

ದಾವಣಗೆರೆ ಖಶ್ವವಿದ್ಯಾನಿಲಯ

ಆಹಾರ ತಂತ್ರಜ್ಞಾನ ಅಧ್ಯಯನ ವಿಭಾಗ,

ಶಿವಗಂಗೋತ್ರಿ, ದಾವಣಗೆರೆ-577 007.

ಡಾ. ರವಿಕುಮಾರ ಪಾಟೀಲ್ ಹೆಚ್.ಎಸ್

ಅಧ್ಯಕ್ಷರು (ಅಧ್ಯಯನ ಮಂಡಳಿ)

ದೂ: 99024 22122

ದಿನಾಂಕ:20/09/2024

ಸಂಖ್ಯೆ:ದಾವಿವಿ:ಆತ:2023-24/467

ರೆ. ಕುಲಸಚಿವರು (ಆಡಳಿತ) ದಾವಣಗೆರೆ ವಿಶ್ವವಿದ್ಯಾನಿಲಯ ದಾವಣಗೆರೆ - 577 007



ಮಾನ್ಯರೆ,

ವಿಷಯ: ಅಧ್ಯಯನ ಮಂಡಳಿ ಸಭೆಯ ನಡಾವಳಿ ಹಾಗೂ ಪರೀಷ್ಕರಣೆ ಮಾಡಿರುವ ಪಠ್ಯಕ್ರಮವನ್ನು ಕಳುಹಿಸುತ್ತಿರುವ ಕುರಿತು.

ಸಂಬಧಿಸಿದಂತೆ, ತಂತ್ರಜ್ಞಾನ ಅಧ್ಯಯನ ಮೇಲ್ಕಂಡ ವಿಷಯಕ್ಕೆ ಆಹಾರ 2024-25ನೇ ಸಾಲಿನ ಸ್ನಾತಕೋತ್ತರ ಹಾಗೂ ಪಿಹೆಚ್.ಡಿ. ದಿನಾಂಕ:20/09/2024ರಂದು ಪರೀಷ್ಕರಣೆಯ ಸಂಬಂಧ ಅಧ್ಯಯನ ಮಂಡಳಿ ಸಭೆಯನ್ನು ನಡೆಸಲಾಯಿತು. ಸದರಿ ಸಭೆಯಲ್ಲಿ ಪರೀಷ್ಕರಣೆ ಮಾಡಿರುವ ಪಠ್ಯಕ್ರಮ ಹಾಗೂ ಸಭೆಯ ನಡಾವಳಿಯನ್ನು ಈ ಪತ್ರದೊಂದಿಗೆ ಲಗತ್ತಿಸಿ ತಮ್ಮ ಮುಂದಿನ ಕ್ರಮಕ್ಕಾಗಿ ಕಳುಹಿಸಿಕೊಡುತ್ತಿದ್ದೇವೆ.

ವಂದನೆಗಳೊಂದಿಗೆ.

ದಾವಣಗೆರೆ ವಿಶ್ವವಿದ್ಯಾನಿಲಯ ಶಿವಗಂಗೋತ್ರಿ ದಾನಗಣಿಸೆ-577 007 2 3 SEP 2024 non: 3203

ಅದ್ಯಯನೆ ನುಂಡೆಳ ಅಧ್ಯಯಸ ಪ್ರಾಣಗ ್ಯಾ_{ನಿಲ}ಯ ಆಹಾರ

ಅಡಕಗಳು :

- ಅಧ್ಯಯನ ಮಂಡಳಿ ಸಭೆಯ ನಡಾವಳಿ ಹಾಗೂ ಆನ್ ಲೈನ್ ಸಭೆಗೆ ಹಾಜರಾದ ಸದಸ್ಯರ ಛಾಯಾಚಿತ್ರ
- 2. ಸ್ನಾತಕೋತ್ಕರ ಹಾಗೂ ಪಿಹೆಚ್.ಡಿ ಪದವಿಯ ಪರೀಷ್ಕರಣೆ ಮಾಡಿರುವ ಪಠ್ಯಕ್ರಮ

• P.G. and Ph.D.(Course Wok) Food Technology syllabus prepared (revised) in 2024-25 and discussed the syllabus with few changes were made from that of the curriculum prepared by BoS committee members. Submitted the same for approval.

The Chairman thanked all the members for their active participation and kind cooperation.

Chairman and Member	rs in the Board of Studies	Signature
Prof. Ravikumar Patil H S	Chairman BoS	18 - Jan
Dr. Shankar J	Member	
Dr. Paramesha M	Member	Edm Ole,
Dr. Veeresh S J	Member	Online
Dr. Giridhar P	External Member	Absent
Dr. Shyam Kumar V	External Member	Online

(Prof. Ravikumar Patil H S)

ತಹಾರ ತಂತ್ರಪ್ಪಾನ ಅಪ್ಪಯನ ವಿಭಾಗ ದಾವಣಗೆರೆ ಎಕ್ಟವಿಬ್ಯಾನಿಲಯ ಶಿವಗಂಗೋತ್ತಿ. ದಾವಣಗೆರೆ~57700**7**





ಅಧ್ಯಕ್ಷರು ಅಧ್ಯಯನ ಮಂಡಳ ಆಹಾರ ತಂತ್ರಜ್ಞಾನ ಅರ್ಧಯನ ವಿಭಾಗ ಧಾವಣಗೆರೆ ಏಕ್ಷ ಎನ್ಯಾನಿಲಯ ಶಿವಗಂಗೋತ್ರಿ, ದಾವಣಗೆರೆ–5770ಟ್





Department of Studies in Food Technology

CURRICULUM
For the
Academic year 2024 – 2025 onwards

Program structure of

M. Sc. Food Technology

Under

Credit based Semester and Grading system

To be implemented from academic year 2024-25

Department of Studies in Food Technology Shivagangotri, Davangere University, Davanagere-577007

ABOUT THE DEPARTMENT:

The Department of Studies in Food Technology was established in the year 2005-06 in a single room at PG Centre of Kuvempu University, Davangere under the eminent leadership of Prof. Basavaraj Madhusudhan and the supporting teaching staff from Department of Biochemistry with M.Sc., (Food technology) prog amme. In the year 2009 the Department of studies in Food Technology has become independent and fully functional under newly established Davangere University. In 2019, the department is expanded with the greater facilities and moved into the present new building and empowered with highly skilled young and energetic permanent faculties who are the academic catalyst at the department to build and prosper the academic and research initiatives at the department. The department has fully completed 16 glorious years of inception.

The department besides M.Sc. programme also offers Ph.D. programmes in major fields of Food Technology such as Food, Drug Nanotechnology, Natural Products, Functional Foods, Therapeutic food formulation, Nutrition, Cancer biology, Food Microbiology, Food immunology, Food Biochemistry and Food Biotechnology, Food Bioactive molecules from dietary sources, Bioremediation and Biotransformation.

The Food Technology Department has successfully established Research centre for Nanoscience and technology (RCNT), Food processing centre (FPC) to provide research and skill training to students. It had established MoU with institutes, industries and universities of national and international repute and excellence in Food technology to promote student exchange and collaborative research in various streams of Food Technology. The department had received research grant from national and state funding agencies and efficiently integrating many projects related to food applications. Currently, department is looking towards a megaproject on establishment of Food processing centre to promote food research and socio-economic support to the indigenous food commodities with better value and nutrition and diverse food products.

DEPARTMENT VISION AND MISSION:

VISION: To be a leading Food Technology department that imparts quality technical education with strong research component, to develop solutions in the field of food & nutrition, health and environment.

MISSION: To provide quality technical education in a conducive learning environment to produce professionals, researchers with a zeal for lifelong learning and a commitment to society.

PROGRAMMES OF THE DEPARTMENT

The department presently executes two academic programmes to nurture the need and interest of students to pursue academic degree the field of Food technology in the jurisdiction of Davangere University.

- Master of Science (M Sc) in Food Technology
- Doctor of Philosophy (PhD) in Food Technology

Programme Objectives (PSOs)

- PO1: Apply the knowledge of science, engineering fundamentals, and mathematical concepts to the solution in the field of food technology.
- PO2: Identify, formulate, review research literature, and analyze complex Food Technology/applications problems and Design solutions for complex problems and design system components or processes that meet the specified needs with appropriate consideration for the food sustainability.
- PO3: Acquire the practical knowledge and demonstrate the ability to design, conduct/troubleshoot experiments and analyze data in the field of food technology
- PO4: Understand the impact of the professional food technology solutions in societal and environmental contexts, and apply ethical principles and commit to professional ethics and responsibilities and communicate effectively and write effective reports and design documentation, make effective presentations.

Program Specific Outcomes (PSO)

- PSO1: To have thorough grounding in Biology, Chemistry and Mathematics.
- PSO2: To be proficient in the principles and practices of Advanced Food Technological / biological sciences
- PSO3: To apply Food technology principles to biological systems to address the societal Problems.

M. Sc. Food Technology (CBCS) Course Structure (2024-25 onwards)

					Marks			T
Semester	Subject/Pape r Code	Title of the Paper	Instructio n	Examination	Internal Assessme	Total Marks	Credits	Examination duration (Hrs.)
		THEORY PAPERS						
	FT 1.1	Food Biochemistry	4	70	30	100	4	-, 3
	FT 1.2	Food microbiology	4	70	30	100	4	3
	FT 1.3	Nutraceuticals and Functional Foods	4	70	30	100	4	3
	FTS1.4A	Food Processing and Preservation Technology	4	70	30	100	4	3
	FTS1.4B	Cell Biology and ^T luman Physiology	4	70	30	100	4	3
-	FTV1	Food Nutrition and Health	2	40	10	50	2	2
SEMESTER-I		PRACTICAL PAPERS		:				
STI	FT 1.5	Food Biochemistry Laboratory	4	40	10	50	2	3
/E	FT 1.6	Food microbiology Laboratory	4	40	10	50	2	3
SEN	FT 1.7	Nutraceuticals and functional foods Laboratory	4	40	10	50	2	3
01	FT 1.8A	Food Processing and Preservation Technology Laboratory	4	40	10	50	2	3
	FT 1.8B	Cell Biology and Human Physiology Laboratory	4	40	10	50	2	3
	Mano	latory Credits: English Language, Communication Skill	2				2	
		THEORY PAPERS		ا ا				
	FT 2.1	Food Analytical Techniques	4	70	30	100	4	3
	FT 2.2	Food Engineering and Enzyme Technology	4 .	70	30	100	4	3
	FT 2.3	Nutrition and Therapeutic Foods	4	70	30	100	4	3
	FT 2.4A	Food Biotechnology	4	70	30	100	4	3
	FT 2.4B	Food Toxicology and Drug Interaction	4	70	30	100	4	3
SEMESTER-II	FTV2	Food Hygiene and culinary science	2	40	10	50	2	2
		PRACTICAL PAPERS					· · · · · · · · · · · · · · · · · · ·	
ES	FT 2.5	Food Analytical Techniques Laboratory	4	40	10	50	2	3
M	FT 2.6	Food Engineering and Enzyme Technology Laboratory	4	40	10	50	2	3
S	FT 2.7	Nutrition and Therapeutic Foods Laboratory	4	40	10	50	2	3
	FT 2.8A	Food Biotechnology Laboratory	4	40	10	50	. 2	3
	FT 2.8A	Food Texicology and Drug Interaction Laboratory	4	40	10	50	2	3
		Mandatory Credits: Computer Skill	2 :	:			2	
		THEOF Y PAPERS		:				
	FT 3.1	Food Preservative, Additive and Packaging	4	70	30	100	4	3
	FT 3.2	Dairy Technology	4	70	30	100	4	3
	FT 3.3	Meat, Poultry and Fish Processing Technology	4	70	30	100	4	3
ļ.	FT 3.4A	Post-Harvest Management of Foods	4	70	30	100	4	3
	FT 3.4B	Bio-processing and Fermentation Technology	4	70	30	100	4	3
	FTE 3.5A	Nutraceuticals	2	40	10	50	2	2
_	FTE 3.5B	Food and Health	2	40	10	50	2	2
SEMESTER-III	FTS1	Food Nanotechnology	2	40	10	50	2	2
Ē	:	PRACT*CAL PAPERS						
ST	FT 3.6	Food Preservative, Additive and Packaging Laboratory	4	40	10	50	2	3
M	FT 3.7	Dairy Technology Laboratory	4	40	10	50	2	3
SE	FT 3.8	Meat, Poultry and Fish Processing Technology Laboratory	4	40	10	50	2	3
ŀ	FT 3.9A	Post-Harvest Management of Foods Laboratory	4	40	10	50	2	3
	FT 3.9B	Bio-processing ar I Fermentation Technology Laboratory	4	40	10	50	2	3
				L				

		THEORY PAPERS & PROJECT WORK/D	ISSER	TATIO	N			
	FT 4.1	Biostatics, Bioinformatics and Research Methodology	4	70	30	100	4	3
	FT 4.2	Waste management, Food Law, IPR and Entrepreneurship	4	70	30	100	4	3
	FT 4.3A	Bakery and Confectionary Technology	4	70	30	100	4	3
	FT 4.3B	Clinical nutrition and diet Therapy	4	70	30	100	4	3
	FT 4.4	Project Work/Dissertation	6	70	30	100	6	3
	FTS2	Food Product Development and Sensory Evaluation	2	40	10	50	2	2
2	PRACTICAL PAPERS & STUDY TOUR/FIELD VISIT							
LER-	FT 4.5	Biostatics, Bioinformatics and Research Methodology Laboratory	4	40	10	50	2	3
SEMESTER-	FT 4.6	Waste management, Food Law, IPR and Entrepreneurship Laboratory	4	40	10	50	2	3
SE	FT 4.7A	Bakery and Confectionary Technology Laboratory	4	40	10	50	2	3
	FT 4.7B	Clinical nutrition and Diet Therapy Laboratory	4	40	10	50	2	3
		Study Tour/Field Visit						
	Mandator	y Credits: Personality Development	2	:			2	
		lits for the Course	142	;		2600	112	

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Registrar
Davangere University
Shivagangotri, Davangere



Department of Studies in Food Technology

Shivagangotri, Davangere-5 77 007

I SEMESTER

					Marks	1		
Semester	Subject/Paper Code	Code Code Title of the Paper	Instruction Hrs./week	Examination	Internal Assessment	Total Marks	Credits	Examination duration (Hrs.)
		THEORY PAPERS						
	FT 1.1	Food Biochemistry	4	70	30	100	4	3
	FT 1.2	Food microbiology	4	70	30	100	4	3
	FT 1.3	Nutraceuticals and Functional Foods	4	70	30	100	4	3
	FTS1.4A	Food Processing and Preservation Technology	4	70	30	100	4	3
	FTS1.4B	Cell Biology and Human Physiology	4	70	30	100	4	3
	FTV1	Food, Nutrition and Health	2	40	10	50	2	2
-	PRACTICAL PAPERS							
ER	FT 1.5	Food Biochemistry Laboratory	4	40	10	50	2	3
S	FT 1.6	Food microbiology Laboratory	4	40	10	50	2	3
SEMESTER-I	FT 1.7	Nutraceuticals and functional foods Laboratory	4	40	10	50	2	3
	FT 1.8A	Food Processing and Preservation Technology Laboratory	4	40	10	50	2	3
	FT 1.8B	Cell Biology and Human Physiology Laboratory	4	40	10	50	2	3
	Mand	atory Credits: English Language, Communication Skill	2				2	

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Registrar Davangere University Shivagangotri, Davangere

FOOD BIOCHEMISTRY

Course Code

: FT 1.1

Credit :4:0:0

Contact Hours

: 64T

Internal Assessment: 30 M

Examination: 70 M

Course coordinator(s): Dr. Pramod S. N.

Course Objective:

• Course will intend to provide structure and physicochemical properties of biomolecules present in the foods.

• It is designed to provide knowledge on dominant occurrence and functionality of Biomolecules in food systems and their significance.

UNIT-I

Water: Biological Properties of Water: Structure and properties of water: Importance of water in biological systems. Ionization of water and concept of pH. Water activity and its influences on food quality and stability. Role of water in food. Carbohydrate: Food sources, occurrence and Abundance. General structure characteristics and Classification. Monosaccharides - Configuration, Conformation, cyclization (glucose, fructose and ribose). Oligosaccharides: formation of glycosidic linkage. Structure and function of lactose, maltose and sucrose. Polysaccharides: Storage polysaccharides - Starch and Glycogen (Homo), Structural polysaccharides - Cellulose, chitin. Glycosaminoglycans (Hetero polysaccharides) and dietary fibers.

16 hours

UNIT-II

Amino acids and peptides: General structure and classification of amino acids based on structure and nutrition. Peptide bond- Formation, characteristic and salient features. Biologically important peptides (glutathione, oxytocin, vasopressin and Insulin). Proteins: Food Sources, occurrence and abundance. Classification based on structure, function and nutritional status. Properties of proteins. Structural organization of proteins-Primary, Secondary, Tertiary and Quaternary structure of proteins. Forces involved in the maintenance of tertiary structure of proteins. Denaturation and renaturation of proteins.

16 hours

UNIT-III

Lipids: Food sources, occurrence and abundance. General properties and Classification. Structure & function of Fatty acids, acylglycerols, phospholipids, sphingolipids —cerebrosides and gangliosides. Structure and functions of Lipoproteins and lipopolysaccharides. Cholesterol and cholesterol esters.

Nucleic acids: Structure of Nitrogenous bases, Nucleosides and Nucleotides, Formation of Phosphodiester bond. Structure of DNA: A, B and Z DNA. Structure of RNA- mRNA, rRNA and tRNA - Clover leaf model and inverted L loop model.

16 hours

UNIT-IV

Metabolism: Metabolic enzymes, functions of Enzymes and importance in metabolism. Metabolism-Anabolism and catabolism and compartmentalization of metabolic pathways. Glycolytic pathway, gluconeogenesis, tricarboxylic acid cycle and Electron transport chain. Energy yields and importance. Anapleurosis, Glycogen Metabolism (br ef). Protein degradation- oxidation of amino acids, Glucose- alanine cycle, Fiosynthesis and nonessential amino acids- Alanine, Aspartate, Glutamate. Degradation of triglycerols (beta oxidation), Biosynthesis of fatty acids.

Sl.	Reference Text Books
No.	
1	Lillian Hoagland Meyer (1974) Food Chemistry, The AVI Publishing Co Inc., Connecticut, MA, USA
2	Eskin NAM, Henderson HM and Townsed RJ (1971) Biochemistry of Foods, Academic Press, New York
3	John W. Brady (2013) Introductory Food Chemistry, Cornell University Press, Ithaca, USA
4	HD. Belitz, W. Grosch and P. Schieberle (2009) Food Chemistry, 4th Ed. Springer-Verlag. Berlin Heidelberg
5	Meyer, L. H. (1987) Food Chemistry. CBS publishers and Distributors, New Delhi.
6	David L Nelson, Michael M. Cox. 2008. Principles of Biochemistry. V edition. W.H Freeman and Company. New York.
7	Jeremy M. Berg, John L. Tymoczko, Lubert Stryer. 2007. Biochemistry. VI edition. W. H. Freeman and Company. New York.
8	Lehninger, 2000, Principles of Biochemistry – Nelson & Cox Worth Pub. London.

- Enables to understand physicochemical properties of water, carbohydrate's structure, functions and biological importance.
- Enables to study amino acids, proteins physicochemical properties, structural organization and biological functions
- The study enables to learn on Lipids and Nucleic acids with relevance structure and functional significance.
- Enables to study enzymes and biochemical transformation reactions. Metabolism of Biomolecules and its significance

FOOD MICROBIOLOGY

Course Code

: FT 1.2

Credit

:4:0:0

Contact Hours

: 64T

Internal Assessment: 30 M

Examination: 70 M

Course coordinator(s): Dr. Jadashiv S. O.

Course Objective:

• Course will intend to provide basic knowledge of microbiology and microbial techniques.

• It is designed to provide knowledge on food spoilage and food borne diseases.

UNIT-I

Microbiology: Introduction, historical developments in food microbiology; prokaryotes and eukaryotes; classification of microorganisms - a brief account (Yeast, Mould and Bacteria); Microbiological Techniques - Sterilization, Cultivation of Microorganisms, culture media and types of culture media, Nutritional requirements of microorganisms, Growth curve, Measurement of growth; Isolation of microorganisms - serial dilutions, streak plate, pour plate & spread plate methods; Staining Techniques - Simple and differential, fluorescent, negative, Structural staining - capsule, spore, cell wall and reserved food material, Preservation of cultures.

UNIT-II

Preservation of Foods: General principles involved in food preservation; low temperature preservation; lethal effects of chilling, freezing and thawing; high temperature preservation. Heat resistance of microorganism, heat penetration and thermal processing; Pasteurization, canning and dehydration; chemical preservation and its toxic effects; irradiations; Thermal inactivation of microbes- Concept, determination & importance of Thermal Death Time, F, Z & D values. Food hygiene and sanitation: Contamination during handling, processing of food and its control; Biochemical changes caused by microorganisms.

16 hours

16 hours

UNIT-III

Food spoilage: Determination of microorganisms and their products in food; sample preparation for analysis; Culture dependent methods. Direct microscopic observation, culture, enumeration and isolation methods; Chemical and Physical methods - Chemical, immunological and nucleic acid based methods; Methods to assess microbial diversity, Merits and demerits of culture dependent and culture independent methods; Molecular analysis of bacterial community - Culture independent techniques - Denaturing Gradient Gel Electrophoresis (DGGE), Terminal Restriction Fragmer Length Polymorphism (T-RFLP), Analytical methods for microbial metabolites- microbial toxins and metabolites.

16 hours

UNIT-IV

Food borne diseases: Bacterial food borne diseases - Salmonellosis, Shigellosis, Enteropathogenic *Escherichia coli* Diarrhea; Food Borne Viral Pathogens - Rotavirus, Adenovirus, Hepatitis A Virus; Food borne animal parasites - Protozoa - Giardiasis, Amebiasis; Roundworm - Trichinosis; Mycotoxins- Aflatoxicosis, Mycotoxicosis, Ergotism; Foods microbiology and public health: Indicators microorganisms; Quality assurance: Microbiological quality standards of food: Government regulatory practices and policies- FDA, EPA, HACCP, ISI, and ISO, applications of hurdle technology forcontrolling microbial growth.

Reference Books

Sl. No.	Text Books
· 1	Food Microbiology, Fundamentals and Frontiers, Doyle, P., Bonehat, L.R. and Mantville, T.J (2010): ASM Press, Washington DC
. 2	Bacterial Pathogenesis A Molecular Approach. 2 ^{r-1} Edition. 2001 by Abigail A. Salyers and Dixie D. Whitt. ASM Publications.
3	Basic Food Microbiology, Banwart, G.J. (1997). CBS Publishers.
4	Fundamental Food Microbiology, Bibek Ray (1996). CRC Press.
5	Microbiology; Pelczar, Chan and Krieg; Tata McGraw Hill, Delhi

- Enables to learn basic concepts and techniques of food microbiology.
- It will create awareness of the importance of microbes in food spoilage and food processing.
- Enables to learn about food borne disease and makes to understand regulation of microbial contamination in foods.
- Helps the students to understand the importance of n icrobes in food spoilage, preservation and processing.

NUTRACEUTICALS AND FUNCTIONAL FOODS

Course Code

: FT 1.3

Credit

:4:0:0

Contact Hours

: 64T

Internal Assessment: 30 M

Examination: 70 M

Course coordinator(s): Dr. Shankar J.

Course Objective:

- To study the concepts of nutraceuticals and functional foods
- To study the classification and biological applications of nutraceuticals and phytoconstituents.
- To study the role of prebiotics & probiotics as functional foods, to understand concept of food and drug interactions.

UNIT-I

Nutraceuticals and functional Foods —Definition, concept, history and market; Evolution of nutraceuticals and functional foods market. Classification of nutraceuticals and functional foods. Relation of functional foods and nutraceutical (FFN) to foods and drugs. Therapeutic properties, significance and relevance of nutraceuticals and functional foods in the management of diseases and disorders. Free radical scavengers, Antioxidants, mechanism and biological role of antioxidant molecules, Antioxidant enzymes, selono enzymes and seleno-compounds, Antioxidants as radioprotectors.

16 hours

UNIT-II

Natural occurrence of certain phytochemicals- Classification of Phytochemicals, Nutraceutical activities and chemical properties of flavonoids: omega – 3 fatty acids, carotenoids, dietary fiber, phytoestrogens; glucosinolates; organosulphur compounds. Nutraceutical remedies for acute and chronic studies in human disorders. Isolation of phytochemicals from plant materials: Care in handling and storage of raw materials with minimal damage to sensitive bioactive compounds; Extractive methods for maximum recovery and minimal recovery and minimal destruction of active material; stability studies.

16 hours

Advancement techniques in the isolation and purification of phytochemicals.

UNIT-III

Prebiotics, probiotics and symbiotics- Probiotics: Definition, types andrelevance; Usefulness in gastro intestinal health and other health benefits; development of a probiotic products; recent advances in probiotics; Challenges and regulatory issues related to probiotic products. Prebiotics: Prebiotic ingredients in foods; types of prebiotics and their effects on gut microbes; health benefits of prebiotics; recent development in prebiotics. Symbiotics. Anti-nutrients, Types of inhibitors present in various foods and their inactivation, general adverse effects and interactions of nutraceuticals.

16 hours

UNIT-IV

Functional foods - Definition, development of functional foods, use of bioactive compounds in appropriate form with protective substances and activators; Effect of environmental condition and food matrix; Effects of processing conditions and storage; Development of biomarkers to indicate efficacy of functional ingredients; Research frontiers in functional foods; Nutrigenomics concept of personalized medicine.

Sl. No.	Reference Text Books
. 1	Brian Lockwood (2007). Neutraceuticals. Pharmaceutical Press, USA
2	Shaidi F and Marian Nazck (2007). Phenolics in Food and Nutraceuticals. CRC Press, Florida.
3	Wildman, Robert (2007). Nutraceuticals and Functional Foods, second edition. Taylor and Francis Group.
4	Gibson GR & William CM (2000). Functional Foods - Concept to Product.
5	Goldberg I (1994). Functional Foods: Designer Foods, Pharma Foods.
6	Cupp J & Tracy TS (2003). Dietary Supplements: Toxicology and Clinical Pharmacology. Humana Press.
. 7	Saarela M (2011) Functional Foods: Concept to Product. 2nd edition. Oxford, Cambridge. Woodhead Publishing Ltd. Bagchi D.
8	Brigelius-Flohé, J & Joost HG. (2006). Nutritiona Genomics: Impact on Healthand Disease. Wiley VCH.

- Able to understand the history, concept and development of nutraceuticals as functional foods.
- Able to understand the classification of phytochemicals and its therapeutic applications.
- Able to understand the role of prebiotics, probiotics and symbiotics and its role in health and diseases.
- Able to understand the development of functional foods, role of bioactive molecules and its interactions with drugs.

FOOD PROCESSING AND PRESERVATION TECHNOLOGY

Course Code

: FT 1.4 A

Credit

:4:0:0

Contact Hours

: 64T

Internal Assessment: 30 M

Examination: 70 M

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Course coordinator(s): Dr. Sharath R.

Course Objective:

- Study and understand about food spoilage and factors affecting food preservation.
- To study the concept of food preservation by low and high temperature.
- To make student learn different food preservation and storage techniques.

UNIT-I

Introduction: Aim and objectives of preservation and processing of foods, characteristics of food components, primary sources of microorganisms found in foods, deterioration of food quality, causes of quality deterioration and spoilage of perishable foods, definition of salf life, perishable foods, semi perishable foods, shelf stable foods. Spoilage in canned foods. Classification of food based on pH, Food infection, Historical development of food processing and preservation.

16 hours

UNIT-II

Low temperature Preservation of foods: Chilling temperatures: Considerations relating to storage of foods at chilling temperatures, low temperature applications in food preservation, controlled and modified atmosphere storage of foods. Freezing temperature: Preparation of foods for freezing, freezing process: slow and fast freezing of foods and its consequences, storage stability of frozen foods, effect of freezing on microorganisms. Enfect of freezing rate on quality of food products and thawing of frozen foods.

16 hours

UNIT-III

High temperature preservation of foods: Basic concepts in thermal destruction of microorganisms D, Z, F, values, Heat resistance and thermophilisms in microorganisms. Cooking, blanching pasteurization and sterilization of foods. Assessing adequacy of thermal processing of foods, general process of canning of foods. Canning and bottling: General aspects of canning and bottling, processing operations exhausting and sealing, retorting, ultra-high temperature processes, determination of thermal process time, processing equipment, canning and bottling of various food products.

16 hours

UNIT-IV

Preservation by Dehydration: Principles, technological aspects and applications of drying and dehydration of foods. drying phenomenon, factors affecting rate of drying, methods of drying of various food products, type of driers and their suitability for different foods; intermediate moisture food processing. Principles, technological aspects and applications of evaporative concentration processes, Freeze concentration and membrane processes for food concentrations. Other techniques in preservation: Principles and applications of sugar and salt, antimicrobial agents, Sources of radiations, effect on microorganisms and different nutrients. Radiation units and doses for foods, dose requirements for radiation, preservation of foods, safe limits irradiation mechanism and survival curve, irradiation of packaging materials.

Sl. No.	Reference Text Books
1	Osman Erkmen and T. Faruk Bozoglu (2016) Food Microbiology Principles in to Practice, John Wiley & Sons, Ltd, UK.
2	Norman N. Potter and Joseph H. Hotchkiss (2013) Food Science, CBS publishersand Distributors.
3	James M Jay (2012) Modern food microbiology, 5th Edn, CBS publishers and Distributors.
4	B. Sivasankar (2009) Food processing and preservation, Eastern economy edition, Prentice-Hall of India Pvt. Ltd.
. 5	John M DeMan (2013) Principles of Food Chemistry, 3rd Edition, Springer Verlag

- Able to understand the basic concepts of different source of contamination and food spoilage parameters.
- Able to understand concept and mechanisms food preservation by low temperature storage.
- Able to understand concept and mechanisms food preservation by high temperature processing.
- Learn and aware about concentration mechanism to minimize contamination and to increase self life period of processed foods through dehydration, additives and radiation sterilization.

CELL BIOLCGY AND HUMAN PHYSIOLOGY

Course Code

: FT 1.4 B

Credit

:4:0:0

Contact Hours

: 64T

Internal Assessment: 30 M

Examination: 70 M

Course coordinator(s): Dr. Poornima DV

Course Objective:

- To acquire the basic concepts of cell theory, structure and functions of cellular organelles and overview on cellular interactions.
- To learn about structure & function of plasma members, membrane transportation, concepts of cell cycle, cell division, mechanism of cell death by apoptosis and necrosis.
- To acquire the knowledge human physiological process and learn about physiological functions of organs and organ systems.

UNIT-I

Cell Theory: Diversity of cell size and shape: Structure of Prokaryotic and Eukaryotic Cells. Structure, functions and difference between animal and plant cellular systems. Sub-cellular fractionation, marker enzymes and criteria of functional integrity. Cellular organelles: The ultra-structure of Nucleus, chromosomes, mitochondria, chloroplast, ribosomes, endoplasmic reticulum, golgi complex, lysosomes and peroxisomes. Cellular interactions: Cell- cell interaction and cell matrix interaction, extracellular matrix, proteoglycan and collagen, Cell – cell adhesion, catherins, desmo omes, gap junction and tight junction. Endocytosis and phagocytosis.

16 hours

UNIT-II

Plasma membrane: Structure, functions and chemical composition of biological membranes. Structure of fluid mosaic model. Simple diffusion- definition, egs. Facilitated transport- definition, types with examples. Symport, uniport and antiport. Active transport- Primary active transport, secondary active transport, Ion channels. Cell cycle and cell divisions: Cell cycle- different phases (G1, S, G2 and M phase) Cell cycle regulations, cell division - Mitosis and meiosis (fundamental study), phases and events in karyok nesis and cytokinesis. Apoptosis and necrosis: Definition, difference between apoptosis and necrosis, cutline study of basic apoptotic pathway, Autophagy and its significance. Respiration- Mechanism of respiration, Transport of oxygen and carbon dioxide in blood, oxygen dissociation curve and Bohr effect. Regulation of respiratory system and waste elimination.

16 hours

UNIT-III

Digestion and absorption: Digestion and absorption of carbohydrates, proteins, and lipids. Defects in digestion and absorption. Generation of gastric HCl, gastric and bile juice - composition and function. Structure of villi, absorption mechanism and importance of portal vein in nutrient transport. Biology of Blood: Formation of blood cells, Constituents of blood, types of cells, components of plasma, types of plasma proteins and function, Blood buffers. Mechanism of blood clotting, Clotting factors, anticoagulants, fibrinolysis, Types and function of haemoglobin.

16 hours

Renal function- Kidneys, location structure and importance. Structure of nephrons, renal excretory mechanism (glomerula filtration, tubular reabsorption and sectretion). Composition of urine, regulation of water and electrolyte balance.

UNIT-IV

Biochemistry of Specialized tissues: Liver: Introduction, structure of lobule, functions of the lobule, Importance and mechanism of detoxification in brief. Muscle system- types of muscles, muscle cell-sarcomere, muscle proteins, mechanism of muscle contraction (Sliding filament theory). Sources of energy for muscle contraction, Role of myoglobin and creatinine phosphate. Nervous system – Introduction to nerve system, classification and nerve cell. General structure of neurons, mechanism of conduction of nerve impulse, membrane action potential, synaptic transmission, neurotransmitters. Blood brain barrier and special sensory organs, visual cycle and sensory receptors.

16 hours

Osteology- Definition, structure and composition of Bone, growth and remodeling of bone, Role of calcium, phosphorus, vitamin D and hormones in bone metabolism. Role of Collagen in bone formation and other factors affecting bone growth.

Sl.	Reference Text Books
No.	
1	Cell Biology by S.C. Rastogi. New Age International Publishers.
2	Cell Biology by Varma and Agarwal. S Chand Publishers.
3	Cell Biology by Gerald Karp, Global Edition, Wiley International Publishers.
4	Molecular Cell Biology by Harvey F. Lodish, 4th Edition, W H Freeman & Co,
	Publishers.
5	Molecular Biology of the Cell by Bruce Alberts, Gerald Publications.
6	Cell and Molecular Biology by Phillip and Sheeler and Don Bianchi, John Wiley &
	Sons Publishers.
7	Human Physiology by C.C. Chatterjee, CBS Publishers and Distributors.
8	Human Physiology: The mechanisms of body function. Eric P. Widamaier et al.,
	McGraw-Hill Education.
9	Textbook of Medical Physiology by Guyton and Hall, Elsevier Saunders Publishers.
10	A textbook of Human Physiology by Ravikumar Patil H.S. I K International
	publishing House Pvt. Ltd.
11	Textbook of Physiology by A.K. Jain. Avichal Publishing Company (APC)
12	Human Physiology by A. Blaisdall, Sports Publishers.

- It enables to understand types, cell structure, organization of components and functions.
- Enables to learn cellular transport, cell cycle, apoptosis and necrosis.
- Help students to learn concept of organ and orgn system to understand physiological functions
- Able to understand the structure and functions of liver.

FOOD, NUTRITION AND HEALTH

Course Code

: FTV1

Credit

:2:0:0

Contact Hours

: 32T

Internal Assessment: 10 M

Examination: 40 M

Course coordinator(s): Dr. Pramod SN

Course Objective:

- The course helps students to acquire information about food Science, nutrition and health.
- The course provides importance of food in health and disease and creates awareness among students about food in nutrition and health management.

UNIT-I

Food as nourishment to boly: Food as source of nutrients, Physical and chemical properties, classification, functions; interdependence and metabolism in the human body. Eating Behavior: Definition of satiety, hunger and appetite. Physiological, psychological and biochemical factors. Food as nutrient: Classification of food groups, RDA, factors influencing nutrient requirements-growth, physical activity, pregnancy and chronic disease. Nutritional outcome in respect of different levels of intake, balance diet, over and under nutrition and significance of energy balance. Special nutrition during pregnancy and lactation. Nutrition through life cycle.

16 hours

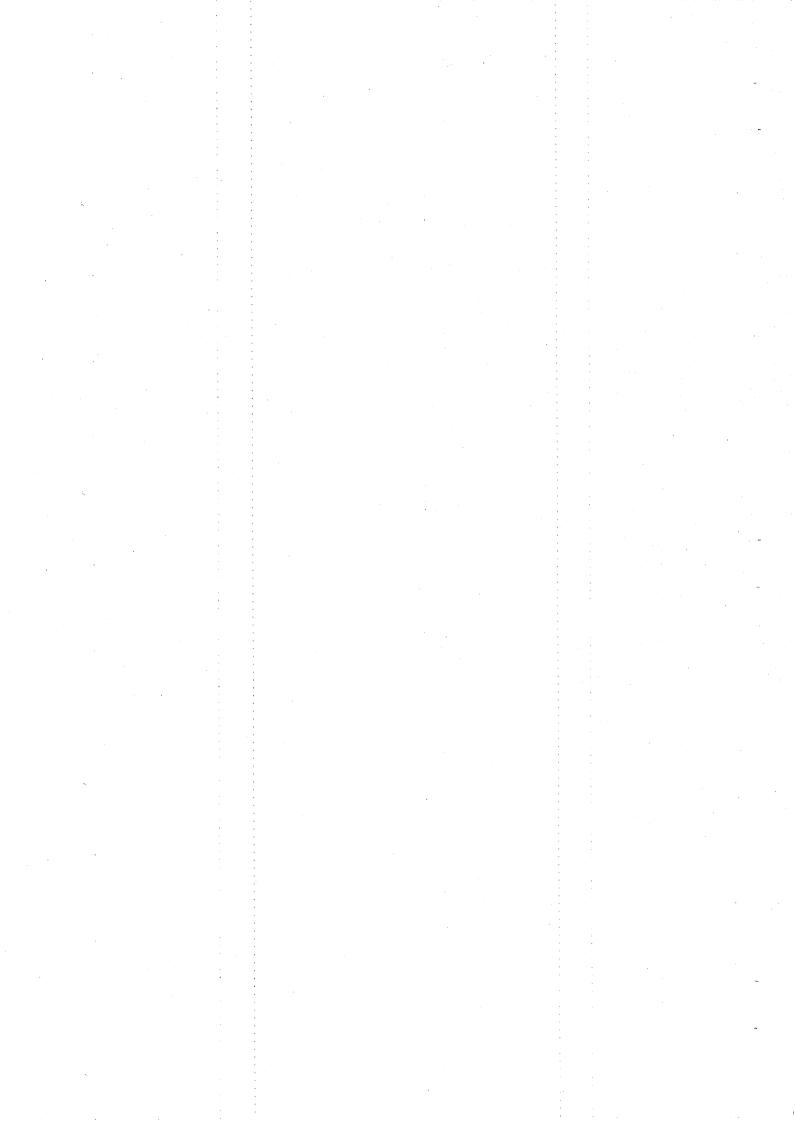
UNIT-II

Health indicators: Definition of Health, Food and health, Use of growth curve to interpret nutritional status. Bl/II significance. Pediatric, adult and geriatric nutrition. Methods of improving nutritional status at individual, family and community levels. Nutritional deficiency disease: protein energy mal nutrition, synergetic relationship of diarrhea and malnutrition. Adult chronic disease-obesity, hypertension, hear diseases and cancer. Factors affecting lifestyle disease and relevance to food and nutrition. Approaches to prevention, control and management of nutritional related disorders.

16 hours

Sl. No.	Reference Text Books
1	Mahan, L. K. and Escott-Stump, S. (2008): Krause's Food Nutrition and Diet Therapy, 12 th , Edition, W-13 Saunders Ltd., Canada.
2	Garrrow J. S, James W. P. T, Ralph A, (2000), Human Nutrition and Dietetics, 10 th edition, Churchill Livingston, London.
4	Williams, S. R. (2003): Nutrition and Diet Therapy, 7th Edition, Times Mirror/Mosby Collage Publishing

- Acquire knowledge on concept of Food components, nutrients and role in health and disease
- Enables the students to gain knowledge on food nutrients, importance of food in acquiring nutrition and maintain good health.
- The students will be e lucated with food and nutrition during health and disease.



FOOD ANALYTICAL TECHNIQUES

Course Code

: FT 2.1

Credit

:4:0:0

Contact Hours

: 64T

Internal Assessment: 30 M

Examination: 70 M

Course coordinator(s): Dr. Pramod S N

Course Objective:

- The course concept was designed to help students to acquire the knowledge on the working principle of various analytical techniques used in food analysis.
- The course provides the theoretical knowledge and practical applications and utilization of analytical instruments to evaluate food components.

UNIT-I

Bioanalytical parameters: Concept of specific gravity, viscosity, solvent, solute, solutions, homogenous and heterogeneous solutions, ionic solutions, ionic strength; molarity, normality, mole concept. Buffers- composition, preparation of buffers and buffer action. Analytical techniques and quality parameters.-Precision; accuracy; sensitivity; specificity; random error; systematic error. Analytical sample preparation methods: Food samples, source and selection methods for analysis. Extraction, choice of solvent for extraction of food components, aqueous and solvent extraction methods. Homogenization techniques-physical, chemical and enzymatic homogenization. Separation and concentration techniques- filtration, ultrafiltration, precipitation, Solubalization, Lyphilization and Dialysis.

16 hours

UNIT-II

Centrifugation: Principle and Definition, Relative centrifugal force (RCF); Different types of rotors used and their importance. Preparative centrifugation; Differential, Rate-Zonal, isop cnic (Equal density) centrifugation; analytical ultracentrifugation and their ap_rlications. Chromatography: Basic principles of chromatography. Distribution coefficient. Partition and adsorption principle. Planar chromatography- Paper and TLC. Column chromatography- Gel permeation, Ion-exchange and Affinity chromatography and their applications. GLC, HPLC and their applications in food component analysis.

16 hours

UNIT-III

Electrophoresis: Basic principle and definition; Types of electrophoresis-Moving boundary and Zone electrophoresis; Factors affecting electrophoretic separation of molecules. Principles and applications of native PAGE and SDS-PAGE, 2-D Isoelectrofocussing, electrophoresis. Agarose gel electrophoresis, Immunological and molecular techniques: ELISA, RIA, Immunoprecipitation, ODD assay. Southern blotting; Northern blotting and Western blotting. PCR. Microscopic Techniques: Light Microscopy; Fluorescence microscopy, Atomic microscope, Electron microscope, Scanning electron microscopy, Transmission Electron microscope.

16 hours

UNIT-IV

Spectroscopy: Electromagnetic spectrum, Laws governing light absorption (Beer-Lambert law) and their limitations. Visible light-colour complementation, principle and construction of colorimeter and spectrophotometer. Principle, instrumentation and applications of UV-Visible spectrophotometry, Turbidimetry, Nephelometry, Fluorescence spectrometry, Flame photometry and IR spectroscopy; Basics of NMR spectroscopy and Mass spectrometry. Proximate analysis: Moisture, fat, Protein, fiber, carbohydrates, ash, vitamins, minerals and other concept in food. Rheology: introduction and rheological parameters Factors affecting rheological parameters.

Sl. No.	Reference Text Books
· 1	Thimmaiah SK, Thimmaiah SK. Standard methods of biochemical analysis. Kalyani publishers; 2004.
2	Biophysical Chemistry. Upadhyay and Upadhyay, 2010 Himalayan Publishing House.
3	Instrumental Methods of Chemical Analysis – Chatwal and Anand (1991) 7th Edn., Himalayan Publishing House
4	Principles and techniques of Biochemistry and Molecular Biology; Keith Wilson and John Walker; 7th Edn. (2010) Cambridge University Press.
5	Physical Chemistry for the Biosciences; Raymond Chang.

- Learn about the basic concepts of solutions and buffers for the reagent preparation and food homogenization.
- Understand the basic principles and concepts of centrifugation and chromatography techniques for food component separation and analysis.
- Able to learn the utilization of various microscopic, electrophoresis and other immunological and molecular techniques for food analysis.
- Able to understand the techniques for systematic proximate analysis of food and rheological properties and effect of radioisotopes in food analysis and applications.

FOOD ENGINEERING AND ENZYME TECHNOLOGY				
Course Code : FT 2.2 Credit	:4:0:0			
Contact Hours : 64T Internal Assessment: 30 M Examinati	on: 70 M			
Course coordinator(s): Dr. Ravikumar Patil H.S				
Course Objective:				
 Understand the basic principles and concepts of Food Engineering and how it relates 	to food			
processing. Examine the liversity of enzymes founding different types of food and the				
applications in food processing.				
Course helps food plant design, Technology and structure of different mechanism and	also			
advantages and their applications. Evaluate the impact of food engineering and				
enzyme technology on quality, safety and shelf life of processed foods.				
UNIT-I: Heat and Mass Transfer in Food Processing				
Introduction to Heat Transfer:	, 			
Modes of heat transfer (conduction, convection, radiation), Heat transfer in food systems, Applications in food processing (pasteurization, sterilization, drying), Thermal properties				
of foods.	16 hours			
Heat Exchangers and Equipment:				
Design and operation of heat exchangers, Plate heat exchangers, tubular heat exchangers,				
Applications in milk pasteurization, juices, etc.				
Mass Transfer Principles:				
Diffusion and convective mass transfer, Mass transfer in food dehydration and extraction Processes, Practical calculations on heat and mass balance in food processing.				
Trocesses, Tractical calculations of fical and mass barance in food processing.				
UNIT-II: Food Drying and Dehydration Technology				
Fundamentals of Drying:				
Principles of drying, types of moisture in food. Water activity, its significance in food	•			
Preservation. Rate of drying, drying curves. Types of Dryers:				
Tray dryer, spray dryer, drum dryer, freeze dryer. Equipment design and operating	16 hours			
Principles. Applications in milk powder, fruit, and vegetable dehydration.				
Dehydration Technologies:				
Recent advancements in dryir 3 technologies (e.g., microwave-assisted drying). Effects	·			
of dehydration on nutritional and sensory properties of food .	***			
UNIT-III: Enzyme Kinetics and Applications in Food Processing	,			
Enzyme Classification and Properties				
Classification of enzymes and enzyme specificity. Factors affecting enzyme activity (pH, temperature, inhibitors). Kinetics of enzyme action (Michaelis-Menten equation,				
Lineweaver-Burk plot).				
Enzyme Technology in Food Processing:	16 hours			
Role of enzymes in food modification (e.g., proteases, amylases, lipases). Industrial				
Enzyme. production and purification techniques. Applications in dairy, brewing, baking,				
and meat industries.				
UNIT-IV ;Immobilized Enzymes and Novel Enzyme Applications	461			
Immobilization Techniques: Mathodo of organic immobilization (adaptation povelent handing entrapment)	16 hours			
Methods of enzyme immobilization (adsorption, covalent bonding, entrapment). Advantages and disadvantages of immobilized enzymes. Applications in the food				
industry (e.g., lactose-free milk, high-fructose syrups).				
Novel Applications of Enzymes:				
Enzymes in health-promoting foods (functional foods). Use of enzymes in food				
Preservation (e.g., antimicrobial enzymes). Emerging trends in enzyme technology (e.g.,				
enzyme engineering, biocatalysis).	·			

References

- 1. "Introduction to Food Engineering" Authors: R. Paul Singh, Dennis R. Heldman Publisher: Academic Press, Year: 2013 (5th Edition)
- 2. "Food Process Engineering and Technology" Author: Zeki Berk Publisher: Academic Press Year: 2018 (3rd Edition)
- 3. "Unit Operations in Food Processing" Author: R. L. Earle Publisher: Pergamon Press Year: 1983
- 4. **"Fundamentals of Food Engineering"** Authors: Romeo T. Toledo Publisher: Springer Year: 2007 (3rd Edition)
- 5. "Food Processing Technology: Principles and Practice" Author: P.J. Fellows Publisher: Woodhead Publishing, Year: 2016 (4th Edition)
- 6. "Enzymes in Food and Beverage Processing" Author: Mohammed Kuddus, Publisher: Academic Press. Year: 2018
- 7. "Microbial Enzymes in Bioconversions of Biomass" Author: Vijai Kumar Gupta Publisher: Springer. Year: 2016
- 8. "Enzymes in Industry: Production and Applications" At hor: Wolfgang Aehle. Publisher: Wiley-VCH. Year: 2007 (3rd Edition)
- 9. "Applications of Enzymes in Food Processing" Author: N.L. Chikere. Publisher: Lambert Academic Publishing, Year: 2011
- 10. "Food Enzymes: Biocatalysis in Food Processing" Authors: Domenico Schiraldi Publisher: Springer, Year: 2014
- 11. "Enzymes in Industry: Production and Applications" Author: Wolfgang Aehle Publisher: Wiley-VCH. Year: 2007 (3rd Edition)
- 12. "Applications of Enzymes in Food Processing" Author: N.L. Chikere. Publisher: Lambert Academic Publishing. Year: 2011

- Understand the fundamental principles and concepts of food engineering and how they related to food processing techniques.
- Able to learn food plant design and its advancements.
- Analyze the role of enzymes in different food processing techniques such as fermentation, preservation and flavor generation.
- Evaluate the impact of Food Engineering and enzyme technology on the quality, safety and shelf life processed foods.

NUTRITION AND THERAPEUTIC FOODS Course Code : FT 2.3 Credit :4:0:0 Examination: 70 M Contact Hours : 64T Internal Assessment: 30 M Course coordinator(s): Dr. Shankar J. **Course Objective:** • The course helps students to acquire information on basic nutritional concepts and its applications to improve community health. The course provides diet and therapeutic importance of food to address malnutrition and disease and to improve growth and development. UNIT-I Introduction: Concept of Nutrition, Nutrients -Macro nutrients (carbohydrate, Proteins and Fats). Micro nutrients (Vitamins and minerals)-importance, sources, and deficiency disorders. Relation of nutrition to health, Types and classification of 16 hours Nutrition. RDA-formulation and dietary guidelines. Energy in human nutrition: Energy balance, unit of energy, determination of energy values of foods- Bomb calorie meter. Assessment of energy requirements -Basal and resting metabolism (BMR and RMR) and its regulation and S. D. A. Total energy requirement during physical activities. Energy modification under normal physiological conditions. National and International agencies involved in promoting Nutrition and health status of a community - UNICEF, FAO, WHO, CARE, NIN, CFTRI, ICMR, etc. **UNIT-II** Growth monitoring and promotion: Somatic, physical, brain and mental development, puberty, menarch, prepubertal and pubertal changes. Factors affecting growth and development; Importance of nutrition for ensuring growth and adequate development. Growth monitoring and promotion; Use of growth charts, standards 16 hours and prevention of growth faltering. Nutrition during pregnancy, lactation and Lactation period: Pregnancy: Physiological adjustments, Nutritional requirements, Nutritional status of Indian pregnant women. Effect of malnutrition on outcome of pregnancy. Lactation: physiology of lactation, Factors affecting lactation, nutritional requirements. Effect of lactation on maternal malnutrition and fertility. **UNIT-III** Growth development from Infancy, pre-school age to adulthood: Infancy: Growth and development, nutritional requirements. Feeding pattern, compositional differences between human milk and milk substitute and their suitability for infant feeding, importance of breast feeding over artificial feeding, weaning practices, 16 hours weaning and supplementary foods. Preschool age: Growth and development, nutritional requirements, special care in feeding them, nutritional problems specific to this age. School age and adolescent children: Growth and development, nutritional requirements, special care in feeding preschoolers, nutritional problems specific to this age. Nutritional requirements young adults, adult population and elderly people, nutritional problems common to this age and special needs. **UNIT-IV** Dietary planning and Nutrition care: Weights and Measures. Nutritional Assessment. Nutritional care process. Nutritional intervention. Therapeutic

modification of the normal diet: diet prescription. Routine Hospital diet - regular diets, clear fluid diet, full fluid diet, soft diet, modifications of food and nutrient

intake, Enteral nutrition, parenteral nutrition, Re-feeding syndrome, Transitional feeding. Medical and nutritional care record types and uses, Format for medical and nutrition charting and documentation record. Food- Drug Interaction: Effect of

Food on Drug Therapy.

Sl. No.	Reference Text Books						
1	Mahan, L. K. and Escott-Stump, S. (2008): Krause's Food Nutrition and Diet Therapy, 12 th , Edition, W-13 Saunders Ltd., Canada.						
2	Garrrow J. S, James W. P. T, Ralph A, (2000), Human Nutrition and Dietetics, 10 th edition, Churchill Livingston, London.						
3	Antia F. P. And Philip Abraham (2001) Clinical Nutrition and Dietetics, Oxford Publishing Company, New Delhi.						
4	Williams, S. R. (2003): Nutrition and Diet Therapy, 7th Edition, Times Mirror/Mosby Collage Publishing						
5	Esther A. Winterfeldt, Margret L. Bogle, LeaL. Ebro. (2011). Dietetics: Practice& FutureTrends. Third Edition. Jones and Barlet Publishers.UK.						

- Acquire knowledge on concept of nutrition, health benefits, food formulations, energy balance and deficiency, BMR and RMR and its regulation.
- Able to learn growth monitoring and promotion, Nutrition during pregnancy, lactation and lactation period.
- Learn about growth development from infancy, pre-school age and adulthood.
- Able to gain knowledge on concept concepts of dietary planning and diet therapy.

FOOD BIOTECHNOLOGY					
Course Code : FT 2.4 A Credit	:4:0:0				
Contact Hours : 64T Internal Assessment: 30 M Examinati	on: 70 M				
Course coordinator(s): Dr. Sharath R.					
Course Objective:					
Students will able to develop basic knowledge on concept of biotechnological states.	gy and				
r-DNA technology					
• To know the concepts of gene transfer techniques to develop transgenic p	olants				
and animals and applications of GMO's and Biosensors.					
UNIT-I					
Introduction to Basic Bio echnology: Chemical structure of nucleic acids,					
proteins; Chemistry and Biology of DNA; Types of DNA; DNA replication, The					
genetic material and its organization in prokaryotes and eukaryotes. Central dogma	16 hours				
of life (Genetic code, Transcription and translation in prokaryotes and eukaryotes).					
DNA repair mechanism; modifying enzymes; recombinant DNA technology;					
mutation and polymorphism and their detection. UNIT-II					
Recombinant DNA technology: Introduction to Genetic engineering. DNA					
Mutations and the Role of Mutagenic Agents. Enzymes involved in the					
Recombinant DNA technology or Genetic engineering. Gene Cloning Vectors: A					
General Account. Gene Cloning Vectors for Bacteria and Yeast. Polymerase Chain	16 hours				
Reaction (PCR), DNA Fingerprinting, Molecular Markers and their applications.	10 110 1111				
Gene Cloning Vectors for Plants and Animals. Preparation of Desired DNA,					
Introduction of Recombinant DNAs into Host Cells (Different Gene Transfer					
Methods), Gene Cloning Strategies, Selection (Screening) of Recombinants,					
Expression of Cloned Genes. UNIT-III					
Fermentation Technology: I rinciples of fermentation and Historical Back ground.					
Microbial Strain Improvement. Natural and synthetic media; Media formulations,					
Media sterilization, batch and continuous media sterilization processes; Sterilization					
of fermenter. Configurations and functions of batch, fed batch and continuous	16 hours				
fermenters. Fermenter devices: baffles, impellers, foam separators, sparger, culture	10 Hours				
vessel, cooling and heating devices. Microbiological fermentation Products: -					
Alcohol- Ethanol, Alcoholic beverage – Wine & Beer, Organic acids – Citric acid.					
UNIT-IV					
Food Biotechnology Applications: Plant cell and tissue cultivation.					
Micropropagation and applica ions. Protoplast fusion. Biosensors: Classification and					
application in food industry Ethical issues concerning GM foods: Testing for					
GMOs, current guidelines for production, release and movement of GMOs, labelling	16 hours				
and traceability, trade related aspects, bio-safety, risk assessment, risk management,	TO HOULS				
public perception of GM foods.					

Sl. No.	Reference Text Books
1	B.D. Singh. 2014. Biotechnology - Expanding Horizons. Kalyani Publishers, NewDelhi.
2	James D. Watson. 2013. Molecular Biology of the Gene, 7th Ed. Benjamin Cummings, San Francisco, USA.
3	Oliver Brandenberg, Zephaniah Dhlamini, Alessandra Sensi, Kakoli Ghosh and Andrea Sonnino 2011.
4	Ashok Agarwal and Pradeep Parihar. 2005. Industrial Microbiology: Fundamentalsand Applications. Agrobios India, Jodhpur.
5	Bharatbhushan (2010). Handbook of Nanotechnology. Springer Publications.

- Able to understand basic knowledge on genetic materials.
- Able to understand the concept of r-DNA technology and molecular marker study
- To know the theoretical knowledge of gene transfer techniques and its applications
- Able to understand the concept of plant tissue culture and food biotechnology applications.

FOOD TOXICOLOGY AND DRUG INTERACTION

Course Code

: FT 2.4 B

Credit

:4:0:0

Contact Hours

: 64T

Internal Assessment: 30 M

Examination: 70 M

Course coordinator(s): Dr. Poornima D V

Course Objective:

- To make students learn about toxicants in food material, agricultural and industrial contaminants. Also to understand the drug nutrition in disease.
- To help students to understand the etiology, physiological and metabolic process and health impacts of drug and food toxicants.

UNIT-I

Food toxicology: Definition scope and general principles of food toxicology. Classification, dose, the Dose-Response Curve, determination of toxins in food; characteristics of exposure; spectrum of undesirable effects; interaction and tolerance; biotransformation and mechanisms of toxicity; naturally occurring toxins from animals, bacterial and fungal and sea food sources; Sea food toxin- PSP, DSP; Food additives and toxicants added or formed during food processing: safety of food additives; toxicological evaluation of food additives; common dietary supplements; relevance of the dose, possible toxic effects; Safety of children consumables; Radioactive contamination of food; risk of genetically modified foods.

16 hours

UNIT-II

Factors affecting toxicity of compounds: Methods used in safety evaluation, risk assessments; Food poisoning and toxicity effect on human body; Agricultural and industrial contaminants in foods: fungicide and pesticide residues in foods, heavy metal contaminants in foods and their health impacts; use of veterinary drugs (e.g. Malachite green in fish and β -agonists in pork); Toxicants generated during food processing such as nitrosamines, heterocyclic amines, acrylamide, benzene, dioxins and furans; persistent organic pollutants, fumigants, carcinogens in smoked foods and pyrolysis, intentional and unintentional additives. Food adulteration and potential toxicity of food adulterants.

16 hours

UNIT-III

Food-Drug Interactions: Introduction to Drugs, Effect of drugs on ingestion, digestion, absorption and metabolism of food and nutrients, stability of the drug. Side-effects of some diet (ft od) on drugs. Food-Drug interactions effect on the pharmacokinetics and pharmacodynamics; Effects of food on some drug such as Warfarin, Monoamine Oxidases, Antihypertensive Drugs, Antibiotics, Analgesics, Antipyretics, Antihistamines, Anti-tubercular Drugs, Bronchodilators, Antidiabetics, Thyroxine and Antitumor Drugs. Effects of drugs on food and nutrition. Modification of drug action by food and nutrients. Effects of drugs on nutritional status. Excipients and food-drug interaction.

16 hours

UNIT-IV

Biology in drug discovery: Traditional drug discovery vs rational drug discovery, concept of target-based drug design and target discovery, Drug-Nutrient Interactions in infancy, pregnancy and lactation women, Drug-Nutrient Interactions in disease; Minerals and drug interaction; Vitamin drug interaction; epigenetic effect of nutritional supplements; Genetics and nutrition therapy. Ethical, legal, and social implications; Plant microbiome and Human Microbiome: Microbiome in fruits and vegetables; Analysing microbiome for enhancing nutrient use efficiency, interaction of plant microbiome with human microbiome-role of drug, reshaping human microbiome with antibiotic intake.

Sl. No.	Reference Text Books
1	Tonu Püssa (2013), Principles of Food Toxicology, Second Edition, CRC Press, ISBN 9781466504103.
2	S.S. Deshpande Ed (2013), Handbook of Food Toxicology, CRC Press, ISBN 9780824707606.
3	Helferich, W., and Winter, C.K. (2001) Food Toxicology, CRC Press, LLC. Boca Raton, FL
4	Shibamoto, T., and Bjeldanes, L. (2009) Introduction to Food Toxicology, 2nd Ed. Elsevier Inc., Burlington, MA.
5	Watson, D.H. (1998) Natural Toxicants in Food, CI C Press, LLC. Boca Raton, FL
6	Mahan, L.K. and Escott-Stump, S. (2000): Krause's Food Nutrition and Diet Therapy, 10th Edition, W.B. Saunders Ltd
7	Shils, M.E., Olson, J.A., Shike, M. and Ross, A.C. (1999): Modern Nutrition in Health and Disease, 9th Edition, Williams and Wilkins.

- This course explains students with food toxicants in plants, animals, microbial and other sources.
- The students learn about Risk and safety management of food toxicants and drugs and their interaction with food components.
- In this, students thus awareness themselves with toxins accumulated during food processing.
- Students understand the drug-food interactions, biochemical metabolic mechanisms involved in drug-food interactions and their recommendations.

FOOD HYGIENE AND CULINARY SCIENCE

Course Code

: FTV2

Credit

:2:0:0

Contact Hours

: 32T

Internal Assessment: 10 M

Examination: 40 M

Course coordinator(s): Dr. Shankar J

Course Objective:

• To acquire knowledge on food hygiene, safety methodologies and learn about government health care programme.

• To learn about basic concepts of culinary methods, stock production and impart knowledge on starch, protein, vegetables cooking skills.

UNIT-I

Introduction to Food Hygiene: Define Food Hygiene -Importance of Food Hygiene - Food safety, Personal Hygiene, Community Hygiene, Medical, Kitchen and Culinary hygiene; WASH (Water, Sanitation and Hygiene) programme. Rural Community Health: Village health sanitation & Nutritional committee (Roles & Responsibilities); Equipment Hygiene- Protective clothing – use of deodorants and Cosmetics in kitchen: Rest, Exercise and Recreation. Sanitary procedures in catering industry, Daily cleaning procedures in commercial kitchen. About Accredited Social Health Activist (ASHA); Village Health Nutrition Day, Rogi Kalyan Samitis. Community & Personal Hygiene: Environmental Sanitation and Sanitation in Public places. Public Awareness through Digital Media.

16 hours

UNIT-II

Introduction to Basic Cooking methods, pre-preparations and fundamental concepts of basic starch, protein and vegetable cookery. Blanching of Tomatoes and Capsicum, Preparation of co casse, Boiling (potatoes, Beans, Cauliflower, etc.,), Frying – (deep frying, shallow frying, sautéing) Aubergines, Potatoes, etc., Braising – Onions, Leeks, Cabbage vii) Starch cooking (Rice, Pasta, Potatoes), Overview and development of fundamental theories. Overview on tasting, kitchen equipment, knife skills, classical vegetable cuts (julienne, jardinière, macedoines, brunoise, payssane, mignonnete, dices, cubes, shred, mirepoix) stock production, thickening agent, soup preparation, grand sauces, Vegetable preparations. Timing and multitasking, station organization, palate development.

Sl. No.	Reference Text Books						
1	Bamji, M.S., K. Krishn. swamy & G.N.V. Brahmam (2009) Textbook of Human Nutrition (3rd edition) Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi						
2	Swaminathan (1995) Food— & Nutrition (Vol I, Second Edition) The Bangalore Printing & Publishing Co Ltd, Bangalore						
3	Vijaya Khader (2000)Food, nutrition— & health, Kalyan Publishers, New Delhi						
4	Srilakshmi, B., (2010)Food Science, (5th Edition) New Age International Ltd., New Delhi, Theory of Catering, K. Arora, Frank Brothers						
5	Thangam Philip., Orient Longman Modern Cookery for Teaching & Trade Vol. I,						
- 6	K.T.Achaya,. Pearson Indian and neighboring countries Food,						
7	Fuller, John., Chef Manual of Kitchen Management.						
8	Jane Grigson., The Book of Ingredients.						

- Acquire the knowledge of food hygiene, food safety aspects and awareness on community health and government health care programs
- Learn about community health, hygiene practices environmental safety and public awareness programs.
- Able to acquire knowledge on various cooking practices nutritive efficiency and dietary balance.
- Learn about kitchen equipment's food raw material processing stock preparations and multitasking skills.

II SEMESTER

		Title of the Paper	Marks					
Semester	Subject/Paper Code		Instruction Hrs./week	Examination	Internal Assessment	Total Marks	Credits	Examination duration (Hrs.)
	THEORY PAPERS							
	FT 2.1	Food Analytical Techniques	- 4	70	30	100	4	3
	FT 2.2	Food Engineering and Enzyme Technology	4	70	30	100	4	3
	FT 2.3	Nutrition and Therapeutic Foods	4	70	30	100	4	3
	FTS 2.4A	Food Biotechnology	4	70	30	100	4	3
	FTS 2.4B	Food Toxicology and Drug Interaction	4	70	30	100	4	3
=	FTV2	Food Hygiene and culinary science	2	40]	10	50	2	2
K.	PRACTICAL PAPERS							
E	FT 2.5	Food Analytical Techniques Laboratory	4	40	10	50	2	3
SEMESTER-II	FT 2.6	Food Engineering and Enzyme Technology Laboratory	4	40	10	50	2	3
SE	FT 2.7	Nutrition and Therapeutic Foods Laboratory	4	40	10	50	2	3
	FT 2.8A	Food Biotechnology Laboratory	4	40	10	50	2	3
	FT 2.8A	Food Toxicology and Drug Interaction Laboratory	4	40	10	50	2	3
		Mandatory Credits: Computer Skill	2				2	

III SEMESTER

		THEORY PAPERS						
SEMESTER-II	FT 2.1	Food Analytical Techniques	4	70	30	100	4	3
	FT 2.2	Food Engineering and enzymes in food processing	4	70 :	30	100	4	3
	FT 2.3	Nutrition and Therapeutic Foods	4	70 :	30	100	4	3
	FT 2.4A	Food Biotechnology	4	70	30	100	4	3
	FT 2.4B	Food Toxicology and Drug Interaction	4	70	30	100	4	3
	FTV2	Food Hygiene and culinary science	2	40	10	50	2	2
	PRACTICAL PAPERS							
	FT 2.5	Food Analytical Techniques Laboratory	4	40	10	50	2	3
	FT 2.6	Food Engineering and enzymes in food processing Laboratory	4	40	10	50	2	3
S	FT 2.7	Nutrition and Therapeutic Foods Laboratory	4	40	10	50	2	3
*-	FT 2.8A	Food Biotechnology Laboratory	4	40	10	50	2	3
	FT 2.8A	Food Toxicology and Drug Interaction Laboratory	4	40	10	50	2	3
		Mandatory Credits: Computer Skill	2	:			2	

FOOD PRESERVATIVE, ADDITIVE AND PACKAGING

Course Code: FT 3.1

Credit :4:0:0

Contact Hours: 64T

In ernal Assessment: 30 M

Examination: 70 M

Course coordinator(s): Dr. Ravikumar Patil H S.

Course Objective:

- To understand the various food preservation methods and Side Effects of Harmful Food Preservatives.
- To understand the importance and functional properties of various food additives.
- To study the importance of packaging, various types of packaging materials and regulations.
- To study the role and responsibility of various food regulatory authorities.

Unit-I

Concepts of Food Preservation and their Methods: Introduction to Food Preservation, Natural Food Preservatives, Chemical Food Preservatives. Methods of Food Preservation: Heat-Based Preservation Methods (Canning and Pasteurization), Cold Storage and Refrigeration, Freezing and Freeze Drying, Dehydration and Drying, Fermentation and Pickling, High-Pressure Processing (HPP) and Pulsed Electric Fields (PEF). Harmful Food Preservatives: Benzoates, Butylates, BHA (butylated hydroxyanisole), Sulfites, Sodium Nitrite. Side Effects of Harmful Food Preservatives. Emerging Preservation Technologies, Food Preservation Regulations and Safety.

16 hrs

Unit-II

Food Additives and Their Applications: Introduction to Food Additives, Types of Food Additives (Preservatives, Colorants, pH controllers, chelating/sequestering agents, leavening agents, antioxidants, emulsifying, stabilizing agents, anti-caking agents, thickeners and firming agents, etc.), Function and Role of Food Additives. Natural vs. Synthetic food additives. Concept of natural and artificial sweeteners. Food Additives and Health Implications: Controversial food additives Saccharin, history, function, aspartame, nitrite and nitrate compounds, nitrosamines. Food Additives Regulations and Labeling, Emerging Trends in Food Additives.

16 hrs

Unit-III

Food Packaging and Its Significance: Introduction to Food Packaging, Packaging Materials (Plastics, Glass, Metals, Paper, etc.), Packaging Design and Functions. Active and Intelligent Packaging, Process of packaging: Material handling, filling, air removal, sealing, retorting, Modified atmosphere packaging, vacuum and gas packaging. Package sterilization techniques, cushioning, unitizing, palletizing, stacking and containerization. Sustainable Packaging Practices. Packaging and labelling regulations and Environmental Impact, Innovations in Food Packaging.

16 hrs

Unit-IV

Quality Control and Food Safety: Importance and functions of quality control and quality assurance. Food Quality Parameters (Appearance, color, texture, viscosity, consistency, flavor, defects, bacterial contamination and foreign matter), Quality Control in Food Preservation, Hazard Analysis and Critical Control Points (HACCP), Food Safety Standards and Certification: Concept of Codex Almentarious, food safety standards authority of India (FSSAI), Foodborne Illnesses and Outbreaks, Food Recall and Traceability, Case Studies in Food Safety.

16 hrs

Sl. No.	Reference Text Books
1.	Food Preservation: Principles and Practices" by Stephanie E. Coupland
2.	"Food Additives: A Comprehensive Guide" by Shan Kuang
3.	"Food Packaging: Principles and Practice" by Gordon L. Robertson
4.	"Food Packaging and Shelf Life: A Practical Guide" by Gordon L. Robertson
5.	"Food Chemistry" by HD. Belitz, et al.
6.	"Handbook of Food Preservation" by M. Shafiur Rahman
7.	"Food Additives Data Book" by Jim Smith and Lily Hong-Shum
8.	"Food Packaging: Principles and Technology" by M. Mathlouthi
9.	"Food Safety Management: A Practical Guide for the Food Industry" by Yasmine Motarjemi
	and Huub Lelieveld
10.	"Food Safety Handbook" by Ronald H. Schmidt and Gary E. Rodrick
11.	"Food Quality and Shelf Life" by Charis M. Galanakis
12.	"Food Packaging and Preservation" by Gordon L. Robertson

- The knowledge of advance techniques in food processing preservation would help the students to develop novel food products with improved quality characteristics.
- Knowledge of harmful food preservatives would make the students acquainted with the scientific and technical know-how use, reduce or eliminate food preservatives during different types of food production.
- The students would become familiar with various novel packaging techniques and can provide their technical skills in the food package manufacturing industry
- Students will understand the chemical and technological properties of relevant food additives used as food improvement.

DAIRY TECHNOLOGY

Course Code: FT 3.2 Credit:4:0:0

Contact Hours: 64T Internal Assessment: 30 M Examination: 70 M

Course coordinator(s): Dr. Paramesha M.

Course Objective:

• The course concept was designed to help students to acquire the basic knowledge of dairy technology.

The course provides the theoretical knowledge on various milk product developments and dairy plant management.

Unit-I

Introduction to Dairy Technology and Genesis of Dairying, Dairy Education & Research in India. Dairy farms in India and world, management of dairy farms and animals. Milk properties, Nutritive components and microbiology of Milk: Milk definition, Composition and Variation, Structure of Milk, Milk Proteins, Enzymes, Carbohydrates, Lipids, Salt Composition in Milk, Milk and minerals. Solution properties of milk, acidity, redexpotential, flavor, density, optical properties and viscosity, basic aspects of surface phenomenon, Characteristics of fat globules in milk, Gel formation and Properties. Factors effecting composition of milk, physiochemical properties of milk, grading of milk, collection of milk, transportation and marketing of milk and milk products.

Unit-II

Basics of milk processing and quality assurance: Enumeration of Microorganisms in assessment of milk-bacteria, yeast and molds. Current awareness on quality and safety of dairy foods. Bactofugation: Principles and thermal processing of milk, kinetics of microbial destruction thermal death curve, D-value, Z-value, and F0-value. Significance of thermization, Lactoperoxidase system, pasteurization (LTLT/HTST concept), vaporization and sterilization. Direct and indirect, upstream and downstream homogenization. Definition and Purpose of packaging: Packaging of milk and milk products.

16 hrs

16 hrs

Unit-III

Milk and milk products: Special Milks and fermented milk products: Toned, Double toned, Recombined milk, Preparation of buttermilk, Acidophilus milk, Yoghurt, Dahi, and Lassi. Fat Rich Dairy Products: Cream, Butter and Ghee.

Condensed and Dried Milks: sweetened condensed skim milk, Evaporated milk, whole milk powder and skim milk powder. Cheese: varieties, preparation of processed cheese. Frozen Dairy Products: Methods of manufacture of Ice cream. Indigenous Milk Products/ Sweets: Khoa and khoa based sweets, paneer-based products. Defects and their control of milk and milk products and its Marketing strategies in India. Types and utility of starter cultures and DVS.

16 hrs

Unit-IV

Dairy plant management and pollution-control: Production Management of dairy plant building, equipment and their maintenance. Effluent treatment (Waste management in dairy industry & Solid waste Management), Pollutions and its control (Solid waste Management and Water pollution, causes and effects, control measures) and Disposal of dairy plant waste. Application of membrane technology in dairy industry. Principles of enumeration of conventional and emerging pathogens in dairy production and biosensor-based techniques for monitoring microbial and non-microbial contaminants in dairy industry.

16 hrs

Sl. No.	Reference Text Books
13.	De, Sukumar. Outlines of dairy technology. Kalyani publishers, 16th edition; 2009.
14.	Pieter Walstra & Tom J. Geurts. Dairy Science and Technology, Second Edition (Food
	Science and Technology); 2005.
15.	Robinson RK. Modern dairy technology: Volume 2 advances in milk products.
	Springer Science & Business Media; 2012.
16.	Ashok K. & Megh Raj. Processing Technologies for Milk and Milk Products: Methods,
	Applications, and Energy Usage, AAP publishers. 2017.
17.	Jenness R & Patton S. Principles of Dairy Chemistry John Wiley & Sons. 1969.

- Acquire knowledge on basic concept of milk and milk nutrition composition.
- Learn about the types, various basic processing of milk and sterilisation of milk.
- Pupil will be able to learn about various milk products like cheese, ice cream, fat rich milk products, indigenous milk products and its nutritive value.
- Pupil will be able to understand about Dairy plant management and pollution-control

MEAT, POULTRY AND FISH PROCESSING TECHNOLOGY		
Course Code: FT 3.3	edit: 4:0:0	
Contact Hours: 64T Internal Assessment: 30 M Examina	tion: 70 M	
Course Coordinator(s): Dr. Venkatesh		
Course Objectives:		
• The main objectives of this course deals with the various sources of animal fo	ods such as	
meat, fish and poultry		
• To study the technology involved in processing, preservation, development	nt of value	
added meat poultry and fish products.		
• To make students aware of processing equipment's, safety regulation and for	od standard	
of meat, poultry and fish products.		
UNIT-I		
Introduction – Sources, Importance and Status of meat, poultry and fishery industry in		
India. Its present scenario in national and international economy. Research and		
development activities on meat, poultry and fishery products. Per capita consumption of	14 hours	
meat, poultry and fish. Safety standards in meat, poultry, fish Industry - GMP, EU	14 Hours	
hygienic regulations. HACCP/ISO/MFPO/Kosher/Halal. FSSAI guidelines on FSMS		
compliance for meat and meat products.		
UNIT-II		
Meat and meat Processing – Abattoir, Ante-mortem inspection of meat animals,	14 hours	
evaluation of animal carcasses, composition of meat, slaughtering, post-mortem changes		
in meat, post-mortem glycolysis, rigor nortis, factors affecting post-mortem changes in		
meat, colour texture, WHC, PSE, DFI condition and shelf life. Mechanical deboning,		
grading and aging. Byproducts from meat industries and their utilization. Preservation of		
meat and meat products – Electrical stimulation, chilling, cold shortening, thaw rigor,		
freezing, Cured, smoked, comminuted and canned products. Nutritive value and		
packaging of meat. Concept of Meat Analogue, Value added meat products		
UNIT-III	1 4 1	
Poultry and products – types poultry, factors affecting poultry farming, chemical	14 hours	
composition and nutritive value of poultry meat, processing of poultry: Scalding,		
picking, evisceration, aging and deboning. Factors affecting the quality of poultry meat. Utilization of poultry industry byproducts. Nutritive value of egg and their preservation		
- Structure, composition, nutritive value and functional properties of egg. Factors		
affecting the egg quality and their measurements. Microbial spoilage and preservation		
methods of eggs.		
UNIT-IV		
Fishery techniques and preservation – Fishing practices, fishery economics and	14 hours	
marketing. Sanitary and Phyto-sanitary requirements for maintenance of fish quality,	14 110015	
quality management of fish and fishery products. Fish grading, chilling, freezing and		
packaging. Factors affecting quality of fresh fish. Nutrient composition of fish -		
proteins, carbohydrates, lipids and fatty acid profiles, vitamins and minerals. Post-		
mortem changes in fish muscle. Microbial contamination of fish and methods of	1	
preservation. Utilization of fish waste such as fish ensilage, compost, sauces, protein		
hydrolysates, fish meal etc.		

Reference Books:

Sl. No.	Text Books
1	Alan, H. V. and Jane, P. S (1995). Meat and Meat Products: Technology, Chemistry and
	Microbiology: Champan & Hill, London.
2	Carmen, R. O. and George, J. M (1997). Poultry Meat and Egg Production: CBS
	Publications, New Delhi.
3	Lawrie, R. A (1998). Lawrie's Meat Science (6 ed.): Woodhead Publications,
	Cambridge.
4	Sharma, B. D (1999) Meat and Meat Products Technology Including Poultry Products
	Technology. Jaypee Brothers Medical Publishers Pvt. Ltd, New Delhi.
5	Sharma, B. D. and Kinshuki Sharma (2011) Outlines of Meat Science and Technology.
	Jaypee Brothers Medical Publishers Pvt. Ltd., New Delhi
Ğ	Vikas Nanda (2014) Meat, Egg and Poultry Science & Technology. I.K. International
	Publishing House Pvt. Ltd., New Delhi.

- Understand the present and future scenario of meat, poultry and fish products in India and abroad.
- Students will have analyze and investigate the different preservation methods of meat, poultry and fish.
- Understand and identify the specific processing technologies used for meat, fish and poultry products.
- Understand the safety standards in relation to meat, poultry and fish products.
- Idea to develop the methods to reduce animal waste and utilize the by-product.

^{*}Yellow highlighted only added

POST- HARVEST MANAGEMENT OF FOODS

Course Code

: FT 3.4 A

:4:0:0

Contact Hours

: 64T

Internal Assessment: 30 M

Credit

Course coordinator: Dr. Sadashiv S. O.

Examination: 70 M

Course Objective:

- Course will intend to provide complete knowledge on post-harvest management of fruits vegetables, Cereals, Pulses, Oil seeds and Spices.
- It is designed to learn traditional and advance techniques in the management of foods.

UNIT-I

Postharvest Management of fruits and vegetables: Importance and scope of postharvest management of fru ts and vegetables, post-harvest losses, pathological disorders in fruits and vegetables-types, symptoms, control measures. Plant growth regulators. pre-harvest factors influencing postharvest life of crops. Browning: - enzymic browning, non - enzymic browning, its prevention, postharvest treatment to increase shelf life, controlled and modified atmosphere storage, general steps in processing of fruits and vegetables. Advancement technologies for post-harvest management of fruits and vegetables

16 hours

UNIT-II

Postharvest Management of Cereals: Introduction to post harvest technology of cereals. Introduction to various post-harvest operations Rice- structure and composition, parboiling of rice, product and by products of rice, milling of rice. Wheat- structure and composition, Wheat production, varieties and their quality. Cleaning, conditioning and milling of wheat. Malting of cereals, detection of gluten. Oat: structure, composition, nutritive value, preparation of oat meal and oat flakes. Sorghum: structure, composition, processing and milling of sorghum and its uses. Food grain storage: principles and parameters affecting during storage. Fumigation-principles, properties and applications. rodenticides for rats and mice.

16 hours

UNIT-III

Postharvest Management of Pulses and Oil seeds- Pulses: Introduction, Structure and composition of pulses, Harvesting- pre drying, threshing, drying, toxic constituents in pulses, processing of pulses- soaking, germination, decortications, cooking and fermentation. Milling of pulses, Dry and Wet milling, Improved milling method. Oilseeds: Introduction, nutritional factors of oil seeds and legumes, processing methods. Extraction of oil and refining, Fats and oils: Properties, manufacture, uses in food systems. Rancidity- types, mechanism and prevention.

16 hours

UNIT-IV	
Spices: Introduction, Production and processing - Black per per, green pepper,	
White pepper, Cardamom, Ginger, Chilies, Turmeric powder, Oleoresin. Minor	
spices (Production and processing) - Ajwain, Coriander, Cumin, Cinnamon,	
Carlic, Mustard, Mace and nutmeg, Onion, Saffron, Cloves, Mint, asafetida.	16 hours
Spices and spice blends: Soluble spices, antioxidant activity of spices,	
microbiological aspects and sterilization of spices. Enzymatic synthesis of flavor	
identicals: fumigation and irradiation of spices.	

Sl. No.	Reference Text Books
1	Preservation of Fruits and Vegetables-Girdhari Lal, Siddhapa and Tondon, ICAR, New Delhi.
2	Hand Book of Analysis and Quality Control of Fruits & Vegetable Products–S. Ranganna Tata McGraw Hill, New Delhi.
3	Commercial Vegetable Processing-Wood Roof &Lue
4	Commercial Fruit & Veg. Processing-W.V. Cruses.
5	Post-harvest Technology of cereals - pulses and oil seeds by A. Chakraverthy, third edition.
6	Rice Chemistry and Technology by B.O. Juliano
7·	Durum Wheat Chemistry and Technology by G. Fabriani and C. Lintas

- Enables to learn concepts and techniques of post-harvest management
- Students will get experimental knowledge of how to determine the different parameters of different kinds of samples.
- With the knowledge of preparation of fermented cereals, pulses-based products, which are very much beneficial human health students can acquire jobs in various food industries.
- Students are able to analyse the food adulteration parameters.

	CITYOT OCT	
BIO-PROCESSING AND FERMENTATION TE		
Course Code : FT 3.4 B	Credit :4:0:0 Co	
Hours : 64T Internal Assessment: 30 M	Examination: 70	M
Course coordinator: Dr. Ravikı mar Patil H.S.	*	
Course Objective:		
To provide knowledge of fermentation technology and its indu	. – –	2
To develop concept regarding basic of bioprocessing princ	iple, design and types	of
Bioreactor.		
To develop understanding of media formulation, sterilization	techniques and separati	Cnof
bioprocessing products. To understand the biash mistry and production of formantation	a meduata	
To understand the biochemistry and production of fermentation UNIT-I	products	
Introduction: Basics of Bioprocess Technology, Principles of ferme	intation and Historical	
Background. Introduction and overview of Microbial Strain Im	-	
selection and improvement of microbial cultures; Screening of micro		16
and secondary metabolites, enrichment, specific screening for the d		hours
improvement for the selected organism -random and strategic screen	ng methods.	
UNIT-II		
Media for Industrial Fermentation: Natural and synthetic media	· · · · · · · · · · · · · · · · · · ·	
Carbon sources, Nitrogen sources, minerals, vitamin sources, nutr		
Precursors and metabolic regulators and Oxygen requirement. Biopi	ocess parameters like	
pH and temperature. Media sterilization, batch and continuou	s media sterilization	16
processes; Sterilization of fermenter; Sterilization of the feeds,	sterilization of air.	16 hours
Development of inocula: bacteria fungal and Yeast. Techniques of in	noculation.	nours
UNIT-III		
Design of Fermenter: Basic functions of a fermenter, Bioreactor of	onfigurations: Design	
features, baffles, impellers, foam separators, sparger, culture vessel	, cooling and heating	
devices. Mass transfer in reactors: Transport phenomena in ferm		
exchange and mass transfer, oxygen transfer, critical oxygen conce	-	ļ.
specialized applications: Stirred tank reactors, Cyclone reactors,		16
Fluidized bed reactors and Trick e flow reactors. Fermentation Proc		hours
and continuous cultivation; Solia state cultivation; Growth of cultivation		
Kinetics of growth in batch culture, continuous culture with respect t		
Specific growth rate, doubling time, doubling number, growth yield	-	
Chemostat Culture, Turbidostatic Culture. Stoichiometry of fermentati	on .	-
UNIT-IV		<u> </u>
Down Stream Processing: Cell disintegration- Physical, chemical an	. •	16 hours
Biomass separation by centrifugation, filtration and flocculation. Ex	1	
phase, liquid extraction, whole broth and aqueous multiphase extr	•	
Chromatography, concentration, ultra-filtration, reverse os	mosis, drying and	
crystallization.; Microbiological fermentation Products: Alcohol (Et	hanol) and Alcoholic	
beverage (Wine, Beer), Organic acids (Citric acid), Microbia	l Enzymes-Industrial	
production of Alpha- amylase and Proteases. Immobilization t	echniques- Industrial	
techniques for whole cell and enzyme immobilization. Single cell prot		

Sl. No.	Reference Text Books
1	Abilasha Mathuria, Industrial Biotechnology, Ane books Pvt. Ltd, 2010
2	Agarwal and Parihar. 2012. Industrial Microbiology. Agrobios, India.
3	Arora, S. 1991. Fundamentals of Environmental Biology. Kalyani Publisher, New Delhi.
4	Bioprocess Engineering, Shule and Kargi, Prentice Hall, 1992.
5	Casida L.E., "Industrial Microbiology", John wiley & Sons, 1968.
6	Chatterji, A.K. 2002. Introduction to Environmental Biotechnology. Prentice Hall of India, New Delhi.
7	Chremissnoff, P,N. 1994. Biomanagement of waste water and wastes. Prentice Hall Englewood Cliffs, New Jersey.
8	Colin Ratledge, Bjorn Kristiansen, Basic Biotechnology, 2nd Edition, Cambridge University Press, 2001.

- Understand the mode of cell cultivation.
- Understand the principle of bioreactor, design and their operation.
- Understand the different raw materials and its use in industria. scale production.
- Understand the mechanism of fermentation process to produce the different bioprocessed product.

		•		
		NUTRACEUTICALS):
Course Code	: FTE 3.5	A	Credit	:2:0:0
Contact Hours	:32T	Internal Assessment: 10 M	Examinati	ion: 40 M
Course coordinate	or(s) :Dr. Shar	kar J.		
Course Objectiv	e:			
The cour	rse will give an	overview on concept, history, class	ification of nutra	ceuticals
and its h	ealth benefits.		· ·	
Helps to	understand the	classification of phytochemicals, is	olation & storage	e and its

UNIT-I

Introduction to Nutraceuticals and Phytonutrient: Definition, concept, history and market: Classification of nutraceuticals Functional foods, pre and probiotics. Free radical scavengers, biological role of Antioxidant molecules. Mechanism and 16 hours biological role of antioxidant molecules. Antioxidant enzymes, selenoenzymes and seleno-compounds. Antioxidants as radioprotectors. Natural occurrence of certainphytochemicals- Classification of Phytochemicals, and flavonoids: omega dietary fiber, phytoestrogens; glucosinolates; fatty acids. carotenoids, organosulphur compounds. Therapeutic properties, significance andrelevance of nutraceuticals in themanagement of diseases and disorders.

biological applications.

UNIT-II

Nutraceutical remedies for acute and chronic studies in human disorders. Isolation of phytochemicals from plant materials: Care in handling and storage of raw materials with minimal damage to sensitive bioactive compounds; Extractive methods for maximum recover and minimal recovery and minimal destruction ofactive material; stability studies. Anti-nutrients, Types of inhibitors present in various foods and their inactivation, safety data, general adverse effects and interactions of nutraceuticals.

16 hours

Sl. No.	Reference Text Books
1	Brian Lockwood (2007). Neutraceuticals. Pharmaceutical Press, USA.
2	Wildman, Robert (2007). Nutraceuticals and Functional Foods, second edition. Taylor and Francis Group.
3	Shaidi F and Marian Nazck (2007). Phenolics in Food and Nutraceuticals. CRC Press, Florida.

- Enable to understand the autraceutical concepts, history, evolution, classification and its health benefits.
- Able to acquire the knowledge on natural occurrence of phytochemicals, classification, isolation and biological/therapeutic applications of phytochemicals.

		FOOD AND HEALTH		
Course Code	: FTE 3.5	В	Credit	:2:0:0
Contact Hours	: 32T	Internal Assessment: 10 M	Examinati	on: 40 M
Course coordinate	or(s) : Dr. Pran	mod S. N.	·	÷
Course Objective				

Course Objective:

- To provide students with the knowledge of basic terminology and several aspects of nutrition and the functions of food in healthy life sustenance
- To ensure that students are familiar with the food classification, nutrition during special conditions and role of special functional food

UNIT-I

Foods, Nutrition and Dietetics: Basic definition, function, classification and dietary sources of foods, nutrition and dietetics. Concept of malnutrition, health, immunity by food and functions of food Classification of macronutrients and micronutrients. Is water a nutrient? Importance of water for health and drinking water quality standards.

16 hours

Nutraceutical and Health: Definition, classification and role of nutraceutical, Introduction to chemistry of prebiotics and probiotics as functional foods. Effect of nutraceutical on health and prevention of diseases. Beneficiary microbes and their metabolism for improving health.

UNIT-II

Nutrition during special conditions: Nutritional principals of adaptation during special circumstances of weather, professions and diseases. Nutrition during pregnancy and lactation. Nutrition for high physical work and industrial worker. Nutrition for extreme weather conditions, sports nutrition, nutrition in space.

16 hours

Advanced food types: Introduction to novel foods, functional foods and organic foods. Principles of convenience foods. Beneficial and harmful effects of genetically modified food, textured and nano-foods.

Sl. No.	Reference Text Books
1	Sheila John & Devaselvam (2016). Essentials of Nutrition and Dietetics for Nursing By; Year · 2016; ISBN · 9789351296669; Pages · 300
2	Brian Lockwood (2007). Nutraceutical: A Guide for Healthcare Professionals, Lockwood, Nutraceuticals. Pharmaceutical Press.
3	Wildman, Robert (2007) Nutraceutical and Functional foods.
4	Myrie, S., Jones, P., & Saarela, M. (2011) In Functional foods: concept to product,
5	Garrow, J.S., James, W.P.T., and Ralph, A. (2000). Human nutrition and dietetics, 10th edn. Churchill Livingstone, Edinburgh.
. 6	Mann, J., & Truswell, A. S. (Eds.). (2017). Essentials of human nutrition. Oxford University Press.

FOOD NANOTECHNOLOGY Credit:2:0:0 Course Code: FTS 1 Contact Hours: 32T Examination: 40 M **Internal Assessment: 10 M** Course coordinator(s): Dr. Sharath R Course Objective: This course will cover the fundamentals of nanoscience and nanotechnology concepts and principles to nanomaterial manufacturing and properties and characterization To provide knowledge on applications of nanotechnology in food industries. **UNIT-I** Nano-Biotechnology: Nanoparticles and types of Nanoparticles. Preparation of Nanoparticles: Chemical method and biological method. Structure and Morphology of Nanoparticles: Fundamental Properties - size effects on structure and morphology of free or supported nar oparticles, size and 16 hours confinement effects. Fraction of surface atoms - specific surface energy and surface stress, effect on the lattice parameter, Characterization of Nanoparticles Principles of DSC, AFM, STM, TEM, XRD and FTIR. UNIT-II Applications of Nanotechnology in Foods: Sensing, Packaging, Encapsulation, Engineering Food Ingredients to Improve Bioavailability - Nanocrystalline Food Ingredients - Nano Emulsions - Nano-Engineered Protein Fibrils as Ingredient Building Blocks Preparation of Food Matrices - Concerns about Using 16 hours Nanotechnology in food production. Nanotechnology in food packaging: Reasons to Package Food Products - Physical

Sl.	Reference Text Books
No.	
1	Nanoparticle Assemblies and Superstructures by Nicholas A. Kotov, CRC, 2006.
2	Nanotechnology in agriculture and food production by Jennifer Kuzma and Peter
	VerHage,, Woodrow Wilson International, 2006.
3	Bionanotechnology by David S Goodsell, John Wiley & Sons, 2004.
4	Nanobiomaterials Handbook by Balaji Sitharaman, Taylor & Francis Group, 2011.
	Biomaterials: A Nano Approach, S Ramakrishna, M Pamalingam, T.S. Sampath
	Kumar, Winston O. Soboyejo, Published by CRC Press
5	Bionanotechnology: Lessons from Nature, D S. Goodsell, by John Wiley & Sons, Inc.
6	Klabunde, K.J. (Ed.), "Nanoscale Materials in Chemistry", John Wiley & Sons Inc. 2001
7	Nalwa, H.S. (Ed.), "Encyclopedia of Nanoscience and Nanotechnology" 2004

Properties of Packaging Materials - Strength - Barrier Properties Light Absorption — Structuring of Interior Surfaces - Antimicrobial Functionality - Visual Indicators — Quality Assessment - Food Safety Indication. Nanoparticles interaction with the biological membrane, uptake and toxicological effects of different nanoparticles.

- Understand the significance and application of Nanotechnology in food sector
- Understand the selection of packages for specific food & agricultural commodities.

- A successful completion of this course will enable students to: summarize and critically discuss/ understand both fundamental and applied aspects of food science.
- They will be able to explain functions of specific nutrients in maintaining health, identifying nutrient specific foods and apply principles from the various facets of food science and related disciplines to solve practical as well as real-world problems.

IV SEMESTER

	THEORY PAPERS & PROJECT WORK/DISSERTATION							
	FT 4.1	Biostatics, Bioinformatics and Research Methodology	4	70	30	100	4	3
	FT 4.2	Waste management, Food Law, IPR and Entrepreneurship	4	70	30	100	4	3
	FT 4.3A	Bakery and Confectionary Technology	4	70	30	100	4	3
	FT 4.3B	Clinical nutrition and diet Therapy	4	70	30	100	4	3
	FT 4.4	Project Work/Dissertation	6	70	30	100	6	3
	FTS2	Food Product Development and Sensory Evaluation	2	40	10	50	2	2
≥	PRACTICAL PAPERS & STUDY TOUR/I IELD VISIT							
SEMESTER-IV	FT 4.5	Biostatics, Bioinformatics and Research Methodology Laboratory	4	40	10	50	2	3
	FT 4.6	Waste management, Food Law, IPR and Entrepreneurship Laboratory	4	40	10	50	2	3
SE	FT 4.7A	Bakery and Confectionary Technology Laboratory	4	40	10	50	2	3
	FT 4.7B	Clinical nutrition and Diet Therapy Laboratory	4	40	10	50	2	3
	Study Tour/Field Visit			:				
	Mandatory Credits: Personality Development		2	:			2	

BIOSTASTICS, BIOINFORMATICS AND RESEARCH METHODOLGY

Course Code: FT 4.1

Credit :4:0:0

Contact Hours: 64T

Internal Assessment: 30 M

Examination: 70 M

Course coordinator(s): Dr. Shankar J.

Course Objective:

- To understand the basic concepts of biostatics and its applications
- Able to understand the basics of Bioinformatics and its applications
- To study the importance of concepts of research methodology

Unit-I

Biostatistics: Aim, scope, definition and elementary idea of statistics in biology; Basic terminology - population, sample, variable, parameter, primary and secondary data, screening and representation of data, tabulation and diagrammatic representation of statistical data, Measures of central tendency and dispersion: measures of central tendency- mean, median, mode. Measures of dispersion; range, variance, standard deviation, standard error, coefficient of variation, symmetry, measures of skewness and kurtosis. Scatter plot, correlation coefficient(r)- positive and negative correlation, Texts of significance: ANOVA- one way and two way classification.

16 hrs

Unit-II

Bioinformatics: The introduction, scope, and applications of bioinformatics, Protein structure related databases, motifs and folds, molecular docking, protein fold classification, Biological Database and its Types-Nucleic acid databases (NCBI, DDBJ, and EMI L). Protein databases (Primary, Composite, and Secondary). Ramachandran Plot, Homology Modelling, Fold Recognition, Protein folding, Molecular Dynamics of Protein, Molecular Docking of Protein. Sequence Alignment — Pairwise and Multiple sequence alignment, Global and Local Alignment, BLAST an FASTA tools for sequence similarity search, Basics of phylogenetics, online tools for sequence alignment. Applications of bioinformatics.

16 hrs

Unit-III

Research Methodology: Introduction: Definitions and Objectives of Research, Motivation in Research, General Characteristics of Research, Criteria of Good Research and Types of Research. Significance of research in science. The Research Problem: Scientific Thinking and Research Problem. Steps in research, Identification selection and formulation of research problem and Sources of the research Problem. Defining, Statement and Evaluation of a Problem. Data for research; primary data, secondary data, meaning, collection of data, observation relevance limitations and cautions.

16 hrs

Unit-IV

The Review of Literature: Meaning and Need of Review of Literature. Objectives, Sources and Functions of Literature. The Research Hypotheses: Meaning, Definitions, Nature, Functions, Importance of Hypothesis and Kinds of Hypothesis. The Research Approach: Research Design. Qualitative and Quantitative Research. Criteria for Selecting a Research Approach. Sampling: Measurement, Sampling, Data Analysis and Interpretation of Data, Reference and citation. Publication, dissertation and Thesis writing. Importance of Plagiarism check.

16 hrs

Sl. No.	Reference Text Pooks
1.	Pranab kumar Banerjee, Introduction to Biostatistics, & Chand Publications
2.	Daniel WW and Cross CL, Biostatistics: Basic concepts and methodology for the health
	sciences, Willey publications
3.	Armugam N. Basic Concepts of Biostatistics, SarsS publications
4.	Introduction to Protein Structure, Carl Branden and John Tooze, Garland Publishing Inc., New
	York
5.	Bioinformatics: sequence and Genome Analysis, DW Mount, Cold Spring Harbor Laboratory
	Press,
6.	Creighton T.E. ed. Protein structure. A practical approach. (2004) Oxford University Press
7.	Research Methodology Methods and Techniques; C.R. Kothari; 2nd edition; New Age
	International;1990 (e-published in 2009).
8.	Research Methodology: Methods and Techniques (2 nd revised edition), C.R. Kothari

- To learn the basic concepts in Mathematics & Statistics.
- To apply the mathematical and statistical concepts in developing bioinformatics tools applied in life science research.
- To utilize bioinformatics tools and databases for retrieving, analyzing, understanding and managing biological data.
- To know Bioinformatics, its scope, importance and outreach

WASTE MANAGEMENT, FOOD LAW, IPR AND ENTREPRENEURSHIP Course Code : FT 4.2 Credit :4:0:0 Contact Hours : 64T Internal Assessment: 30 M Examination: 70 M Course coordinator(s): Dr. Sadashiv S. O. Course Objective: > Course will intend to provide food waste management, and food safety rules It is designed to provide detailed knowledge on food laws and standards, and to give insight on entrepreneurship UNIT-I Introduction: Definitions, sources and types of wastes from food industries and their special characteristics; Waste reduction strategies, Waste disposal methods -16 hours physical, chemical and biological. Treatment methods of solid wastes: Biological composting, drying and incineration; Design of solid waste management system: Landfill digester, Vermicomposting pit. Treatment methods for liquid wastes from food processing industries; Wetlands, Design of activated sludge process, Trickling filters, Biogas plant. Ion exchange treatment of waste water, Drinking-water treatment. Recovery of useful materials from effluents by different methods. UNIT-II Food safety, Quality and Assurance: Quality assessment of food materials on the basis of sensory evaluation, Physical, chemical microbiological methods. QC and OA: Definition, Concepts and functions in food industries. Total quality 16 hours management system, ISO 9000 series: Process of ISO 9001 and ISO 22000 certification. IPR: Definition, types and process of filing. Auditing: Introduction, types and process of auditing in food industries. **UNIT-III** Food Laws and Standards: Food Safety and Standards Act 2006, Food Safety and Standards Rules 2011, Dutie and Responsibilities of Food Safety Authorities, Food Safety and Standards Regulations. Food Safety Management Systems, PRP's: 16 hours GMP, GHP, HACCP plan and principles. National and International Food Safety Standards: Mandatory and voluntary standards, FSSAI, AGMARK, BIS, CODEX organization structure and functions, IFS, BRC. **UNIT-IV** Entrepreneur: Evolution and concept of Entrepreneur, Characteristics of an Entrepreneur, Distinction between an Entrepreneur and manager, Types of Entrepreneurs, Concept of Entrepreneurship, Start-Up: Small enterprises, Definition, characteristics, relationship between small and large units, objectives and scope. 16 hours Production and operation management: Investment analysis, Plant location, plant

layout, product design, production design, quality control (Importance and Methods). Marketing Management: Marketing concepts and problems. Human

resource management: manpower planning, Job requirements, Recruitment.

Sl. No.	Reference Text Books
1	Food Industry Wastes: Disposal and Recovery; Herzka A & Booth RG; 1981, Applied Science Pub Ltd.
2	Devraj, Rakesh Sharma and V K Joshi, 2011: Quality control for value addition in food processing, New india publishing agency, Pitam Pura, New Delhi.
3	Inteaz Alli. 2004. Food Quality Assurance: Principlesand Practices. CRC Press, Boca Raton, FL, USA.
4	Ronald H. Schmidt and Gary E. Rodrick. 2003. Food Safety Handbook. John Wiley & Sons, Inc., Hoboken. New Jersey, USA.R E.
5	S S Khanka, 2012. Entrepreneurial Development, S. Chand Publishing, New Delhi.
. 6	H. Nandan, (2013). Fundamentals of Entrepreneurship, Prentice Hall India Learning Private Limited; Third edition.
7	Sangram Keshari Mohanty, (2005). Fundamentals of Entrepreneurship, Prentice Hall India Learning Private Limited

- Students will understand the solid and liquid waste management and learn sustainable utilization of waste generated from various food processing industries.
- The students would be enabled to implement quality management systems and how to have IPR.
- Students will learn the national and international foo I safety laws and standards.
- The knowledge of entrepreneurship enables students to start their own industry and apply their skills while working in food industries.

BAKERY AND CONFECTIONARIES TECHNOLOGY

Course Code: FT 4.3 A

Credit:4:0:0

Contact Hours

: 64T

Internal Assessment: 30 M

Examination: 70 M

Course coordinator(s): Dr. Paramesha M.

Course Objective:

Course will intend to provide an overview and complete knowledge on Bakery and confectionaries technology. The course designed to learn the basic concepts, measurements, components, making, and storage of different bakery and confectionaries products.

UNIT-I

Introduction to Bakery, Scope & organizational structure bakery. Bakery & confectionery terms, units of measurements, basic and advanced equipments used in bakery (dough mixing and mixers, dividing, rounding, sheeting, and laminating, fermentation enclosures and brew equipment), baking temperatures for bakery products. concept of hygiene & its importance in bakery (personal and working area hygiene). Flour: introduction to wheat flour, composition & types of wheat flour. grades of wheat flour and its water absorption power, gluten content of wheat flour role of raw materials used for bread making: essential: flour, salt, yeast, water, sugar. Optional: fats and oils, eggs, bread improvers, milk.

16 hours

UNIT-II

Method of bread making: General overview of method of bread making, straight dough method (salt delay method & no time dough method), sponge and dough method. Accelerated processing, chorley wood bread process, dough retarding and freezing, stages in processing of bread and bread making methods and advantages and disadvantages of various methods of bread-making. Characteristics of good bread: general overview of characteristics of good bread bread. External characteristics: volume, symmetry of shape, bloom, crust colour, evenness of bake, oven break. Internal characteristics: colour of bread, structure, sheen and texture, flavors and aroma, crum clarit, moistness and cleanliness.

16 hours

UNIT-III

Introduction to Confectionery: General overview, scope of confectionery, confectionery terms, small and large equipment used in confectionery. functions and role of raw materials used in confectionery: essential & optional ingredients flour, sugar (sugar from cane, guar, khandasari sugar, raw sugar, refined sugar, white sugar, beet sugar, forms of sugar, liquid sweeteners), moistening agents: milk, egg & water. Fats and oils: composition, functions, types and storage of fats and oils in confectionery. Leavening agents: importance & types (biological and chemical) leavening agents. Types of confectionery products-chocolate boiled sweets caramels toffees.

16 hours

UNIT-IV

Confectionery products and its making: Overview of cake making methods, sugar batter method, flour batter method, genoise/sponge method, and all in one method. Chocolate: different forms coco and chocolate, the process of chocolate tempering chocolate designs, garnishes and presentations. Preparation of cookies and biscuits. Factors affecting the quality of biscuits / cookies. Chewing gum: ingredients and

16 hours

preparation, gelled products and liquorice. Aerated products: marshmallows and nougats. Lozenges: ingredients and manufacturing. Storage of confectionery product. Present scenario of Indian Bakery & confectionery industries.

Sl. No.	Reference Text Fooks			
1	Schunemann, C. & Treu, G. Baking: the art and the science. Calgary, Alberta,			
	Canada: Baker Tech, Inc., c1988.			
2	Sultan, W. J. Practical baking. 5th edition. New York: Van Nostrand Reinhold,			
	c1990			
3	Sultan, W. J. Elementary baking. New York: McGraw-Hill, c1969.			
4	Gisslin, W. Professional baking. New York: John Wiley & Sons, c1985.			
5	Matz, S. Glossary of milling and baking terms. McAllen, TX: Pan-Tech			
	International, c1993.			
6	Matz, S. Ingredients for bakers. 2nd edition. McAllen, TX: Pan-Tech International,			
	c1996.			
7	Pyler, E. Baking science and technology. 3rd edition. Merriam, KS: Sosland			
	Publishing Co., c1988.			

- 1. Pupils enable to distinguish and importance of different ingredients used in bakery and confectionery.
- 2. Enables to find the different working temperatures for bakery products and able to define the bread faults and remedies of bakery products
- 3. Pupils able to write recipes of different breads, pastries and gateaux.
- 4. Able to differentiate different cake mixing methods able to define the internal and external characteristics of cakes
- 5. Able to describe the different cake faults and remedies
- 6. Able to Demonstrate working knowledge of Chocolate and Sugar confectionery.

CLINICAL NUTRITION AND DIET THERAPY

Course Code

: FT 4.3 B

Credit

:4:0:0

Contact Hours

: 64T

Internal Assessment: 30 M

Examination: 70 M

Course coordinator(s): Dr. Venkatesh

Course Objective:

- To enable students to understand the nutritional disorders, assessing the nutritional status of an individual and community.
- To enable students to acquire knowledge about the preparation of diet chart during various disease conditions and helpful to formulate diet-based nutrition therapies.
- To develop ability to plan balanced diets for various stages of Life cycle/ Activity/Income Level.

UNIT-I

Clinical Nutrition and Dietetics: Introduction to clinical nutrition, Interrelationship between food, nutrition and health, Therapeutic and normal diets. Malnutrition and over nutrition. Nutritional disorders- Epidemiology, clinical features, prevention and dietary treatment. Major nutrition related community health problems — Protein Energy Malnutrition, anemia, iodine deficieny, vitamin A deficiency, scurvy, beri beri, pellagra, fluorosis etc.

16 hours

UNIT-II

Nutritional Screening and Assessment: Principle of nutritional screening and assessment, Nutritional Screening Tools. **Methods of assessing nutritional status**: a) Sampling techniques, Identifications of risk groups, b) Direct assessment - Diet surveys, anthropometric, clinical and biochemical estimation. c) Indirect assessment-Food balance sheet and ecological parameters.

16 hours

Community nutrition progra nme planning - Identification of problem, analysis of causes, resources constraints, selection of interventions, setting a strategy, implementations and evaluation of the programme. Nutrition education themes and messages in nutrition and health, Antenatal and postnatal care.

UNIT-III

Nutrition therapy: Basic concepts of diet therapy. Principles and classification of Therapeutic Diets- Routine Hospital Diet – Fluid, Soft and Regular diet, Pre-operative and post-operative diets, tube feeding. **Special modified diet** - Febrile conditions, infections and surgical conditions. Diets for gastro - intestinal disorders, constipation, diarrhea, peptic ulcer. Diet for renal diseases - Nephritis, Nephrotic syndrome and renal failure. Diet for obesity and cardiovascular disorders. Diet for Diabetes mellitus.

16 hours

UNIT-IV

Diet management during disease: Nutrition in Immune system dysfunction. Nutrition in Allergy. Nutrition support in metabolic disorders. Nutrition - Addictive behavior in anorexia, nervosa, bulimia & alcoholism. Nutrition in rheumatic disorders Nutrition in cancer and AIDS. Nutrient-drug interaction. Feeding the patients - Psychology of feeding the patient, assessment of patient needs. Feeding infants & children. Nutrition & diet clinics - Patients checkup and dietary counseling, educating the patient and follow up of patient's case wise during diet therapy.

16 hours

Sl. No.	Reference Text Books
1	Mahan, L.K. and Escott-Stump, S. (2000): Krause's Food Nutrition and Diet Therapy, 10th Edition, W.B. Saunders Ltd.
- 2	Shils, M.E., Olson, J.A., Shike, M. and Ross, A.C. (1999): Modern Nutrition in Health and Disease, 9th Edition, Williams and Wilkins.
3	Escott-Stump, S. (1998): Nutrition and Diagnosis Related Care, 4th Edition, Williams and Wilkins.
4	Garrow, J.S., James, W.P.T. and Ralph, A. (2000): Human Nutrition and Dietetics, 10th Edition, Churchill Livingstone.
5	Williams, S.R. (1993): Nutrition and Diet Therapy, 7th Edition, Times Mirror/Mosby College Publishing.
6	Davis, J. and Sherer, K. (1994): Applied Nutrition and Diet Therapy for Nurses, 2nd Edition, W.B. Saunders Co.
7	Walker, W.A. and Watkins, J.B. (Ed) (1985): Nutrition in Pediatrics, Boston, Little, Brown & Co.
8	World Cancer Research Fund (1997). Food, Nutrition and the Prevention of Cancer, A Global perspective, Washington E.D. WCRF

- Enable to understand concept nutrition and method of assessing nutrition status to correlate with clinical disease and disorders.
- Enables to study interrelation of nutrition and infection and design nutritional Programme at community levels for sustainable health and life style.
- The study enables to learn on the role of dietician and design of special and modified diets to address nutritional disease and disc ders.
- Enables to study on the design of nutritional diet during disease condition and also expose to techniques for patients' feeding during disease conditions.

FOOD PRODUCT DEVELOPMENT AND SENSORY EVALUATION

Course code: FTS2 Credit: 2:0:0

Contact hours: 2/week Internal assessment 30 M Examination; 40 Marks

Course Coordinator: Prof. Ravikumar Patil H S

Course Objectives:

- Understanding Food Product Development Process: Gain a comprehensive understanding of the stages involved in food product development, from concept generation to commercialization.
- Mastering Sensory Evaluation Techniques: Familiarize with the principles and methodologies of sensory evaluation in the context of food product development.
- > Integrating Sensory Evaluation into Product Development: Understand the pivotal role of sensory evaluation in guiding product optimization and quality assurance processes.

UNIT-I

Principles of Food Product Development: Introduction to Food Product Development; Definition and scope of food product development, Importance and challenges in food product development ,Role of food scientists and technologists in product development Stages of Food Product Development Process; Idea generation and concept development , Formulation and prototype development .Optimization and scale-up ,Commercialization and launch Market Research and Consumer Insights; Market analysis and trend identification , Consumer preferences and behaviour analysis ,Incorporating consumer feedback into product development Regulatory Considerations ;Food safety and quality regulations ,Labelling requirements and claims substantiation , Compliance with international standards

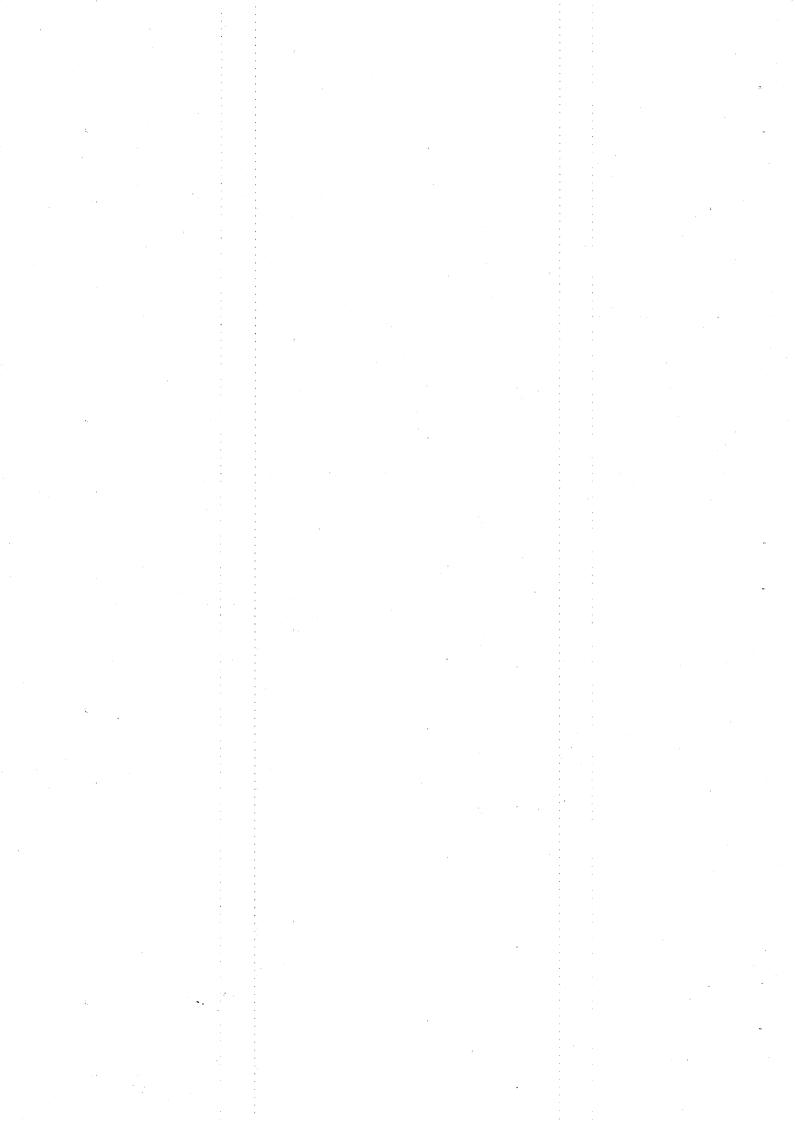
UNIT-II

Sensory Evaluation Techniques: Introduction to Sensory Evaluation Definition and significance of sensory evaluation, Role of sensory evaluation in food product development, Sensory perception and factors influencing it Sensory Testing Methods; Discrimination tests (triangle test, duo-trio test) Descriptive analysis (sensory profiling, trained panel evaluation), Affective tests (hedonic scaling, preference mapping), Novel sensory evaluation methods (temporal dominance of sensations, Check- All-That Apply) Statistical Analysis of Sensory Data; Data collection and organization, Analysis of variance (ANOVA). Multivariate techniques (principal component analysis, cluster analysis) Application of Sensory Evaluation in Product Development, Product optimization based on sensory feedback, Shelf-life determination through sensory testing, Consumer acceptance testing and market prediction.

Reference books

Sl. No.	Reference Text Books			
1.	"Food Product Development: From Concept to the Marketplace" (Year of Publication: 2016)			
	by M. C. Gacula Jr., A. P. Sing, and V. Rakesh. Publisher: CRC Press.			
2.	"Sensory Evaluation Techniques" (Year of Publication: 2006) by M. C. Meilgaard, G. V.			
	Civille, and B. T. Carr. Publisher: CRC Press.			
3.	"Consumer-Led Food Product Development" (Year of Publication: 2013) by H. J. H.			
	MacFie. Publisher: Woodhead Publishing.			
4.	"Sensory Evaluation Practices" (Year of Publication: 2012) by H. Stone, R. N. Bleibaum,			
	and H. A. Thomas. Publisher: Academic Press.			
5.	"Product Development: A Structured Approach to Consumer Product Development, Design,			
	and Manufacture" (Year of Publication: 2013) by M. Trott. Publisher: Prentice Hall.			
6.	"Principles of Food Chemistry" (Year of Publication: 2017) by J. M. deMan. Publisher:			
	Springer.			

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OUESTION PAPER PATTERN

	QUESTIONTHERITATIEN	
Fuper Name: Paper Code: Time: 3 Hours		Max Marks :70
	PART – A	
~ 0.1: 0.1:		(2-7-10)
1. Answer any five of the fol	lowing	(2x5=10)
a)		
b)		
c)		
d)		
e)		
f)		
$\mathcal{E}_{\mathcal{A}}$		
h)		
	PART – B	
Answer any Four of the	following	(5x4 = 20)
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7.		
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	PART – C	
	0.11	(10 4 40)
Answer any Four of th	e following	(10x4 = 40)
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