Technology of Cereal, 5th Ed. Pergamon Press.
REFERENCE BOOK	
1	Chakraborty. (2014) Post-Harvest Technology of Cereals, Pulses and Oilseeds, revised ed., Oxford & IBH Publishing Co. Pvt Ltd

COURSE TITLE	FOOD AND NUTRITION			CREDITS	4
COURSE CODE	FTB1303	COURSE CATEGORY	PC	L-T-P-S	3-1-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course will provide theoretical knowledge about the correlation between the food and nutrition with the individual nutrient roles and their enhancement functions in a productive manner for the improvement of food stuff products. The mechanisms and pathways have a vital role to be played in body which emphasizes on the role of it in daily routine and metabolisms,
Course Objective	To enable the students 1. To Elucidate the role of nutrients in food 2. To analyze the nutrient specializations in accordance with the food stuff. 3. To discuss the correlation of food and nutrition from diet planning strategy. 4. To implement the nutritional skills in clinical and technological food materials. 5. To inculcate the ideology in research oriented fashion.
Course Outcome	Upon completion of this course, the students will be able to 1. Understand about the main nutrient classification present in the food. 2. Gain knowledge about micronutrient analysis involved in food classifications. 3. Learn about the protein formation and their role with amino acid essentials 4. Detect the analytical energy based roles of macro and micro-nutrients in food 5. Develop study on the mechanism of action of the food metabolism of nutrients.

Prerequisites: FTB1202 Principles of food science

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	2	-	-	2	-	-
CO-2	2	1	1	-	-	-	1
CO-3	1	1	2	-	2	2	2
CO-4	1	2	-	1	-	1	-
CO-5	-	2	-	1	1	-	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – FATS AND LIPID	**(9L+3T=12)**
Understanding relationship between food, nutrition and health. Functions of food- physiological, psychological and social. Concept of balanced diet. Lipids - Classification, Composition function - essential fatty acids, deficiency, food sources of EFA, Function of TGL, Characteristics of animal and vegetable fats, sterols - cholesterol - function, food sources, phosopholipids - function, ketone bodies - fat requirements - food sources,	**CO-1 BTL-2**

dietary lipids and their relation to the causation of Ahteroscleorosis	
MODULE 2 – NUTRIENTS-VITAMINS AND MINERALS	**(9L+3T=12)**
Nutrients – Classification, Functions, Dietary sources, RDA. Fat soluble vitamins - A, D, E and K. Water soluble vitamins - thiamin, riboflavin, niacin, pyridoxine, folate, vitamin B12 and vitamin C. Minerals- Role of Ca, P, Fe, Na, K, I, F, Se.	**CO-2** **BTL-2**
MODULE 3 – CARBOHYDRATES AND PROTEINS	**(9L+3T=12)**
Proteins and Carbohydrate - Composition - structure and classification, function of protein, carbohydrates, Amino acids Indispensable and dispensable amino acids - special function of amino acids Protein Energy Malnutrition - KWASHIORKOR and MARASUMS - etiology, clinical features, treatment and prevention - Evaluation of protein quality - PER, BV, NPU and NPR, chemical score mutual and amino acid supplementation of proteins.	**CO-3** **BTL-3**
MODULE 4 – BASICS OF ENERGY	**(9L+3T=12)**
Energy units - Kilocalories, Megajoules, determination of energy value of foods, using Bomb calorimeter, diagram of Bomb Calorimeter - gross calorific values, Physiological energy, value of foods, relation between oxygen used and calorific value	**CO-4** **BTL-2**
MODULE 5 – METABOLISM OF NUTRIENT ACTION	**(9L+3T=12)**
Determination of energy requirements, direct calorimetry. Relation between Respiratory quotient and energy output - Specific dynamic action of food .indirect calorimetry - Basal metabolism - definition, determination - factors affecting BMR - determination of energy metabolism, during work - energy requirements for various types of activities, recommended allowances for calories, energy requirements of adults expressed in terms of reference man and reference woman - FAO committee and ICMR committee percent calories supplied by carbohydrates, fats and proteins in average Indian diets - Energy requirements for different age group	**CO-5** **BTL-2**
TEXT BOOK	
1.	B.Srilakshmi(2014) Food Science, New Age International Publishers (India).
REFERENCE BOOK	
1	Raina U, Kashyap S, Narula V, Thomas S, Suvira, Vir S, Chopra S (2015). Basics Food Preparation: A Complete Manual, Fourth Edition. Orient Black Swan Ltd.
E Books	
1	https://pdfgoal.com/downloads/food_and_nutrition_swaminathan
MOOC	
1	https://www.coursera.org/browse/health/nutrition

COURSE TITLE	FOOD ADDITIVES			CREDITS	4
COURSE CODE	FTB1304	COURSE CATEGORY	PC	L-T-P-S	3-1-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course will provide the importance of food additives in food acting as a compliment in order to improvise its quality presumption. The formula addition and the desired additive will be based on the food content and nutritive value. The course completely relates to the preservation and additive components pertaining to the food substance.
Course Objective	To enable the students 1. To elucidate the role of additives in food 2. To analyze the nutrient specializations in accordance with the food additive. 3. To discuss the correlation of food and its additive 4. To implement the formulation skills in industrial oriented mechanisms. 5. To inculcate the ideology in research oriented fashion.
Course Outcome	Upon completion of this course, the students will be able to 1. Understand about the main additive classification in varieties of food. 2. Gain knowledge about micronutrient analysis involved in food classifications. 3. Learn about the protein formation and their role with amino acid essentials 4. Detect the analytical energy based roles of macro and micro-nutrients in food 5. Develop study on the mechanism of action of the food metabolism of nutrients.

Prerequisites: FTB1202 Principles of Food Science

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	2	-	-	2	-	-
CO-2	2	2	1	-	-	-	1
CO-3	1	-	2	-	2	2	2
CO-4	1	3	-	1	3	1	-
CO-5	-	2	-	1	-	-	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – INTRODUCTION	**(9L+3T=12)**
Food additives- definitions, classification and functions, need for food additives, food preservatives, classifications, antimicrobial agents. safety concerns, regulatory issues in India, international legal issues Nutrient supplements & thickeners, polysaccharides, bulking agents, antifoaming agents, synergists, antagonists.	**CO-1 BTL-2**
MODULE 2 – ANTIOXIDANTS	**(9L+3=12T)**

Antioxidants (synthetic and natural, mechanism of oxidation inhibition), chelating agents: types, uses and mode of action.	**CO-2** **BTL-2**
MODULE 3 – COLOURING AGENTS	**(9L+3T=12)**
Color retention agents, applications and levels of use, natural colorants, sources of natural color (plant, microbial, animal and insects), misbranded colors, color extraction techniques, color stabilization.	**CO-3** **BTL-3**
MODULE 4 – FLAVOURING AGENTS	**(9L+3T=12)**
Flavoring agents: flavors, flavor enhancers, flavor stabilization, flavor encapsulation Flour improvers: leavening agents, humectants and sequesterants, hydrocolloids, acidulants, pH control agents buffering salts, anticaking agents, etc.	**CO-4** **BTL-2**
MODULE 5 – SWEETNERS	**(9L+3T=12)**
Sweeteners: natural and artificial sweeteners, nutritive and non-nutritive sweeteners, properties and uses of saccharin, acesulfame-K, aspartame, corn sweeteners, invert sugar sucrose and sugar alcohols (polyols) as sweeteners in food products Emulsifiers: Types, selection of emulsifiers, emulsion stability, functions and mechanism of action. Additives, food uses and functions in formulations; permitted dosage	**CO-5** **BTL-2**

TEXT BOOK	
1.	Seyed Mohammed Nobavi. (2012). Food Additives and Human Health
REFERENCE BOOK	
1	Morton ID & Macleod AJ .(2014). Food Flavours. Part A, B & C. Elsevier.
MOOC	
1	https://efsa.onlinelibrary.wiley.com/doi/full/10.2903/j.efsa.2020.e181110

COURSE TITLE	FOOD MICROBIOLOGY LAB			CREDITS	2
COURSE CODE	FTB1331	COURSE CATEGORY	PC	L-T-P-S	0-0-4-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments / Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Objective	To Enable students 1. To develop skills of performing basic staining tests important in food investigations 2. To develop familiarity with microbial assay techniques. 3. To introduce students to various practical aspects food microbiology and co-relate with the food contamination and spoilage 4. To make them analyze the spoilage methods associated with microbial actions 5. To decipher the microscopic and laboratory activities in food microbiology based experiments
Course Outcome	Upon learning the course the students will be able to 1. Know the major microbiological assays that reveals the bacterial food analysis 2. Understand the principles behind analytical techniques associated with food. 3. Demonstrate practical proficiency in the culturing techniques 4. Learn how to standardize antibiotic assays 5. Separate microbial classifications on growth curve patterns

Prerequisites: FTB1301 Food Microbiology, Contamination and Spoilage of Food

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	-	-	2	3	-	-
CO-2	1	1	-	2	-	3	2
CO-3	3	-	3	-	2	2	-
CO-4	2	1	1	1	2	3	2
CO-5	-	1	2	-	-	-	1

1: Weakly related, 2: Moderately related and 3: Strongly related

LIST OF EXPERIMENTS	(3L+3P)
Microscopic methods in the identification of microorganisms	CO-1, BTL-2
Hanging drop method	CO-1, BTL-2
Culturing of microorganisms – in bread and identification of molds, yeasts	CO-2, BTL-2
Staining techniques – grams' and differential	CO-3, BTL-2
Effect of disinfectants on microbial flora	CO-4, BTL-2
Isolation and identification of microorganisms from different sources – water and milk	CO-5, BTL-2
Antibiotic sensitivity assay	CO- 5, BTL-2

TEXT BOOK	
1.	Neelima Garg, K. L. Garg, K. G. Mukerji, I. K. (2014) Laboratory Manual of Food Microbiology. International Pvt Ltd
REFERENCE BOOK	
1	Ahmed E. Yousef, Carolyn Carlstrom. (2015) Food Microbiology: A Laboratory Manual ISBN: 978-0-471-39105-0.
E BOOK	
1.	https://www.yumpu.com/xx/document/view/62503047/extra-food-microbiology-laboratory-ebook-pdf-download

COURSE TITLE	FOOD CHEMISTRY LAB-III			CREDITS	2
COURSE CODE	FTB1332	COURSE CATEGORY	PC	L-T-P-S	0-0-4-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments / Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Objective	To enable students 1. To develop skills of performing basic chemical analysis in food investigations 2. To develop familiarity with macro and micro nutrient food chemistry 3. To introduce students to various techniques in identification of the nutrient content present in the given food sample. 4. To apply the food chemical practical applications in industry and project works 5. To decipher the new chemical research in connection to food industry.
Course Outcome	Upon learning the course, the students will be able to 1. Know the qualitative analysis of macronutrient content present in the food. 2. Understand quantitation of minerals and vitamins in various food samples 3. Demonstrate practically study on different methods on similar food samples 4. Learn how to standardize the protocol and analyze the demonstration 5. Compare and justify the accuracy in food chemical lab techniques pertaining to the food sample.

Prerequisites: FT1131 Food Chemistry Lab-I

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	-	1	2	1	2	3
CO-2	-	2	2	-	-	-	1
CO-3	2	1	3	2	-	-	2
CO-4	3	-	1	1	2	3	3
CO-5	2	1	3	2	3	2	-

1: Weakly related, 2: Moderately related and 3: Strongly related

LIST OF EXPERIMENTS	**(2L+4P)**
1. Qualitative tests for sugars - glucose, fructose, lactose, maltose and glucose.	**CO-1, BTL-2**
2. Qualitative estimation of reducing sugar.	**CO-1, BTL-2**
3. Qualitative tests for proteins.	**CO-2, BTL-2**
4. Qualitative tests for minerals	**CO-2, BTL-2**
5. Quantitative estimation of calcium	**CO-3, BTL-2**
6. Quantitative estimation of phosphorous.	**CO-4, BTL-2**
7. Quantitative estimation of vitamin C.	**CO-5, BTL-2**

8. Demonstration Experiments a. Estimation of total nitrogen in foods (Micro or Macrokjeldahl methods) b. Lipid extraction c. Determination of Iodine value d. Estimation of Iron	**CO-5, BTL-2**

TEXT BOOK	
1.	Connie M. Weaver, James R. Daniel. (2014). The Food Chemistry Laboratory: A Manual for Experimental Foods, Dietetics, and Food Scientists. Second Edition
REFERENCE BOOK	
1	Miller DD. (2016). Food Chemistry lab manual. John Wiley Publications
E BOOK	
1.	http://154.68.126.6/library/Food%20Science%20books/batch1/The%20Food%20Chemistry%20Laboratory.pdf

COURSE TITLE	TECHNOLOGY OF PROCESSING FISH, MEAT & POULTRY			CREDITS	3
COURSE CODE	FTB1401	COURSE CATEGORY	PC	L-T-P-S	3-0-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course deals with the processing of fish, meat and poultry, and as well as quality and hygienic aspects of handling various meat, fish and poultry products during processing.
Course Objective	1. To study about the different processing methods 2. To learn about the preservation techniques without loss of nutrients 3. To study about the various chemical reactions that takes place in meat products 4. To understand about the spoilage of meat .
Course Outcome	Upon completion of this course, the students will be able to 1. Advance their knowledge on processing of meat, poultry and fish. 2. Examine on nutritional qualities of different foods 3. Elucidate the properties and processing of the derived products 4. Analyze the features and modifications during the processing of food products 5. Understand the safety aspects of handling meat, fish and poultry products.

Prerequisites: FTB1302 Food and Nutrition

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	1	1	2	1	1	2
CO-2	-	2	2	2	2	-	2
CO-3	2	3	-	1	-	2	-
CO-4	-	2	1	1	1	-	-
CO-5	-	1	-	2	-	1	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – FISH AND PROCESSING (9L)

Classification of fresh water fish and marine fish, commercial handling, storage and transport of raw fish, average composition of fish, freshness criteria and quality assessment of fish, spoilage of fish, methods of preservation of fish, canning, freezing, drying, salting, smoking and curing.	**CO-1 BTL-2**

MODULE 2 – FISH PRODUCTS	**(9L)**
Production of fish meal, fish protein concentrate, fish liver oil and fish sauce and other important by-products, quality control of processed fish, fish processing industries in India	**CO-2** **BTL-2**
MODULE 3 – MEAT PROCESSING	**(9L)**
Development of meat and poultry industry in India and its need in nation's economy. Psychological and pathological abnormalities. Pale soft exudate muscle. Dark culting beef-pH, Water Holding Capacity (WHC) and ERC. Meat freshness. Quality control assessments.	**CO-3** **BTL-3**
MODULE 4 – POULTRY	**(9L)**
Classification of poultry meat, composition and nutritional value of poultry meat & eggs, processing of poultry meat and eggs, spoilage and control, by-product utilization and future prospects, poultry farms in India	**CO-4** **BTL-2**
MODULE 5 – SLAUGHTER PROCESS AND QUALITY MANAGEMENT	**(9L)**
Meat quality -Effects of feed, breed and environment on production of meat animals and their Quality. Meat Quality-color, flavor, texture, Water-Holding Capacity (WHC), Emulsification capacity of meat. Slaughter process: Slaughter, inspection and grading, Anti-mortem examination of meat animals, slaughter of buffalo, sheep/ goat, poultry, pig. A Generic HACCP model, dressing of carcasses, post-mortem examination of meat, different cuts of pork, beef, mutton, chicken.	**CO-5** **BTL-2**

TEXT BOOK	
1. Srilakshmi.(2015) Dietetics. Newage publishers.	
REFERENCE BOOK	
1	Anandharamakrishnan, C (2017). Handbook of drying for dairy products. John Wiley & Sons.
E BOOK	
	https://www.pdfdrive.com/food-science-and-technology-d41395460.html

COURSE TITLE	FOOD PRESERVATION TECHNOLOGY			CREDITS	3
COURSE CODE	FTB1402	COURSE CATEGORY	PC	L-T-P-S	3-0-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course deals with the preservation of various food products, which includes canning, pickling, drying, irradiation. Significance of consuming preserved foods
Course Objective	Enable the students 1. To learn about various food preservation techniques 2. To process food and avoid wastage of food 3. To provide sustainable food to all. 4. To make seasonal foods available at all seasons 5. To reduce the high cost of seasonal foods.
Course Outcome	Upon completion of this course, the students will 1. Have Knowledge on preservation of food products. 2. Examine on nutritional qualities of preserved foods 3. Elucidate the properties and processing of the derived products 4. Understand the safety aspects of consuming preserved food products.

Prerequisites: FTB1304 Food Additives

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	1	2	-	2	1	1	2
CO-2	2	2	1	1	2	-	2
CO-3	2	-	1	1	-	1	-
CO-4	2	-	1	1	1	2	-
CO-5	3	1	-	2	1	2	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – INTRODUCTION TO FOOD PRESERVATION	**(9L)**
Objectives and techniques of food preservation, canning, classification of cans, can specification, structure of cans lacquering, canning of food items, thermal process time calculations for canned foods, spoilage in canned foods.	**CO-1 BTL-2**
MODULE 2 – THERMAL PROCESSING AND DRYING	**(9L)**

Thermal Processing Principles & application– Blanching, Pasteurization, Sterilization, Ultra high temp sterilization, Aseptic processing Drying- Significance: Natural drying- Solar drying, Artificial drying- Hot air drying, Drum drying, Spray drying, Dehydrofreezing , Freeze drying Pre-treatments, blanching, sulphuring	**CO-2** **BTL-2**
MODULE 3 – FREEZING	**(9L)**
Effect of low temperature on Fresh Fruits, Vegetables, Meat & Fish products, Chill injury. Freezing, Freezing rate Quick freezing, Slow freezing Air blast freezing, Contact freezing, Immerssion freezing, Cryogenic freezing Quality of frozen foods- Retrogradation, Protein denaturation, Freezer burn.	**CO-3** **BTL-3**
MODULE 4 – MODULE 4 – IRRATIATION AND FERMENTATION	**(9L)**
Irradiation - Source of ionization irradiation, Dose & Dosimetry, Mode of action, Scope of irradiation. Fermentation - Principles, Types of fermentation, Advantages	**CO-4** **BTL-2**
MODULE 5 – CHEMICAL PRESERVATIVES	**(9L)**
Natural preservatives-Mode of action, Chemical preservatives- Sulphur dioxide, , Benzoic acid, Sorbic acid , Antioxidants, Recent Trends - Pulsed electric fields, High pressure technology, Ohmic heating, Microwave heating, Hurdle technology	**CO-5** **BTL-2**
TEXT BOOK	
	Barba, Francisco J. 2015. Innovative Technologies for Food Preservation. Academic Press.
REFERENCE BOOK	
1	Augusto, Pedro ED, Beatriz MC Soares, and Nanci Castanha. 2013."Conventional technologies of food preservation. Academic Press.
E BOOK	
	https://www.pdfdrive.com/food-science-and-technology-d41395460.html

COURSE TITLE	FOOD WASTE MANAGEMENT			CREDITS	3
COURSE CODE	FTB1403	COURSE CATEGORY	PC	L-T-P-S	3-0-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course deals with the classification and characterization of food industrial wastes from fruit and vegetable processing industry, Beverage, Fish, Meat & Poultry industry, Sugar and Dairy industry; Waste disposal methods – Physical, Chemical & Biological.
Course Objective	To enable the students 1 To learn various designing of activated sludge process. 2 To provide scientific knowledge about treatment of waste 3 To develop their capacity to undertake research into the waste management 4. To make effective use of waste. 5 To create knowledge-based skill towards research-oriented aspiration.
Course Outcome	Upon completion of this course, the students will be able to 1. Have Knowledge on treatment methods for liquid food 2. Examine on design of Solid waste management system 3. Characterization of food wastes from Fruit and Vegetable processing industry 4. Analyze the Recovery of useful materials from effluents by different methods. 5. Learn the preparation of Vermicomposting

Prerequisites: FTB1402 Food Preservation Technology

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	1	2	2	2	1	1	2
CO-2	2	2	-	1	2	-	2
CO-3	2	-	1	1	-	1	-
CO-4	2	-	1	1	1	2	-
CO-5	3	1	3	2	-	2	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – INTRODUCTION	**(9L)**
Classification and characterization of food industrial wastes from Fruit and Vegetable processing industry, Beverage industry; Fish, Meat & Poultry industry, Sugar industry and Dairy industry; Waste disposal methods – Physical, Chemical & Biological; Economical aspects of waste treatment and disposal.	**CO-1 BTL-2**
MODULE 2 – WASTE FROM FOOD INDUSTRIES	**(9L)**
Treatment methods for liquid wastes from food process industries; Design of Activated Sludge	**CO-2**

Process, Rotating Biological Contactors, Trickling Filters, UASB, Biogas Plant.	**BTL-2**
MODULE 3 – MANAGEMENT OF SOLID WASTES	**(9L)**
Biological composting, drying and incineration; Design of Solid Waste Management System: Landfill Digester, Vermicomposting Pit.	**CO-3** **BTL-3**
MODULE 4 – BIOTEATMENT OF WASTES	**(9L)**
Biofilters and Bioclarifiers, Ion exchange treatment of waste water, Drinking-Water treatment, Recovery of useful materials from effluents by different methods.	**CO-4** **BTL-2**
MODULE 5 – ENVIRONMENT MANAGEMENT	**(9L)**
Environment management systems (ISO 14000) and its application in food industry; legislation related to waste management; standards for emission or discharge of environmental pollutants from food processing industries.	**CO-5**
TEXT BOOK	
1.Mario Kosava.(2015) Waste management. Oxford publishing house.	
REFERENCE BOOK	
1	Närvänen, Elina.(2015)Introduction: a framework for managing food waste." Food Waste Management. Palgrave Macmillan.
E BOOK	
	https://www.pdfdrive.com/food-science-and-technology-d41395460.html

COURSE TITLE	FOOD ANALYSIS LAB-I			CREDITS	2
COURSE CODE	FTB1431	COURSE CATEGORY	PC	L-T-P-S	0-0-4-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Objective	To enable the students 1. To develop skills to performing food analysis tests in food industries 2. To advance familiarity with chemical laboratory techniques 3. To practice various aspects of determination of extraneous matter in food. 4. To make them analyze brix acid ratio. 5. To initiate a research based approach in the field of food analysis.
Course Outcome	Upon completion of this course, the students will be able to 1. Know the total soluble solids in fruits by physical method 2. Demonstrate practical proficiency in a food analysis laboratory. 3. Estimation of Ascorbic acid content in juice 4. Examination of extraneous material in foods.

Prerequisites: FTB1201 Food Analysis Techniques

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	**2**	**3**	**1**	**-**	**3**	**2**	1
CO-2	2	**2**	**2**	**-**	**1**	1	1
CO-3	1	**2**	2	**1**	**2**	2	-
CO-4	**1**	**3**	1	**1**	2	1	**2**
CO-5	**3**	**1**	1	**2**	-	**2**	**1**

1: Weakly related, 2: Moderately related and 3: Strongly related

LIST OF EXPERIMENTS **(2L+4T)**

1. Determination of adulterants in spices 2. Total soluble solids in fruits by physical method 3. pH and acidity of juices 4. Estimation of Ascorbic acid content in juice 5. Examination of extraneous material in foods. a. Extraneous matter in soft cheese. b. Extraneous matter in jam c. Extraneous matter in potato chips. d. Extraneous matter in citrus juice.	**CO-1, BTL-2** **CO-2, BTL-2** **CO-3, BTL-2** **CO-4, BTL-2** **CO-5, BTL-2**

TEXT BOOK

Suzanne Nielsen. (2014) Food Analysis Laboratory Manual. Springer Science & Business Media.

COURSE TITLE	FOOD PROCESSING LAB – I			CREDITS	2
COURSE CODE	FTB1432	COURSE CATEGORY	PC	L-T-P-S	0-0-4-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Objective	Students will learn to 1.To develop products from fruits like jams and jellies 2. To develop products like sauces and pickles 3. To prepare noodles by using extrusion technology 4. To learn various methods of preserving milk products
Course Outcome	Upon completion of this course, the students will be able to 1. Know the preparation of squash 2. Understand the preparation of jam and jellies. 3. Develop sponge cake & bread 4. Formulate the protocol for pickle preparation 5. Prepare new formulations of bread with enhanced quality

Prerequisites: FT1302 Processing of Cereals, Fruits, Vegetables & Beverages

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	**2**	1	**1**	**2**	**1**	**2**	2
CO-2	**3**	-	**2**	**2**	**1**	1	2
CO-3	**3**	1	1	**1**	**2**	-	-
CO-4	**1**	1	-	**1**	**2**	1	-
CO-5	**3**	-	-	**2**	**1**	**2**	1

1: Weakly related, 2: Moderately related and 3: Strongly related

LIST OF EXPERIMENTS (3L+3P)

1. Preparation of orange squash.	**CO-1, BTL 2**
2. Preparation of mango jam.	**CO-2, BTL 2**
3. Preparation of guava jelly.	**CO-3, BTL 2**
4. Preparation of tomato ketchup.	**CO-4, BTL 2**
5. Preparation of canned peas/ pine apple.	**CO-4, BTL 2**
6. Preparation of mango pickle.	**CO-4, BTL 2**
7. Preparation of dried carrot.	**CO-5, BTL 2**
8. Preparation of frozen prawn.	**CO-5, BTL 2**
9. Preparation of sponge cake.	**CO-5, BTL 2**
10. Preparation of bread	**CO-5, BTL 2**

TEXT BOOK	
	Arora, M (2015) Practical Manual Food Processing, 1st Edition, Nirali Prakashan
REFERENCE BOOK	
	Sakunthala manay. (2014) Food facts and principles.New age publishers

COURSE TITLE	FOOD PROCESS TECHNOLOGY – MILK AND DAIRY PRODUCTS			CREDITS	3
COURSE CODE	FTB1501	COURSE CATEGORY	PC	L-T-P-S	3-0-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course will cover basics of dairy (liquid food) food processing and preservation technologies required in any dairy and food processing industries. The basic knowledge on dairy food processing is intermingled with most of the unit operations at some or other stage of processing. A comprehension of these aspects of processing and preservation will enrich the knowledge base of the students in general.
Course Objective	To enable the students 1. To understand the need and importance of dairy 2. To know the compositional and technological aspects of milk 3. To learn the social and economic impact made by the dairy industry 4. To explore the variety of products and by-products generated from milk. 5. To analyze the quality aspects of dairy products
Course Outcome	Upon completion of this course, the students will be able to 1. Learn the technology of milk and its processing methods 2. Gain knowledge about the various milk processing equipments 3. Improve skills in manufacturing selected dairy products in a pilot plant setting 4. Determine the safety and quality factors that regulate the acceptability of the dairy products by consumers 5. Advance their ability to adapt new technology and develop quality products

Prerequisites: FTB1402 Food Preservation Technology

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	2	2	-	2	2	1
CO-2	2	1	1	-	-	2	1
CO-3	1	1	2	2	-	2	1
CO-4	-	-	-	1	-		
CO-5	2	-	-	1	1	1	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – PROPERTIES OF MILK (9L)

Definition, composition and nutritive value; factors affecting composition of milk. - chemical properties of milk lipids, milk fat structure, fat destabilization; functional properties of milk lipids, milk proteins, their types, precipitation (casein micellar structure and its aggregation); milk enzymes, milk coagulation; lactose; vitamins and minerals in milk	**CO-1 BTL-2**
MODULE 2 – : PROCESSING OF MILK	**(9L)**
Technology of fluid milk: filtration/clarification, standardization, pasteurization (LTLT, HTST), sterilization, homogenization, UHT processing, aseptic packaging, storage and distribution.	**CO-2 BTL-2**
MODULE 3 – TECHNOLOGY OF RECOMBINED AND RECONSTITUTED MILK	**(9L)**
Technology of milk powders (WMP, SMP): composition, process of manufacture, problems and prevention methods - Technology of Cheese: classification, composition, Nutritive value, process of manufacture of cheddar, mozzarella, cottage and processed cheese, defects (their causes and prevention)	**CO-3 BTL-3**
MODULE 4 – MILK PRODUCTS	**(9L)**
Technology of yogurt, Acidophilus milk, bulgaricus milk, kumiss and kefir. Technology of frozen milk products: composition, process of manufacture, defects (their causes and prevention). Technology of indigenous milk products: dahi, butter, ghee, channa, paneer, khoa etc. Newer concepts in dairy products: cream powder, sterilized cream, butter spread, butter powder, cheese spread, whey protein concentrates, Lactose.	**CO-4 BTL-2**
MODULE 5 – MILK GRADATION	**(9L)**
Grading of milk and criterion of grading, milk adulteration problem, synthetic milk Dairy plant sanitation: hygiene in dairy Industry, different types of cleansing and sanitizing agents, their applications, cleaning systems	**CO-5 BTL-2**
TEXT BOOK	
1.	Walstra P (2015), Dairy Science and Technology. 2nd Ed. Taylor & Francis
REFERENCE BOOK	
1.	Srilakshmi B (2013) Nutrition Science. New age publishers.

COURSE TITLE	BAKERY, CONFECTIONARY AND MISCELLANEOUS PRODUCTS			CREDITS	3
COURSE CODE	FTB1502	COURSE CATEGORY	PC	L-T-P-S	3-0-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course deals about the process and role of bakery ingredients in preparation of breads, cakes, biscuits, chocolates, etc. The course will provide individuals with key knowledge of packaging, labeling, food safety and food laws that can be applied directly in existing products and also in development of new products. The course has been designed for baking professionals, students aspiring to work in the field of bakery and confectionery, entrepreneurs, all involved in implementing and maintaining product quality systems, quality control
Course Objective	To enable the students 1. To learn the formulation and processing of bakery and confectionary products 2. To understand standards and regulations followed in bakery industry 3. To acquire knowledge of bakery unit processing machinery 4. To attain the concepts of confectionery processing machinery 5. To explore the nutritional aspects of bakery and confectionery products
Course Outcome	Upon completion of this course, the students will be able to 1. Adapt the standards and regulations followed in bakery and confectionary industry 2. Grasp basic knowledge about food ingredients and its used in bakery products 3. Utilize bakery unit processing machinery effectively 4. Handle confectionary products and check quality in process line 5. Acclimatize various process flow line in confectionary and bakery products

Prerequisites: FTB1304 Food Additives

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	1	2	2	2	2	2	1
CO-2	2	1	1	-	1	-	1
CO-3	1	1	2	1	-	2	2
CO-4	2	-	2	1	-	1	1
CO-5	1	2	2	1	1	1	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – INTRODUCTION TO BAKING	(9L)
Bakery ingredients and their functions; Machines & equipment for batch and continuous processing of bakery products	CO-1 BTL-2

MODULE 2 – BAKING TECHNIQUES	**(9L)**
Testing of flour; Manufacture of bread, cake and biscuits; Analysis of bakery products; Cake icing techniques, wafer manufacture, cookies and crackers	**CO-2** **BTL-2**
MODULE 3 – BAKED PRODUCTS	**(9L)**
Manufacture of bread rolls, sweet yeast dough products, cake specialties, pies and pastries, doughnuts, chocolates and candies; Maintenance, safety and hygiene of bakery plants.	**CO-3** **BTL-3**
MODULE 4 –EXTRUDING TECHNOLOGY	**(9L)**
Objectives and importance of extrusion in food product development; Components and functions of an extruder; Classification of extruder; Advantages and disadvantages of different types of extrusion	**CO-4** **BTL-2**
MODULE 5 – EXTRUDED PRODUCTS	**(9L)**
Change of functional properties of food components during extrusion; Pre and post extrusion treatments; Use of extruder as bioreactor; Manufacturing process of extruded products; Application of extrusion technologies in food industries.	**CO-5** **BTL-2**

TEXT BOOK	
1.	Ashokkumar Y.(2014)Textbook of Bakery and Confectionery PHI Publications
REFERENCE BOOK	
1	Srilakshmi B (2013) Nutrition Science. New age publishers.

COURSE TITLE	FOOD ADULTERATION AND FOOD TOXICOLOGY			CREDITS	3
COURSE CODE	FTB1503	COURSE CATEGORY	PC	L-T-P-S	3-0-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	Food adulteration and toxicology is concerned with assessing the adulteration and injurious effects on living systems of chemicals present in foods. The chemical agents can be man-made (e.g., pesticide residues, food additives, contaminants originating with processing machinery, or packaging materials) or of natural origin (e.g., microbial, animal or plant toxins).
Course Objective	To enable the students 1. To understand interaction between constituents and its effects on food quality 2. To illustrate the importance of food safety, food quality, food laws and regulations in Food industry. 3. To describe the food quality management systems. 4. To explain the nationals and international food laws and regulations. 5. To exemplify different food adulterants.
Course Outcome	Upon completion of this course, the students will be able to 1. Asses nutritional quality of food and composition 2. Evaluate sensory quality test with instruments 3. Setup quality management system in food industry 4. Inspect from raw material to final product in processing line 5. Analyze undesirable constituents in food during processing

Prerequisites: FTB1403 Food Waste Management

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	1	2	2	2	2	2	1
CO-2	0	1	1	1	2	-	1
CO-3	1	1	1	-	2	2	2
CO-4	0	2	2	1	2	1	1
CO-5	2	2	-	1	-	1	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – ADULTERATION	(9L)
Introduction to common adulterants and their detection techniques in salts, fats, oil, milk and milk products, spices and condiments, tests for some specific adulterants impact of adulteration and new adulterant.	CO-1 BTL-2

MODULE 2 – : INTRODUCTION TO FOOD TOXICOLOGY	**(9L)**
Classification, dose, determinants of toxins in foods; naturally occurring toxins from animals, bacterial and fungal and sea food sources. Risk assessment in food toxicology; laws and regulation of safety assessment of foods including food additives, environmental contaminants, pesticides and antibiotic residues.	**CO-2** **BTL-2**
MODULE 3 – TOXIC MATERIALS	**(9L)**
Allergens, toxic constituents and anti-nutritional factors of plant foods (enzyme inhibitors, trypsin and chymotrypsin inhibitor, amylase inhibitor, flatulence causing sugars, phytolectins).	**CO-3** **BTL-3**
MODULE 4 –AGRICULTURAL AND INDUSTRIAL CONTAMINANTS	**(9L)**
Pesticides residues in fruits and vegetables, metal contaminants in foods and their toxicity in human body; animal drug residues in food and water, dioxins and related compounds in food; metals such as lead, arsenic and mercury.	**CO-4** **BTL-2**
MODULE 5 – FOOD ADDITIVES AS TOXICANTS	**(9L)**
Artificial colors, preservatives, sweeteners; toxicants formed during food processing such as nitrosamines, maillard reaction products acrylamide, benzene, heterocyclic amines and aromatic hydrocarbons and irradiation; risk of genetically modified food, food supplements, persistent organic pollutants, toxicity implications of nanotechnology in Food	**CO-5** **BTL-2**
TEXT BOOK	
1.	Shibamato T. and Bjeldanes L. (2014) Introduction to Food Toxicology, Academic Press, Inc. San Diego, CA
REFERENCE BOOK	
1	Tõnu Püssa (2014). Principles of Food Toxicology, Second Edition, CRC Press.

COURSE TITLE	FOOD ANALYSIS LAB – II			CREDITS	2
COURSE CODE	FTB1531	COURSE CATEGORY	PC	L-T-P-S	0-0-4-0
Version	1.0	Approval Details		Version	1.0

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	First Periodical Assessment	Second Periodical Assessment
15%	15%	10%	5%	15%	15%

Course Description	To provide knowledge and skills in the applications, principles and practices of the analysis of foods for purposes of trade, compliance, quality assurance, authentication, complaint investigation, nutritional attributes and scientific research.
Course Objective	To enable the students 1. To identify different types of analytical instruments in their respective laboratories 2. To develop an understanding about the advanced analytical and instrumental techniques. 3. To illustrate the principle and mechanism of analytical instruments. 4. To describe bio-chemical analysis of food components. 5. To inculcate the concept of instrumental protocol for analysis
Course Outcome	Upon completion of this course, the students will be able to 1. Take professional sampling and sample treatment prior to analysis 2. Calibration of Instrumental methods and troubleshoot 3. Understand and capable of performing basic chemical processes in an analytical laboratory 4. Perform measurements on basic analytical instruments (photometers, spectrometers, chromatographs, ion-selective electrodes) 5. Evaluate the result of analysis and identify the compounds present in it.

Prerequisites: FTB1431 Food Analysis Lab – I

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	-	2	2	-	-	2	-
CO-2	2	1	1	2	2	1	1
CO-3	1	1	2	2	1	1	2
CO-4	2	-	2	1	-	-	2
CO-5	-	2	2	1	-	2	-

1: Weakly related, 2: Moderately related and 3: Strongly related

List of Experiments	(3L+3P)
1. Determination of starch and pectic substances using different methods.	CO-1, BTL-2
2. Estimation of sugars using HPLC.	CO-1, BTL-2
3. Electrophoresis of proteins for their identification.	CO-2, BTL-2
4. Determination of free fatty acids of GLC.	

5. Estimation of anti-nutritional factors including tannin, trypsin inhibitor, phytates etc. 6. Determination of food additives in foods. 7. Detection of adulteration in foods. 8. Estimation of toxins and pesticide in foods. 9. Rheological properties of foods. 10. Estimation of toxin trace analysis	**CO -2, BTL-2** **CO-3, BTL-2** **CO-3, BTL-2** **CO-3, BTL-2** **CO-4, BTL-2** **CO-4, BTL-2** **CO-5, BTL-2**

REFERENCE BOOK	
1.	Joslyn, M.A. Ed. 2015. Methods in Food Analysis. Academic Press, New York.
2.	King, R.D. Ed. 2017. Developments in Food Analysis Techniques-1. Applied Science, Publishers Ltd., London.

COURSE TITLE	FOOD PROCESSING LAB – II			CREDITS	2
COURSE CODE	FTB1532	COURSE CATEGORY	PC	L-T-P-S	0-0-4-0
Version	1.0	Approval Details		Version	1.0

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	First Periodical Assessment	Second Periodical Assessment
15%	15%	10%	5%	15%	15%

Course Description	The course deals about strategies and programs developed by governmental and non-governmental organizations to improve the dietary intake and the nutritional status of individuals and groups within a community. It also covers nutrition-related programs, for groups at nutritional risk, nutritional issues/ concerns across the lifecycle.
Course Objective	To enable the students 1. To understand the concepts of post-harvest technology of fruits and vegetables. 2. To acquaint the effects of pre-processing treatments on shelf-life of fruit. 3. To adopt the techniques of processing & preservation of fruits and vegetables. 4. To provide information about regulation of processed food products 5. To imply the techniques of processing various agri-products
Course Outcome	Upon completion of this course, the students will be able to 1. Identify the specific processing technologies used for vegetable, fruits products 2. Understand the application of scientific principles in the processing technologies. 3. Detect the changes in the raw material to the type of processing technology used. 4. Determine the effects of of storage on quality and shelf-life of fruits and vegetables 5. Illustrate the changes in quality parameters of dairy and extruded products

Prerequisites: FT1432 Food Processing Lab-I

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO -1	PO-2	PO-3
CO-1	-	2	2	1	-	2	2
CO-2	2	1	1	2	2	1	1
CO-3	1	1	2	1	1	1	2
CO-4	-	-	2	1	1	-	1
CO-5	1	2	2	1	1	2	2

1: Weakly related, 2: Moderately related and 3: Strongly related

List of Experiments	(3L+3P)
1. Preparation of dry onion/ chilli/ garlic.	CO-1, BTL-2
2. Cultivation of oyster mushrooms.	CO-1, BTL-2
3. Manufacture of macaroni by extruder.	CO-2, BTL-2
4. Manufacture of potato powder.	CO-3, BTL-2
5. Manufacture of ice cream.	CO-3, BTL-2
6. Manufacture of Rosogolla and Sandesh.	

7. Manufacture of candid fruits. 8. Production of dried milk by drum drying 9. Production of milk powder by spray drying	**CO-4, BTL-2** **CO-5, BTL-2** **CO-5, BTL-2**
REFERENCE BOOK	
1.	K. Sharma, Steven J. Mulvaney, Syed S. H. Rizvi. (2014) Food Process Engineering: Theory and Laboratory Experiments.
2.	RAJUVA T. A. and P.P. Joy (2014). A Food Technology Lab Manual, Aromatic and Medicinal Plants Research Station.

COURSE TITLE	PROCESSING OF OILS AND FATS			CREDITS	3
COURSE CODE	FTB1601	COURSE CATEGORY	PC	L-T-P-S	3-0-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course will provide theoretical knowledge about oils and fats, their supply chain, and extraction process of oil. Furthermore, students will learn the difference between oils and fats and their functionality. They will gain a deeper understanding of the chemistry involved in fats and oils, storage, refining, modification, and nutrition.
Course Objective	To enable the students 1. To understand about the physical and chemical properties of fats and oils 2. To gain knowledge about the extraction and refining processes 3. To learn about the various types of packaging available in the market 4. To detect adulteration and know about the standards of identifying oil 5. To develop value added products from oil seed waste
Course Outcome	Upon completion of this course, the students will be able to 1. Describe the physical and chemical property of oils and fats 2. Identify different methods of oil extraction for edible purpose 3. Write down process flow line for oil extraction 4. Classify different types of fat and oil products 5. Discuss about the various storage and packaging materials used

Prerequisites: FTB1202 Principles of food science

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	2	-	-	2	-	-
CO-2	2	1	1	-	-	-	1
CO-3	1	1	2	-	2	2	2
CO-4	1	2	-	1	3	1	-
CO-5	3	2	-	1	1	-	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – INTRODUCTION	**(9L)**
Pulses and Legumes: Composition, Nutritive value, Anti-nutritional factors. Changes during cooking, Factors affecting cooking time. Germination-Changes duringgermination. Nuts & Oilseeds: Composition, sources of proteins and oil - Protein concentrates and isolates, texturised vegetable protein.	**CO-1 BTL-2**
MODULE 2 – PROCESSING OF OILS	**(9L)**

Milling techniques: Dry milling and wet milling; processing of legumes: soaking, germination, decortication, cooking, fermentation; puffing, roasting and parching; utilization of pulses; protein isolates and concentrates; role of legumes in human nutrition.	**CO-2 BTL-2**
MODULE 3 – PROCESSING OF SOYABEAN AND OTHER PRODUCTS	**(9L)**
Processing and utilization of soyabean for value added products; soy based fermented products; innovative products from pulses and oilseeds; future developments in products and processes; products from legumes and uses: starch, flour, protein concentrates and isolates.	**CO-3 BTL-3**
MODULE 4 – EDIBLE OILS	**(9L)**
Sources of edible oils (groundnut, mustard, soyabean, sunflower, safflower, coconut, sesame and oil from other sources); physio-chemical properties; processing of oilseeds: rendering, pressing, solvent extraction, refining, hydrogenation; factors affecting extraction; packing and storage of fats and oils, changes during storage.	**CO-4 BTL-2**
MODULE 5 – SPECIALITY OIL PRODUCTS	**(9L)**
Margarine, mayonnaise, salad dressing, fat substitutes etc; chemical adjuncts: lecithins and GMS; Nutritional food mixes from oilseeds: processing of oilseeds for food use, protein rich foods, protein enriched cereal food	**CO-5 BTL-2**
TEXT BOOK	
1.	N. Shakuntala Manay. (2014) Food facts and principles. New age publishers. Third revised edition.
REFERENCE BOOK	
1	B.Srilakshmi (2013).Food Science. New age publishers. Seventh edition.
E BOOKS	
1	https://www.pdfdrive.com/food-lipids-chemistry-nutrition-and-biotechnology-e167399800.html
MOOC	
1	https://www.coursera.org/search?query=human%20nutrition&page=2&index

COURSE TITLE	FERMENTED FOODS			CREDITS	3
COURSE CODE	FTB1602	COURSE CATEGORY	PC	L-T-P-S	3-0-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course deals about the history of fermented foods and beverages and the impact of fermentation on flavour, aroma, and taste and from chemistry to microbiology of fermented foods, the role of different types of microbes in production, preservation, and enhancement of diverse foods.
Course Objective	1. To understand various principles and procedures involved in fermentation of foods 2. To examine the different biochemical and microbial systems involved in various food and beverage fermentations 3. To study common biochemical pathways involved in different fermentation systems 4. To discuss on the methods for starter culture preparation, protection and use. 5. To learn about the impact of fermentation on nutritive value, flavour,aroma
Course Outcome	Upon completion of this course, the students will be able to 1. Identify the principles of food fermentation technology 2. Evaluate the types of starters used in Food Industry 3. Discuss about the production of various fermented foods, alcoholic and non-alcoholic beverages. 4. Apply the benefits of traditional foods and its existence at present to explore 5. Compile the Impact of fermented products and its benefits

Prerequisites: FT1301 Food microbiology

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	2	-	2	2	2	1
CO-2	2	1	1	3	3	3	1
CO-3	1	-	2	-	2	2	-
CO-4	2	3	-	1	2	1	2
CO-5	2	2	-	1	-	1	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – IMPORTANCE OF FERMENTED FOODS	(9L)
Fermentation - Principles, Types of fermentation, Types of fermented foods, Advantages of fermentation. Organisms used for production of fermented food products; Environmental parameters for fermentation process; safety criteria of fermented foods.	CO-1 BTL-2

MODULE 2 – BENEFICIAL ASPECTS OF FERMENTATION	(9L)
Microorganism involved in Fermentation, Microbial activities with specific role in Fermentation, Significance of Fermentation food in Indian diet, Factors influence growth & Metabolic activities of microbes in food Fermentation.	**CO-2** **BTL-2**
MODULE 3 – CEREAL BASED FERMENTED PRODUCTS	**(9L)**
Cereal and legume based fermented products like Bread, Soya Sauce, Koji, Tempeh, Miso, Natto, Tofu, Angkkak; Indian products like Idly, Dosa, Vada, Bori. Alcoholic beverages and vinegar.	**CO-3** **BTL-3**
MODULE 4 –VEGETABLES, FISH AND MEAT BASED FERMENTED PRODUCTS	**(9L)**
Different types of pickles like olive cucumber, salt stock and dill pickles, Fish sauce, sausages and Surimi.	**CO-4** **BTL-2**
MODULE 5 – DAIRY BASED FERMENTED PRODUCTS	**(9L)**
Cheese, Butter, Yoghurt, Kefir, Koumiss, Srikhand, Cultured butter milk; Whey based fermented products	**CO-5** **BTL-2**

TEXT BOOK	
1.	Joshi VK (2014). Indigenous fermented foods. CRC press I edition
REFERENCE BOOK	
1	Sankarnarayan A(2013)Fermented food products. CRC press I edition
E BOOK	
1	https://www.itseyeris.com/book/100-of-the-top-fermented-foods
MOOC	
1	WWW.udemy.com/fermented foods/online courses

PROFESSIONAL ELECTIVES

COURSE TITLE	FOOD INFORMATION AND REGULATIONS			CREDITS	3
COURSE CODE	FTC1701	COURSE CATEGORY	PE	L-T-P-S	3-0-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course deals with the specifications and standards for various food products. Various food laws as well as authorizing body were discussed in detail to maintain the safety and quality of foods
Course Objective	1. To become food scientists capable of ensuring the production and marketing of safe and quality foods. 2. Provide a broadly based scientific education whose can also enter into employment in other sectors of the food chain 3. To allow individuals to develop their capacity to undertake research into the science of foods. 4. To provide undergraduates with opportunities to develop their inter-personal and communication skills. 5. To create a knowledge based skill towards research oriented aspiration.
Course Outcome	Upon completion of this course, the students will be able to 1. Have Knowledge on FSSAI. 2. Examine on Material used for packing and laws related to packaging. 3. Elucidate the Methods to detect adulterant of various foods 4. Have Knowledge on PFA 5. Have Knowledge on FDA

Prerequisites: FTB1701 FOOD INFORMATION AND REGULATIONS

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	1	1	2	1	1	2
CO-2	-	2	2	-	2	2	2
CO-3	2	-	-	1	2	-	-
CO-4	2	2	1	1	1	1	-
CO-5	-	1	2	-	2	2	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – MODULE 1 – INTRODUCTION TO LAWS AND REGULATIONS (9L)

Objective of Food Laws, Major Food Laws and Regulations of India and Regulation of Food Sanitation.	**CO-1 BTL-2**
MODULE 2 – NATIONAL LAWS	**(9L)**
Prevention of food Adulteration Act (PFA), Fruit Product Order (FPO), Meat Product Order (MPO), Agmark, Bureau of Indian Standards (BIS), Food Safety and Standards Authority of India (FSSAI).	**CO-2 BTL-2**
MODULE 3 – INTERNATIONAL LAWS	**(9L)**
Certification of HACCP, ISO, Codex Alimentarius, FDA, USDA, CARE.	**CO-3**
MODULE 4 – LABELING AND PACKAGING	**(9L)**
Packaging – Functions, Classifications, Material used for packing and laws related to packaging. Labeling – Nutrition Labeling, Labeling provisions in existing food laws.	**CO-4 BTL-2**
MODULE 5 – FOOD ADULTERATION	**(9L)**
Definition – Methods to detect adulterant of various foods.	**CO-5**
TEXT BOOK	
1.	Sanchez, Marc. (2016) Food Science Text Series. Food Law and Regulation for Non-Lawyers. Springer International.
REFERENCE BOOK	
1	Corinne T. Netzer .2014. The Complete Book of Food Counts. Popular book depot
E BOOK	
1.	https://www.pdfdrive.com/food-science-and-technology-d41395460.html

COURSE TITLE	VALUE ADDITION TO FOOD INDUSTRY REFUSE			CREDITS	3
COURSE CODE	FTC1702	COURSE CATEGORY	PE	L-T-P-S	3-0-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course deals with the classification of food industry refuse - handling, transportation and storage of industrial refuse – contamination of industrial refuse – effect of contamination and prevention methods
Course Objective	1. To enter a career in the food industry as food scientists ensuring the production and marketing of safe and quality foods. 2. To Provide a broadly based scientific education whose graduates can work in scientific sectors. 3. To allow individuals to develop capacity to undertake research into the science of foods. 4. To provide undergraduates with opportunities to develop their inter-personal and communication skills. 5. To create a knowledge-based skill towards research-oriented aspiration.
Course Outcome	Upon completion of this course, the students will be able to 1. Have Knowledge on Production of pectin. 2. Examine on Marketable products like chitin, chitosan, fertilizer, nutritional enhancer animal feed from shells. 3. Elucidate the Utilization of tea waste as feed for livestock & poultry. 4. Have Knowledge on texturised fish protein concentrate 5. Have Knowledge on extraction of prolamin

Prerequisites: FTC1702 VALUE ADDITION TO FOOD INDUSTRY REFUSE

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	1	1	2	1	1	2
CO-2	1	2	2	1	2	-	2
CO-3	2	1	-	1	1	2	1
CO-4	2	2	1	1	1	2	-
CO-5	1	1	1	2	1	2	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – INTRODUCTION	(9L)
Types of food industries, classification of food industry refuse - handling, transportation and storage of industrial refuse – contamination of industrial refuse – effect of contamination and	CO-1 BTL-2

prevention methods – processing methods and processing equipments – their applications.	
MODULE 2 – FRUITS & VEGETABLES	**(9L)**
Production of pectin, ethanol, natural gas, citric acid, activated charcoal, fibre extract from apple pomace, vitamins - Production of citrus oil from peels of citrus fruits; Manufacture of candied peel and pectin from albedo of citrus fruits. Production of single cell protein by the use of potato wastes; Recovery of - Protein from potato starch plant waste.	**CO-2** **BTL-2**
MODULE 3 – FISH, MEAT, POULTRY	**(9L)**
Production of fish meal; Fish protein concentrate; Animal feed; Shell product; Glue from seafood processing waste. Texturised fish protein concentrate (marine beef); Utilization of organs and glands of animal as human food. Production of human food from animal blood and blood protein; Marketable products like chitin, chitosan, fertilizer, nutritional enhancer animal feed from shells	**CO-3** **BTL-3**
MODULE 4 – CEREALS	**(9L)**
Feed for livestock from wheat and corn bran and germ. Extraction of oil & wax from rice bran, Puffed cereals from broken rice; Starch, modified starch and industrial alcohol from non-usable cereals; Silica from rice husk; Extraction of plolamin (Zein & katirin); Protein from sorghum; Beer spent graining.	**CO-4** **BTL-2**
MODULE 5 – DAIRY INDUSTRY AND BEVERAGES	**(9L)**
Fermentation products from whey. Condensed & dried products from whey; Production of lactose and protein from whey; Utilization of tea waste as feed for livestock & poultry.	**CO-5** **BTL-2**
TEXT BOOK	
1.	Anil Kumar (2013)Food Processing By-Products and their Utilization, Wiley-Blackwell.
REFERENCE BOOK	
1	Lawrence K. (2016) Waste Treatment in the Food Processing Industry., CRC Press.

COURSE TITLE	FOOD SAFETY			CREDITS	3
COURSE CODE	FTC1703	COURSE CATEGORY	PE	L-T-P-S	3-0-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course deals with the Introduction to concepts of food quality, food safety, food quality assurance and food quality management; objectives, importance and functions of quality control, Current challenges to food safety.
Course Objective	To enable the students 1 To enter a career in the food industry as food safety scientists ensuring the production and marketing of foods. 2 To Provide a broadly based scientific education whose graduates can also enter into mployment in other sectors of the food chain 3 To develop capacity to undertake research into the science of foods. 4 To provide undergraduates with opportunities to develop their inter-personal and communication skills.
Course Outcome	Upon completion of this course, the students will be able to 1. Have Knowledge on food quality and food safety. 2. Examine on Desirable safety features of some food processing equipment. 3. Elucidate the Role of maintenance staff and plant operators 4. Have Knowledge on AGMARK 5. Have Knowledge on BIS

Prerequisites: FTC1703 FOOD SAFETY

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	1	1	2	1	1	2
CO-2	1	2	2	2	2	1	2
CO-3	2	2	1	1	1	2	1
CO-4	2	2	1	1	1	2	1
CO-5	2	1	-	2	-	2	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – INTRODUCTION TO FOOD SAFETY	(9L)
Introduction to concepts of food quality, food safety, food quality assurance and food quality management; objectives, importance and functions of quality control, Current challenges to	CO-1 BTL-2

food safety.	
MODULE 2 – SAFETY ACT	**(9L)**
Role of national and international regulatory agencies, Bureau of Indian Standards (BIS), AGMARK, Food Safety and Standards Authority of India (FSSAI), Introduction to WTO agreements: SPS and TBT agreements, Codex alimentarious commission, USFDA, International organization for standards (ISO) and its standards for food quality and safety (ISO 9000 series, ISO 22000, ISO 15161, ISO 14000)	**CO-2** **BTL-2**
MODULE 3 – SAFETY DURING PROCESSING	**(9L)**
HACCP; Desirable safety features of some food processing equipment; Personal protective equipment; Safety from adulteration of food.	**CO-3** **BTL-3**
MODULE 4 – PLANT MAINTENANCE	**(9L)**
Role of maintenance staff and plant operators; Preventive maintenance; Guidelines for good maintenance & safety precautions; Lubrication & lubricants; Work place improvement through '5S'.	**CO-4** **BTL-2**
MODULE 5 – PERONAL HYGENE	**(9L)**
Hygiene and sanitation requirement in food processing and fermentation industries; Cleaning, sanitizing & pest control in food processing; storage and service areas	**CO-5** **BTL-2**
TEXT BOOK	
1.	Yasmine Motarjemi. (2012) Food Safety Management, A Practical Guide for the Food Industry. Academic Press.
REFERENCE BOOK	
1	S J Forsythe, P R Hayes. (2016) Food Hygiene, Microbiology & HACCP. Springer.

COURSE TITLE	FAST FOODS AND CATERING SERVICES			CREDITS	3
COURSE CODE	FTC1704	COURSE CATEGORY	PE	L-T-P-S	3-0-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	This course deals with the Types- trends- general cooking methods of fast foods. Preparation of raw materials. Indian fast foods. South Indian and North Indian Vegetarian and non-vegetarian gravies. General Indian Flavourings. Kadai preparations and tawa preparation. Fried items
Course Objective	To enable the students 1. To enter a career in the catering industry as catering scientists capable of ensuring the production of safe and quality foods. 2.Provide a broadly based scientific education whose graduates can also enter into employment in other sectors of the food chain or related scientific sectors where they can apply their scientific skills. 3.To allow individuals to develop their capacity to undertake rese arch into the science of foods. 4.To provide undergraduates with opportunities to develop their inter-personal and communication skills. 5. To create a knowledge based skill towards research oriented aspiration.
Course Outcome	Upon completion of this course, the students will be able to 1. Have Knowledge on food quality and food safety. 2. Examine on preparation of fast foods. 3. Elucidate the Role of maintenance staff and plant operators 4. Have Knowledge on Various types of catering establishments 5. Have Knowledge on Various cleaning procedures in a hotel.

Prerequisites: FTC1704 FAST FOODS AND CATERING SERVICES

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	1	1	2	1	1	2
CO-2	1	2	2	-	2	-	2
CO-3	2	2	1	1	-	2	-
CO-4	2	2	1	1	1	2	-
CO-5	1	1	-	2	-	1	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – CONCEPTS OF FAST FOOD (9L)

Types- trends- general cooking methods of fast foods. Preparation of raw materials. Indian fast foods. South Indian and North Indian Vegetarian and non-vegetarian gravies. General Indian Flavourings. Kadai preparations and tawa preparation. Fried items.	**CO-1** **BTL-2**
MODULE 2 – CONTINENTAL COOKERY	**(9L)**
Cooking methods. Ingredients used. Continental fast foods – pizza- burgers-french fries – cutlets – bread preparations- pastas. Role of wine in continental cookery. Fast foods – Nutritional aspects.	**CO-2** **BTL-2**
MODULE 3 – EVOLUTION OF CATERING INDUSTRY	**(9L)**
Various types of catering establishments. Classification of hotels. Various functional departments. Functions of food and beverage service department. Organization structure. Types of service – water – budget etc.	**CO-3** **BTL-3**
MODULE 4 – EATING ETIQUETTES	**(9L)**
Star classification. Speciality restaurants. Other hospitality industry and career opportunities. Heritage hotels.	**CO-4** **BTL-2**
MODULE 5 – FRONT OFFICE – MEANING AND FUNCTIONS	**(9L)**
Guest registration formalities. Housekeeping. Meaning and functions. Various cleaning procedures in a hotel.	**CO-5** **BTL-2**

TEXT BOOK	
1.	Thangam Philip. (2017)Modern Cookery: Vol. 1 & Vo.2.MAcmillian Press
REFERENCE BOOK	
1	Krishna Arora (2015) Theory of Cookery, Frank Brothers and Company, New Delhi
E BOOK	
1.	https://watchrovibe.files.wordpress.com/2015/07/hotel-housekeeping-training-manual-sudhir-andrews-pdf.pdf

COURSE TITLE	ENTREPRENEURSHIP DEVELOPMENT			CREDITS	3
COURSE CODE	FTC1705	COURSE CATEGORY	PC	L-T-P-S	3-0-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	Entrepreneurs require a foundation in several key areas in order to be successful. This course will focus on multiple topics including: opportunities and challenges for new ventures, benefits/drawbacks of entrepreneurship, strategic management and forms of business ownership, marketing strategies, venture finance and human resource management
Course Objective	To enable the students 1. To systematically apply an entrepreneurial way of thinking that will allow them to identify and create business opportunities that may be commercialized successfully. 2. To acquire necessary knowledge and skills required for organizing and carrying out entrepreneurial activities 3. To develop the ability of analyzing and understanding business situations in which entrepreneurs act 4. To master the knowledge necessary to plan entrepreneurial activities. 5. To advance the ability of analyzing various aspects of entrepreneurship activities
Course Outcome	Upon completion of this course, the students will be able to 1. Acquire the ability to discern distinct entrepreneurial traits 2. Know the parameters to assess opportunities and constraints for new business ideas 3. Understand the systematic process to select and screen a business idea 4. Design strategies for successful implementation of ideas 5. Write a business plan

Prerequisites: FTC1705 ENTREPRENEURSHIP DEVELOPMENT

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	-	2	2	2	2	2	1
CO-2	2	1	1	-	-	-	1
CO-3	1	1	1	-	2	2	1
CO-4	-	-	2	1	2	1	2
CO-5	-	2	-	1	1	1	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – INTRODUCTION (9L)

Entrepreneur & entrepreneurial flair; Classification of small, medium and large scale manufacturing industries; Opportunities of food processing industries in West Bengal.	**CO-1** **BTL-2**
MODULE 2 – SCOPE OF ENTREPRENEURSHIP	**(9L)**
Nature, scope and importance of entrepreneurship; business ideas, source of business ideas, feasibility studies, problem solving and decision making. Agricultural sector and food processing industry problems and opportunities; self-employment need and entrepreneurship in foods sector, project sizing, fund management and enterprise management issues in food entrepreneurship, entrepreneurship development policies of government in food business	**CO-2** **BTL-2**
MODULE 3 – PROCEDURE	**(9L)**
Trade license and registration marks; Sources of finance; Selection of land and factory sheds.	**CO-3** **BTL-3**
MODULE 4 –EQUIPMENT MANAGEMENT	**(9L)**
Agencies for promotion of food processing industries; Source of machine and equipment.	**CO-4** **BTL-2**
MODULE 5 – WRITING PROJECT PROPOSAL	**(9L)**
Preparation of project report; Market feasibility reports; Techno-economic feasibility report on fruits and vegetable processing, bakery and confectionary, mushroom manufacture and soybean processing.	**CO-5** **BTL-2**
TEXT BOOK	
1.	Kanka. (2014) Entrepreneurial Development, Himalaya Publishing House.
REFERENCE BOOK	
2.	Poornima. (2013.)Entrepreneurial Development, S Chand & Co

COURSE TITLE	FOOD QUALITY TESTING AND EVALUATION			CREDITS	3
COURSE CODE	FTC1706	COURSE CATEGORY	PC	L-T-P-S	3-0-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course deals about the sensory evaluation of food based on which the market of the product id decided. Sensory attributes like smell, taste, vision , texture of a product are taught step by step which will enable the student to understand the importance of sensory evaluation in product development as well as quality control
Course Objective	To enable the students 1. To learn about quality management in food production chain 2. To illustrate the importance of food safety, food quality, food laws and regulations 3. To describe the food quality management systems. 4. To explain the nationals and international food laws and regulations. 5. To exemplify different food adulterants.
Course Outcome	Upon completion of this course, the students will be able to 1. Describe about physical, chemical contaminants in foods 2. Imply food safety system in industry 3. Implement international food laws and standards for food industry 4. Demonstrate national food laws and standards 5. Suggest food labeling regulations to an industry

Prerequisites: FTC1706 FOOD QUALITY TESTING AND EVALUATION

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	1	2	1	2	1	2	-
CO-2	2	1	1	1	-	-	1
CO-3	1	1	2	-	2	2	1
CO-4	1	-	2	1	2	1	1
CO-5	1	2	-	1	1	1	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – INTRODUCTION TO QUALITY ATTRIBUTES	**(9L)**
Appearance, flavour, textural factors and additional quality factors – Concept and Importance of Food Appearance, Sensory Assessment of Appearance- panel selection, screening and training; Physical requirement for food appearance, types of sensory test, Appearance Scales.	**CO-1 BTL-2**
MODULE 2 – TASTE	**(9L)**

Introduction, Organs involved in taste perception- tongue, papillae, taste buds, salivary glands mechanism of taste perception. Chemicals responsible for sweet, salt, sour, and bitter taste their structure and chemical dimensions. Factors affecting taste quality, reaction time and factors affecting it. Absolute and recognition threshold taste abnormalities.	**CO-2** **BTL-2**
MODULE 3 – OLFACTION	**(9L)**
Introduction and definition, anatomy of nose, mechanism of odour perception. Prerequisites for odour perception, odour classification, chemical specificity of odour. measurement of odour using different techniques primitive, double tube olfactometer, Elseberg techniques, Wenzel's olfactometer, sniffing, merits and demerits of each methods, olfactory abnormalities.	**CO-3** **BTL-3**
MODULE 4 –COLOUR	**(9L)**
Introduction to natural and synthetic colours. Functions of colour in foods. Optical aspect of colour, perception of colour, objective evaluation, colour measurement using different systems- Munsellcolour system, CIE colour system, qualitative and quantitative analysis of colour, reflectance spectrophotometry and Colorimetry.	**CO-4** **BTL-2**
MODULE 5 – TEXTURE	**(9L)**
Introduction, definition and classification of texture profile. Subjective evaluation, phases of oral processing. Objective analysis, rheological methods of texture measurement including rheological models. Measurement of texture in various food groups viz. cereals, dairy, fruits and vegetables, fish, meat and meat products.	**CO-5** **BTL-2**
TEXT BOOK	
1.	Maynard A. Amerine, Rose Marie Pangborn, Edward B. Roessler.(2015) Principles of Sensory Evaluation of Food. Elsevier Publication
REFERENCE BOOK	
1.	DeMan. 2014. Principles of Food Chemistry, 3rd edition, Springer Publication.

COURSE TITLE	FOOD PACKAGING TECHNOLOGY			CREDITS	3
COURSE CODE	FTC1707	COURSE CATEGORY	PC	L-T-P-S	3-0-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course provides knowledge and skills in the handling and packaging of foods, and to develop values about the safety and environmental impact of packaging. Also this course imparts the knowledge on application of fundamentals of engineering in packaging design for developing optimal packaging systems for range of products in food systems.
Course Objective	To enable the students 1. To study about the functions of packaging along with the influence of various factors on food. 2. To explain various recent techniques of food packaging and applications 3. To understand the principles and requirements of packaging techniques. 4. To identify the purpose, principle and advance knowledge related to the various packaging technology systems. 5. To demonstrate suitable recycling methods of packaging materials, biodegradable packaging materials and safety and legislative aspects.
Course Outcome	Upon completion of this course, the students will be able to 1. Understand packaging materials and its importance in food Industry 2. Adapt and utilize packaging materials for right application in Food Industry 3. Check Barrier properties of packaging materials to avoid cross contamination with air, water and printing ink 4. Standardize testing methods for packaging material to assure quality 5. Demonstrate packaging laws and regulations meeting standards

Prerequisites: FTC1707 FOOD PACKAGING TECHNOLOGY

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	1	2	2	2	1	2	1
CO-2	2	1	1	2	2	2	1
CO-3	1	1	-	1	2	-	2
CO-4	-	1	1	1	1	1	
CO-5	1	-	1	1	1	2	

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – INTRODUCTION TO FOOD PACKAGING (9L)

Definition, factors involved in the evolution and selection of a food package, functions of food packaging (containment, protection, convenience and communication). Paper and paper-based packaging materials: types of paper (Kraft, bleached, greaseproof, glassine), paper products (paper bags, cartons, drums and molded paper containers), functional properties of paper; testing of paper packaging materials.	**CO-1 BTL-2**
MODULE 2 – PLASTIC PACKAGING MATERIALS	**(9L)**
Classification of polymers, functional and mechanical properties of thermoplastic polymers; processing and converting of thermoplastic polymers (extrusion, blow molding, injection molding, compression molding, lamination and heat sealing); testing of plastic packages. Packaging requirements of selected foods- cereal and snack food, beverages, milk and dairy products, poultry & eggs, red meat, frozen foods, horticultural products and microwavable foods.	**CO-2 BTL-2**
MODULE 3 –METAL PACKAGING MATERIALS	**(9L)**
Container making processes (end manufacture, three-piece can manufacture and protective and decorative coatings); functional properties of metal containers; Tin plate containers- quality control tests.	**CO-3 BTL-3**
MODULE 4 –GLASS PACKAGING MATERIAL	**(9L)**
Composition and manufacture of glass containers; glass container nomenclature; glass containers-closure functions, closure terminology and construction; properties of glass containers – mechanical, thermal and optical properties; testing of glass containers.	**CO-4 BTL-2**
MODULE 5 – ASEPTIC PACKAGING OF FOODS	**(9L)**
Sterilization of packaging material food contact surfaces & aseptic packaging systems; active food packaging – definition, scope, physical and chemical principles involved. Edible films and coatings– use of edible active layers to control water vapor transfer, gas exchange, modification of surface conditions with edible active layers. Oxygen absorbents – classification, factors influencing the choice of oxygen absorbents, Ethanol vapor: ethanol vapour generator, uses of ethicap for shelf-life extension of food, effect of ethanol vapour on food spoilage/food poisoning bacteria, and advantages and disadvantages of ethanol/vapour generators.	**CO-5 BTL-2**
TEXT BOOK	
1.	Robertson, G.L. (2016). Food Packaging: Principles and Practice (2nd ed.), Taylor & Francis
REFERENCE BOOK	
1.	Ahvenainen, R. (2014) Novel Food Packaging Techniques, CRC Press.

COURSE TITLE	QUALITY CONTROL MANAGEMENT			CREDITS	3
COURSE CODE	FTC1708	COURSE CATEGORY	PE	L-T-P-S	3-0-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Course Description	The course deals about providing safe and wholesome food to consumers through quality control methods. Sensory evaluation the most important feature in product development is discussed in detail.
Course Objective	To enable the students 1.To understand basic sensory quality attributes of raw and processed foods. 2.To provide an insight of basic tastes and derived tastes in food. 3.To understand the methods of detecting food adulterants 4.To provide fundamental knowledge on food safety aspects 5.To provide in-depth knowledge on food laws and regulations
Course Outcome	Upon completion of this course, the students will be able to 1.Apply the principles of sensory science in product development 2. Identify the various chemical, physical contaminants during processing, packaging and storage 3. Detect food adulteration by various techniques 4. Analyse quality of the processed food products 5.Compile various methods of sensory evaluation

Prerequisites: FTC1708 FOOD QUALITY TESTING AND EVALUATION

CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PSO-1	PSO-2	PSO-3
CO-1	2	-	2	2	2	-	1
CO-2	-	1	1	-	-	2	1
CO-3	1	1	2	1	2	2	2
CO-4	-	-	-	-	2	1	1
CO-5	1	2	2	1	1	-	-

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1 – FOOD QUALITY	**(9L)**
Introduction to food quality management - Definition, quality concepts, quality, quality perception, quality attributes, safety, health, sensory, shelf life, convenience, extrinsic attributes, factors affecting food quality. Total food quality management functions.	**CO-1 BTL-2**
MODULE 2 – FOOD CONTAMINATION	**(9L)**

Contamination in Food-: Physical, Natural toxins, chemical, heavy metals, antibiotics, dioxins, environmental pollutants. Contaminants formed during processing nitrosamines, acrylamide, contaminants form packaging materials.	**CO-2** **BTL-2**
MODULE 3 – FOOD ADDITIVES	**(9L)**
Meaning, Need, Classification, Characteristics and classification of food additives. Antimicrobial agents – Nitrites, sulphides, sulphur di oxide, sodium chloride, hydrogen peroxide. Colors- Importance, classification- natural, artificial colours	**CO-3** **BTL-3**
MODULE 4 –FOOD SAFETY	**(9L)**
GRAS (Generally Recognised as Safe). Permissible limit for Food additives. ADI, LD50. Food labelling.	**CO-4** **BTL-2**
MODULE 5 – FOOD LAWS, STANDARDS AND REGULATIONS	**(9L)**
National and International Food laws & regulations: FSSAI, FPO, PFA, AGMARK, BIS, ISI, HACCP, USFDA, EU, Codex alimantarious. World Trade Organization- Sanitary and Phyto Sanitary agreement, Technical Barriers in Trade, Tinned foods -Standards of Identity, Standards of Quality.	**CO-5** **BTL-2**
TEXT BOOK	
1.	Heather A. (2015) Sensory evaluation practices. Fifth edition. CRC press
REFERENCE BOOK	
1.	Gail Vance (2014) Sensory evaluation practices. Fifth edition. CRC press
E BOOK	
1.	https://face-cii.in/sites/default/files/presentation/3dec/Aruna%20ram%20Kumar.pdf