

M.Sc. FOOD SCIENCE AND NUTRITION

**CHOICE BASED CREDIT SYSTEM -
LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS - LOCF)**

(Applicable to the candidates admitted from the academic year 2026- 2027 onwards)

Sem.	Course	Course Title	Ins. Hrs.	Credit	Exam Hrs.	Marks		Total
						Int.	Ext.	
I	Core Course - 1 (CC - 1)	Advance Food Science	6	4	3	30	70	100
	Core Course - 2 (CC - 2)	Applied Human Physiology	6	4	3	30	70	100
	Core Practical -1 (CP - 1)	Food Analysis (P)	6	4	3	40	60	100
	Discipline Centric Elective Course - 1 (DCEC-1)	Any one from the list	5	4	3	30	70	100
	Generic Elective Course - 1 (GEC - 1)	Any one from the list	5	3	3	30	70	100
	Skill Enhancement Course - 1 (SEC - 1)	Food Biotechnology	2	2	3	30	70	100
	Value Added Course - 1 (VAC - 1)*	Nutrition Counselling and Education	-	2*		30	70	100*
	Total		30	21	-	-	-	600
II	Core Course - 3 (CC - 3)	Advanced Nutrition	6	4	3	30	70	100
	Core Course - 4 (CC - 4)	Clinical Biochemistry	6	4	3	30	70	100
	Core Practical - 2 (CP - 2)	Clinical Biochemistry (P)	6	4	3	40	60	100
	Discipline Centric Elective Course - 2 (DCEC - 2)	Any one from the list	4	4	3	30	70	100
	Generic Elective Course - 2 (GEC - 2)	Any one from the list	4	3	3	30	70	100
	Skill Enhancement Course - 2 (SEC - 2)	Computer Application in Research	2	2	3	30	70	100
	Non-Major Elective Course - 1 (NMEC - 1)	One Course from Outside Department	2	2	3	30	70	100
	Total		30	23	-	-	-	700
Summer Internship / Industrial Activity during the Summer Vacation after 1 st Year								

III	Core Course - 5 (CC - 5)	Therapeutic Nutrition	6	4	3	30	70	100
	Core Course - 6 (CC - 6)	Research Methodology and Statistics	6	4	3	30	70	100
	Core Practical -3 (CP - 3)	Therapeutic Nutrition (P)	6	4	2	40	60	100
	Discipline Centric Elective Course - 3 (DCEC - 3)	Any one from the list	5	4	2	30	70	100
	Generic Elective Course - 3 (GEC - 3)	Any one from the list	5	3	3	30	70	100
	Non-Major Elective Course - 2 (NMEC - 2)	One Course from Outside Department	2	2	3	30	70	100
	Internship / Industrial Activity @		-	2	-	20	80	100
	Total		30	23	-	-	-	700
IV	Core Course - 7 (CC - 7)	Techniques of Food Preservation	6	4	3	30	70	100
	Core Course - 8 (CC - 8)	Food Microbiology and Safety	6	4	3	30	70	100
	Core Course - 9 (CC - 9)	Public Health Nutrition	6	4	3	30	70	100
	Discipline Centric Elective Course - 4 (DCEC - 4)	Any one from the list	4	4	2	30	70	100
	Entrepreneurship / Industry Based Course @	Food Product Development	3	3	3	30	70	100
	Project Work @		5	5	-	20	80	100
	Value Added Course - 2 (VAC - 2)*	Bakery and Confectionary	-	2*	-	30	70	100*
	Total		30	24	-	-	-	600
Grand Total				91				2600

LIST OF DISCIPLINE CENTRIC ELECTIVE COURSE

Discipline Centric Elective Course - 1 (DCEC - 1)	
1.	Nutritional Biochemistry
2.	Food Packaging
Discipline Centric Elective Course - 2 (DCEC - 2)	
1.	Food Processing
2.	Food Service Management
Discipline Centric Elective Course - 3 (DCEC - 3)	
1.	Food Evaluation and Quality Control
2.	Food Instrumentation Techniques
Discipline Centric Elective Course - 4 (DCEC - 4)	
1.	Nutrigenomics
2.	Waste Management in Food Industry

LIST OF NON-MAJOR ELECTIVE COURSE (for other Department Students only)

Sl. No.	NON-MAJOR ELECTIVE COURSE
1.	Consumer Education
2.	Nutrition for the Family

LIST OF GENERIC ELECTIVE COURSE (GEC)

GENERIC ELECTIVE COURSE - 1 (GEC - 1)	
1.	Nutrition in Life Span
2.	Nutrition in Critical Care
3.	Nutrition in Special Needs
GENERIC ELECTIVE COURSE - 2 (GEC - 2)	
1.	Functional Foods and Nutraceuticals
2.	Principles of Resource Management and Interior Design
3.	Paediatric and Geriatric Nutrition
GENERIC ELECTIVE COURSE - 3 (GEC - 3)	
1.	Sports and Fitness Nutrition
2.	Culinary Art
3.	Palliative Care

SUMMARY OF CURRICULUM STRUCTURE OF PG PROGRAMMES

Sl. No.	Types of the Course	No. of Courses	Credits for each Course	Total Credits	Marks
1.	Core Course	9	4	36	900
2.	Core Practical	3	4	12	300
3.	Discipline Centric Elective Course	4	4	16	400
4.	Generic Elective Course	3	3	9	300
5.	Skill Enhancement Course	2	2	4	200
6.	Non-Major Elective Courses	2	2	4	200
7.	Internship / Industrial Activity @	1	2	2	100
8.	Entrepreneurship/ Industry Based Course @	1	3	3	100
9.	Project @	1	5	5	100
Total		26	-	91	2600
Value Added Courses *		2*	2	4*	200

*	The value added courses credit will not be included in the total CGPA. These courses are extra-credit courses. Instruction hours for these courses is 30 hours								
@	Summer Internship will be carried out during the summer vacation after the First year. Viva Voce will be conducted by the college and Marks shall be sent to the University and the same will be included in the 3rd semester Mark Statement. Summer Internship / Industrial Activity& Project Scheme of Evaluation: <table border="1" style="margin-left: 20px;"> <tr> <th>Description</th><th>Marks</th></tr> <tr> <td>Report</td><td>80</td></tr> <tr> <td>Viva</td><td>20</td></tr> <tr> <td>Total</td><td>100</td></tr> </table>	Description	Marks	Report	80	Viva	20	Total	100
Description	Marks								
Report	80								
Viva	20								
Total	100								

PO1	Disciplinary Knowledge: Broad and in-depth knowledge of advanced scientific concepts, principles, and methodologies within the chosen domain. Ability to critically explain, integrate, and apply scientific knowledge to theoretical and practical problems. Opportunities to earn additional credits through specialized and interdisciplinary courses further enhance expertise and broaden disciplinary understanding.
PO2	Critical Thinking: Field visits, academic interactions, and experiential learning activities will help students develop critical observation, interpretation, and analytical skills. Ability to evaluate and interpret scientific data, formulate hypotheses, and draw logical conclusions. Encourages independent thinking and the ability to assess scientific problems from multiple perspectives.
PO3	Analytical Reasoning: Through classroom discussions, scientific literature reviews, and interactive learning environments, students will strengthen their analytical reasoning abilities. Ability to critically evaluate scientific texts, identify gaps in existing knowledge, formulate research questions, and synthesize new ideas and concepts. Promotes evidence-based reasoning and logical interpretation of scientific information.
PO4	Scientific Reasoning: Strong foundation in scientific methods, experimental design, and data interpretation through laboratory-based courses. Enhances practical knowledge of scientific instrumentation, calibration procedures, laboratory safety, and appropriate research techniques. Ability to conduct scientifically sound experiments and interpret results accurately.
PO5	Self-Directed Learning: Encourages independent and self-directed learning through assignments, field reports, project work, and literature-based studies. Ability to organize, analyze, and present scientific findings in professional formats relevant to academic and industrial settings. Fosters responsibility, time management, and continuous self-improvement in learning.
PO6	Reflective Thinking: Laboratory-intensive core courses will expose students to a broad range of research methodologies and experimental techniques. Ability to reflect on learning experiences, evaluate the effectiveness of scientific approaches, and understand the broader applications of scientific techniques within the discipline.
PO7	Problem-Solving Skills: Ability to develop and apply scientific principles, quantitative reasoning, and mathematical concepts to solve discipline-specific problems. Ability to analyze experimental data, interpret scientific observations, and derive meaningful conclusions. Prepares students to address real-world scientific and societal challenges effectively.
PO8	Research-Related Skills: Internships, dissertation work, and research-oriented projects provide opportunities to design, develop, and execute independent research studies. Students gain hands-on experience in research methodology, experimental techniques, data analysis, scientific writing, and ethical research practices. These experiences strengthen laboratory competence and prepare students for advanced research and professional careers.
PO9	Lifelong Learning: Cultivates a mindset of continuous learning and professional adaptability. Ability to identify gaps in knowledge and skills, adapt to emerging technologies and scientific advancements, and pursue self-directed learning throughout their careers. Encourages lifelong learning that supports academic growth, employability, and professional excellence.
PO10	Leadership Readiness: Ability to take initiative, work collaboratively, and manage academic and research responsibilities effectively. Through seminars, group projects, internships, and research activities, students develop decision-making, problem-solving, organizational, and interpersonal skills. Ability to lead scientific teams, communicate effectively in professional environments, and contribute responsibly to academic, industrial, and societal development.

First Year

**CORE COURSE I
ADVANCED FOOD SCIENCE
(Theory)**

Semester: I

Code:

Credit: 4

COURSEOBJECTIVES: To enable the student to

- Provide systematic knowledge and understanding of the chemistry of water and dispersion systems.
- Comprehend the composition of various foods and the effects of cooking and processing on various components.
- Understand the physical, chemical, and functional properties of foods

UNIT-I WATERCHEMISTRYANDDISPERSIONSYSTEMS:

Water: Structure of water, free, bound and entrapped water; Water activity and relative vapour pressure– definition and measurement, factors affecting water activity. Moisture sorption isotherms, hysteresis and moisture determination. Food as dispersed systems, liquid dispersions; colloids- definition, characteristics of colloids, gels, emulsions, foams.

UNIT-II CARBOHYDRATESANDLIPIDS:

Carbohydrates: Classification, structure, physico – chemical properties of monosaccharides -pentoses, and hexoses, oligosaccharides – di saccharides - maltose, lactose, sucrose – crystallisation of sugars, polysaccharides – starch- amylose and amylopectin, cellulose and pectin- structure and properties. Gelatinisation of starches and hydrolysis. Types of browning- Maillard and caramelization. Malting, ARF and its advantages.

Lipids: Nomenclature, classification – milk fats, animal fats, vegetable fats. Physical properties – crystallization, plasticity; Chemical properties – thermal decomposition, chemistry of frying, hydrogenation, inter-esterification, rancidity of fats- types and prevention

UNIT-III PROTEINSAND AMINO ACIDS:

Proteins: Classification, structure, physical properties. functional properties –protein denaturation protein hydration, solubility, interfacial properties, emulsification and foaming, gelation, dough formation. Texturized vegetable protein, protein concentrate and isolates preparation methods; methods, emulsifying activity index, protein load, capacity and stability of emulsion–factors influencing emulsifications, foaming properties, flavour binding. Thermo dynamics of protein- flavors interaction

Aminoacids: Physiochemical properties of aminoacids. Structure and classification stereo chemistry of amino acids. Isoelectric point. Hydrophobic properties of aminoacids. Chemical reactivity of amino acids – Reaction with ninhydrin & reactions. Synthesis of aminoacids in food fortification.

UNIT-IV PIGMENTS:

Pigments in animals and plants tissues-myoglobin, oxymyoglobin, metmyoglobin
- colour of meat, colour change on processing - pigment stability on packaging.
Chlorophyll - influence of pH on processing; technology of colour preservation -
enzymic - metallo complex formation; carotenoids-occurrence-distribution. Betalins-
structure-stability-effects of pH, heat and light. Extraction of carotenes, lycopene,
chlorophyll and curcumin.

UNIT-V ENZYMES:

Classification and its nature; mechanism of action; factors influencing enzyme activity;
enzymes in food industry - carbohydrates, proteases, lipases; Role of enzymes in food
products; Immobilized enzymes and its application in food industries. Modification of
food using enzymes; Role of endogenous enzymes in food quality, colour
lipoxygenase, chlorophyllase, texture-pectic enzymes; flavour and aroma changes,
nutritional quality in food.

UNIT -VI CURRENT CONTOURS:(For Continuous Internal Assessment Only):

Poster making on process, application and uses of sustainable food extraction
techniques

TEXTBOOKS:

1. Swaminathan, M.,(2015), Advanced Textbook on Food and Nutrition, 2nd Edition, The Bangalore Printing and Publishing Co., Ltd. Bangalore.
2. Manay,S.N., and Shadaksharaswamy, M,(2001), Food Facts and Principles, 2nd Edition, New Age International, Pvt., Ltd, New Delhi.
3. Srilakshmi, B.,(2015), Food Science, New Age International Pvt., Ltd, New Delhi.
4. Potter, N.M.(1973), Food Science, The AVI Publishing Company Inc., West Port, Connecticut, U.S.A.

REFERENCEBOOKS:

1. Vaciavik,V.A.,(2021), Essentials of Food Science, 5thedition, Springer Publications, New York.
2. Eskein, (2012), Biochemistry of Food, Elsevier Publications, UK.
3. O'brien Nabors, L., (2001), Alternative Sweeteners, Taylor and Francis Publications, UK.
4. Ward, J.D., and Ward, L., (2006), Principles of Food Science, 4th Edition, Stem Publishers, USA.
5. Reddy, S.M., (2015), Basic Food science and technology, New Age International Publishers, New Delhi.
6. Sharma, A., (2017), Text Book of Food Science and Technology, 3rd Edition, CBS Publishers and Distributors Ltd., New Delhi.
7. Sahin,S., and Sumnu,S.G.,(2006), Physical properties of Foods, Springer Publications, New York.

8. Vaclavik, V. A., Christian, E.W., Tad Campbell, T., (2020), Essentials of Food Science, 5th Edition, Springer, New York.
9. Pace, M., Parker, R., (2016), Introduction to Food Science and Food Systems, CBS Publishers, Bangalore.

E-LEARNING RESOURCES

1. <https://epgp.inflibnet.ac.in/>
2. <https://www.ifst.org/lovefoodlovescience/resources>
3. <https://libguides.reading.ac.uk/food/e-resources>
4. <https://libguides.ntu.edu.sg/food-science-technology/eresources>
5. <https://foodresearchgh.org/e-resources>

COURSE OUTCOMES: (With Mapping)

At the end of the course, the students will have the ability to		
CO1	Demonstrate the chemistry of water and the dispersion systems that influence food quality	LO1
CO2	Appraise the physicochemical properties, chemical and biochemical reactions of carbohydrates and lipids that are vital in the applications of food industry.	LO4
CO3	Recognise the role of protein and amino acids their interactions among food components	LO5
CO4	Interpret the characteristics and stability of natural food pigments and evaluate the effects of processing and preservation.	LO7 LO13
CO5	Classify enzymes and explain their role, mechanism, and applications in food systems	LO10 LO11
CO6	Apply principles of food chemistry to evaluate physicochemical changes occurring during food processing, preservation, and storage for improving food quality and stability	LO6 LO15

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	1	1	1	2	2	1	2	2
CO 2	3	3	2	2	2	2	1	1	2	2
CO 3	3	3	2	2	2	3	1	1	1	1
CO 4	3	3	2	2	1	3	2	1	1	1
CO 5	3	2	2	1	1	2	2	1	2	2
CO 6	3	3	3	2	2	3	2	2	3	2

S- Strong(3) M-Medium(2) L-Low(1)

OBJECTIVES: To enable the students to

Acquire enhanced knowledge and appreciation of Circulatory system

- Understand the physiology of respiratory and gastro intestinal system
- Appreciate the structure and functions of reproductive and endocrine function
- Comprehensive knowledge on renal and sensory physiology
- Aware about the changes and system of musculoskeletal and nervous system

UNIT-I BODY FLUIDS AND CARDIO VASCULAR PHYSIOLOGY:

Body Fluids: Compositions and functions of blood; plasma proteins and types, bone marrow- structure and its functions; erythropoiesis, leucopoiesis, thrombopoiesis; structure, synthesis and functions of haemoglobin; Haemostasis- blood coagulation and mechanisms; Lymph- origin, circulation and functions; Reticulo-endothelial System- structure and functions.

RBC Indices -TC, DC, PCV, MCV, MCHC, Colourindex. Arneth and Schilling index; ESR -their determination and significance. Activation of WBC and production of antibodies. Role in inflammation and defence mechanism.

Cardiovascular: Structure and function of heart, properties of cardiac muscle, cardiac cycle, systemic and pulmonary circulation; Electrocardiogram (ECG) - recording principle, generation of EGC waves, electrical axis, normal and abnormal ECG. Heart sounds, heart rate, arterial blood pressure, radial pulse. Cardiovascular adjustments during exercise.

UNIT-II RESPIRATORY AND GASTRO INTESTINAL PHYSIOLOGY:

Respiratory: Structure and function, physiology of respiration, exchange of gases and transport, pulmonary volume and pulmonary capacities. Regulation of respiration; pulmonary function tests; artificial respiration; principles of respiratory mechanisms and regulations; elastic forces, lung volumes, pressure/volume relationship. Respiratory system resistance; physical principles of gas flow and resistance; non respiratory functions of the lung; filtration, defence against inhaled substances; the endocrine lung, immune function of lungs and inflammatory mechanism of airway diseases. Physiology of pulmonary disease, lung transplantation

Gastrointestinal: Review of structure and function. Secretory, digestive and absorptive functions. Structure and functions of liver, pancreas and gall bladder and their dysfunction. Hormones of GIT.

Immune functions of GI tract, Gut microbiomes & use of prebiotic, probiotic, symbiotic. Gut-brain interaction; Gut-liver-brain axis, neuronal & endocrine regulations, role of microbiomes, role of phytochemicals including phytoestrogen, Phyto insulin & Phyto polyphenols.

UNIT-III REPRODUCTIVE AND ENDOCRINE PHYSIOLOGY:

Reproductive: Structure, physiological functions of male and female reproductive organs, menstrual and ovarian cycle, spermatogenesis, conception, parturition, contraceptives, infertility and its recent developments.

Endocrine: Anatomy and physiological functions of endocrine glands-hormones- mode of action-pituitary, adrenal, thyroid, parathyroid, sex glands, and pancreas: hypo and hyper activity of the glands.

UNIT-IV RENAL AND SENSORY PHYSIOLOGY:

Renal: Formation of urine, characteristics of urine, normal and abnormal constituents of urine, control of body fluid osmolality and electrolytes; urine concentration and dilution, antidiuretic hormone (ADH, AVP) and cellular actions, control of extracellular fluid volume and regulation of renal NaCl excretion. Renal regulation of electrolytes; potassium, calcium, and phosphate homeostasis. Acidosis- diabetic ketoacidosis, anion gap; neural control of renal functions; distribution and functions of renal nerves, autoregulation, micturition and reflexes, atonic bladder and incontinence.

Sensory system: From receptor to perception – sensory modalities, sensory receptors, sensory circuits and sensory perception; chemical senses, common chemical sense; **Taste**– Receptor organs – distribution, ultramicroscopic structures, innervation, - membrane mechanisms of transduction; sensory processing; taste pathways; taste behaviour. **Olfactory**– Olfactory epithelium and receptors, turnover and regeneration of olfactory receptor cells; central olfactory connections; psychophysics – anosmia and directional smelling; **Visual** - Structures of retina and sensory transduction; visual pathway, visual cortex and cortical processing; colour vision – retinal and neural mechanisms, binocular and stereoscopic perception; **Auditory** - Organ of corti-ultramicroscopic structure, cochlear mechanics, sensory transduction and processing; functions of auditory system – frequency analysis and its discrimination; pitch, intensity processing – factors determining loudness, discrimination of loudness, loudness adaptation, masking, auditory fatigue

UNIT-V MUSCULOSKELETAL AND NERVOUS SYSTEM PHYSIOLOGY:

Muscle: Protein components and contraction mechanism, excitation – contraction coupling, role of fast and slow channels, Ca⁺⁺ binding protein including calmodulin, muscle fibre types. Structure of skeletal muscle - neuromuscular junction, muscular contraction; biochemical and contractile, characteristics of skeletal muscle; characteristics of individual fibre type; classification and performance; alterations in skeletal muscle due to exercise inactivity, and aging - exercise-induced changes in skeletal muscles, muscle atrophy due to inactivity, age-related changes in skeletal muscle.

Nerve: Effects of various degrees of nerve injury; regeneration of nerve; problem of regeneration of neurone within CNS; Neuro-Muscular Junction (NMJ), structural architecture including 3-dimensional structure; End Plate Potential (EPP) recording and miniature EPP; neuro-muscular transmission – electrical and biochemical events; acetylcholine receptor–protein and antigenic structure and its relevance to myasthenia gravis, structure-function relationship; Acetylcholine – structure- function relationship, metabolism and regulation; drugs acting at NMJ; acetylcholine esterases; ganglion-blocking drugs; neurotoxins at NMJ. motor unit, control of human movement.

UNIT-VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

- 1 Preparation of teaching models of specific biological systems
- 2 Visit to a diagnostic lab–Understand the patterns of ECG and MRI

TEXTBOOKS:

1. Sembulingam, Kirma and Prema Sembulingam. Essentials of medical physiology. JP Medical Ltd, 2012.
2. Ashalatha, P.R., and G. Deepa. Text book of Anatomy & Physiology for

- Nurses. JP Medical Ltd, 2012.
3. Chatterjee C C, Human Physiology, Volume I, 11th Edition, CBS Publishers, New Delhi, 2016.
 4. Sathya P and Devanand V, Textbook of Physiology, First edition, CBS Publishers and Distributors Pvt. Ltd, New Delhi, 2013.

REFERENCEBOOKS:

1. Kale, C. A. and Nail, E Samson Wright's Applied Physiology, Oxford University press, 1994.
2. Boron WF and Boulpaep EL, Medical Physiology, II edition, Saunders Elsevier, 2009
3. Marieb E N, Human Anatomy and Physiology, VI edition, Pearson edition, 2004
4. Tortora G & Grabowski, S.R. Principles of Anatomy & Physiology, 10th Edition, John Wiley & Sons, USA, 2003
5. Griffins, M. Introduction to Human Physiology, Mac Millan and Co. 1974.
6. Best C. H. and Taylor N.B., The living body, Asia publishing House, 1975.
7. Jain, A.K., Text book of physiology. Vol I and II. Avichal publishing co., New Delhi, 2017.
8. Guyton, A.C, and Hall, J. B., Text Book of Medical Physiology, 9th Edition, W.B. Sanders company, Prime Books (Pvt.) Ltd., Bangalore, 2020.

E-RESOURCES:

1. <https://egyankosh.ac.in/handle/123456789/81726>
2. <https://tripurauniv.ac.in/>
3. <https://nwtc.libguides.com/>
4. <https://palmbeachstate.libguides.com/>

COURSE OUTCOMES: (With Mapping)

CO1	Explain the composition and physiological functions of blood and cardiovascular system
CO2	Describe the mechanisms of respiration and gastrointestinal physiology
CO3	Interpret the physiological principles of reproductive and endocrine systems
CO4	Analyse renal physiology and sensory system functions
CO5	Understand the physiology of muscles and nervous system
CO6	Illustrate the structure and functional organization of the human body.

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	1	1	2	2	2	2	2	2
CO 2	3	3	2	2	2	2	1	2	2	2
CO 3	3	3	2	2	2	3	1	1	2	1
CO 4	3	3	2	2	1	3	2	1	1	2
CO 5	3	2	2	1	1	2	2	1	2	2
CO 6	3	3	3	2	2	3	2	2	3	2

S- Strong(3) M-Medium(2) L-Low(1)

OBJECTIVES: To enable the students to

- Know the principles and techniques in food analysis.
- Able to select the appropriate analytical technique when presented with a practical problem.
- Demonstrate practical proficiency in food analysis.
- Apply and incorporate the principles of food science in practical, real-world situations and problems.

Quantitative Estimation

Macronutrients

1. Sugars in fruits.
2. Starch content of cereals.
3. Moisture content of a food sample
4. Ash content of a food sample
5. Fiber content of a food sample
6. Fat content of a food sample
7. Crude protein of a food sample

Quantitative Estimation

Micronutrients-Vitamins

1. Total carotenoids
2. Ascorbic acid

Micronutrients-Minerals

1. Calcium
2. Iron
3. Phosphorus

REFERENCEBOOKS:

1. Damodaran, S., Parkin, K.L. and Fennema, O.R.(2007). Fennema's Food Chemistry, fourth edition, published by CRC Press.
2. Meyer L.H. (2003). Food Chemistry, Reinhold Pub. Corp.
3. Nielsen, S.S.(2003).Food Analysis, Third Ed., Kluwer Academic/Plenum Publishers, New York.

COURSE OUTCOMES: (With Mapping)

At the end of the course, the students will have the ability to		
CO1	Explain the principles and importance of quantitative estimation of nutrients in food samples.	LO1
CO2	Perform laboratory estimation of macronutrients in given food samples	LO4
CO3	Analyze and interpret results obtained from proximate composition analysis of foods.	LO5
CO4	Estimate vitamin and mineral content in food stuffs	LO7 LO13
CO5	Apply standard analytical techniques, calculations, and laboratory procedures for nutrient estimation	LO10 LO11
CO6	Demonstrate skills in handling laboratory instruments, reagents, and safety practices during food analysis.	LO6 LO15

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	2	1	2	2	2	2	2	2
CO 2	3	3	2	2	2	2	1	2	2	2
CO 3	3	3	2	2	2	3	1	1	2	1
CO 4	3	3	2	2	1	3	2	1	1	2
CO 5	3	2	2	1	1	2	2	1	2	2
CO 6	3	3	3	2	2	3	2	2	3	2

S- Strong (3) M-Medium (2) L-Low (1)

First Year DISCIPLINE CENTRIC ELECTIVE COURSE1 Semester I

1. NUTRITIONAL BIOCHEMISTRY

Code: (Theory)

Credit:4

OBJECTIVES: To enable the students to

- Understand the chemical characteristics of different classes of nutrients with reference to their physical properties and relate it to their functions in the body.
- Explore the integration of pathways during the metabolism of fat, protein and carbohydrate and to examine the mechanisms for the regulation of flux through these pathways
- Gain in sight in to inter relationships between various metabolic pathways.
- Interpret the role of enzymes in clinical diagnosis and disease conditions.
- Relate the importance of minerals and biochemical pathways to health and disease conditions.

UNIT – I – CARBO HYDRATES:

Aerobic and anaerobic degradation, glycogenesis, glycogenolysis, gluconeogenesis, HMP shunt pathway. Hormonal regulations of blood glucose.

Bioenergetics – Principles of bioenergetics, free energy – endergonic and exergonic process, role of high energy compounds in energy storage, formation of ATP.

Biological oxidation and electron transport chain - reduction potentials, anatomical site and components of oxidative phosphorylation, enzymes involved, membrane location of electron transport, chemiosmotic theory, inhibitors of respiratory chain.

UNIT - II - PROTEIN AND AMINO ACIDS:

Protein degradation, fate of nitrogen (urea cycle), plasma proteins – nature, properties and functions. Metabolism of aromatic, sulfur containing, branched chain amino acids and other amino acid pool. Synthesis of specialized products from amino acids: thyroxine, melanin, serotonin, histamine, melatonin, dopamine.

Protein biosynthesis - Gene expression and its regulation, transcription, translation, post-translational modification, inhibitors of protein biosynthesis, Gene expression in mitochondria, systems, biology including metabolomics and proteomics.

Nucleic acids-metabolism of nucleic acid components, biosynthesis of nucleotides. Purine and pyrimidine metabolism. DNA replication; mutation, repair and recombination concepts.

UNIT- III - LIPIDS:

Intestinal transport of lipids, cellular uptake and metabolism of lipids (beta- oxidation, de novo synthesis of fatty acids, synthesis and break down of unsaturated fatty acids, cholesterol, phospholipids and triacylglycerol), lipoprotein metabolism, VLDL and LDL ('Forward' Cholesterol transport), VLDL and LDL (Endogenous TAG transport), HDL ('Reverse' Cholesterol transport). Regulation of lipid metabolism at substrate level, enzyme level, hormonal level and organ level, disorders of lipid metabolism, dyslipidemias.

Oxidative stress and antioxidants–free radicals–definition, formation in biological systems, defense against free radicals. Role of free radicals and antioxidants in health and disease. Determination of free radicals, lipid peroxides and antioxidants, oxidative damage.

UNIT – IV - ENZYMES:

Membrane structure, composition and transport of metabolites across membranes; acid base balance and its regulation. Enzyme kinetics of mono substrate and BI substrate catalyzed reactions (including inhibition); enzyme specificity, regulation of enzyme activity and synthesis, enzymes in clinical diagnosis, detoxification in the body-metabolism of xenobiotics (Phase I and Phase II enzymes).

Cell Signaling: Overview of extra cellular cell signaling, G protein couple receptors and their effectors, enzyme linked receptors and their effectors, ras and rho family signaling; primary messenger and secondary messenger, map kinase pathways

UNIT – V - MINERALS:

Biological role of minerals-iron, iodine, copper, cobalt, molybdenum, zinc, calcium, phosphorus and selenium. Detoxification and xenobiotics–metabolism of foreign compounds.

UNIT – VI – CURRENT CONTOURS (For Continuous Internal Assessment Only):

1. Development of teaching modules, charts, PPTs' and mocks
2. Case study

TEXTBOOKS:

1. Ambika Shanmugam, Fundamentals of biochemistry for medical students, 8th edition, Wolters Kluwer Health, India, 2016.
2. Vasudevan DM, Sree kumari S, Textbook of Biochemistry, 5th edition, Jaypee Publishers, New Delhi, 2007.
3. Veera KumariL, Biochemistry, 1st edition, MJP Publishers, 2005.
4. SulochanaH, Principles of Biochemistry, PBS enterprises, Chennai, 2010.

REFERENCE BOOKS:

1. Rodwell V, Bender D, Botham KM, Kennelly PJ, Weil PA, Harper's Illustrated Biochemistry, 30th Edition, Mc Graw hill Education, 2015
2. Murray RK, Granner D K, Mayes P A, Rodwell V W, Harper's Illustrated Biochemistry, 26th edition, Mc graw hill publishing house, 2003.
3. Cox MM and Nelson DL, Leininger Principles of biochemistry, 5th edition, EH Freeman & Company, New York, 2008

RERESOURCES:

1. https://www.youtube.com/watch?v=YQV_ODVCzQQ
2. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=NuAs6SreCGryddEfs4kkBA>
==
3. https://www.youtube.com/watch?v=ePZc-71PT_4
4. https://www.youtube.com/watch?v=ruPRVAQ_wrI
5. https://www.youtube.com/watch?v=HD7ErUVccJ4&list=PLyvXYqABoA5UxMmEimkcS8qOY_o1zpJWG&index=4
6. <https://www.youtube.com/watch?v=2UfjwZAGTl0&list=PLRpz4J5dUMCej6t2g8bfzDjkbQC0nSEP9>

COURSE OUTCOMES: (With Mapping)

At the end of the course, the students will have the ability to		
CO1	Illustrate systematic knowledge on carbohydrate metabolic regulation	LO1
CO2	Describe the mechanisms of protein synthesis, gene expression, nucleic acid metabolism, and molecular regulation.	LO4
CO3	Examine the lipid metabolism and its regulation	LO5
CO4	Appraise the enzymes, their types, enzyme activity	LO7 LO13
CO5	Explain the physiological and biochemical roles of essential minerals such as iron, iodine, copper, cobalt, molybdenum, zinc, calcium, phosphorus, and selenium.	LO10 LO11
CO6	Correlate biochemical mechanisms with clinical diagnosis, metabolic disorders, detoxification processes, and nutritional health.	LO6 LO15

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	1	1	-	2	2	-	2	2
CO 2	3	3	2	2	2	2	1	1	2	2
CO 3	3	3	2	2	2	3	1	1	1	1
CO 4	3	3	2	2	1	3	2	1	1	1
CO 5	3	2	2	1	1	2	2	1	2	2
CO 6	3	3	3	2	2	3	2	2	3	2

S- Strong (3) M-Medium (2) L-Low (1)

OBJECTIVES: To enable the students to

- Understand the classification, properties, selection criteria, and testing methods of various food packaging materials used in the food industry.
- Relate the principles, functions, and requirements of food packaging and evaluate the suitability of packaging materials for different food products.
- Gain knowledge of modern packaging systems, packaging machinery, and advanced packaging technologies used for food preservation and shelf-life enhancement.
- Analyze packaging requirements and safety considerations for fresh, processed, and value-added food products throughout the supply chain.
- Infer the food packaging regulations, labeling requirements, recycling practices, and sustainable packaging solutions, including biodegradable and edible packaging materials.

UNIT –I INTRODUCTION TO FOOD PACKAGING MATERIALS

Introduction to Food Packaging Materials Selection of packaging materials and types- Ceramics (glass, ceramics and earthenware), Paper and paper board, Corrugated fibre board (CFB), Metal containers: Tin Plate and Aluminium, Composite containers, Collapsible tubes, Plastic Films, Laminations, Metalized films, Co extruded films, their mechanical sealing and barrier properties. Testing of packaging material. Rigid and flexible plastics- polyamides, polyester, PVC, PVDC, PVA, polycarbonates, olefins, cellophane, inomers, copolymers, phenoxy, acrylic, and polyurethanes.

UNIT- II FOOD PACKAGING

Food packaging Terminology - Definition. Functions of food packaging, Packaging environment. Characteristics of food stuff that influences packaging selection. Food Package Development-Current trends in food packaging in India and abroad. Properties of packaging materials- Properties of materials such as tensile strength, bursting strength, tearing resistance, puncture resistance, impact strength, their methods of testing and evaluation.

Unit III PACKAGING SYSTEM AND METHODOLOGY

Types of Packaging- Vacuum Packaging (VP), controlled atmospheric packaging (CAP), Modified atmospheric packaging (MAP), Aseptic Packaging, Retort processing, and Microwave packaging, Active Packaging, Intelligent packaging, Shrink and stretch packaging. Packaging equipment and its Application-Vacuum packaging machine, gas packaging machine, seal and shrink packaging machine, bottling machines, carton making machines. Liquid and powder filling machines – like aseptic system, form and fill (FFS) (volumetric and gravimetric), and multilayer aseptic packaging machines.

UNIT IV PACKAGING OF FRESH AND PROCESSED FOODS

Food packaging systems and safety- Packaging of Fruits and vegetables, Fats and Oils, Spices, meat, Poultry and sea foods, Dairy Products, Bakery, beverages, Dehydrated and frozen foods. Intelligent packaging: Role of packaging in the supply chain, creating integrated packaging, storage and distribution: alarm systems and time temperature indicators, traceability, radio frequency identification

UNIT V PACKAGING DESIGN AND HEALTHY SOLUTIONS

Food marketing and role of packaging- Migration in food packaging. FSSAI regulations for packaging and food labelling. Labelling and patent- Standards, bar coding, purpose, description types of labels, nutrition labelling, health claims, and mandatory labelling provision. Recycling packaging materials- Recyclability of packaging plastics, improving the recyclability of plastics packaging, Testing the safety and quality of recycled material, using recycled plastics in packaging, Modern packaging systems- Sources of Bio-plastics for food packaging, problems of plastic packaging on human, livestock and environment, range of biopolymers, developing novel biodegradable and edible materials and films.

UNIT VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

1. Case study on different packaging materials
2. Document the sustainability and recycling process of packaging materials

Text Books

1. Gordon Robertson, Food Packaging and Shelf Life: CRC, Taylor and Francis New York. 2010
2. Food Packaging: The Smarter Way edited by Ashutosh Kumar Shukla, Springer Singapore, 2022
3. Gordon L. Robertson, Food Packaging: Principles and Practice, Third Edition, 2013.
4. Walter Soroka, Fundamentals of Packaging Technology-Fourth Edition.

REFERENCEBOOKS:

1. Luciano P, Sara L, 2016, Food Packaging Materials, Springer cham Heidelberg, New York
2. Food Packaging and Preservation, 1st Edition - October 10, 2017
3. Ruben Hernandez, Susan E. M. Selke, John Culter, John D. Culter, Plastics Packaging: Properties, Processing, Applications, and Regulations, 2000.

ERESOURCES:

1. <https://www.bizongo.com/blog/food-packaging-trends>
2. <https://www.sciencedirect.com/journal/food-packaging-and-shelf-life>
3. <https://www.sciencedirect.com/science/article/abs/pii/B9780128115169000014>
4. <https://www.annualreviews.org/doi/abs/10.1146/annurev.food.080708.100836>

COURSE OUTCOMES: (With Mapping)

At the end of the course, the students will have the ability to		
CO1	Adapt the various packaging concepts and its properties	LO1
CO2	Relate the use of various available packaging materials and choose them accordingly	LO4
CO3	Prioritize various packaging systems, equipments and machineries	LO5
CO4	Appraise the appropriate packaging systems for different kinds of foods	LO7 LO13
CO5	Infer the role of FSSAI regulations and development of eco friendly packaging options	LO10 LO11
CO6	Design and recommend appropriate packaging systems for diverse food products by integrating material science, packaging technology, safety regulations, and sustainability principles.	LO6 LO15

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	1	1	-	2	2	-	2	2
CO 2	3	3	2	2	2	2	1	1	2	2
CO 3	3	3	2	2	2	3	1	1	1	1
CO 4	3	3	2	2	1	3	2	1	1	1
CO 5	3	2	2	1	1	2	2	1	2	2
CO 6	3	3	3	2	2	3	2	2	3	2

S- Strong(3) M-Medium(2) L-Low(1)

1. NUTRITION IN LIFE SPAN

Code:

(Theory)

Credit: 3

OBJECTIVES: To enable the students to

- Recognize the importance of nutrition during various life stages.
- Provide basic nutrition information, including food sources of nutrients, role of nutrients in the body and disorders associated with inadequate nutrition.
- Calculate basic nutritional requirements for all age groups from infancy to the elderly.
- Improve the life style through proper diet planning
- Identify national nutrition guide lines, policies and strategies to combat the nutritional problems.

UNIT-I PRENATAL AND INFANT NUTRITION:

Foetal origins of adult disease, intrauterine growth retardation, low birth weight, cleft palate, foetal alcohol syndrome –causes and consequences. Immunization schedule.

Infancy –nutrient needs, current feeding practices and nutritional concerns, infant formula – types, complementary foods- liquid, semi-solid and solid food, guidelines for feeding normal and low birth weight infants.

Growth and nutritional assessment, growth chart, LBW babies – characteristics and nutritional care, lactose intolerance; feeding the premature infant, allergies and infant obesity

UNIT-II NUTRITION DURING CHILDHOOD:

Preschool age – Growth and development, food and nutrient needs. Development of healthy gut microbiome. Aetiology and treatment of PEM, Vitamin A Deficiency, Anaemia. Planning meals for children with Attention Deficit Hyperactivity Disorder (ADHD) and autism.

School age - Growth and development, food and nutrient needs, food choices and meal patterns, nutrition related problems.

Packed lunch – dietary guide lines and nutritional requirements.

UNIT-III NUTRITION DURING ADOLESCENCE:

Growth and development, food and nutrient requirements.

Food habits, eating disorders, nutrition related problems.

Causes, consequences and treatment of adolescent pregnancy, PCOD, hormonal imbalance, premenstrual syndrome.

UNIT-IV NUTRITION IN PREGNANCY AND LACTATION:

Maternal nutrition – Factors influencing fertility, food and nutrient requirements in pregnancy, effects of nutritional deficiencies during pregnancy, physiological changes.

Effects of smoking, drugs and alcohol on foetal growth and pregnancy outcome.

Pregnancy complications-nausea, vomiting, constipation, heartburn, PIH, eclampsia, pre-eclampsia and gestational diabetes.

Lactation – Physiology, nutritive value and composition of breast milk, colostrum. Food and nutrient requirements for nursing mother, advantages of breast feeding, importance of breastfeeding over formula feeds. Public health measures for pregnant and lactating women. Complications during Lactation.

UNIT-V NUTRITION IN ADULTHOOD AND OLD AGE:

Food and nutrient requirements during adulthood, nutrition related problems.

Effect of occupational hazards, stress related disorders and lifestyle modifications to overcome them. Signs and symptoms of menopause and beneficial nutrient supplements.

Geriatric nutrition - Physiological changes, food and nutritional requirements, food modifications required for the elderly. Nutritional problems of old age.

UNIT-VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

Preparation of flyers/ pamphlets with food and nutrient requirements for specific stage of the life cycle.

Preparation of AV aids promoting the awareness on specific nutrition problems related to specific life cycle

TEXTBOOKS:

- 1 Srilakshmi B, Dietetics, sixth edition, Newage Publishing Press, New Delhi, 2011
- 2 Krishnasamy, K. and Sesikeran, B., (2013), Dietary Guidelines for Indians, National Institute of Nutrition, ICMR, Hyderabad.
- 3 Gopalan C., Ramanathan, P.V. Balasubramanian, S.C., Nutritive value of Indian foods, NIN, Hyderabad, 2001.
- 4 Swaminathan, M., (2012), Advanced Textbook on Food and Nutrition, Vol. 1, Second Edition, Bangalore Printing and Publishing Co. Ltd., Bangalore.
- 5 Shubhangini, A., Joshi (2002), Nutrition and Dietetics, 2nd edition, Tata Mc Graw-Hill Publishing Company Limited, New Delhi.
- 6 Antia, F.P.(2005), Clinical Nutrition and Dietetics, Oxford University Press, Delhi.

REFERENCE BOOKS:

- 1 Sharma M, Text book of Nutrition, 1st edition, CBS publishers & distributors PVT Ltd, New Delhi, 2017.
- 2 Longvah T, Ananthan R, Bhaskar K, Venkaiah K, Indian Food Composition Tables, National Institute of Nutrition, 2017.
- 3 Abraham S, Nutrition Through Life cycle, 1st edition, New age international publishers, New Delhi, 2016.
- 4 Verma P, Food, Nutrition & Dietetics, 1st edition, CBS publishers & distributors PVT Ltd, New Delhi, 2015.
- 5 Edelstein S, Life cycle Nutrition-An evidence-based approach, 2nd edition, Jones & Bartlett learning publications, 2015.
- 6 Mahan L K, Stump SE and Raymond JL, Krause's Food and Nutrition Care Process, 13th Edition, Elsevier Saunders, Missouri, 2012
- 7 Stump SE, Nutrition and diagnosis related care, 7th edition, Lippincott, 2012.

- 8 StacyN, William's Basic Nutrition and Diet Therapy, 12th edition, Elsevier publications, UK, 2005.
- 9 Whitney EN and Rolfes SR, Understanding Nutrition, 9th edition, West / Words worth, 2002.
- 10 Garrow J S, James WPT, RalphA, Human Nutrition and Dietetics 10th edition, Churchill Livingstone, NY, 2000.
- 11 Groff JL, Gropper SS, Advanced Nutrition and Human Metabolism 3rd edition, West / Wadsworth, UK. 2000.

E-RESOURCES:

- 1 www.bam.gov/
- 2 www.health.gov.healthypeople
- 3 www.ncemch.org
- 4 www.e-geriatric.net
- 5 www.cfsan.fda.gov
- 6 www.four-h.purdue.edu/foods/Nutritionthroughthe...
- 7 <https://main.icmr.nic.in/guidelines>
- 8 <https://www.nutrion.org.uk-pregnancy>
- 9 <https://www.who.int-infantsnutrition>
- 10 <https://youtu.be/ZF4aNuttc3g>
- 11 https://youtu.be?S0_ZipHXW1A

COURSE OUTCOMES: (With Mapping)

At the end of the course, the students will have the ability to		
CO1	Relate the prenatal and neonatal growth and development, evaluate the nutritional needs of infants.	LO1
CO2	Analyze the factors affecting optimum growth and development of children, outline the causes of nutritional disorders and develop diet charts for children with special needs.	LO4
CO3	Determine the food and nutrient requirements of adolescent. Analyze the eating disorders and examine the causes of problems during adolescence.	LO5
CO4	Recall the food and nutrient requirements and understand the physiological changes during pregnancy and lactation.	LO7 LO13
CO5	Review the food and nutrient requirements during adulthood and old age, infer the physiological changes that occur during old age and examine the need for dietary modifications	LO10 LO11
CO6	Apply life-cycle nutrition principles to assess nutritional status, identify nutrition-related problems, and design evidence-based dietary interventions for individuals across different stages of life.	LO6 LO15

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	2	2	1	1	2	2	2	2	2	2
CO 2	3	3	2	2	2	2	1	2	2	2
CO 3	3	3	2	2	2	3	1	2	2	1
CO 4	3	3	2	2	1	3	2	1	2	2
CO 5	3	2	2	1	1	2	2	1	2	2
CO 6	3	3	3	2	2	3	2	2	3	2

S- Strong(3) M-Medium(2) L-Low(1)

First Year

**GENERIC ELECTIVE COURSE I
2.NUTRITION IN CRITICAL CARE**

Semester: I

Code:

(Theory)

Credit: 3

OBJECTIVES: To enable the students to

- Screen and assess critically ill patients.
- Manage parenteral & enteral nutrition in ICU setup.
- Assess the critically ill & calculate nutritional requirements.
- Know the role of immunity and infection.
- Understand the pathophysiology and metabolic alterations in high risk conditions.

UNIT-I NUTRITION CARE PROCESS AND ASSESSMENT:

Nutrition screening and assessment methods - MNA, SGA, PG-SGA, MUST, disease specific tools and methods followed for assessment of nutritional status of critically ill or hospitalised individuals. Nutrition care process- Assessment, Diagnosis, Interpretation, Monitoring, and Evaluation (ADIME). Palliative care - importance, care process and ethics.

UNIT-II LIFE SUPPORT NUTRITION:

Enteral and parenteral feeding: principles, types, methods of administration, monitoring and complications. Types of feeds, advantages and disadvantage of home-based feeds, commercial formula feeds. Incorporation of easily digestible foods. Enteral and parenteral feed calculations for critically ill patients.

UNIT-III NUTRITION AND INFECTION:

Introduction-Patho-physiology of immune response to infection-nutritional modulation of immune function – malnutrition and immunocompetence - nutrients of importance – metabolic consequences of infection – altered nutritional requirements – nutrient recommendations– immuno-nutrition for the critically ill.

UNIT-IV NUTRITION IN BURNS, SURGERY AND TRAUMA:

Patho-physiological, clinical and metabolic aspects in the following conditions: Burns - classification, complications, dietary management, mode of feeding and nutrition support, non-dietary treatment of burns.

Surgery- physiological response to surgery, dietary management – pre and post operative nutritional care.

Trauma-physiological response to injury, metabolic response to injury, hormonal responses to injury and dietary management.

UNIT-V NUTRITION IN HIGH-RISK CONDITION:

Sepsis- systemic metabolic responses, catabolic responses, dietary management of sepsis with or without multiple organ dysfunctions.

Dietary management in chronic renal failure (CRF), dialysis, transplant, AIDS, rheumatic heart disease, congestive heart failure and cancer.

UNIT– VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

- 1 Visit to critical care centre or palliative care institute.
- 2 Case study of critical care conditions.

TEXTBOOKS:

1. Escott-Stump, S. (1998): Nutrition and Diagnosis Related Care, 4th Edition, Williams and Wilkins.
2. Garrow, J.S., James, W.P.T. and Ralph, A. (2000): Human Nutrition and Dietetics, 10th Edition, Churchill Livingstone.
3. Mahan, L.K. and Escott-Stump, S. (2000): Krause's Food Nutrition and Diet Therapy, 10th Edition, W.B. Saunders Ltd.
4. Shils, M.E., Olson, J.A., Shike, M. and Ross, A.C. (1999): Modern Nutrition in Health and Disease, 9th Edition, Williams and Wilkins.
5. Williams, S.R. (1993): Nutrition and Diet Therapy, 7th Edition, Times Mirror/Mosby College Publishing.

REFERENCE BOOKS:

1. Davis, J. and Sherer, K. (1994): Applied Nutrition and Diet Therapy for Nurses, 2nd Edition, W.B. Saunders Co.
2. Fauci, S. A. et al (1998): Harrison's Principles of Internal Medicine, 14th Edition, McGraw Hill.
3. Guyton, A.C. and Hall, J.E. (1999): Textbook of Medical Physiology, 9th Edition, W.B. Saunders Co.
4. Ritchie, A.C. (1990): Boyd's Textbook of Pathology, 9th Edition, Lea and Febiger, Philadelphia.
5. Walker, W.A. and Watkins, J.B. (Ed) (1985): Nutrition in Pediatrics, Boston, Little, Brown & Co.
6. World Cancer Research Fund (1997). Food, Nutrition and the Prevention of Cancer-A Global perspective, Washington E.D. WCRF.

RESOURCES:

1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7958189/>
2. <https://www.who.int/news-room/fact-sheets/detail/palliative-care>
3. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7808007/>
4. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5930530/>
5. <https://www.uptodate.com/contents/nutrition-support-in-critically-ill-patients-an-overview>
6. <https://med.uth.edu/surgery/burn-unit-nutritional-support/>

COURSE OUTCOMES: (With Mapping)

At the end of the course, the students will have the ability to		
CO1	Develop skills to screen and assess nutritional status of critically ill patients.	LO1
CO2	Review the need for life support nutrition and calculate the exact quantity of feed and nutrients required for individuals on support nutrition.	LO4
CO3	Describe the relation between infection and immunity and prescribe altered nutrient requirements during infection.	LO5
CO4	Justify the dietary management for surgery, burns, trauma and other high risk conditions.	LO7 LO13
CO5	Appraise the dietary management and reasons for inclusion of specific foods in sepsis, CKD and MOD.	LO10 LO11
CO6	Integrate advanced clinical nutrition knowledge and counselling skills for effective management of critically ill and high-risk patients.	LO6 LO15

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	2	2	2	1	2	2	2	2	2	2
CO 2	3	3	2	2	2	2	1	2	2	2
CO 3	3	3	2	2	2	3	1	1	2	1
CO 4	3	3	2	2	2	3	2	1	1	2
CO 5	3	2	2	1	2	2	2	1	2	2
CO 6	3	3	3	2	2	3	2	2	3	2

S- Strong(3) M-Medium(2) L-Low(1)

OBJECTIVES: To enable the students to

- Understand the regulations, policies, and school food service responsibilities related to children with disabilities and special dietary needs.
- Familiarize with various developmental, neurological, genetic, and metabolic disorders and their nutritional implications.
- Develop knowledge of food allergies, food sensitivities, allergen management, and strategies for ensuring food safety in children.
- Assess nutritional challenges and implement appropriate dietary modifications for children with special health care needs.
- Create awareness of special formulas, medical foods, feeding environments, and supportive nutritional interventions to improve the health and well-being of children with disabilities.

UNIT I REGULATIONS AND SCHOOL FOOD SERVICE

Regulations and School Food Service - Disabilities Definition, Individuals with Disabilities Education Act (IDEA). Diet Prescription, Role of Physician for Children with Disabilities, Medical Statement for Children with Special Dietary Needs The Role of School Food Service - school issues, school food service responsibilities, Providing Special Meals to Children with Disabilities, Menu Modifications for Children with Disabilities, Texture Modifications for Children with Disabilities.

UNIT II DESCRIPTION OF SELECTED DISABILITIES

Attention deficit hyperactivity disorders- Autism, Spectrum disorders, Cerebral Palsy, Epilepsy or Seizure Disorder - #Muscular Dystrophy#. Mental Retardation - Down Syndrome - Prader Willi (PW) Syndrome - Spina Bifida - Cystic Fibrosis -Rett Syndrome. 2.3 Metabolic Diseases - Inborn Errors of Metabolism (IEM) – Galactosemia, Phenylketonuria.

UNIT III FOOD ALLERGIES AND FOOD SENSITIVITIES

Common Food Allergens , Foods that commonly contain the “Big Eight” allergens and should be avoided, Symptoms of Food Allergy. Gastrointestinal symptoms associated with food allergy - Cutaneous, or skin, symptoms associated with food allergy - Respiratory symptoms associated with food allergy – Anaphylaxis and its signs. Managing Food Allergies in Children – In the kitchen -Know which foods to avoid, Keep the kitchen organized to avoid cross-contamination, clean- Outside the kitchen. Monitoring for an allergic reaction. Food Intolerance.

UNIT IV ISSUES IMPACTING NUTRITION AND SPECIAL DIETARY ORDERS

Energy Needs – Overweight- Intervention strategies for reducing calories in school lunch and Breakfast. Underweight - Ways to Increase Calories. Feeding Problems. Oral-Motor Problems. Modification of Food Texture – Chopped, Ground, Pureed. Positioning Problems. Behavioural Issues- Self-feeding, Tube Feedings.

UNIT V SPECIAL FORMULAS AND SPECIAL MEDICAL FOODS

The Purchase of Special Formulas and Special Medical Foods. Fluids and Fiber. Environmental Considerations. Dining Environment. Scheduling. Space. Location. Lighting. Dealing with Distractibility. Food safety issues.

UNIT- VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

1. Case Study on nutritional requirement for special needs
2. Diet Planning Activity
3. Poster presentation

TEXT BOOKS

1. Hand book for Children with Special Food and Nutrition Needs, Item No ET69-06, National Food Service Management Institute, The University Mississippi (2006).

REFERENCE BOOKS:

E- RESOURCES

1. <https://www.cdc.gov/disabilityandhealth>
2. <https://www.fns.usda.gov>
3. <https://www.ndss.org>

COURSE OUTCOMES: (With Mapping)

At the end of the course, the students will have the ability to		
CO1	Explain the regulations, dietary prescriptions, and roles of healthcare professionals and school food service personnel in providing nutrition support for children with disabilities.	LO1
CO2	Describe the characteristics, nutritional concerns, and dietary management of selected disabilities, developmental disorders, and metabolic diseases affecting children.	LO4
CO3	Identify common food allergens, recognize symptoms of food allergies and intolerances, and develop strategies to prevent and manage allergic reactions in children.	LO5
CO4	Assess nutritional problems such as underweight, overweight, feeding difficulties, and behavioral issues, and recommend appropriate dietary modifications and feeding interventions.	LO7 LO13
CO5	Evaluate the use of special formulas, medical foods, environmental considerations, and food safety practices to support children requiring specialized nutritional care.	LO10 LO11
CO6	Apply principles of clinical nutrition, food service management, and individualized dietary planning to provide safe, effective, and inclusive nutrition care for children with disabilities and special health care needs.	LO6 LO15

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	1	1	2	2	2	2	2	2
CO 2	2	3	2	2	2	2	2	2	2	2
CO 3	3	2	2	2	2	3	2	1	2	1
CO 4	3	3	2	2	1	3	2	1	1	2
CO 5	3	2	2	1	1	2	2	1	2	2
CO 6	3	3	3	2	2	3	2	2	3	2

S- Strong(3) M-Medium(2) L-Low(1)

OBJECTIVES: To enable the students to

- Develop knowledge, understanding and skills in food biotechnology.
- Enhance their ability to identify current and future research directions in food biotechnology.
- Imbibe the necessary skill sets for food production and manufacturing based on industry needs.
- Instil confidence and provide there quired environment for practical research in the field of food biotechnology that is socially significant.
- Develop there quired skills for efficient communication and team work to have a successful professional career.

UNIT-I INTRODUCTION TO FOOD BIOTECHNOLOGY:

Introduction, history, scope, importance and present status of biotechnology in India with reference to food technology. Applications; methods for the microbiological examination of water and foods; control of microbiological quality and safety; food borne illnesses and diseases; microbial cultures for food fermentation, their maintenance and strain development.

UNIT-II FOOD FERMENTATION:

History of food fermentation; types of fermented foods and substrates / raw materials used, traditional fermented foods, major biotransformation of raw materials during fermentation, modern fermentation food industries, properties of fermented foods, fermented foods in the twenty-first century, health benefits of fermented foods and beverages. Alcoholic beverages - beer, wine; non-alcoholic beverages-tea, coffee, cocoa, dairy products.

UNIT-III FERMENTED FOOD PRODUCTS:

Fermented dairy products: Introduction, consumption of cultured dairy products, cultured dairy products- yogurt, cultured buttermilk, sour cream, kefir and other cultured dairy products. Cheese -introduction, manufacturing principles, general steps in cheese making, types of cheese, cheese ripening, microbial defects and recent technological advances in cultured dairy products technology.

Fermented Vegetable products: Introduction, production principles, manufacture of sauerkraut, principles of pickle production, fermented olives, kimchi, fermented vegetables and biogenic amines.

Fermented Fruit products: Wine - basics, grape composition, wine manufacture principles- harvesting and preparation of grapes, crushing and maceration, sulphur dioxide treatment, separation and pressing, fermentation, yeast metabolism, factors affecting yeast metabolism, sulphur and nitrogen metabolism, stuck fermentations, adjustments, blending, and clarification, aging, malolactic fermentation, types of wine, wine spoilage and defects.

UNIT-IV FERMENTED MEAT AND FISH PRODUCTS:

Fermented meat product sausages- History and evolution of the fermented meat industry, meat composition, fermentation principles, meat starter cultures, principles of fermented sausage manufacture, manufacture of fermented sausage- cutting and mixing, stuffing, casing materials, fermentation, cooking, drying, and smoking, mold-ripening, flavour of fermented meats, defects and spoilage of fermented meats. fermented fish products fish sauces, fish paste- manufacturing steps, biochemical changes, storage and shelf-life of products.

UNIT-V GENTICALLY MODIFIED FOODS:

Genetically modified foods – concept, types and application. Regulations concerning genetically modified foods in India and at the International level; Ethical issues concerning GM foods; testing for GMOs; current guidelines for the production, release and movement of GMOs; labeling and trace ability; trade related aspects; biosafety; risk assessment and risk management. Public perception of GM foods. IPR. GMO Act 2004. Genetically Modified Crops Management Act 2004.

UNIT VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

- 1 Prepare analbumon GM foods available in India and International markets.
- 2 Debate/Group Discussion on Pros and Cons of GM Foods.
- 3 Prepare a video of fermented food preparation.
- 4 Visit to food preservation unit.

TEXTBOOKS:

- 1 Mehta Varun (2016) Food Biotechnology Publisher: Campus Books International
- 2 Vinod K. Joshi & R. S. Singh (2012) Food Biotechnology: Principles and Practices, Publisher I.k. International New Delhi.

REFERENCEBOOKS:

- Owen award (1989), Fermentation Biotechnology Principles, Processes and Products, Prentice H New Jersey.
- Solomons, G.L. (1983), Single Cell Proteins-Critical Reviews of Biotechnology, Moo Young Compressive Biotechnology Scientists Foundations, Engineering Consideration.
- Prescott (1987), Industrial Food Preservation, John Willey and Sons.
- Frazier and West Hoff (1995), Food Microbiology, Tata Mc grawHill Publishing Company Ltd, New Delhi.
- Dubey, R.C. (2001)Text Book Biotechnology S.Chand and Co Ltd, New Delhi.
- Gupta, P.K. (1996), Elements of Biotechnology, Rostogi and Co, Meerut.

- Paul, P.C. and Palmer (1972) Food Theory and application John Wiley Sons, New York
- Gary Walsh and Denis R. Headen, Protein Biotechnology, S.Chand and Co, Ltd, New Delhi.
- Dubey, R.C. and Maheswari, D.K.A. TextBook of Microbiology, S. Chand and Co, Ltd New Delhi.
- Gustara F.Gutierrez - Lopez. Food Science and Food Biotechnology, 2003,
- Lee, B.H. Fundamentals of Food Biotechnology. VCH. 2006.

ERESOURCES:

1. <https://journals.sbm.ac.ir/afb>
2. <https://appliedfoodtechnology.org/index.php/jaft>
3. https://k8449r.weebly.com/uploads/3/0/7/3/30731055/37_food_science_and_food_biot_echnology_-_g._gutierrez-lopez-signed.pdf
4. <https://archive.org/details/FoodBiotechnologySecondEdition>

COURSE OUTCOMES: (With Mapping)

At the end of the course, the students will have the ability to		
CO1	Associate the nature of food and distinctive features of food industry.	LO1
CO2	Inferthecurrentapplicationsandforeseefuturetrendsinfoodbiotechnology.	LO4
CO3	Summarize and distinguish the different types of fermented foods.	LO5
CO4	Apply basic knowledge of microbiology, biochemistry and genetic engineering in preparing fermented foods.	LO7 LO13
CO5	Outline the traditional and modern fermented foods.	LO10 LO11
CO6	Apply principles of biotechnology for the development of safe, innovative, and value-added food products.	LO6 LO15

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	1	1	2	2	2	2	2	2
CO 2	3	3	2	2	2	2	1	2	2	2
CO 3	3	3	2	2	2	3	1	1	2	1
CO 4	3	3	2	2	1	3	2	1	1	2
CO 5	3	2	2	1	1	2	2	1	2	2
CO 6	3	3	3	2	2	3	2	2	3	2

S- Strong(3) M-Medium(2) L-Low(1)

OBJECTIVES: To enable the students to

Understand the principles and methods of counselling.

Apply counselling methods to patients with different diseases

UNIT I COUNSELLING

Counselling techniques, stage of change. Activities that facilitate behavior change, understanding cultural factors, developing Discrepancy, avoiding arguments / defensiveness, rolling with resistance, supporting self- efficacy. Intervention Model – Interviewing, assessment of current eating behavior and assessment of readiness to change.

UNIT II NUTRITIONAL COUNSELLING SESSIONS

Nutritional Counselling Sessions – not ready to change counselling sessions - asking open – ended questions, reflective listening, affirming, summarizing, eliciting self motivational statements, intention to change, ending the session. Ready to change counselling sessions- action plan, arranging for the next contact, resistance behaviors and potential strategies to modify them-reflecting, double-sided reflection, shifting focus, emphasizing personal choice, reframing.

UNIT III PSYCHOLOGY

Psychology- Introduction, definition., basic concepts –Attention, Perception, Learning, Memory, Personality, Cognition, Motivation. Counseling Psychology-Introduction, definition, meaning and importance.

UNIT IV COUNSELLING PROCESS

Counselling Process -Various phases / stages in counseling process. Types of Counselling: crisis counselling, facilitative counselling, preventive counselling and Development counselling. Counsellor-Counsee Relationship - nature and characteristics, factors influencing the relationship. Counselling and Psychotherapy, values in counselling.

UNIT V Family Counselling

Family planning counselling, abortion counselling, #importance of counselling for children and adolescents. Geriatric counseling - for patients with specific diseases like HIV/AIDS, cancer, and Diabetes.

TEXTBOOKS:

1. L.K. Mahan and M.T. Arlin, Krause's Food Nutrition and Diet Therapy, Eleventh Edition, W.B.Saunders Company, London (2000).
2. Robinson, Normal and Therapeutic Nutrition, Seventeenth Edition, Oxford & LBM Publishing, Bombay (1990).
3. M. E. Shils, J. A. Olson, M. Shike, & A.C. Ross, Modern Nutrition in Health & Disease, Tenth Edition, Lippincott Williams and Wilkins (2006).

REFERENCE BOOKS:

1. Currie, Joe, Barefoot Counseling, A Premier in Building helping Relationships, Asian Trading Cooperation, Bangalore (1976).
2. K.K. Bhatia, Principles of Guidance and Counselling, Kalyani Publishers Ludhiana (2002).
3. Nelson – Jones, Richard, Practical Counselling and helping Skills, Better Yourself Books, Bombay (1994).

COURSE OUTCOMES: (With Mapping)

CO1	Associate the nature of food and distinctive features of food industry.
CO2	Infer the current applications and fore see future trends in food biotechnology.
CO3	Summarize and distinguish the different types of fermented foods.
CO4	Apply basic knowledge of microbiology, biochemistry and genetic engineering in preparing fermented foods.
CO5	Outline the traditional and modern fermented foods.
CO6	Apply principles of biotechnology for the development of safe, innovative, and value-added food products.

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	2	2	2	2	2	2	2	2
CO 2	3	3	2	2	2	2	1	2	2	2
CO 3	3	3	2	2	2	3	1	1	2	1
CO 4	3	3	2	2	1	3	2	1	1	2
CO 5	3	2	2	1	1	2	2	1	2	2
CO 6	3	3	3	2	2	3	2	2	3	2

S- Strong(3) M-Medium(2) L-Low(1)

OBJECTIVES: To enable the students to

- As certain the energy requirements and energy components.
- Understand the metabolism of macro nutrients and its significance in health.
- Know the significance of micronutrients and their role humans.
- Recognize the physiological changes that occur in humans while being exposed to high altitude and sea travel.
- Comprehend the nutrition management strategies during mergencies.

UNIT-I MACRONUTRIENTS:

Energy: Energy requirements of individuals and groups, RDA, principles and the methods used for RDA measurement. Concept of energy balance, energy input and expenditure; measurement of energy input and expenditure; factors influencing energy expenditure.

Carbohydrate, Protein, Lipid: Physiological functions, digestion, absorption, metabolism, utilization, food sources and requirements. Metabolic adaptation to fasting and starvation.

Water: Physiologicalrole, requirements.

UNIT-II MICRONUTRIENTS:

Vitamins: Physiological functions, digestion, absorption, metabolism and utilization, food sources, requirements, deficiency and toxicity.

Minerals: Physiological functions, digestion, absorption, metabolism and utilization, food sources, requirements, deficiency and toxicity.

UNIT-III NUTRITION FOR SPACE, SEA ANDAIRTRAVEL:

Space Nutrition: Physiological changes in astronauts; nutrient requirement and dietary management during space travel. Physiological changes in human body during sea and air travel; Psychological preparedness for sea and air travel; health problems encountered during sea and air travel; Nutrient requirements and dietary management during sea and air travel.

UNIT-IV NUTRITIONINHIGHALTITUDEANDEMERCENCIES:

Nutritional requirements in extreme environmental temperature, in high altitude, physiological changes due to high altitude, altitude sickness and related health problems; nutrient requirements and dietary management of mountaineers. Nutritional support system in relief and rehabilitation. Surveillance of nutritional status in emergency relief situations such as flood, cyclone, earthquake, drought and war.

UNIT-V NUTRITIONTRANSITION:

Changingtrendsinlifestyleanddietarypatternsinspopulationgroupsandtheir implications on nutritional status and disease. Triple burden of malnutrition. Improving nutritional quality of diets- fortification, bioavailability of nutrients, dietary diversity and new food basket.

UNIT–VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

1. Planning sample diets for persons travelling in sea and high altitude.
2. Preparation of food rations for emergency relief situations namely flood and drought.

TEXTBOOKS:

- 1 Raheena Begum, M.(2009),Textbook of Foods, Nutrition and Dietetics Sterling Publishers, New Delhi
- 2 Bamji, M.S., Rao,N.P & Reddy,V.(1996).Textbook of Human Nutrition. Oxford & IBH Publishing Co. (P). Ltd. Delhi.
- 3 Nutrition and Dietetics – S.A. Joshi; Tata McGraw-Hill Publishing Company Limited, New Delhi.
- 4 Gopalan, G. Rama Shastri B.V & Balasbramnian, S.C. (2000). Nutritive Value of Indian Foods. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad 500-007, India.
- 5 Sri Lakshmi, B. (2000). Nutrition Science. New Age International (P) Ltd. Pub. New Delhi
- 6 Swaminathan, M. (2009). Textbook of Food and Nutrition. BAPPCO publishers, Bangalore.

REFERENCEBOOKS:

1. Gibson, G.R. and M.B. Roberfoid (1999),Colonic Microbiota, Nutrition and Health. Kulwer Academic Publishers, Dordecht.
2. Whitney, E. R. and S.R. Rolfes (2009) understanding Nutrition 9th ed.Wads worth Thomson, Learning, Australia.
3. Chandra, R.K.and New berne, P.M., (1982) Nutrition immunity and infection. Plenum Press.
4. Shills, M.E., Olson, J., Shike, M. and Roos, C.(2005): Modern Nutrition in Health and Disease. 10th Edition. Williams and Williams. A. Beverly Co. London.
5. WHO. (1997). Applied health research priorities in complex emergencies, Geneva
6. Young, H. and Jaspars, S.(1995). Nutrition matters: People, food and famine, Intermediate Technology Publications, London.
7. UNHCR. (1999). UNHCRH and book of emergencies,2nd edition, Geneva. UNHCR

ERESOURCES:

1. www.nutrition.gov
2. www.nal.usdfa.gov/fnic
3. [E-LearningPrograms\(nestlenutrition-institute.org\)](http://E-LearningPrograms(nestlenutrition-institute.org))
4. WFP Nutrition's LearningPlatform |Humanitarian Library
5. <http://ebookstorages.com/Advanced-Nutrition-and-Human-Metabolism-1305627857.html>

COURSEOUTCOMES:

- Estimatetheenergyrequirementsforindividualsandcomprehendtheneedfor macronutrients.
- Realizetheimportanceofmicronutrientsingrowthanddevelopmentofhumans.
- Predictthedietaryrequirementswhilescalinghighaltitudesandinemergencies.
- Plan diets for space, sea and air travel.

- Relate the changing trend in the lifestyle of individuals and nutrition transition.

COURSE OUTCOMES: (With Mapping)

At the end of the course, the students will have the ability to		
CO1	Estimate the energy requirements for individuals and comprehend the need for macronutrients.	LO1
CO2	Realize the importance of micronutrients in growth and development of humans.	LO4
CO3	Predict the dietary requirements while scaling high altitudes and in emergencies.	LO5
CO4	Plan diets for space, sea and air travel.	LO7 LO13
CO5	Relate the changing trends in the lifestyle of individuals and nutrition transition	LO10 LO11
CO6	Assess strategies to improve nutritional quality of diets through food fortification, dietary diversity, bioavailability enhancement, and development of new food products	LO6 LO15

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	2	3	2	2	2	2	2	2
CO 2	3	3	2	2	2	2	1	2	2	2
CO 3	3	3	2	2	2	3	1	3	2	2
CO 4	3	3	2	2	2	3	2	3	1	2
CO 5	3	2	2	3	2	2	2	1	2	2
CO 6	3	3	3	2	2	3	2	2	3	2

S- Strong(3) M-Medium(2) L-Low(1)

OBJECTIVES: To enable the students to

- Understand the biochemical mechanisms and pathophysiological processes responsible for common biochemical disorders.
- Overview of normal and abnormal metabolic functions, the impact of disorders on metabolic processes.
- Interpret the clinical significance of organ function tests
- Gain insight into the immune response and its functions
- Comprehend the role of hormones in health.

UNIT-I BODY FLUIDS AND BIOMARKERS:

Intracellular fluid compartment, extracellular fluid compartment, measurement of body fluid volumes, the dilution principle for measuring fluid volumes, determination of blood volume, measurement of extra cellular fluid volume, measurement of total body water, transport across cell membranes - passive transport, active transport, solute-solvent interaction. Hematological indices.

Abnormal urine constituents – relevance to disease diagnosis. Biomarkers – thyroid markers, cardiac markers, bone markers, rheumatoid factor, tumour markers, acute phase proteins.

UNIT – II ABNORMAL METABOLIC FUNCTIONS AND INBORN ERRORS OF METABOLISM:

Glucose level in normal blood, renal threshold, hyper and hypoglycemia and glycosuria; glucose tolerance tests - oral, intravenous, other types, lab diagnosis of early and latent diabetes mellitus - diabetic coma, ketonuria, secondary degenerative changes associated with diabetes mellitus. Glycogen storage disorders I -VI, Pentosuria, and galactosemia.

Agammaglobulinemia, alpha – fetoprotein, amyloidosis, cryoglobulinemia; hypo and hyper immune gamma-globulinemia. Abnormalities in nitrogen metabolism– uremia, porphyrias and porphyrinuria. Inborn error of protein metabolism: Phenylketonuria, alkaptonuria, albinism, tyrosinosis, maple syrup urine disease, histidinemia.

Disorders of lipids: Plasma lipoproteins, cholesterol, triglycerides & phospholipids in health and disease. Hyperlipidemia, hyperlipoproteinemia, ketone bodies, fatty liver. Inborn errors of lipid metabolism -Leish – Nyhan syndrome, Fabry's disease, Gaucher's disease, Tay–Sachs and Niemann–Pick disease.

UNIT III ORGAN FUNCTION TESTS:

Liver function tests. Gastric function tests. Renal function tests.

UNIT IV IMMUNOLOGY:

Cells and molecules involved in innate and adaptive immunity, antigens, antigenicity and immunogenicity. B and T cell epitopes, structure and function of antibody molecules. Generation of antibody diversity, monoclonal antibodies, antibody engineering, antigen-antibody interactions, MHC molecules, antigen processing and presentation, activation and differentiation of B and T cells, B and T cell receptors, humoral and cell – mediated immune responses, primary and secondary immune modulation, the complement system, Toll-like receptors, cell-mediated effector functions. Inflammation, hypersensitivity and autoimmunity, immune response during bacterial (tuberculosis), parasitic (malaria) and viral (HIV) infections, congenital and acquired immunodeficiency, vaccines.

UNIT V IMMUNOLOGY:

Cells and molecules involved in innate and adaptive immunity, antigens, antigenicity and immunogenicity. B and T cell epitopes, structure and function of antibody molecules.

Generation of antibody diversity, monoclonal antibodies, antibody engineering, antigen-antibody interactions, MHC molecules, antigen processing and presentation, activation and differentiation of B and T cells, B and T cell receptors, humoral and cell-mediated immune responses, primary and secondary immune modulation, the complement system, Toll-like receptors, cell-mediated effector functions.

Inflammation, hypersensitivity and autoimmunity, immune response during bacterial (tuberculosis), parasitic (malaria) and viral (HIV) infections, congenital and acquired immunodeficiency, vaccines.

UNIT V METABOLIC CHANGES DURING PHYSIOLOGICAL STRESS:

Metabolism during starvation.

Effect of stress and diseases.

Disorders of acid base homeostasis. Water and electrolyte imbalance.

UNIT-VI CURRENT CONTOUR (For Continuous Internal Assessment Only):

- 1 Seminar talks and group discussion on recent research topics related to above contents and a related assignment.
- 2 Preparing reference value for complete biochemical and haematological parameters.
- 3 Visit to NABL accredited diagnostic laboratory.

TEXT BOOKS:

- 1 M.N.Chatterjee & Ranashinde, Text Book of Medical Biochemistry, Jaypee Publisher, 6th edition, 2006.
- 2 Nessar Ahmed, Clinical Biochemistry, Oxford University Press, 1st Edition, 2011.
- 3 Nanda Maheshwari, Clinical Biochemistry Jaypee Publishers, 2008.
- 4 M.N.Chatterjee and Rana Shinde, Text book of Medical Biochemistry, Jaypee Brothers, 2015

REFERENCE BOOKS:

- 1 Rodney F.Boyer, Biochemistry Laboratory: Modern Theory and Techniques, 2th edition, Pearson Prentice Hall, 2011.
- 2 Undurti N., Das Molecular Basis of Health and Disease, 1st edition, Springer, 2011.
- 3 M N Chatterjea, Ranashinde, Text book of Medical Biochemistry, 8th edition, JAYPEE, 2012.
- 4 William J. Marshall, S. K. Bangert, Clinical Biochemistry: Metabolic and Clinical Aspects, 1st edition, Churchill livingstone, 1995.
- 5 Michael Lieberman, Allan D. Marks, Marks' Basic Medical Biochemistry: A Clinical Approach, 3rd edition, Lippincott Williams & Wilkins, 2009.

ERESOURCES

1. https://books.google.co.in/books?id=P3TWDwAAQBAJ&printsec=copyright&redir_esc=y#v=onepage&q&f=false
2. https://www.google.co.in/books/edition/Ambika_Shanmugam_s_Fundamentals_of_Bioch/f_bsDwAAQBAJ?hl=en&gbpv=1&dq=ambika+shanmugam+biochemistry
3. <https://egyankosh.ac.in/handle/123456789/76754>
4. https://www.google.co.in/books/edition/Fundamental_Immunology/x0gpapT-Y2kC?hl=en&gbpv=1&dq=immunology+book+e+link&printsec=frontcover

COURSE OUTCOMES:

COURSE OUTCOMES: (With Mapping)

At the end of the course, the students will have the ability to		
CO1	Enumerate the analytical techniques, biomarkers and their significance in health.	LO1
CO2	Examine the abnormalities in metabolic functions and analyse the in born errors of metabolism.	LO4
CO3	Appraise the various organ function tests and their significance.	LO5
CO4	Discuss the role of different immune bodies and their mechanism of action	LO7 LO13
CO5	Speculate the metabolic changes during stress and infer the physiological changes.	LO10 LO11
CO6	Correlate molecular basis of diseases and novel strategies to prevent the diseases.	LO6 LO15

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	2	3	2	2	2	2	2	2
CO 2	3	3	2	2	2	2	1	2	2	2
CO 3	3	3	2	2	2	3	1	3	2	2
CO 4	3	3	2	2	2	3	2	3	1	2
CO 5	3	2	2	3	2	2	2	1	2	2
CO 6	3	3	3	2	2	3	2	2	3	2

S- Strong(3) M-Medium(2) L-Low(1)

OBJECTIVES: To enable the students to

- Apply biochemical principles in laboratory investigations.
- Develop technical skills in clinical and nutritional biochemistry.
- Interpret laboratory data for assessment of health and disease conditions.
- Demonstrate competency in laboratory safety, accuracy, and ethical practices.
- Utilize biochemical findings for nutritional assessment and clinical decision-making.

I Urine Analysis

1. Qualitative analysis of urine sugar, albumin, ketone bodies and bile salts.
2. Estimation of Urine sugar.
3. Estimation of Urine Albumin.
4. Estimation of Urine Creatinine.
5. Estimation of urine urea.

II Blood Analysis

1. Methods of collection of blood. Separation of serum and plasma.
2. Estimation of Haemoglobin.
3. Estimation of glucose.
4. Estimation of serum creatinine.
5. Estimation of serum bilirubin.
6. Estimation of serum cholesterol.
7. Estimation of serum urea.
8. Estimation of total protein, AG Ratio.
9. Estimation of SGPT / SGOT.

TEXTBOOKS:

1. Sadasivam, S. and Manickam, A. Biochemical Method, Second Edition, New Age International P. Ltd., Publishers, New Delhi, 2003.
2. Raghuramulu, N., Madhavan nair, K. and Kalyana Sundaram, National Institute of Nutrition, 2003, A Manual of Laboratory Techniques, Hyderabad, 500007.

REFERENCEBOOKS:

1. H. Varley, Gowen Lock. A.H, William Heinemann: Practical Clinical Biochemistry, Medical Books CBS Publishers and Distributors Ltd, 5th Edition
2. Raphael Lynch's medical laboratory technology, W B Saunders Co publication
3. Wootten: Micro analysis in Medical Biochemistry—Outline of Biochemistry—Coon and stump
4. J. Ochei and A. Kolhatkar, Medical laboratory science theory and practice, Tata MC Graw Hill publication, 4th Edition, 2008.
5. Medical Laboratory Technology, Tata MC Graw Hill Publishers, 1988.
6. Ramnik sood, Textbook of medical Laboratory technology, JAYPEE publisher, 2006.
7. Manual of Medical Laboratory Techniques, JAYPEE Publisher, 1st Edition, 2008.
8. Ramakrishnan S, Sulochana K. N, Shankara S, M. K Ganesh, A Hemavathi: Laboratory Manual for practical Biochemistry, JAYPEE publisher, 1st Edition, 2008.
9. V.H. Talib: Handbook Medical Laboratory Technology, CBS Publishers & Distributors (Dec 2008)

COURSEOUTCOMES:

COURSE OUTCOMES: (With Mapping)

At the end of the course, the students will have the ability to		
CO1	Demonstrate proper collection, handling, and processing of urine and blood samples for biochemical analysis.	LO1
CO2	Perform qualitative analysis of urine constituents such as glucose, albumin, ketone bodies, and bile salts and interpret the results.	LO4
CO3	Estimate and evaluate urinary biochemical parameters including glucose, albumin, creatinine, and urea using standard laboratory methods.	LO5
CO4	Apply appropriate laboratory techniques for blood analysis, including separation of serum and plasma and estimation of hemoglobin and blood glucose.	LO7 LO13
CO5	Determine and interpret serum biochemical parameters such as creatinine, bilirubin, cholesterol, urea, total protein, albumin-globulin ratio, SGOT, and SGPT in relation to health and disease conditions.	LO10 LO11
CO6	Analyze laboratory findings and correlate biochemical test results with nutritional status, metabolic disorders, liver function, kidney function, and other clinical conditions.	LO6 LO15

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	2	3	2	2	2	2	2	2
CO 2	3	3	2	2	2	2	1	2	2	2
CO 3	3	3	2	2	2	3	1	3	2	2
CO 4	3	3	2	2	2	3	2	3	1	2
CO 5	3	2	2	3	2	2	2	1	2	2
CO 6	3	3	3	2	2	3	2	2	3	2

S- Strong(3) M-Medium(2) L-Low(1)

Code:	(Theory)	Credit: 4
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- Understand the structure and significance of the food processing industry in India and its role in the food supply chain.
- Study the principles, methods, and technologies involved in processing cereals, pulses, oilseeds, fruits, vegetables, milk, eggs, meat, poultry, and fish.
- Gain knowledge about milling, preservation, extrusion, fermentation, fortification, and value-added food products.
- Understand the nutritional, physicochemical, and quality changes occurring during food processing and storage.
- Learn about by-product utilization, food standards, and modern processing techniques used in the food industry.

Enrichment and fortification - definition, fortification and enrichment of cereal products with vitamins and minerals. Outline of Green Revolution.

Nuts and Oil seed Processing—Methods of oil extraction, refining and processing of oil seeds – groundnut and coconut, peanut butter and nut butters, Outline of Yellow Revolution.

UNIT-III FRUIT, VEGETABLE AND PLANTATION PROCESSING:

Maturity indices, ripening, changes during ripening-climacteric & non-climacteric, post-harvest technology of fruits and vegetables - size reduction, mixing, separation, harvesting, handling.

Fruit processing -fruit juice concentrates, frozen fruit powders, blended juices, RTS, nectar, cordial, fruit butter; tomato products - puree, paste and powder. Nutritional losses during Processing,

Vegetable processing-puree, pastes, vathals, soup mixes and vegetable juices.

Coffee processing - changes during fermentation, instant coffee powder; tea processing-manufacture of different types of tea-green, black, white, yellow and oolong tea.

Cocoa processing - manufacture of cocoa powder, chocolate and cocoa butter Spices and condiments processing-extraction of essential oils and colors from spices, processed products of spices and condiments.

UNIT-IV MILK AND EGG PROCESSING:

Introduction to dairy processing, milk production in India, dairy development programmes; Outline of White Revolution

Milk Processing- milk pre-processing and processing - separation, homogenization, pasteurization, standardization, sterilization (UHT), evaporation (Spray Drying), chilling, freezing and refrigeration; nutritional losses during processing.

Manufacture of dairy products such as standardised, toned and double toned milk, ice-cream, cheese, yoghurt skimmed milk powder.

Fermented milk products - chakka, srikhand, yoghurt - composition, standards, flow diagram for production process; Production of non-fermented milk products - whey protein concentrates, cheese - composition, standards and flow diagram for production process.

Frozen milk products-softy, kulfi, -composition, standards, flow diagram for production process.

Egg Processing-composition, standards, flow diagram for production process of - whole egg powder, frozen egg pulp, designer eggs and egg yolk powder.

UNIT-V MEAT, POULTRY, FISH AND SHELLFISH PROCESSING:

Meat processing - meat quality - colour, flavour, texture, water holding capacity (WHC), emulsification capacity of meat; tests for assessment of raw meat - TVN, FFA, PV, nitrate and nitrite in cured meat.

Meat products-sausages, RTE meat products, salami, kebabs, sliced, minced, refrigerated, frozen, corned meat production process.

Poultry processing - chicken patties, canned, dried, pickling, cured and smoking, salami, kebabs, sausages, sliced, minced, corned poultry production process.

Fish Processing - surimi- introduction, fish muscle proteins, the surimi process, traditional and modern surimi production lines, quality of surimi products, comparison of surimi and fish mince products.

Canned fish, fish protein concentrates (FPC), fish protein extracts (FPE), fish protein hydrolysis (FPH). Fish bone; Outline of Blue Revolution.

UNIT–VI CURRENT CONTOURS: (For Continuous Internal Assessment Only):

1. Poster presentation on by-products of processed foods
2. Visit to related research institutes

TEXTBOOKS:

1. Subbulakshmi, G., (2021), Food Processing and Preservation, Second edition, New Age International Private Limited, New Delhi.
2. Sivasankar, B., (2002), Food Processing & Preservation, Prentice Hall India Learning Private Limited, New Delhi.
3. Potter, N.H., (1998), Food Science, CBS Publication, New Delhi.
4. Ramaswamy, H. and Marcott, M., (2006), Food Processing Principles and Applications, CRC Press, New York.
5. Manay, S. N. Shadaksharaswamy, M., (2004), Food Facts and Principles, 2nd edition, New Age Publisher, New Delhi.
6. Roday, S., (2011), Food Science, 1st edition, Oxford Publication, UK.
7. Srilakshmi, B., (2015), Food science, 6th edition, New Age Publishers, New Delhi.
8. Fellows, P., (2000), Food Processing Technology, 2nd Edition, Woodhead Publishing Limited, India.
9. Sharma, A., (2017), Textbook of food science and Technology, 3rd edition, CBS Publishers and Distributes Ltd., Bangalore.

REFERENCE BOOKS:

1. Rao, P.G., (2010), Fundamentals of Food Engineering, PHI Learning Pvt. Ltd., New Delhi.
2. Romeo, T., (1999), Fundamentals of Food Process Engineering, Aspen Publishers, USA.
3. Fellow, P. (2000), Food Processing Technology, Principles and Practice, CRC Press, New York.
4. Tripathi, M.K., Mangaraj, S., Ali, N., (2022), Handbook of Food Processing Nutrition & Health, Satish Serial Publishing House, New Delhi.
5. Ward, J. D. and Larry Ward, L., (2006), Principles of Food Science, 4th edition, Stem Publishers, USA.
6. Srivastava, R. P. and Kumar, S., (2006), Fruits and Vegetables Preservation- Principles and Practices, 3rd edition, International Book Distributing Co., Lucknow.
7. Crusess, W.B., (2004), Commercial Unit and Vegetable Products, W.V. Special Indian Edition, 2nd edition, Pub Agrobios, India.

E-RESOURCES

1. <http://www.fao.org/3/V5030E/V5030E00.htm>
2. <https://ebooks.inflibnet.ac.in/ftp1/chapter/scope-of-food-processing-in-india-with-national-and-international-perspective/>
3. <https://www.fssai.gov.in/>
4. <https://www.pdfdrive.com/food-process-engineering-and-technology-d19901906.html>
5. <https://ia801408.us.archive.org/20/items/textbookoffoodsc0000khad/textbookoffoodsc0000khad.pdf>

COURSE OUTCOMES: (With Mapping)

At the end of the course, the students will have the ability to		
CO1	Explain the organization and importance of the Indian food processing industry and the food supply chain.	LO1
CO2	Describe cereal milling, pulse processing, oil extraction, extrusion cooking, and fortification techniques.	LO4
CO3	Discuss processing methods and value-added products of fruits, vegetables, plantation crops, dairy, eggs, meat, poultry, and fish.	LO5
CO4	Analyse the effects of processing on nutritional quality, physicochemical properties, and shelf life of dairy products	LO7 LO13
CO5	Explain the processing methods and quality evaluation of meat, poultry and fish products	LO10 LO11
CO6	Illustrate flow diagrams and production processes for major processed food products such as dairy products, meat products, surimi, fruit beverages, and cereal products.	LO6 LO15

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	2	3	2	2	2	2	2	2
CO 2	3	3	2	2	2	2	2	2	2	2
CO 3	3	3	2	2	2	3	2	3	2	2
CO 4	3	3	2	2	2	3	2	3	1	2
CO 5	3	2	2	3	2	2	2	2	2	2
CO 6	3	3	3	2	2	3	2	2	3	2

S- Strong(3) M-Medium(2) L-Low(1)

OBJECTIVES: To enable the students to

- Know the functioning of different types of food service institutions.
- Understand the types of kitchen and kitchen layout
- Comprehend the space allocation and arrangement of food service units.
- Develop skills on the concept of quantity food cookery
- Utilize resources effectively in food service industry.

UNIT – I FOOD SERVICE INDUSTRY:

Types of Food Service Institutions -Commercial and Non-commercial Definition, objectives and functions of Hotel, Motel, Restaurant, Cafeteria and chain hotels. Welfare – Hospital, School lunch, Residential establishment and Industrial catering. Transport – Air, Rail, Sea and Space, Miscellaneous – Contract and outdoor.

UNIT – II FOOD PRODUCTION AND SERVICE:

Food Production: Importance, Principles of Menu Planning in Food Service Institutions, Type of Menu, Techniques of Menu Writing. Standardization of Recipe, Portion Control, Utilization of left over foods in food service institutions. Food cost control. Book of accounts Food Service: Formal and Informal types, Styles of Food Services, Centralized and Decentralized System of Service

UNIT – III FOOD SERVICE MANAGEMENT:

Management: Principles, Functions and Tools of Management Resource management - Money, Time, Energy, Computer applications in menu planning. Personnel Management: Recruitment, Selection, Induction, Training, Motivation and Leadership, Wages and other welfare benefits for personnel Laws Governing Food Service Establishment pertaining to employees –Labour laws.

UNIT – IV PHYSICAL PLANT, EQUIPMENT AND FOOD PURCHASE:

Layout of kitchens, types of kitchens – Planning, Receiving and storage space of foods, table setting, Dishwashing. Equipment - Classification, factors involved in selection, use and care of major equipments Food Purchase- Procedures and Factors involved in the selection of food

UNIT – V HYGIENE, SANITATION AND SAFETY IN FOOD SERVICE INSTITUTIONS:

Definition, importance of personnel hygiene, importance of pest and rodent control in food services. Safety in disposal of food waste. Accidents in food service and safety procedure, legal responsibilities of food service manager FSSAI (Food safety standard authority of India), Procedures to apply for FSSAI in Tamil Nadu. Entrepreneurship in catering.

UNIT – VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

Application of principles of sanitation in college laboratory and hostel. Visit to catering institutions to know about organization pattern and personnel Management. Cost comparison of different types of fuel. Explore the different traditional and modern equipments used in food service. Eco kitchen / green kitchen concept.

TEXT BOOKS:

1. West, B.B. and Wood, L. 1979. Food Service in Institutions, John Wiley, New York.
2. Kinton. R And Ceserani, V. 1992. The Theory of Catering . ELBS Publishers.
3. T. Ramaswamy. Principles of Management Himalaya Publication.
4. Subba Rao, P. 2014 Management Theory and Practice, Himalaya publication
5. Swaminathan, M. 1979, Food Service and Experimental Foods, Ganesh & Co., Madras

CO1	Elucidate the origin and categorization of food service sectors.	LO1
CO2	Develop skills in volume food production, various styles of services	LO4
CO3	Employ the basic principles and tools of management for efficaciously handling an establishment and utilize the expertise obtained for managing human resources.	LO5
CO4	Understand the concepts of layout, equipment in cooking and service area and the food purchase	LO7 LO13
CO5	Explore the importance of hygiene and safety in the food service units and comprehend the procedures for registration of the units.	LO10 LO11
CO6	Review the recent development in hospitality industry	LO6 LO15

REFERENCE BOOKS:

1. Mohini Sethi and Surjeet Malhan, "Catering Management – an integrated approach", 2nd edition, Wiley Eastern Limited, New Delhi, Reprint 2007.
2. Suganthi, V and Premakumari, C. (2017). Food Service Management. Chennai: Dipti Press (OPC) Pvt. LTD.
3. Mary, B. Gregoire, Marian, C. Spears. (2007). Food Service Organizations. United States : Pearson Prentice Hall.
4. Jyoti, S. Sharma. (2006). Food Service Modern Technique and Practices. New Delhi: Akansha Publishing House.
5. Roday, S. (2017). Food Hygiene and Sanitation. (2nd ed.). India: McGraw-Hill Education (India) Pvt Limited.

E-REFERENCE

1. <https://www.ccohs.ca/oshanswers/hsprograms>
2. <https://www.eatrightpro.org/practice/practice-resources>
3. <https://www.ers.usda.gov/topics/food-markets-prices/food-service-industry.aspx>
4. <https://theicn.org/>
5. www.fssai.gov.in

COURSE OUTCOMES: (With Mapping)**Mapping with Program Outcomes:**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	1	3	2	2	2	2	2	2
CO 2	3	3	2	2	2	2	2	2	2	2
CO 3	3	3	2	2	2	3	2	3	2	2
CO 4	3	3	1	2	2	3	2	3	2	2
CO 5	3	2	2	3	2	2	2	2	2	2
CO 6	3	3	3	2	2	3	2	2	3	2

S- Strong(3) M-Medium(2) L-Low(1)

First Year	GENERIC ELECTIVE COURSE 2	Semester II
	1.FUNCTIONAL FOODS AND NUTRACEUTICALS	
Code:	(Theory)	Credit: 3

COURSE OBJECTIVES: To enable the students to

- Gain insight into the specific uses of functional foods and nutraceuticals
- Understand the use of various functional foods in their mechanism of action
- Study the effects of prebiotics, probiotics and synbiotics products
- Relate the therapeutic value of functional foods in disease prevention
- Infer the safety and regulatory aspects pertaining to functional foods and nutraceuticals.

UNIT-I FUNCTIONAL FOODS:

Introduction to functional foods; importance, history, definition, classification, types – modified, medicinal, conventional and dietary use of foods and their benefits. The origin of functional food – plant, animal, microbes as functional foods. Traditional Vs processed foods.

UNIT-II NATURAL PHYTOCHEMICALS:

Antioxidants and flavonoids: omega – 3 fatty acids, carotenoids; dietary fiber, phytoestrogens; saponins, amylase inhibitors, lectins or haemagglutinins, phytates and their health benefits. Dosage for effective control of disease and prevention with adequate safety; animal and human studies; acute and chronic studies; Regulations.

UNIT-III PREBIOTICS, PROBIOTICS AND SYNBIOTICS:

Probiotics: Definition, types and relevance; usefulness in gastro intestinal health and other health benefits; development of a probiotic product; 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. Synbiotics- significance and use.

UNIT-IV THERAPEUTIC FUNCTIONAL FOODS:

Functional foods in gastrointestinal disorder, cancer, CVD, diabetes mellitus, HIV and dental disease; Functional foods and immune competence; role and use in obesity and nervous system disorders.

UNIT-V REGULATORY AND SAFETY ASPECTS:

Health claims, regulations and safety issues- international and national. FSSAI regulations, ICMR guidelines for probiotic. Marketing and regulatory issues for functional foods and nutraceuticals. Research frontiers in nutraceutical and functional foods.

UNIT-VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

Conduct a market survey on functional foods and nutraceuticals in your locality
Preparation of catalogue with information on functional foods and nutraceuticals.

TEXTBOOKS:

1. Mary, K. Schmidl and Theodore, P. Labuza, Essentials of Functional Foods, Culinary and hospitality industry publication services, 2000.
2. Israel Goldberg, Functional foods, pharmafoods, Nutraceuticals, Culinary and hospitality industry publication services, 2001
3. Robert easy Wildman, Handbook of Nutraceuticals and functional foods, Culinary and hospitality industry publication services, Third Edition, Wallace, 2002.

REFERENCEBOOKS:

1. Wildman, Robert. Nutraceuticals and Functional Foods, second edition. Taylor and Francis Group, 2007.
2. Gibson GR & William CM. Functional Foods-ConcepttoProduct,2000.
3. Goldberg I. Functional Foods: Designer Foods, Pharma Foods, 2010.
4. Brigelius - Flohé, J & Joost H G. Nutritional Genomics: Impact on Health and Disease. Wiley VCH, 2006.
5. Cupp J & Tracy TS. Dietary Supplements: Toxicology and Clinical Pharmacology. Humana Press, 2003.
6. Watson Ronald Ross, 'Functional Foods and Nutraceuticals in Cancer Prevention' Iowa State Press, Blackwell Pub Co, Iowa, 2003
7. Aluko, Rotimi, Functional Foods and Nutraceuticals, Springer-Verlag New York Inc., 2012.

E RESOURCES:

1. <https://krishi.icar.gov.in/jspui/bitstream/123456789/71744/1/FINAL-231-250.pdf>
2. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3257668/>
3. <https://www.fda.gov.tw/upload/189/content/2014012817043536259.pdf>
4. https://gavsispanel.gelisim.edu.tr/Document/bgcol/20190220115348732_dcfb1798-bc12-4788-a50f-ec72d7f69ef4.pdf
5. <https://www.youtube.com/watch?v=QxORI49hcI4>
7. https://onlinecourses.swayam2.ac.in/cec23_ag02/preview
8. <https://youtu.be/9G1wWUjkyz8?si=0XDM9lh7T6f1IGEY>

COURSE OUTCOMES: (With Mapping)

At the end of the course, the students will have the ability to		
CO1	Explain the growing importance of nutraceuticals and functional food	LO1
CO2	Identify, analyze and isolate the different types of functional foods and their nutraceutical components.	LO4
CO3	Outline the beneficiary role of probiotics, prebiotics and synbiotics	LO5
CO4	Assess the role of nutraceuticals and functional foods in disease prevention	LO7 LO13
CO5	Analyze ethical and marketing challenges associated with functional foods and nutraceutical products.	LO10 LO11
CO6	Appreciate the effects of nutraceuticals in health and therapeutic conditions	LO6 LO15

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2	1	3	2	2	1	2	2	2
CO 2	3	3	2	2	2	2	2	2	2	2
CO 3	3	3	2	2	2	3	2	3	2	2
CO 4	3	3	1	2	2	3	2	3	2	2
CO 5	3	2	2	3	2	2	2	2	2	2
CO 6	3	3	3	2	2	3	2	2	3	2

S- Strong(3) M-Medium(2) L-Low(1)

First Year

GENERIC ELECTIVE COURSE – 2
2. PRINCIPLES OF RESOURCE MANAGEMENT AND INTERIOR DESIGN

Semester II

Code: (Theory)

Credit: 3

OBJECTIVES: To enable the students to

- Understand concepts and principles and functions of management.
- Recognise the importance of wise use of resources to achieve ones goal.
- Acquire the knowledge of various elements and principles of art in interior.
- Learn skills in using the basic principles of art at home in commercial situations and other occasions.
- Apply theoretical knowledge of interior decoration to practical situations

UNIT-I Resource Management

Understanding, meaning, classification and characteristics of resources, factors affecting utilization of resources. Maximizing use of resources and resource conservation. Availability and management of specific resources by an individual / family –money, time, energy, space. Functions of management: Decision making, planning, supervising, controlling, organising.

UNIT-II Design and Good taste

Objectives of aesthetic planning, beauty, expressiveness, functionalism. Concept of design, purpose of design, elements of design, types of design, structural design, and decorative design. Colour: Sources of colour- dimension of colour (hue, value, intensity / chroma). The prang colour system (primary, secondary, intermediate hue, tertiary and quaternary colour) . Procedure for making a colour scheme for a room: factors affecting the use of colour scheme for room (the room, mood, style, fashion, personality, possessions). Application of art principle in the use of colours for a room (balance, proportion, harmony, rhythm, emphasis).

UNIT-III Lighting

Sources of light (natural, artificial light).Types of Lighting: General / ambient lighting, task lighting, accent lighting. Requirements of an Ideal Lighting Installation- Steadiness of the source of light, elimination of glare, avoidance of shadows, sufficient illumination to suit the nature of the visual task, non production of excessive heat, minimum consumption of oxygen from the air.

UNIT-IV Furniture

Requirement and arrangement in the home, materials used in furnishing items. Furnishing: Different types of furnishing, factors considered in the selection of furnishing. Floor Coverings: Factors for selecting floor coverings, salient features of carpet, types, use and care of floor coverings.

UNIT-V Accessories

Selection, types ,use and care of accessories. Traditional and Modern: Art objects, pictures. Flower Arrangement: Principles, types and steps in preparing flower arrangement.

UNIT–VICURRENTCONTOURS: (For Continuous Internal Assessment Only):

Assignment on human resources and preparation of Album for uses of colour, flower arrangements and lighting in home interior.

TEXTBOOKS:

1. Graig. H.T., And Rush, C.H. “Homes with Character”, D.C. Health and Company, Boston, 1965.

- Alexander, M.J., "Designing Interior Environment", Har court Brace Jauaroui Inc., New York. 1972.
- Sherwood, R.F. "Homes Today and Tomorrow": Chart Bannet, Co., Inc., PEORIC, Illinois, 1972
- Premavathy Seetharaman and Parveen banu "Interior Design and Decoration" CBS Publishers, New Delhi, 2007.

REFERENCEBOOKS:

- Nickell. P. and Dorsey. J.M. – "Management in Family Living", John Wiley and Sons, Inc, New York, 1960.
- Goldstein. H and Goldstein. V. "Art in Everyday Life", Macmillan and Company, New York, 1966.
- Rutt, A.H., "Home Furnishings", John Wiley and Sons, New York, 1961
- Roy Day, "All about Decorating Your Home" Hamlyn, London", 1976

COURSE OUTCOMES: (With Mapping)

At the end of the course, the students will have the ability to		
CO1	Explain the meaning and classification of resources	LO1
CO2	Apply art principles in aesthetic planning, and create room colour schemes	LO4
CO3	Identify sources and types of lighting, evaluate requirements for ideal installations	LO5
CO4	Appraise the principles of arrangement and furnishing selection, and evaluate floor coverings and carpets for durability, aesthetics, and care.	LO7 LO13
CO5	Create flower arrangements using traditional and modern techniques, and evaluate their effectiveness in enhancing interior aesthetics.	LO10 LO11
CO6	Integrate the knowledge of resource management and interior design in home	LO6 LO15

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2	2	2	2	2	2	2	2	2
CO 2	3	3	2	2	2	2	2	2	2	2
CO 3	3	3	2	2	2	3	2	3	2	2
CO 4	3	3	1	2	2	3	2	3	2	2
CO 5	3	2	2	3	2	2	2	2	2	2
CO 6	3	3	3	2	2	3	2	2	3	2

S- Strong(3) M-Medium(2) L-Low(1)

3. PAEDIATRIC AND GERIATRIC NUTRITION**Code:**

(Theory)

Credit: 3**OBJECTIVES:** To enable the students to

- Learn the importance of nutritional care and nourishment of children
- Understand the nutritional requirements of children and the effects of various diseases on their nutritional status Gain knowledge on the various dimensions of ageing to improve quality of life
- Understand the multifaceted aspects of aging the importance of nutrition during old age

UNIT I Infancy & Immunization Schedule

Paediatrics – concept, physical development, assessment of nutritional status- anthropometric measurements, biochemical examination, clinical assessment. Nutritional and food requirements for infants. Immunization schedule during pregnancy, infancy and childhood. Identification of Sick Newborn- Detection of abnormal signs- cyanosis, jaundice, respiratory distress, bleeding, seizures, refusal of feeding, abdominal distention, dehydration, failure to pass meconium and urine.

UNIT II Nutritional Management

Premature, LBW Babies and children with developmental disabilities Characteristics, causes and complications, feeding methods, growth and nutritional assessment. Nutritional care for premature babies. Nutritional Management for Children with Special Conditions-Causes, symptoms and dietary management for autism, ADHD (Attention Deficit Hyperactivity disorder), cerebral palsy.

UNIT III Ageing and nutrition

A global challenge – Introduction to geriatrics (old age), definition. The ageing process- physiological and biochemical changes. Lifestyle pattern. Policy framework of WHO related to ageing.

UNIT IV Nutritional Requirements

Nutritional requirements during old age, food requirements and balanced diet. Food habits of the elderly. Supplements for the elderly. Nutritional and health status of elderly- Nutritional assessment during old age. Factors influencing food and nutrient intake- Changes in organ function and impact on nutrient intake, nutritional concerns of the elderly, modification of diet during old age.

UNIT V Nutritional problems of the elderly, chronic degenerative diseases and disability disorder

Malnutrition, osteoporosis, obesity, neurological dysfunction, anaemia, constipation, dental problems, indigestion, cardiovascular disease, diabetes mellitus, cancer, vision problems and arthritis – their etiology and prevention – a review. Drug and Nutrient Interaction.

UNIT–VICURRENTCONTOURS: (For Continuous Internal Assessment Only):

Prepare case studies on nutrition management for geriatric and pediatrics

TEXT BOOKS

1. Sushila Srivastava and K. Sudha Rani, Text Book of Human development A life span developmental approach, First Edition, S. Chand & Company Pvt, 2014.
2. B. Srilakshmi, Dietetics, Seventh Edition, New Age International (P) Ltd. Publishers, Chennai, 2011.
3. S. R. Mudambi, M. V. Rajagopal, Fundamentals of Foods & Nutrition & Diet Therapy, 5th Edition, New Age International (P) Ltd, 2007.
4. Dr. M. Swaminathan, Advanced Text Book of Food & Nutrition Vol-I Fundamental Aspects, 2nd Edition, BAPPCO, 1985.
5. Jim Mann, A. Stewart Truswell, Essentials of Human Nutrition, 4th Edition, Oxford University press, 2012.

REFERENCE BOOKS

1. Mahan, L.K. and Escott-Stump, S. Krause's Food Nutrition and Diet Therapy, 10th Edition, W.B. Saunders Ltd, 2000.
2. Depak K Guha, Neonatology Principles and Practices, Third Edition, Jaypee Brothers Medical Publications (P) Ltd, New Delhi, 2005.
3. Textbook of pediatric nutrition- Book review, Stephen J Rose, Arch Dis Child, 1995.
4. Shils, M.E., Olson, J.A., Shike, M. and Ross, A.C. Modern Nutrition in Health and Disease, 9th Edition, Williams and Wilkins, 1999.
5. Escott-Stump, S, Nutrition and Diagnosis Related Care, 4th Edition, Williams and Wilkins, 1998

COURSE OUTCOMES: (With Mapping)

CO1	Explain paediatric concepts and assess nutritional status
CO2	Appraise the characteristics and complications of premature
CO3	Analyse the lifestyle patterns and quality life of geriatrics
CO4	Create modified diet plans addressing physiological and psycho-social changes in ageing.
CO5	Evaluate preventive and dietary management strategies including drug-nutrient interactions
CO6	Integrate and preventive strategies across the life cycle.

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2	2	3	2	2	2	2	2	2
CO 2	3	3	2	2	2	2	2	2	2	2
CO 3	3	3	2	2	2	3	2	3	2	2
CO 4	3	3	1	2	2	3	2	3	2	2
CO 5	3	2	2	3	2	2	2	2	2	2
CO 6	3	3	3	2	2	3	2	2	3	2

S- Strong(3) M-Medium(2) L-Low(1)

OBJECTIVES: To enable the students to

- Understand the features of MS Office
- As certain the use of computer applications in research work
- Identify Microsoft programmes that aid in enhancing there search work
- Effectively use websites and search engines in research methodology.

UNIT-I INTRODUCTION TO MS WORD:

Introduction to MS Word, starting word–creating a document–saving and printing a document–move and copy text–smart cut and paste–quickly opening recently used files – copying text to another file – formatting text – using bulletsandnumberinginparagraphs– findingtext–replacecommand–checkingspellingandgrammar– usingautocorrecttoautomaticallyfixtyping errors

UNIT-II DATA DOCUMENTATION PRINCIPLES:

Enhancing a document–page setup–inserting page breaks–looking at a document in different views – adding borders and shading to paragraphs – using headersandfootersinthedocument–printpreview–printoptions–creating tables–formatting a table–using table auto format to format a table – calculations in a table–using mail merge.

UNIT-III INTRODUCTION TO WORK SHEET AND MS EXCEL:

Gettingstartedwithexcel–editingcellsandusingcommandsandfunctions– excel functions – range – moving and copying, inserting and deleting rows and columns–formatting a worksheet–formatting numbers.

Creating charts – resizing and moving the chart – changing the chart type – controlling the appearance of a chart – updating, modifying and deleting a chart – previewing and printing charts–using date and time in a worksheet–naming ranges and using statistical, math functions.

UNIT-IV APPLICATION OF SOFTWARE IN SIMPLE STATISTICS:

Mean, medium, mode, measures of central tendency and variability using MS Excel, parametric and non-parametric test using MS Excel.

UNIT-V POWER POINT:

Power Point–creating a presentation–power point views–running a slideshow – printing a presentation.

End note application for reference.

UNIT–VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

- 1 Prepare a power point presentation for any concept related to the core Programme.
- 2 Prepare different graphical representation of data sets.

TEXT BOOKS:

- 1 Kumar Bittu, Mastering MS Office, V & S Publishers, 2017.
- 2 Arora Ritu, Advance Excel 2016 training guide, BPB Publications, 2016.
- 3 Web tech Solutions, Mastering Microsoft Excel Functions and Formulas1 Edition, Khanna Publishers, 2010.
- 4 R K Taxali, PC Software for Windows 98 Made Simple, Mc Graw Hill Education Pvt. Ltd., 2015

REFERENCE BOOKS:

- 1 Jodi Davenport, Critch Greaves, Michael Grohand Eruce Hall Berg, Inside Microsoft Office Professional, New Riders Publications, 1994.
- 2 Cloria Madumere, 3 – IN – 1 Microsoft Word, Power point and Excel 2010, First Edition Create space Independent Publishing Platform, 2016.

E-RESOURCES:

- <https://egyankosh.ac.in/bitstream/123456789/41974/1/Unit-4.pdf>
- <https://egyankosh.ac.in/bitstream/123456789/41973/1/Unit-3.pdf>
- https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000827HE/P001415/M011933/ET/1527226202H16RM09-QL.pdf
- https://www.researchgate.net/publication/209729264_Textbook_of_Computer_applications_and_biostatistics

COURSE OUTCOMES: (With Mapping)

At the end of the course, the students will have the ability to		
CO1	Identify the tools and formats of MS applications	LO1
CO2	Apply documentation and presenting skills.	LO4
CO3	Demonstrate proficiency in using windows, word processing applications and spreadsheet applications.	LO5
CO4	Prepare effective power point presentations	LO7 LO13
CO5	Develop and deliver effective presentations using MS PowerPoint by creating, organizing, and presenting slides with appropriate visual aids.	LO10 LO11
CO6	Use EndNote software for organizing references, managing citations, and preparing bibliographies according to academic standards	LO6 LO15

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	2	2	1	3	2	2	2	2	2	2
CO 2	3	3	2	2	2	2	2	2	2	2
CO 3	3	3	2	2	2	3	2	3	2	2
CO 4	3	3	1	2	2	3	2	3	2	2
CO 5	3	2	2	3	2	2	2	2	2	2
CO 6	3	3	3	2	2	3	2	2	3	2

S- Strong(3) M-Medium(2) L-Low(1)

COURSE OBJECTIVES: To enable the students to

- Introduce the concept of consumerism and consumer roles in the economy.
- Develop understanding of human wants, demand, supply, and income concepts.
- Impart knowledge on markets, marketing systems, and consumer behavior.
- Familiarize students with quality standards and certification marks.
- Create awareness about consumer rights, protection laws, and decision-making.

Unit – I CONSUMERISM AND CONSUMER BUYING PROBLEM:

Definition and the concept of consumerism – consumer, producer and market. Characteristics of consumers, role of consumers in the Indian economy. Malpractices – Incorrect weights and measures. Misleading Advertisement and Misbranding.

Unit- II HUMAN WANTS, DEMAND AND SUPPLY:

Definition, classification of human wants – necessities, comfort and luxuries. Meaning of demand and supply. Relation between utility, demand and supply. Factors influencing demand and supply. Types of income - Real, money, psychic, relationship of GNP, national income, personal income, disposable income.

UNIT – III MARKETS AND MARKETING:

Basic Concept, Classification and functions of Markets, Types of Market. Channels of Distribution: Meaning, types and their advantages and disadvantages. Consumer in the market - Consumer buying habits, buying motives and buying problems. Consumer Aids a. Brand – Different types and its importance. Labels – Importance, Merits and demerits. Importance of Packaging and Advertising.

UNIT-IV QUALITY ASSESSMENT OF PRODUCTS:

Definition – Standards and standardization and its Importance. Quality Seal – BIS, ISI, AGMARK, ISO, HALL MARK, BEE LABEL and FPO.

UNIT-V CONSUMER DECISION MAKING PROCESS:

Types of consumer decisions, process of decision making, factors determining and influencing consumer behavior, guidelines for wise buying practices. Consumer Protective Services - Consumer Protection Act, Food Adulteration Act – FSSAI. Quality control and inspection Act. Consumer Rights and consumer responsibilities.

UNIT - VI CURRENT CONTOURS (Self-directed learning activities for Continuous Internal Assessments Only):

Prepare a scrapbook on misleading advertisements collected from newspapers, television or social media. Collect products carrying quality seals such as ISI, AGMARK, FPO and BIS and prepare a comparison chart. Collect labels and packages of food and household products and evaluate their usefulness to consumers.

Recommended Books:

1. Gupta, C.B. and Nair, R.N (2004). Marketing Management: Sultan Chand and Sons,
2. Juliana, M (2011). Green consumerism, United States: SAGE Publishers.
3. Kathiresan, S. Radha, V (2004), Marketing: Chennai, Prasanna Publisher.
4. Kumar, N., (1999), Consumer Protection in India, Delhi, Himalaya Publishing House.

Reference:

1. Pattanchetti, C.C. and Reddy, 2002). Principles of Marketing, Coimbatore: Rainbow Publishers, India.
2. Seetharaman, P. and Sethi, M. (2001). Consumerism: Strategies and Tactics, CBS Publishers and Distributors, New Delhi.
3. Steven, D.S, (2016). Consumer Economics: A Practical Overview”, New York: Routledge Taylor and Francis group.
4. Suja Nair (2002). Consumer Behaviour: New Delhi. Sultan Chand and Sons.

E- Reference:

- <https://consumeraffairs.nic.in/>
- <https://ncdr.nic.in/>
- <https://www.bis.gov.in/>
- <https://www.sebi.gov.in/>
- <https://www.legalservicesindia.com/>
- <https://www.consumerinternational.org/>
- <https://ndl.iitkgp.ac.in/>
- <https://www.inflibnet.ac.in/>

COURSE OUTCOMES (With Mapping)	
At the end of the course, the students will have the ability to	
CO1	Explain the concepts of consumerism, consumer characteristics, and consumer buying problems.
CO2	Describe human wants, demand, supply, utility, and different types of income influencing consumer behavior.
CO3	Discuss the functions of markets, marketing systems, distribution channels, and consumer aids such as branding, labeling, packaging, and advertising.
CO4	Identify quality standards, certification marks, and standardization procedures used for consumer products.
CO5	Explain the consumer decision-making process and factors influencing consumer behavior.
CO6	Apply knowledge of consumer rights, responsibilities, and consumer protection laws for wise buying practices and consumer welfare.

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2	1	1	1	2	-	1	1	2
CO 2	3	3	2	1	1	2	1	2	2	1
CO 3	3	3	2	2	1	2	1	2	1	1
CO 4	3	3	2	2	2	3	1	1	1	1
CO 5	3	3	2	2	1	2	2	1	2	1
CO 6	3	3	3	2	2	3	2	1	3	2

S- Strong(3) M-Medium(2) L-Low(1)

OBJECTIVES: To enable the students to

- Understand the need for dietetics in healthcare.
- Relate the aetiology, pathophysiology and dietary management of gastro intestinal and liver disorders.
- Manage weight imbalance and respiratory and endocrine disorders through diet.
- Recommend dietary management for cardiovascular and renal diseases.
- Comprehend the dietary management of neurological, musculoskeletal diseases and inborn errors of metabolism.

UNIT-I NUTRITION CAREPROCESS:

Definition and history of Dietetics; need for dietetics in health care. Modification of normal diets to therapeutic diets, understanding routine hospital diets; enteral and parenteral feeding methods and formulas. Classification of dietitian, role of dietitian-functions and team approach in patient care.

UNIT – II MEDICAL NUTRITION THERAPY FOR GASTRO INTESTINAL AND LIVER DISORDERS:

Prevalence, types, aetiology, risk factors, patho-physiology, nutritional care, diet therapy and recent dietary considerations and treatments:

Upper gastrointestinal tract diseases –Diseases of oesophagus - oesophagitis, gastro esophageal reflux disease [GERD] and hiatus hernia.

Disorders of stomach - Indigestion, gastritis, gastric and duodenal ulcers, and dumping syndrome.

Lower gastrointestinal tract diseases/disorders- Flatulence, constipation, haemorrhoids, diarrhoea, steatorrhoea, celiac disease, tropical sprue, intestinal brush border enzyme deficiencies, diverticular disease, irritable bowel syndrome, inflammatory bowel disease.

Diseases of the Liver-hepatitis, hepatic coma, cirrhosis, cholecystitis, cholelithiasis and pancreatitis.

UNIT – III MEDICAL NUTRITION THERAPY FOR WEIGHT IMBALANCE, RESPIRATORY DISEASES AND ENDOCRINE DISORDERS:

Prevalence, types, aetiology, risk factors, pathophysiology, nutritional care, diet therapy and recent dietary considerations and treatments:

Weight imbalance–obesity and underweight.

Pulmonary disease- chronic pulmonary diseases- asthma, cystic fibrosis, chronic obstructive pulmonary disease, pneumonia and fevers.

Endocrine disorders – diabetes mellitus, polycystic ovary disease, thyroid imbalances.

UNIT – IV MEDICAL NUTRITION THERAPY FOR CVD AND RENAL DISEASES:

Prevalence, types, aetiology, risk factors, pathophysiology, nutritional care, diet therapy and recent dietary considerations and treatments:

Cardio vascular diseases–dyslipidemias, atherosclerosis, hypertension, ischemic heart disease, congestive cardiac failure.

Renal Disease–glomerulonephritis, nephrotic syndrome, renal failure: acute and chronic, ESRD, urolithiasis.

UNIT – V MEDICAL NUTRITION THERAPY IN MUSCULO - SKELETAL, NEUROLOGICAL DISEASES AND INBORN ERRORS OF METABOLISM:

Prevalence, types, aetiology, risk factors, pathophysiology, nutritional care, diet therapy and recent dietary considerations and treatments:

Musculo–skeletal disorders–bone fractures, osteoporosis and arthritis.

Neurological diseases–Parkinson’s, Alzheimer’s and epilepsy.

In born errors of metabolism–PKU, maple syrup disease, glycogen storage disease, Neiman-pick disease and fabry disease.

UNIT VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

1. Case studies.
2. Current updates on emerging diseases.

TEXTBOOKS:

1. Robinson, Corinne Hogden, and Marilyn R. Lawler. Normal and therapeutic nutrition. No. Ed. 16. Collier Macmillan Publishers, 1982.
2. Dietary Guidelines of Indians – A Manual, National Institute of Nutrition, Hyderabad, 2006.
3. Srilakshmi B, Dietetics, sixth edition, New age Publishing Press, New Delhi, 2011
4. Stacy N, William’s Basic Nutrition and Diet Therapy, 12th edition, Elsevier publications, UK, 2005.
5. Elia M, Ljungqvist O, Stratton R J, Lanham S A, Clinical Nutrition (The Nutrition Society Textbook), 2nd edition, Wiley Blackwell Publishers, 2013.
6. Mahan L K, Stump S E and Raymond J L, Krause's Food and Nutrition Care Process, 13th Edition, Elsevier Saunders, Missouri, 2012.
7. Stump S E, Nutrition and diagnosis related care, 7th edition, Lippincott Williams and Wilkins, Canada, 2012.

REFERENCE BOOKS:

1. Gopalan C., Ramanathan, P.V. Balasubramanian, S.C., Nutritive value of Indian foods, NIN, Hyderabad, 2010
2. Marian Metal., Clinical Nutrition for surgical patients, Jones and Bartlett Publishers, Canada, 2008
3. Joshi Y. K, Basics of Clinical Nutrition, 2nd edition, JP Medical Publishers Pvt Ltd, New Delhi, 2008
4. Stacy N, William’s Basic Nutrition and Diet Therapy, 12th edition, Elsevier publications, UK, 2005
5. Gibney MJ, Elia M, Ljungqvist O, Clinical Nutrition (The Nutrition Society Textbook) Wiley Blackwell Publishers, 2005

6. Whitney EN and Rolfes SR, Understanding Nutrition, 9th edition, West/Wordsworth, 2002
7. Guthrie H, Introductory Nutrition, CV Mos by Co. St. Louis, 2002
8. Williams SR, Nutrition & Diet Therapy, C V. Mos by St. Louis, 2001
9. Garrow et al, Human Nutrition & Dietetics, 10th Edition, Churchill Livingston, 2001.

E-RESOURCES:

1. www.nutrition.gov – Service of National agricultural library, USDA, <http://ecoursesonline.iasri.res.in/course/view.php?id=190>
2. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=NuAs6SreCGryddEfs4kkBA>
3. <https://vinu.libguides.com/nutrition/onlineresources>
4. <https://www.espen.org>
5. <https://www.idf.org>
6. <https://ispad.org>
7. <https://www.diabetes.org>

COURSE OUTCOMES: (With Mapping)

CO1	Explain the principles, history, and importance of dietetics and nutrition care process in health care settings.
CO2	Assess the etiology, risk factors, pathophysiology, and dietary management of gastrointestinal and liver disorders.
CO3	Explain the nutritional management of obesity, underweight, respiratory diseases, and endocrine disorders
CO4	Apply medical nutrition therapy principles in the management of cardiovascular diseases and renal disorders.
CO5	Describe dietary management strategies for musculo-skeletal disorders, neurological diseases, and inborn errors of metabolism.
CO6	Develop individualized diet plans and therapeutic meal modifications for patients with acute and chronic diseases.

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2	2	2	2	2	2	2	1	2
CO 2	3	3	2	1	1	2	1	2	2	1
CO 3	3	3	2	2	1	2	1	2	1	1
CO 4	3	3	2	2	2	3	1	1	1	1
CO 5	3	3	2	2	1	2	2	1	2	1
CO 6	3	3	3	2	2	3	2	1	3	2

S- Strong(3) M-Medium(2) L-Low(1)

RESEARCH METHODOLOGY AND STATISTICS

Code:

(Theory)

Credit: 4

OBJECTIVES: To enable the students to

- Learn the basic concepts of research and its types and different types of sampling.
- Apply the different statistical analyses.
- Know the scientific investigations to solve the problem, test hypotheses, develop or invent new products.
- Gain in sight in the research process and report preparation.
- Develop skills in using research tools and techniques for drafting and preparing research articles.

UNIT-I INTRODUCTION TO RESEARCH METHODS:

Research: definition, the process of research, objectives of the research, and characteristics of research. Identifying the research problem, sources of the research problem, basic components of research design.

Types of research: fundamental/ basic research, applied research, action research, descriptive research, exploratory research, case studies, experimental research. Review of literature: meaning, sources of literature review, the importance of literature collection.

UNIT-II DATA AND METHODS OF SAMPLING:

Primary and secondary data, methods of data collection, interview schedule, questionnaire, observation, experimentation, pre-testing and pilot study. Methods of sampling- probability and non-probability. Hypothesis- meaning and types of hypothesis.

UNIT-III DATA ANALYSIS- DESCRIPTIVE MEASURES:

Measure of central tendency-mean, median, mode and their uses with applications. Measures of dispersion, significance and methods used in studying dispersion and their uses with applications, standard deviation-uses and applications. Tables, figures and charts-formulation, interpretation and application.

UNIT-IV PROBABILITY AND TEST OF SIGNIFICANCE:

Co-efficient of correlation, rank correlation, basic concepts in regression, student- "t" test, chi-square: use and application of t test and chi square. Analysis of variance- one way and two-way classification- characteristics of ANOVA. Parametric and non parametric.

UNIT-V SCIENTIFIC WRITING AND RESEARCH ETHICS:

Scientific writing as a means of communication, different forms of scientific writing - articles in journals, research notes and reports, review articles, monographs, dissertations, bibliographies.

Use of tools/techniques for research, methods to search required information effectively, reference management software -Zotero/Mendeley, software for paper formatting - LaTeX/MS Office.

Ethics-ethical issues, ethical committees-human& animal; IPR- intellectual property rights and patent law, commercialization, copy right, royalty, trade related aspects of intellectual property rights (TRIPS); scholarly publishing- IMRAD concept and design of research paper, citation and acknowledgement, plagiarism, reproducibility and accountability. Softwares for detection of plagiarism.

UNIT VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

- 1 Design a questionnaire.
- 2 SPSS SOFTWARE–learn basic data entry and do simple analysis.

TEXTBOOKS:

- 1 Kothari, Chakravanti Rajagopalachari. Research methodology: Methods and techniques. New Age International, 2004.
- 2 Statistical Methods – S. P. Gupta, Sultan Chand & Sons Publisher-NewDelhi,2021.
- 3 Research Methodology, Methods and Techniques – C. R. Kothari Wiley Eastern Limited, 2004.
- 4 An Introduction to Statistical Methods–C.B. Gupta & V.Gupta – Vikas Publishing House PVT Ltd., 2004.
- 5 Methodology and Techniques of Social Research – P. L. Bandarkar & T.S. Wilkinson – Himalaya Publishing House- Mumbai.

REFERENCEBOOKS:

- 1 Singh, Yogesh Kumar. Fundamental of research methodology and statistics. New Age International, 2006.
- 2 Goddard, Wayne, and Stuart Melville. Research methodology: An introduction. Juta and Company Ltd, 2004.
- 3 McNeill, Patrick. Research methods. Routledge, 2006.
- 4 Bhandarkar, P.L., T. S. Wilkinson, and D.K. Laldas. "Methodology & Techniques of Social Research Himalaya Publishing House. "2000.
- 5 Corbetta, Piergiorgio. Social research: Theory, methods and techniques. Sage, 2003.
- 6 Chiang, Chin Long. Statistical methods of analysis. World Scientific, 2003.

E RESOURCES:

- 1 <https://ncert.nic.in/textbook/pdf/kesy105.pdf>
- 2 <https://www.tandfonline.com/toc/tsrm20/current>
- 3 <https://bmcmmedresmethodol.biomedcentral.com/>
- 4 https://mrcet.com/downloads/digital_notes/CSE/Mtech/I%20Year/RESEARCH%20METHODOLOGY.pdf
- 5 https://www.iare.ac.in/sites/default/files/IARE_RM_Lecture%20Notes.pdf

COURSE OUTCOMES: (With Mapping)

CO1	Examine the concepts and application of research.
CO2	Analyze the process of developing are search plan.
CO3	Apply efficient methods to document data and prepare reports.
CO4	Test the usage of different statistical tools and interpretation of data.
CO5	Review research ethics and the application of research tools in scientific studies.
CO6	Identify research problems and formulate appropriate research designs for different types of investigations.

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2	2	2	2	2	2	2	1	2
CO 2	3	3	2	1	3	2	2	2	2	2
CO 3	3	3	2	2	3	2	1	2	1	1
CO 4	3	3	2	2	2	3	1	1	1	1
CO 5	3	3	2	2	1	2	2	1	2	1
CO 6	3	3	3	2	2	3	2	1	3	2

S- Strong(3) M-Medium(2) L-Low(1)

OBJECTIVES: To enable the students to

- Understand the principles of therapeutic diets and routine hospital diets used in clinical settings.
- Apply nutritional principles in dietary management of gastrointestinal and liver disorders.
- Plan and prepare therapeutic diets for weight imbalance, respiratory diseases, endocrine disorders, and metabolic diseases.
- Understand dietary modifications required for cardiovascular and renal disorders.
- Apply medical nutrition therapy principles in neurological disorders, musculo-skeletal disorders, and inborn errors of metabolism.

CONTENTS:

1. Therapeutic diets-Planning and preparation of routine hospital diets and formula feeds.
2. Plan and prepare diets for gastro esophageal reflux disease [GERD], gastritis, gastric and duodenal ulcers, irritable bowel syndrome, inflammatory bowel disease, hepatitis, cirrhosis and cholecystitis.
3. Plan and prepare diets for weight imbalance, cystic fibrosis, asthma, diabetes mellitus and polycystic ovary disease.
4. Plan and prepare diets for atherosclerosis, hypertension, glomerulonephritis, nephrotic syndrome, renal failure: acute and chronic, urolithiasis.
5. Plan and prepare diets for Parkinson's, Alzheimer's, epilepsy, osteoporosis and PKU, glycogen storage disease and Neiman-pick disease.

TEXTBOOKS:

1. Srilakshmi (2014). Dietetics. 7th edition, New Age International Pvt. Ltd, New Delhi
2. Sue Rodwell Williams (2013) Nutrition, Diet Therapy (9th ed.). W.B. Saunders Company, London
3. J.I. Boullata and V.T. Armenti (2010) Handbook on Drug and Nutrient Interaction, Humana Press, USA
4. Mahan L K and Escott – Stump S (2004). Krause's Food Nutrition and Diet Therapy 10th Ed WB Saunders Ltd
5. Antia.P.(1989) Clinical Nutrition and Dietetics, Oxford University, Mumbai.

REFERENCE BOOKS:

1. Mahan, L. K. and Escott Stump. S.(2016) Krause's Food & Nutrition Therapy 14th ed. Saunders-Elsevier
2. Gibson, G.R. and M.B. Roberfoid(1999), Colonic microbiota, Nutrition and Health. Kulwer Academic Publishers, Dordrecht.
3. Whitney, E.R. and S.R. Rolfes (2009) understanding Nutrition 9th ed. Wadsworth Thomson, Learning, Australia.
4. Chandra, R.K. and Newberne, P.M.,(1982) Nutrition immunity and infection. Plenum Press.
5. Shills, M.E., Olson, J., Shike, M. and Roos, C.(2005): Modern Nutrition in Health and Disease. 10th Edition. Williams and Williams. A. Beverly Co. London.
6. Mahtab, S, Bamji, Kamala Krishnasamy, Brahmam, G.N.V. (2019). Text Book of Human Nutrition, Fourth Edition, Oxford and IBH Publishing Co. P. Ltd., New Delhi.

7. Jim Mann and A. Stewart Truswell. (2008). Essentials of Human Nutrition. (pp 502-513). New York, Oxford University Press.

COURSE OUTCOMES: (With Mapping)

At the end of the course, the students will have the ability to		
CO1	Plan and prepare routine hospital diets, therapeutic diets, and formula feeds according to patient requirements.	LO1
CO2	Design and prepare diets for gastrointestinal and liver disorders	LO4
CO3	Plan and prepare therapeutic diets for weight imbalance, respiratory and endocrine disorder	LO5
CO4	Apply dietary modifications for cardiovascular and renal diseases	LO7 LO13
CO5	Demonstrate skills in therapeutic menu planning, nutrient calculation, and preparation of disease-specific diets.	LO10 LO11
CO6	Integrate clinical nutrition knowledge and practical dietetic skills for effective patient care and disease management.	LO6 LO15

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2	2	2	2	2	2	2	2	2
CO 2	3	3	2	1	2	2	1	2	2	1
CO 3	3	3	2	2	2	2	1	2	1	1
CO 4	3	3	2	2	2	3	1	1	1	1
CO 5	3	3	2	2	1	2	2	1	2	1
CO 6	3	3	3	2	2	3	2	1	3	2

S- Strong(3) M-Medium(2) L-Low(1)

OBJECTIVES: To enable the students to

- Knowledge on the principles of food safety, hygiene, sanitation, and quality management systems in the food industry.
- Familiarize with food adulteration, food specifications, and methods for detecting adulterants.
- Understand the national and international food laws, regulations, standards, and certification systems.
- Interpret the sensory evaluation techniques for assessing food quality and consumer acceptability.
- Explain objective methods and instruments used in food quality evaluation and texture analysis.

UNIT I: INTRODUCTION TO FOOD SAFETY AND HYGIENE

Food Safety - definition of food safety and food quality, factors affecting food safety; Food safety management tools - GMP, GAP, SSOP, GHP; stages of quality control. Hygiene and sanitation in food industries - Waste disposal methods, Pest and rodent control, Personal hygiene practices. Hazard Analysis Critical Control Point (HACCP): principles of HACCP, applications of HACCP

UNIT II: FOOD ADULTERATION AND SPECIFICATION

Common food adulterants, Adulterants-Intentional & Incidental- adulterants; methods to detect intentional adulterants, Ill effects of adulterants on human health, adulteration path from manufactures to consumers, preventive measures – checking points, awareness & education, punishment & disapproval. Specifications for food products and food additives- Definition, Objectives and Advantages

UNIT III: FOOD REGULATIONS AND STANDARDS

Indian Food regulations, standards and certification – FSSAI, BIS, AGMARK Fruit Product Order, Meat Products Order, Milk and Milk Product Order and Prevention and Food Adulteration Act; Consumer Protection Council – Food and Consumer Rights. International food regulations and certifications - ISO and FAO. WTO and Codex Alimentarius Commission

UNIT IV: SUBJECTIVE EVALUATION OF FOODS

Sensory characteristics of food- Appearance, colour, flavour, texture; types of evaluation, reasons for testing food quality; trained panel members; requirements to conduct sensory evaluation – testing laboratory, preparation of samples and evaluation card.

Types of tests– (1) Difference tests – paired comparison test, duo trio test and triangle test; (2) rating tests – ranking test, single sample test, two sample difference test, multiple sample difference test, hedonic rating test, numerical scoring test, composite scoring test; (3) sensitivity tests – sensitivity threshold test, dilution test; (4) descriptive flavour profile method.

UNIT V: OBJECTIVE EVALUATION OF FOODS

Basic guidelines for conducting the test: advantages and disadvantages. Tests used for objective evaluation – chemical methods, physico chemical methods, microscopic examination and physical methods.

Instruments used for texture evaluation of liquids and semi solids – precent sag, baker's jelmeter, stormer viscometer, brookefield synchroelectric viscometer, Bostwick consistometer, efflux-tube viscometer, Adams consistometer, penetrometer and Brabender farinograph.

Instruments used for solids – Magness-Taylor pressure tester, succulometer, tenderometer, fibrometer, shortometer, Christal texturometer, Kramer-shear press, tensile strength, compressimeter and universal testing machine.

UNIT - VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

- Organoleptic evaluation of food items in the laboratory using subjective methods.
- Methods of detecting food adulterants by using a home kit.

TEXT BOOK

- Srilakshmi, B. (2018), Food Science, New Age International Publishers.
- Shapton, D.A., and Shapton, N.F., (2011) Principles and Practices for the Safe Processing of Foods, Heineman Ltd., Oxford.
- FSSAI., (2006) “Manual of Food Safety Management System”, FSS Act, 2006, Ministry of the Health and Family Welfare, New Delhi, 2006.
- Philip. A.C. (2001), Reconceptualizing Quality. New Age International Publishers, Bangalore.
- Kher, C.P. (2000), Quality Control for the food Industry. ITC Publishers. Geneva.

REFERENCE BOOKS

- Recommended International Code of Practice (2012) – General Principles of Food Hygiene, CAC/RCP/. Rev.3. Amd.
- Instruction Manual – Part I and II – (Methods for detection of Adulterants), (2012), Food Safety and Standards Authority of India (FSSAI), FDA Bhavan, Kotla Road, New Delhi.

COURSE OUTCOMES: (With Mapping)

CO1	Name the attributes of a safe food pertaining to the food safety management tools.
CO2	Compare the quality food with the adulterated food and perform the test for adulterants.
CO3	Examine the food labels for the certifications and standards and confirm their relevance to the food product.
CO4	Justify the use of appropriate instruments to objectively evaluate the food quality and derive inference.
CO5	Design different types of sensory tests to ascertain the acceptability of new food products.
CO6	Analyze food quality and safety parameters and recommend appropriate quality control measures for food products and processing operations.

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	1	1	2	2	2	1	2	2
CO 2	3	3	2	2	2	2	2	2	2	2
CO 3	3	3	2	2	2	3	1	1	1	1
CO 4	3	3	2	2	1	3	2	1	1	1
CO 5	3	2	2	1	1	2	2	1	2	2
CO 6	3	3	3	2	2	3	2	2	3	2

S- Strong(3) M-Medium(2) L-Low(1)

OBJECTIVES: To enable the students to

UNIT – I GENERAL PREPARATION OF SAMPLES FOR FOOD ANALYSIS

Grinding dry materials, grinding moist materials, enzymatic and chemical treatment General application and chemical Composition: Determination of moisture – Air oven methods, Distillation methods, chemicals methods, physical methods Ash and minerals – Determination of ash, ashing procedures for elemental analysis.

UNIT – II SPECTROSCOPIC INSTRUMENTATION FOR FOOD ANALYSIS

Working Principles and applications UV-Visible Spectroscopy, Atomic-Absorption Spectroscopy (AAS), Mass spectroscopy, Fourier Transform Infrared Spectroscopy (FT-IR).

UNIT – III Chromatographic techniques for food analysis

Working Principles and Applications: Paper and thin layer chromatography, Column chromatography, HPLC, HPTLC, Gas – liquid chromatography, GC-MS.

UNIT- IV Rheological methods and instrumentation

Working Principles and applications Rheological Properties, Rheological methods and instrumentation, Measuring the components of Food texture.

UNIT-V Rheological Instrumentation

Wire cutting, Circular Cutting Devices, Cone Penetrometer of Varying Dimensions Pea Tenderometer, The Warner – Bratzler Shaler Test Kramer Shear Press, Instron Machine, The Ottawa Texture Measuring System General Foods Texturometer, Other Instruments.

UNIT-VI CURRENT CONTOUR (For Continuous Internal Assessment Only):

Prepare PowerPoint presentation on rheological methods and instrumentation techniques.

TEXT BOOKS

1. Pomeranz. Y and Clifton E. Meloan, Food Analysis : Theory and Practice, 2004. 3rd Edition, CBS Publishers & Distributors Pvt, Ltd.
2. S. Ranganna, Hand Book of Analysis and Quality Control for Fruit and Vegetable Products, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2004.

REFERENCE BOOK

1. S. Sadasivam, A. Manickam, biochemical methods, New Age International Publisher, New Delhi, 2004.

COURSE OUTCOMES: (With Mapping)

CO1	Discuss the principles behind analytical techniques
CO2	Categorizing modern instrumental methods to analyse proximate composition of foods
CO3	Determine the nutrient content of food analysis by standard methods
CO4	Correlating the purposes and methods of food analysis in research and food industry
CO5	Assessing the Rheological Properties of food by Instrumentation
CO6	Interpret the principles of instrumentation analytical techniques

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	1	1	-	2	2	-	2	2
CO 2	3	3	2	2	2	2	1	1	2	2
CO 3	3	3	2	2	2	3	1	1	1	1
CO 4	3	3	2	2	1	3	2	1	1	1
CO 5	3	2	2	1	1	2	2	1	2	2
CO 6	3	3	3	2	2	3	2	2	3	2

S- Strong(3) M-Medium(2) L-Low(1)

OBJECTIVES: To enable the students to

- Understand the importance of nutrition, fitness and health.
- Gain knowledge on exercise physiology and nutrition for physical activity.
- Comprehend the techniques and gadgets used in physical training.
- Realise the risks of hypokinetic diseases.
- Appreciate the principles of exercise and stress management.

UNIT-I INTRODUCTION TO SPORTS NUTRITION:

Introduction to sports nutrition – definition and scope of sports nutrition - diet and performance - importance of sports nutrition. Requirements during training and performance for athletes and endurance games, aerobic and anaerobic exercise, fuel for exercise, glycogen load. Exercise to maintain fitness. Health club equipments and activities – tread mill, hammer strength, steppers, cycles, body sculpting, kickboxing, hanging, handgrips, swing, climbing and lifting weight.

Determining energy requirements of athletes: Contribution of resting metabolic rate, thermic effect of food, exercise and non-exercise activity thermogenesis (NEAT) towards energy expenditure; variation in resting metabolic rate across resistance versus endurance training.

UNIT-II PHYSICAL FITNESS AND NUTRITIONAL ASSESSMENT:

Importance and benefits of physical activity. Physical activity–frequency, intensity, time and type with example, physical activity pyramid. Physical fitness: types of fitness, components of physical fitness-methods and benefits.

Kin anthropometry: definition, introduction, body size and proportion; somatotyping; circumferences; skin fold measurement sites and determining body composition; applications. Body composition and performance: factors that affect body composition; body composition assessment.

Techniques: direct, indirect and doubly indirect -under water weighing, DEXA, whole body conductivity, skin folds, bioelectrical impedance, total body potassium, near infrared interactome.

UNIT – III EXERCISE PHYSIOLOGY AND NUTRITION FOR PHYSICAL ACTIVITY:

Definitions of terminologies - work, power, speed, strength, efficiency; types of exercise-aerobic and anaerobic; limiting factors, exercise intensity and duration. Adaptations to exercise: physiological and metabolic adaptations to training; muscle hypertrophy and performance; endurance versus resistance training and performance; training adaptations and maladaptation and detraining. General principles of training: exercise response-modality, intensity, duration, categories, response patterns and interpretation; exercise training- health and sports related fitness, dose response relationship, training principles,

periodization; metabolic training principles and adaptations specificity, overload, rest/recovery/adaptation, progression, individualization, maintenance, retrogression, warm-up and cool down.

UNIT-IV DIETARY SUPPLEMENTS & ERGOGENIC AIDS:

Dietary supplement: definition and classifications. Macro nutrient supplements: protein supplements-whey, casein, egg albumen, soy protein, pea protein & amp; other vegan proteins/protein blends, protein bars, protein shakes, amino acid supplements-BCAA, glutamine, arginine, taurine. Carbohydrate supplements: carbo loading, sports drinks, bars and gels. Fat supplements: omega fatty acids, medium chain triglycerides, fish oils. Vitamin supplements: B-Complex vitamins, vitamin C, vitamin D, vitamin E supplements, multivitamin supplements. Mineral Supplements: calcium, magnesium, iron supplements, chromium, zinc. Antioxidants supplements: antioxidants- vitamins & amp; mineral supplements.

UNIT – V NUTRITIONAL CARE PROCESS AND REGULATIONS:

Nutritional care process and counselling strategies – nutritional care process; role and skills of a sport dietitian. Detailed study of nutrition counselling theories and strategies- cognitive behavior therapy, rationale motive behavioural therapy. Stress management & Counselling; tools of psychological testing, counselling of individual sports persons and teams.

Dietary Supplement Health and Education Act of 1994; Government Protections from Dietary Supplement Hazards and Risks; New Dietary Ingredients; FDA Regulatory Action: Ephedra Supplements and DMAA; FDA Regulatory Actions: Androstenedione, Piracetam, and ATD; Contaminated Supplements and Banned Ingredients; Anabolic Steroid Control Act and Designer Anabolic Steroid Control Act; World anti-doping agency and National Anti-doping agency (NADA).

UNIT-VI CURRENT CONTOUR (For Continuous Internal Assessment Only):

- 1 Prepare a food pyramid/Choose my plate concept recommended and developed by you for any sports activity
- 2 Prepare an album suggesting yoga and relaxation techniques for fitness.

TEXTBOOKS:

- 1 Geetanjali Bhide, Subhadra Mandalika (2018) Nutritional Guidelines for Sports persons, Jaypee digital publications.
- 2 B. Srilakshmi, V. Suganthi (2022) Exercise Physiology Fitness and Sports Nutrition, New Age Publications.
- 3 D. L Ramachandra (2022) Sports & Exercise Physiology and Nutrition Evince pub Publishing.

REFERENCEBOOKS:

- 1 Werner W. K Hoejer (1989), Life time Physical Fitness and Wellness, Morton Publishing Company, Colorado.
- 2 Mishra, S. C (2005) Physiology in Sports. Sports Publication, New Delhi

- 3 Greenberg, S. J and Pargman, D (1989) Physical Fitness – A Wellness Approach Prentice Hall International (UK) Limited, London
- 4 Swaminathan M. (2008) Essentials of Food and Nutrition Bangalore Printing Publishing Co. New Delhi
- 5 McArdle, W. D, Frank I. Katch, F. I and Victor L. Katch (1996) Exercise Nutrition: Energy Nutrition and Human Performance. William & Wilkin Publishing USA.
- 6 Mahan, K and Stump, E. S (1996) Krause Food and Nutrition and Diet Therapy W.B Saunders Company, USA.

ERESOURCES:

- <https://archive.org/details/sportsfitnessnut0000wild/page/n531/mode/2up>
- <https://oiipdf.com/the-complete-guide-to-sports-nutrition-complete-guides>.
- <https://stillmed.olympics.com/>
- <http://ommolketab.ir/aaf-lib/5g2s72u8j4qfbi9p4x56zhsjxru8rf.pdf>.

COURSE OUTCOMES: (With Mapping)

CO1	Examine the importance and dimensions of sports nutrition.
CO2	Associate the role of nutritional assessment in physical fitness.
CO3	Appraise exercise physiology in terms of training principles and adaptations.
CO4	Review the nutritional care process and counselling strategies for sports person.
CO5	Evaluate current nutritional information dietary supplements & ergogenic aids.
CO6	Demonstrate knowledge of sports nutrition regulations, anti-doping policies, dietary supplement safety, and ethical issues in sports practice.

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	2	2	1	2	2	1	2	2
CO 2	3	3	2	2	2	2	1	2	2	2
CO 3	3	3	2	2	2	3	2	2	1	1
CO 4	3	3	2	2	1	3	2	1	2	1
CO 5	3	2	2	1	1	2	2	1	2	2
CO 6	3	3	3	2	2	3	2	2	3	2

S- Strong(3) M-Medium(2) L-Low(1)

OBJECTIVES: To enable the students to

UNIT – I CULINARY FOUNDATION - I

Methods of cooking- Moist heat method, Dry heat method, Combination Method. Preparation Techniques-Handling Knife ,Basic Cuts And Shapes, Cutting Techniques, Preliminary Cooking, Equipment in the kitchen, Hygiene and sanitation.

UNIT- II CULINARY FOUNDATION – II

Stocks- Introduction Definition of Stock & Glazes. Uses of Stock & Glazes. Classification of Stock. Soups- Classification of soups. Tips for Making Good Soups. Sauces- Definitions, Functions & Uses, Structure of Sauces, Classification of Sauces, Preparation of Basic sauce. Gravies- Introduction, Concept of Dry & Wet Masalas, Pastes used in Indian Cooking, Difference between Gravies & Curries, Preparation of Gravies. Salads- Introduction, Composition of a Salad, Salient Features of Preparing Good Salads.

UNIT- III INDIAN CUISINE

Introduction Philosophy of Indian cuisine, Features of early Indian cuisine, Tradition, cookware, ingredients, festive cooking in India. Northern India: North-west frontier, Kashmiri, Delhi and Avadhi (Dum Pukht) Eastern India: Bengal, Bihar, Orissa and Arunachal Pradesh Western India: Goa, Gujrat, Kohlapuri, Malwani, Konkan and Agri –Koli Southern India: Karnataka, Kerala , Hyderabad and Chettinad.

UNIT – IV CONTINENTAL CUISINE

Historical background - Ethnic cuisine, staple food with regional influences, Ingredients, Emblematic international dishes of different countries Elementary continental cooking: Vegetable preparations, garnishes and accompaniments. Preparation of minimum five continental menus with starter, soup, main course and simple dessert.

UNIT- V CULINARY MATH MEASUREMENT

Ingredients Measurement, Weight, Volume Count Portion Control, Portion Control in preparation, Portion Control in Plating & Service. Procedure for scaling total yield, Procedure for scaling portion size. Food Cost Calculation- Food Cost percentage, Yield Cost Analysis, Raw Yield Test, Cooked Yield Test, Portion Cost. Inventory Control- Physical & Perpetual Inventory, Inventory Valuation, FIFO (First In First Out) ,LIFO (Last In First Out), FEFO (First Expiry First Out) ,Weighted Average , Inventory Turnover Ratio.

UNIT–VI CURRENT CONTOURS: (For Continuous Internal Assessment Only):

Group discussion on different types of cuisine and its aesthetic role of foods.

TEXTBOOKS:

1. Fundamentals of Culinary Art (Theory and Practice of Cooking), S Chand and Company, 2013
2. Parvinder S.Bali, Theory of Cookery, Oxford University Press, First Edition,2017
3. K. T. Achaya, A Historical Dictionary of Indian Food, Oxford University Press, second edition,1997
4. Thangam E. Philip, Modern Cookery For teaching and the trade, Orient Black Swan, volume I and Volume II, sixth edition, 2010
5. J Inder Singh Kalra, Prashad Cooking with Indian Masters, Allied Publishers Pvt ltd,2022

REFERENCEBOOKS:

1. K. T. Achaya, Indian food Historical Companion, Oxford University Press, second edition 1997
- 2.J Inder Singh Kalra, Prashad, Cooking with Indian Masters, Allied Publishers Pvt ltd,2022

COURSE OUTCOMES: (With Mapping)

At the end of the course, the students will have the ability to		
CO1	Demonstrate the preparation of stocks, soups, salads, gravies and masalas and various recipes	LO1
CO2	Summarise the historical events that influenced the food culture and emblematic dishes, typical products of different countries and their origin.	LO4
CO3	Organise proper vegetable cuts, justify different cooking methods and Produce cold and hot sauces and their derivatives.	LO5
CO4	Distinguish the relationship between culinary skills and culinary math	LO7 LO13
CO5	Prioritise the historic background of continental cuisine.	LO10 LO11
CO6	Analyse the impact of culinary nutrition on health	LO6 LO15

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	1	1	-	2	2	-	2	2
CO 2	3	3	2	2	2	2	1	1	2	2
CO 3	3	3	2	2	2	3	1	1	1	1
CO 4	3	3	2	2	1	3	2	1	1	1
CO 5	3	2	2	1	1	2	2	1	2	2
CO 6	3	3	3	2	2	3	2	2	3	2

S- Strong(3) M-Medium(2) L-Low(1)

Second Year

GENERIC ELECTIVE COURSE –3

Semester: III

3. PALLIATIVE CARE

Code:

(Theory)

Credit: 3

OBJECTIVES: To enable the students to

- Understand the principles, philosophy, and models of palliative care in clinical practice.
- Develop knowledge of pain mechanisms and evidence-based pain management strategies.
- Recognize and manage physical symptoms associated with terminal and chronic illnesses.
- Understand psychosocial, emotional, and spiritual aspects of patient and family care.
- Build communication skills and ethical decision-making abilities in palliative care settings.

UNIT I PRINCIPLES AND PRACTICE OF PALLIATIVE CARE:

Definitions, need for palliative care, goals of palliative care, palliative care and suffering: inter-professional care, multidisciplinary and inter-professional teams, principles of palliative care, communication with patients, advance care planning, models of care, integration of palliative care into clinical care, barriers to palliative care; types – respite, hospice.

UNIT II PAIN AND ITS MANAGEMENT:

Definition, nature of pain, concept of total pain, causes and types of pain, pain assessment; Pain management - explanation, raising pain threshold, modification of life style, pain perception and pathological process, physical therapies for pain, psychosocial aspects of pain control, anticancer therapy for pain.

UNIT III PHYSICAL SYMPTOMS AND ITS MANAGEMENT:

Respiratory symptoms and management – Breathlessness, cough, terminal respiratory congestion; Gastrointestinal symptoms and management – nausea, vomiting, bowel obstruction and constipation; Constitutional symptoms and management – anorexia, weight loss, cachexia, weakness and fatigue; Neurological and management - acute confusion, delirium and terminal restlessness.

UNIT IV PSYCHOSOCIAL SYMPTOMS AND ITS MANAGEMENT:

Psychosocial distress – factors predisposing to psychological stress, depression, anxiety, spiritual and existential distress, caring for family and friends; Management of psychosocial symptoms

UNIT V COMMUNICATION AND ETHICAL ISSUES IN PALLIATIVE CARE:

Communication- definition, need for good communication, barriers to communication – lack of time, lack of privacy, uncertainty, embarrassment, collusion; Problems in interprofessional communication, ways to improve communication. Ethical Issues- Principles of medical ethics, communication and disclosure, withholding and withdrawing treatments, artificial nutrition, artificial hydration, euthanasia and physician-assisted suicide, ethics in research.

UNIT VI CURRENT CONTOURS (Self-directed learning activities for Continuous Internal Assessments only):

Palliative care services in India and other countries. Visit to a Palliative Care Centre

TEXT BOOKS:

1. Russell K. Portenoy, David C. Currow ,etal (2019),. **Oxford Textbook of Palliative Medicine** Oxford University Press
2. Betty R. Ferrell, Nessa Coyle,(2021), **Textbook of Palliative Nursing**, Oxford University Press

•Palliative Care Nursing: Quality Care to the End of Life

Editors: Marianne Matzo, Deborah Witt Sherman

Publisher: Springer Publishing**Year of Publication:**2019**COURSE OUTCOMES: (With Mapping)**

CO 1	Explain the principles, philosophy, goals, and models of palliative care and its integration into clinical practice.
CO 2	Analyze the nature, types, and assessment of pain and apply appropriate pain management strategies.
CO 3	Evaluate physical symptoms such as respiratory, gastrointestinal, neurological, and constitutional issues and their management approaches.
CO 4	Assess psychosocial, emotional, and spiritual distress in patients and apply appropriate supportive care strategies for patients and families.
CO 5	Examine communication skills and ethical issues in palliative care including disclosure, decision-making, and end-of-life care.
CO6	Apply interdisciplinary palliative care approaches in case-based scenarios demonstrating holistic patient management.

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	1	1	1	1	1	1	1	1	1
CO 2	3	3	1	1	1	1	1	1	1	1
CO 3	3	3	2	1	1	1	1	1	1	1
CO 4	2	2	1	2	1	1	1	2	2	1
CO 5	3	1	1	1	1	1	1	2	3	2
CO 6	1	2	3	1	2	1	2	3	1	1

S- Strong(3) M-Medium(2) L-Low(1)

OBJECTIVES: To enable the students to

- Understand the basic concepts of nutrition
- Aware about the nutritional demands in various stages of life cycle.
- Acquire skills in planning adequate meals in different stages of life cycle.

UNIT I : Food groups

Basic five, nutritional classification of foods - energy yielding, body building and protective foods. Basic principles of Meal planning – basic principles of meal planning, balanced diet- meaning, food guide pyramid.

UNIT II Nutritional needs during Pregnancy

Nutritional needs and dietary guidelines; general dietary problems, complications. Nutrition during Lactation - dietary guidelines for lactating women, nutritional components of colostrum and mature milk.

UNIT III Nutrition during Infancy

Nutritional need and dietary guidelines for infants, advantages of breast feeding, disadvantages of bottle feeding; Weaning foods (definition) and types of supplementary food. Nutritional needs of Pre-school children (1-6 years) - factors to be considered while planning meals for pre-school children. PEM – types, symptoms, dietary guidelines.

UNIT IV Nutrition for School children

Nutrition need and dietary guidelines, factors considered in planning packed lunch. Nutrition during Adolescence – general dietary guidelines; causes, complications & dietary guidelines for nutritional anaemia- (Iron, Folic acid, Vitamin B12 deficiency), obesity and underweight.

UNIT V Nutritional needs of Adults

Dietary guidelines for adults. Nutrition during Old age - physiological changes in ageing, psycho-social factors affecting food intake. Nutritional problems of aged and their management.

UNIT-VI CURRENT CONTOURS: (For Continuous Internal Assessment Only):

Power point presentation on nutrition demand and nutritional problems in different stages of life.

TEXT BOOKS

1. Srilakshmi.B, "Dietetics", 7th edition, New Age International Pvt. Ltd., (2014).
2. Joshi.A.S, "Nutrition & Dietetics", 3rd edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, (2010).

REFERENCE BOOKS

1. Mahan, L.K & Arlin.M.T, "Krause's Food, Nutrition and Diet Therapy", 11th Edition, W.B. Saunder Company, London, (2000).
2. Sele stein. S. & Sharlin. J, "Life Cycle Nutrition", Jones & Bartlett publications, (2008).
3. Begum. M. R, "A Textbook of Food, Nutrition & Dietetics", 3rd edition, Sterling publications Pvt. Ltd., (2008).
4. Srilakshmi. B, "Nutrition Science", 5th edition, New Age International Pvt.Ltd., (2008).
5. Mudambi S.R and Rajagopal M.V, "Fundamentals of foods and Nutrition", 3rd edition, New Age International Pvt. Ltd., (1997).
6. Pasricha. S, "Some Therapeutic Diets", 5th edition, National Institute of Nutrition,(2004).

7. ICMR-Nutritive value of Indian Foods, National Institute of Nutrition, Hyderabad, (1989). 8. Mudambi. S.R, Rao. S.M, & Rajagopal. M. V, "Food Science", New Age International Pvt. Ltd. Publishers, New Delhi, (2007).

COURSE OUTCOMES: (With Mapping)

At the end of the course, the students will have the ability to		
CO1	Classify foods and explain principles of meal planning	LO1
CO2	Apply dietary guidelines to prevent complications during pregnancy and lactation	LO4
CO3	Create meal plans for preschool children while addressing Protein Energy Malnutrition	LO5
CO4	Evaluate the causes and complications of nutritional anaemia, obesity, and underweight, and evaluate dietary strategies to manage these conditions.	LO7 LO13
CO5	Explain the ageing process and their nutritional problems	LO10 LO11
CO6	Analyze the balanced diet requirements using tools for different stages of life.	LO6 LO15

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2	2	2	2	2	2	2	2	2
CO 2	3	3	2	2	2	2	1	2	2	2
CO 3	3	3	2	2	2	2	1	2	1	1
CO 4	3	3	2	2	2	3	1	1	1	2
CO 5	3	3	2	2	1	2	2	1	2	1
CO 6	3	3	3	2	2	3	2	1	2	2

S- Strong(3) M-Medium(2) L-Low(1)

INTERNSHIP/INDUSTRIAL ACTIVITY**Code:****Credits: 2****COURSE OBJECTIVES:** To enable the students to

- Provide practical exposure to the organization and functioning of hospital dietary departments.
- Develop skills in nutritional assessment, diet history collection, and interpretation of patient case records.
- Acquire competency in planning, calculating, and evaluating therapeutic diets for different disease conditions.
- Gain experience in inpatient and outpatient diet counselling and nutrition education.
- Understand dietary service management, diet tray preparation, and patient follow-up procedures.
- Develop professional skills in documentation, report writing, communication, and ethical dietetic practice.

DIETARY INTERNSHIP - MULTISPECIALTY REPUTED HOSPITAL FOR ONE MONTH:

- Observe different sections in the dietary department
- Observe and prepare organization set up
- Prepare a layout of the dietary department
- Take up hospital rounds with the senior dietitian to assist patient dietary requirement
- Read and comprehend case sheets of patients in critical care, paediatric care, diabetes care, dialysis ward, CVD ward, maternity ward etc.
- Screening of patients for nutritional status & take diet history of patients
- Calculate nutritive value of planned diet
- Develop normal dietary approaches considering the nutraceutical properties of food groups
- Setting up diet tray in the dietary kitchen department
- Follow up of patient's case sheet and diet history
- Experience and practice outpatient diet counselling and group counselling
- Preparation of diet counselling materials like charts PowerPoint models and videos
- Maintenance of dietary internship logbook & Internship report writing
- Receive students feed back of the internship

COURSE OUTCOMES: (With Mapping)

CO1	Explain the organization and functions of the dietary department in a multispecialty hospital.
CO2	Apply nutritional screening, diet history assessment, and dietary planning for patients with different clinical conditions.
CO3	Analyze patient case sheets and calculate the nutritive value of therapeutic diets.
CO4	Demonstrate skills in diet tray setup, patient follow-up, and hospital dietary services.
CO5	Conduct individual and group nutrition counselling and prepare effective nutrition education materials.
CO6	Prepare and maintain an internship logbook, case records, and internship report while demonstrating professional ethics and communication skills.

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2	2	2	1	2	2	2	2	2
CO 2	3	3	3	3	2	2	3	3	2	2
CO 3	3	3	3	3	2	2	3	3	3	2
CO 4	3	2	2	3	3	3	3	2	2	3
CO 5	3	3	2	2	3	3	3	3	3	3
CO 6	3	2	2	2	3	3	2	3	3	3

S- Strong(3) M-Medium(2) L-Low(1)

OBJECTIVES: To enable the students to

- Know the different food preservation techniques.
- Choose the best preservation techniques for a specific group of produce.
- Develop different preserved food product to increase the shelf of the product.
- Review the different suitable packaging materials for processed foods
- Aware about the home based food preservation

UNIT-I Advance sterilization, pasteurization and blanching. Food preservation by using low temperature – principles of refrigeration and freezing.

UNIT-II Food preservation using drying, dehydration – principles of drying; dehydration and types of drying. Irradiation-principles and safety limits.

UNIT-III CHEMICAL METHODS:

Food preservation using natural preservative – salt, sugar, oil and spices.

Food preservation using chemicals- principles, classification, types of chemical preservative.

UNIT-IV CONTAINERS AND PACKAGING:

Types of containers used in storage of processed foods, selection of containers for the preserved foods, special food packaging.

UNIT-V HOME BASED PRESERVATION:

Rice –vadam, Pulses – dhal powders, Fruits – fruit preserves, jam, jelly, Vegetables–vathals and pickle, fleshy Foods – dry fish, cured meat pickle.

UNIT VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

- 1 List the foods that are preserved at home and identify the method and preservatives used for preservation in your locality /community.
- 2 Identify the processed food made using artificial sweeteners that are available in your area.

TEXTBOOKS:

- 1 Subbulakshmi, G and Udipi, S. A. (2001). Foods Processing and Preservation, New Delhi: New Age International (P) Ltd. Publishing
- 2 Desrosier N W and Desrosier J N (1987) The Technology of Food Preservation, 4th Edition, CBS, New Delhi.
- 3 Fellows P J(2000) Food Processing Technology: Principles and Practice 2nd edition CRC Woodhead Publishing Ltd., Cambridge.
- 4 Sivasankar B (2002) Food Processing & Preservation, Prentice Hall, India.

REFERENCE BOOKS:

- 1 Khetarpaul Neelam (2005) Food Processing and Preservation, Daya Publications, New Delhi.
- 2 Salunke D K and Kadam S (1995) Hand book of Food Science and Technology- production, composition, storage and processing, Marcel Dekker INC, New York.
- 3 Scottsmith and Hui Y. H(Editors) (2004) Food Processing–Principles and Applications London Blackwell Publishing.
- 4 Brennan, JG. 2006. Food processing handbook. Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany.
- 5 Rahman, M.S. 2007. Handbook of food preservation. CRC Press, Taylor & Francis Group, Boca Raton, Florida, USA.
- 6 Awan, J.A. and Rehman, S.U. 2009. Food preservation manual. Unitech Communications, Faisalabad, Pakistan.

ERESOURCES:

1. <https://www.fao.org/3/av105e/av105e.pdf>
2. <https://ncert.nic.in/textbook/pdf/lehe105.pdf>
3. <https://egyankosh.ac.in/bitstream/123456789/12397/1/Unit-15.pdf>
4. <http://www.cold.org.gr/library/downloads/Docs/Handbook%20of%20Food%20Preservation.PDF>
5. https://www.google.co.in/books/edition/New_Methods_of_Food_Preservation/8iQBCAAQBAJ?hl=en&gbpv=1&dq=techniques+for+food+preservation+book+pdf&printsec=frontc
6. https://www.google.co.in/books/edition/Food_Preservation_Techniques/PPGiAgAAQBAJ?hl=en&gbpv=1&dq=techniques+for+food+preservation+book+pdf&printsec=frontc
7. https://www.google.co.in/books/edition/Food_Preservation/jgctEAAAQBAJ?hl=en&gbpv=1&dq=techniques+for+food+preservation+book+pdf&printsec=frontcover

COURSE OUTCOMES: (With Mapping)

At the end of the course, the students will have the ability to		
CO1	Explain the techniques of food preservation.	
CO2	Apply methods of dehydration and freezing to extend food shelf life.	LO4
CO3	Create novel preserved foods through precise processes.	LO5
CO4	Implement food safety practices to prevent spoilage and contamination.	LO7 LO13
CO5	Evaluate quality and trouble shoot issues in preserved food products.	LO10 LO11
CO6	Apply food preservation techniques for safe storage, value addition, and small-scale entrepreneurship opportunities.	LO6 LO15

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	2	2	2	2	2	2	2	2	2	2
CO 2	3	3	2	2	2	2	2	2	2	2
CO 3	3	3	2	2	2	2	1	2	1	1
CO 4	3	3	2	2	2	3	2	1	2	2
CO 5	3	3	2	2	1	2	2	1	2	1
CO 6	3	3	3	2	2	3	2	1	2	2

S- Strong(3) M-Medium(2) L-Low(1)

OBJECTIVES: To enable the student to

- Enhance their knowledge on the micro-organisms involved in the food spoilage, infections and intoxications.
- Understand the concept of preservation and microbiological safety in various food operations.
- Illustrate the characteristics of food borne and water borne diseases.
- Provide an overview of food toxins and common food adulterants.
- Comprehend the food safety rules and regulations.

UNIT-I INTRODUCTION TO MICROBIOLOGY AND FOOD SPOILAGE:

Importance of micro-organisms in food- Primary sources of micro-organisms in food, intrinsic and extrinsic parameters of food affecting microbial growth. Isolation and detection of micro-organisms in food. Contamination and spoilage of non-perishable and perishable foods; general principles underlying spoilage of food, fitness and unfitness of food for consumption, agents that control micro- organisms.

UNIT-II FOOD & WATER BORNE MICROBIAL DISEASES:

Public health hazards: Food borne infections and intoxications; non – bacterial- myco toxins, food parasites, sea food in toxications - symptoms, mode of transmission and methods of prevention; emerging food pathogens. Microorganisms in contaminated water, test for contamination, standards for drinking water.

UNIT-III FOOD ADDITIVES AND ADULTERANTS:

Adulteration- definition, types, means of adulteration, methods of detecting adulteration. Food Additives - definition; common food additives their function and use; permissible limits of additives; implications of additives on consumers health;, classification and functions, preservatives, antioxidants, colours and flavours - synthetic and natural, emulsifiers, sequestrants, humectants, hydrocolloids, sweeteners, acidulants, anticaking agents - chemistry, food uses and functions in formulations; indirect food additives; toxicological evaluation of food additives. Food adulteration and potential toxicity of food adulterants. Endocrine disrupters in food. Adulteration- definition, types, means of adulteration, methods of detecting adulteration.

UNIT-IV FOOD TOXINS:

Classification of toxic agents; characteristics of exposure; spectrum of undesirable effects; interaction and tolerance; biotransformation and mechanisms of toxicity. Evaluation of toxicity, risk Vs benefit, natural toxins of importance in food-toxins of plant and animal origin; microbial toxins - bacterial toxins, fungal toxins and algal toxins, natural occurrence, toxicity and significance, fungicide and pesticide residues in foods; heavy metal and their health impacts; use of veterinary drugs-Malachite green in fish and β -agonists in pork.

Other contaminants in food, radioactive contamination of food, determination of

toxicants in foods and their management. Legal requirements and specific screening methods as per OECD guidelines in vitro and in vivo studies; clinical trials.

UNIT-V FOOD SAFETY STANDARDS AND SANITATION:

Indicator micro-organisms; Concept of Food Safety Management System, Codex Alimentarius, GHP and GMP, HACCP, ISO 22000.

FSSAI - Food Safety and Standard Act 2006, quality control laboratories; consumer education; consumer problems, rights and responsibilities; COPRA 2019; offenses and penalties; procedures to complaint and compensation to victims.

Microbiology in food plant sanitation, bacteriology of water, sewage, and waste treatment and disposal. Microbiology of the food product. Indicators of food safety and quality-microbiological criteria of foods and their significance. Food sanitation principles, rules and regulations in food service industries and home.

UNIT VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

1. Collection of information on adulteration of some common foods from local market
2. Demonstration of adulteration detection methods for any 10-edible commodity to the public.
3. Visit to microbiology Lab of food industry or FSSAI.

TEXTBOOKS:

- 1 Adams M. R and Moss M.O, Food Microbiology, New Age International (P) Ltd., New Delhi, 2005.
- 2 Frazier C and Denis, W.C, Food Microbiology, 4th edition, Tata Mc Graw Hill publishing Company. New Delhi, 2006.
- 3 Vijaya Ramesh, K. Food Microbiology, MJP Publishers, Chennai, 2007
- 4 James G. Cappuccino and Natalie Sherman, Microbiology—A Laboratory Manual, Pearson Education Publishers, USA, 2008.
- 5 James M. Jay Modern Food Microbiology, Fourth edition, CBS Publishers and Distributors, New Delhi, 2005.
- 6 Ananda narayanan R and Panicker C K, Textbook of Microbiology, Seventh edition, University Press, Hyderabad, 2009.
- 7 Ramesh V K, Food Microbiology, MJP Publishers, 2012.
- 8 Sullia S B and S Shantharam-(1998) “General Microbiology” Oxford and IBH Publishing Ltd.

REFERENCE BOOKS:

- 1 Garbutt, J. (1997). Essentials of Food Microbiology. Arnold London.
- 2 Jay, J.M., Loessner, D.A. & Martin, J. (2006). Modern Food Microbiology. 7th Edition. Springer
- 3 Banwart, G.J. (2004). Basic Food Microbiology. 2nd Edition. CBS Publishers and Distributors, India.
- 4 Pelzar, M.J., Chan, E.C.S., Krieg, N. (1993). Microbiology. 5th Edition. Tata McGraw-Hill Publishing Co. Ltd.
- 5 Prescott, L.M., Harley, J.P. & Klein, D.A. (2017). Microbiology. 10th Edition. Tata McGraw-Hill Publishing Co. Ltd.

- 6 Mathur, P. (2018). Food Safety and Quality Control. 1st Edition. Orient Blackswan Private Ltd. India.
- 7 Forsythe, J.S.(2011).The Microbiology of Safe Food. 2nd Edition. Wiley-Blackwell Publishing.
- 8 Ravisha shankar, R. & Jamuna, B.(2015). Microbial Food Safety and Food Preservation. CRC Press, Boca Raton.
- 9 Dubey RC, Maheswar DK, A Textbook of Microbiology, 1st edition, S. Chand &Co Ltd Publications,2005.
- 10 Manual of Methods of Analysis of Foods-Microbiological Testing.(2012).Lab Manual 14. FSSAI, GoI, New Delhi.

ERESOURCES:

- 1 <https://www.sciencedirect.com/journal/international-journal-of-food-microbiology>
- 2 <https://www.alliedacademies.org/journal-food-microbiology/>
- 3 https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000015FT/P000043/M00_0082/ET/1500370047M-02.pdf
- 4 <https://egyankosh.ac.in/bitstream/123456789/12422/1/Unit-1.pdf>

COURSE OUTCOMES: (With Mapping)

CO1	Cite the micro organisms and their general characteristics and role in food spoilage.
CO2	Enumerate the food and water borne microbial diseases.
CO3	Analyze and describe the characteristics of food additives and food adulterants.
CO4	Examine the toxins and contaminants in various foods operations.
CO5	Apply food safety, standards and sanitation in food service establishments.
CO6	Integrate microbiological, toxicological, and regulatory knowledge to ensure safe, hygienic, and high-quality food production and handling practices.

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2	2	2	2	2	2	2	2	2
CO 2	2	3	2	2	2	2	2	2	2	2
CO 3	3	3	2	2	2	2	1	2	2	1
CO 4	2	3	2	2	2	3	1	1	1	2
CO 5	3	3	2	2	1	2	2	1	2	1
CO 6	3	3	3	2	2	3	2	1	2	2

S- Strong(3) M-Medium(2) L-Low(1)

Second Year

**CORE CHOICE COURSE 9
PUBLIC HEALTH NUTRITION**

Semester IV

Code:

(Theory)

Credit: 4

OBJECTIVES: To enable the student to

- Know the basics of public health nutrition.
- Understand the need of prioritizing nutrition issues.
- Assess the nutritional and health status of an individual and community.
- Learn nutritional programmes and policies to overcome malnutrition.
- Appraise the various national and international nutritional organizations for combating malnutrition.
- Apply ICT in the formulation of community nutrition education programme.

UNIT-I INTRODUCTION TO COMMUNITY & PUBLIC HEALTH NUTRITION:

Meaning and scope of public health nutrition; roles and responsibilities of public health nutritionists; definition of nutritional status, nutrition intervention, food and nutrient supplements, nutrition education, morbidity, mortality rates, health transition, ecology of malnutrition.

UNIT-II NUTRITIONAL ASSESSMENT:

Introduction, definition of nutritional status, standard of reference, age assessment, measurement techniques, instruments, weight, linear measurement/height, circumferences, soft tissue, subcutaneous fat, objectives and classification of nutritional assessment methods, overview of nutritional status assessment methods: Direct nutritional assessment parameters - anthropometry, clinical signs and symptoms, dietary assessment and biochemical parameters.

Anthropometry measurements - techniques commonly used in public health weight forage, weight for height, height forage & BMI forage, comparison of indices with references.

Biochemical Estimation—deficiency disorders—iodine, iron, vitamin A, fluorine.

Clinical Examination of common nutritional deficiencies - specific nutrient deficiency signs & symptoms - vitamin A, iron, iodine, zinc, B complex vitamins; grouping of signs; WHO check list.

Dietary intake methods: 24-hour diet recall methods; food frequency method; weighed food inventory; food diaries and food composition methods; rapid assessment methods for dietary intake; dietary survey and types of nutritional survey.

Indirect nutritional assessment parameters: vital statistics, age specific mortality rate, morbidity and cause of specific mortality.

UNIT-III NUTRITION EDUCATION:

Scope of nutrition education, steps in planning, conducting and evaluating nutrition and health education programmes; methods of imparting nutrition education; monitoring and evaluation of effectiveness of nutrition and health education programmes.

UNIT - IV NATIONAL, INTERNATIONAL & VOLUNTARY ORGANIZATIONS THAT COMBAT MALNUTRITION:

Nutrition Intervention programmes in India – Integrated Child Development Services (ICDS): ICDS mission mode, ICDS mission in various states; role of AWW; Supplementary Nutrition, Balbhog, Sakhibhog, Shishubhog; Chief Minister's Nutritious Noon Meal Programme (CMNNMP); fortification programme.

National programmes that combat micronutrient malnutrition- Iron: National Nutritional Anaemia Control Programme, Nutritional Programme for Control of Anaemia among Adolescent Girls, National Iron Plus Initiative (NIPI); Vitamin A: Vitamin A Prophylaxis Programme (VAPP); Iodine: National Iodine Deficiency Disorders Control Programme (NIDDCP), Universal Salt Iodization (USI), Double Fortified Salt (DFS); Diarrhoea Control Programme; Role of Zinc, ORS and National Deworming Campaign; Fluorosis Control Programme.

Organizations Working towards Meeting Global Nutrition Targets - National organization – ICAR, ICMR, CSWB, SSWB, NNMB, NIN, CFTRI, DFRL, NIPCCD and NFI, Save the Children.

International Organizations - World Bank, World Health Organization (WHO), United Nations International Children's Emergency Fund (UNICEF), World Food Programme (WFP).

Voluntary organizations – Global Alliance for Improved Nutrition (GAIN) Micronutrient Initiatives, CARE, CRS, AFPRO, IDA; World Alliance for Breast feeding Action (WABA).

UNIT-V EPIDEMIOLOGY:

Definition, causes, signs and symptoms, treatment and prevention of communicable diseases, respiratory infections and intestinal infections, other infections- dengue, flu. Types of immunity- active, passive and herd-group protection; immunization agents- vaccines, immunoglobulin; immunization schedules - National and WHO Expanded Programme on Immunization -Universal Passive, Combined, Chemoprophylaxis, non-specific measures: basic measurements in epidemiology. Types of studies.

UNIT-VI CURRENT CONTOUR (For Continuous Internal Assessment Only):

- 1 Conduct a Mini survey in your locality for any Respiratory infections.
- 2 Prepare a body circumference analysis using Vernier caliper for any specified age group.

TEXTBOOKS:

1. Chander Vir S, Public Health Nutrition in developing countries, Part I, 1st edition, Wood head Publishing, New Delhi, 2011.
2. Park K, Park's Textbook of preventive medicine, 2005.
3. Bamji, Textbook of Human Nutrition, Oxford publishers, New Delhi, 2010.

REFERENCE BOOKS:

1. Chander Vir S, Public Health Nutrition in developing countries, Part II, 1st edition, Wood head Publishing, New Delhi, 2011
2. Gopalan C., Ramanathan, P.V. Balasubramanian, S.C., Nutritive value of Indian foods, NIN, Hyderabad, 2010.
3. Bhatt VB, Protein Energy Malnutrition, Pee Publishers, New Delhi, 2008
4. Sharma N, Child Nutrition, 1st edition, Murarilal & sons, New Delhi, 2006
5. Gupte S, Textbook of Pediatric Nutrition, Pawan inder P Vij Publishers, New Delhi, 2006.

JOURNALS/ERESOURCES:

- 1 <https://www.ijcmph.com/index.php/ijcmph>
- 2 <https://www.youtube.com/watch?v=Jd3gFT0-C4s>
- 3 <https://communitymedicinejournal.org/>
- 4 https://www.researchgate.net/publication/344210222_LECTURE_NOTES_Introduction_to_Public_Health
- 5 <https://alraziuni.edu.ye/uploads/pdf/An-Introduction-to-Community-Health.pdf>

COURSE OUTCOMES: (With Mapping)

CO1	Enumerate the ecology of malnutrition and then nutritional problems that have public health significance.
CO2	Choose the appropriate nutrition assessment method to find the nutritional status of the population
CO3	Examine the role of national, international and voluntary nutritional organizations that combat malnutrition.
CO4	Organize community nutrition education programme with the application of computers.
CO5	Apply immunological intervention programmes to overcome epidemic of communicable diseases.
CO6	Explain the epidemiology, prevention, and control of communicable diseases and the importance of immunization programmes.

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	2	2	2	2	2	2	2	2	2	2
CO 2	2	3	2	2	2	2	1	2	2	2
CO 3	3	3	2	2	2	2	1	2	1	1
CO 4	2	3	2	2	2	3	2	1	1	2
CO 5	2	3	2	2	1	2	2	1	2	1
CO 6	2	3	3	2	2	3	2	1	2	2

S- Strong(3) M-Medium(2) L-Low(1)

1.NUTRIGENOMICS

Code: (Theory)

Credit: 4

OBJECTIVES: To enable the students to

- Understand the basic molecular biology and genetic expression.
- Familiarize with the basic concepts in nutritional genomics.
- Aware about the different technologies in nutrigenomics.
- Relate the interrelationship of genomics and gene regulation with respect to diet.
- Appreciate the role and importance of nutrition in disease prevention.

UNIT-I MOLECULAR BIOLOGY:

Structure and functions of nucleic acids: Introduction to molecular biology; DNA; carrier of genetic information, chemical structure of DNA and base composition, biologically important nucleotides, Watson Crick Model, structure of different types of nucleic acids.

UNIT-II DNA REPLICATION, REPAIR AND GENE EXPRESSION:

Unit of replication, enzymes involved, fidelity of replication, DNA damage and repair mechanisms. RNA synthesis and processing; structure and function of RNA polymerases. Transcription factors and machinery, formation of initiation complex, transcription activators and repressors, RNA processing, editing and splicing. Structure and functions of different types of RNA, RNA transport.

UNIT-III TECHNOLOGIES IN NUTRIGENOMICS:

Genomic Techniques: Different sequencing approaches, Microarray, Mass array, SNP genotyping, Polymerase Chain Reaction (PCR) and RT-PCR techniques.

Proteomic Techniques: 1-D, 2-D gel electrophoresis, Difference Gel Electrophoresis (DIGE), peptide sequencing methods. **Metabolomic Techniques:** chromatography and mass spectrometry techniques.

UNIT-IV INTRODUCTION TO GENE - DIETINTER ACTIONS:

Nutrigenomics: scope and importance to human health and industry. Transporter gene polymorphisms - interaction with effects of micronutrients in humans. Polymorphismsingenesaffectingtheuptakeandtransportofomega-6and omega-3 PUFA; interactions with dietary lipids and chronic disease risk. The intestinal microbiota-role in nutrigenomics.

UNIT-V MODIFYING DISEASE RISK THROUGH NUTRIGENOMICS:

Modulating the risk through nutrigenomics - cardiovascular disease; diabetes mellitus; obesity; cancer; inflammatory bowel diseases; malnutrition.

UNIT-VI CURRENTCONTOUR (For Continuous Internal Assessment Only):

1. Develop and prepare case studies on diseases.
2. Identify and prepare a list of different types of public domain data bases and submit a mini report on current health status.

TEXTBOOKS:

Catherine Shanahan (Deep Nutrition: Why Your Genes Need Traditional Food Publisher: Flatiron Books; 1st edition.

REFERENCEBOOKS:

- 1 Anne Pemberton (2022) Using Nutrigenomics within Personalized Nutrition: A Practitioner's Guide Publisher.
- 2 Raffaele Caterina, Alfredo Martinez, Martin Kohlmeier (2019) Principles of Nutrigenetics and Nutrigenomics 1st edition.
- 3 Lynette R Ferguson Nutrigenomics and Nutrigenetics in Functional Foods and Personalized Nutrition Publisher: CRC Press Taylor & Francis Inc.
- 4 Louis Henry (2021) Nutrigenetics: Health and Disease; Publisher: American Medical Publishers.
- 5 Brigelius-Flohé, J & Joost HG. Nutritional Genomics: Impact on Health and Disease. Wiley VCH. 2006.

ERESOURCES:

- 1 <http://www.ga-online.org/files/Antalya2011/WS2-Daniel.pdf>.
- 2 <http://www.authorstream.com/Presentation/winingneeraj01-1272374-nutritionalgenomics>
- 3 [https://www.khanacademy.org/science/ap-biology/heredity/environmental-effects-on-phenotype/v/gene-environment-interaction\](https://www.khanacademy.org/science/ap-biology/heredity/environmental-effects-on-phenotype/v/gene-environment-interaction)
- 4 https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000444FN/P000551/M012155/ET/1533298139Q1.pdf
- 5 https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/Anthropology/08._Human_Population_Genetics_/05.Mutation_and_Genetic_Load/et/6188_et_m5.pdf

COURSE OUTCOMES: (With Mapping)

CO1	Examine the functions of nucleic acids and DNA.
CO2	Relate the role of nutrigenomics in nutrition and health research.
CO3	Explore the different omic technologies in nutri genomics.
CO4	Appraise nutrient-gene interaction and its role in disease prevention.
CO5	Employ nutritional strategies for prevention of chronic diseases
CO6	Integrate knowledge of molecular biology and nutrition to understand personalized nutrition and disease prevention strategies.

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2	2	2	2	2	2	2	2	2
CO 2	2	3	2	2	2	2	1	2	2	2
CO 3	3	3	2	2	2	2	1	2	3	1
CO 4	3	3	2	2	2	3	1	2	1	2
CO 5	3	3	2	2	1	2	2	1	2	1
CO 6	3	3	3	2	2	3	2	1	2	2

S- Strong(3) M-Medium(2) L-Low(1)

Second Year DISCIPLINE CENTRIC ELECTIVE COURSE IV Semester IV
2.WASTE MANAGEMENT IN FOOD INDUSTRY
Code: (Theory) Credit: 4

OBJECTIVES: To enable the students to

- Aware about the waste emission of food industries
- Understand the waste treatment method in food industries
- Reuse the waste product from food industry

UNIT- I Waste management overview

Introduction, classification and characterization of food industrial wastes from fruits and vegetable processing industry, beverage industry, fish, poultry meat , sugar and dairy industry.

UNIT- II Waste from food processing industry

Introduction and types of waste generated; bio degradable, non-degradable wastes, food industrial wastes from fruits, vegetables processing industry, fish, meat , poultry and dairy industry.

UNIT – III Treatment methods of waste from food industry

Treatment methods for liquid waste from food industry- Design of activated sludge process, bioremediation, trickling filter process and anaerobic, design of solid waste treatment methods from food industry-drying, incineration and Solid waste storage and disposal methods- land-filling, burial, incineration, vermin composting pit, recycling. Hospital waste management-Infectious, hazardous, radioactive and general.

UNIT-IV Emerging trends in waste management

Utilization of waste- methods of utilizing wastes to make value added products; pectin, food colorants, antioxidants from fruit peels (citrus, mango, pomegranate), lycopene from tomato peels, enzymes from meat processing. Recovery and reuse of trimmings and pulps from fruit and vegetable.

UNIT- V Regulatory issues with food industry waste

International and national scenario on disposal of waste from food industries, Regulatory issues with food industry waste. environmental impact assessment, ISO 14000.

UNIT–VI CURRENT CONTOUR (For Continuous Internal Assessment Only):

Power point presentation on General characterization of food industry wastes, Types of waste generated from fruits and vegetables, Uses of recycling methods in food processing industry, Relate food waste management with nutraceuticals, Characterization of regulatory issues with food industry waste.

Text Books

1. Ioannis S. Arvanitoyannis (2008). Waste management for the food Industry. (1sted). Academic Press, United Kingdom
2. V. K. Joshi (2011). Food processing waste management: Treatment and utilization. (1sted) India Publishing Agency, New Delhi
3. Sivasankar B. "Food processing and preservation. (1sted) Prentice Hall of India Pvt. Ltd., New Delhi.

Reference Books

1. Keith Waldron (2009). Hand book of waste management and co product recovery in food processing volume 2. (1sted).CRC Press. Wood head publishing Limited. New Delhi.
2. Maria Kosseva, Colin Webb (2013). Food industry waste assessment and recuperation of commodities, (2nded)Elsevier, Unites States of America
3. Monika Thakur, V. K. Modi, Renu Khedkar (2021). Sustainable food waste management: Concepts and Innovation. (1sted).Springer. Elsevier

4. Herzka A & Booth RG (1981), Food Industry Wastes: Disposal and Recovery. (1sted). Applied Science Pub Ltd, London

ERESOURCES:

1.<https://egyankosh.ac.in/handle/123456789/12399>

2.<https://www.pdfdrive.com/waste-management-for-the-food-industries-food-science-and-technology-food-science-and-technology-e184360163.html>

3.<https://swayam.gov.in/> Category: Engineering & Technology. Sub Category: Agriculture and Food Engineering

COURSE OUTCOMES: (With Mapping)

CO1	Identify the basic principles of waste in food industries
CO2	Describe the types of waste generated in various food industries
CO3	Predict the methods of various waste treatment
CO4	Determine the methods of utilizing wastes to make value added product
CO5	Evaluate the recent trends in managing the waste food industries
CO6	Analyse the advance techniques to reuse the waste products into value added products

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	2	2	2	2	2	2	2	2	2	2
CO 2	3	3	2	2	2	2	1	2	2	2
CO 3	3	3	2	2	2	2	1	2	1	1
CO 4	2	3	2	2	2	3	3	1	1	2
CO 5	3	3	2	2	1	2	2	1	2	1
CO 6	3	3	3	2	2	3	2	1	2	2

S- Strong(3) M-Medium(2) L-Low(1)

Second Year ENTREPRENEURSHIP/INDUSTRY BASED COURSE Semester IV
FOOD PRODUCT DEVELOPMENT

Code: (Theory)

Credit: 3

OBJECTIVES: To enable the students to

- Familiarize students with the product life cycle.
- Understand the trends and new techniques in processing.
- Know the applications and uses of ingredients in food product development.
- Study the characteristics and behaviour of food constituents during processing.
- Gain insight into consumer behavior, funding agencies, legal specification and marketing trends.

UNIT-I FOOD CONSUMPTION PATTERN:

Trends in food consumption pattern. Economical, psychological and sociological dimensions of food consumption patterns. Trends in social change as a base for new product development. Food product development in India, advantages of new food product development and its new trends.

UNIT-II INTRODUCTION TO FOOD PRODUCT DEVELOPMENT:

Phases in new food product development; Generation of new product ideas - internal sources of idea, external sources of idea and marketplace analysis. Screening of the ideas, team approach and involvement of various departments, objectives of screening, criteria for screening ideas.

Prototype development, standardization of the recipe, statistical modelling for product formulation- variables, test levels, Black-Box Modeling and input-output consideration process and mixture experiment, classical one-factor experimental method and multiple factor experiment.

UNIT-III STANDARDIZATION AND LARGE SCALE PRODUCTION:

Process design, equipment needed; establishing process parameters for optimum quality; sensory evaluation; lab requirements; different techniques and tests; statistical analysis; application in product development and comparison of market samples; stages of integration of market and sensory analysis.

UNIT-IV QUALITY, SAFETY AND REGULATOR ASPECTS:

Product stability; evaluation of shelf life; changes in sensory attributes and effects of environmental conditions; accelerated shelf life determination; developing packaging systems for maximum stability and cost effectiveness; interaction of package with food; regulatory aspects of a standard product and conformation to standards; approval for proprietary product.

UNIT-V PRODUCT COMMERCIALIZATION AND MARKETING STRATEGIES:

Outcomes and activities in product commercialization, pre-launch trial, steps in product launch, evaluation of the launch, product performance testing,

Institutional support-training and finance for entrepreneurship development. Financial institutions-Central and State Government, Role of Government in promoting agricultural marketing, banks/funding agencies, marketer search, marketing strategies, developing test market strategies. Cost calculation, advertising methods, product sales, product license, legal specifications, consumer behaviour and food acceptance.

UNIT VI CURRENT CONTOUR (For Continuous Internal Assessment Only):

Develop a new product of your choice prepare cost analysis choose the packaging material and justify the same and prepare a mini report.

TEXTBOOKS:

- 1 Smith, Jim, and Edward Charter, eds."Functional food product development." (2011).
- 2 Sankaranarayanan, A., N. Amaesan, and Dharumadurai Dhanasekaran, eds. Fermented food products. CRC Press, 2019.
- 3 Fuller, Gordon W. New food product development: from concept to market place. CRC Press, 2016.
- 4 Vijaya Khader "Textbook of Food Science and Technology", Indian Council of Agricultural Research, 2013.

REFERENCEBOOKS:

- 2 Jacqueline H. Beckley, M.Michele Foley Elizabeth J.Topp & J.C. Huang Witoon Prinyawiatkul, Accelerating New Food Product Design and Development. Blackwell PublishingCompany.IFTPress.USA,2007.
- 3 Howard R. Moskowitz, I. Sam Saguy & Tim Straus (2009). An Integrated Approach to New Food Product Development. Taylor and Francis Group, LLC.USA,2009.
- 4 Mary Earle and Richard Earle, Case studies in food product development Wood head Publishing Limited and CRC Press LLC.USA, 2008.

ERESOURCES:

1. <https://nzifst.org.nz/resources/foodproductdevelopment/Chapter-3.htm>
2. <https://nzifst.org.nz/resources/creatingnewfoods/documents/CreatingNewFoodsCh5.pdf>
3. <https://cwsimons.com/steps-in-food-product-development/>
4. <https://www.eufic.org/en/food-production/article/processed-food>
5. <https://www.destechpub.com/wp-content/uploads/2015/01/Methods-for-Developing-New-Food-Products-preview.pdf>

COURSE OUTCOMES: (With Mapping)

CO1	Reflection the role of food trends in the development of new food products.
CO2	Design a food product through the application of systematic knowledge on product life cycle.
CO3	Create and evaluate a novel food product.
CO4	Design and apply pack aging for food products and evaluate product quality.
CO5	Exhibit theoretical knowledge and practical skill to reproduce existing food products.
CO6	Evaluate shelf life, product stability, packaging systems, and environmental factors affecting food quality and safety.

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2	2	2	2	2	2	2	2	2
CO 2	2	3	2	2	2	2	1	2	2	2
CO 3	3	3	2	2	2	2	1	2	1	2
CO 4	3	3	2	2	2	3	1	1	2	2
CO 5	2	3	2	2	2	2	2	1	2	2
CO 6	3	3	3	2	2	3	2	1	2	2

S- Strong(3) M-Medium(2) L-Low(1)

Code:

Credit: 5

OBJECTIVES: To enable the student to

- Plan, and engage in an independent and sustained critical investigation and evaluation of a chosen research topic relevant to environment and society.
- Identify systematically relevant theory and concepts, relate these to appropriate methodologies and evidence, apply appropriate techniques and draw conclusions.
- Engage in systematic discovery and critical review of appropriate and relevant primary and secondary sources of data.
- Find and apply qualitative and/or quantitative evaluation processes to original data to test the hypotheses.
- Understand and apply ethical standards of conduct in the collection and evaluation of data.

GUIDELINES:

Each candidate shall be required to take up a Project Work and submit it at the end of the final year. The Head of the Department shall assign the Guide who, in turn, will suggest the Project Work to the student in the beginning of the final year. A copy of the Project Report will be submitted to the University through the Head of the Department on or before the date fixed by the University.

The Project will be evaluated by an internal and an external examiner nominated by the University. The candidate concerned will have to defend his/her Project through a Viva-voce.

CONTENTS:

1. The topic of the dissertation should be submitted at the end of first year.
2. The Dissertation/ Project work shall be conducted under the supervision of an allotted guide of the opted specialization. The work shall relate to the lab investigations/ nutrition status/ nutritional intervention/product design and development and quality management.
3. If the candidate intends to change the topic of dissertation, the same has to be informed before the end of the first year to the HOD through the assigned Supervisor.
4. The dissertation should be submitted as per university norms in the prescribed format and well in advance that is duly signed by the Supervisor cum Professor of that branch and the same has to be forwarded to the Controller of Examination through the Principal of the College three months prior to the Examination.

ASSESSMENT/EVALUATION/VIVA-VOCE:

1. PROJECT REPORT VALUATION (Both Internal & External):

I. Plan of the Project	-20marks
II. Execution of the Plan/collection of Data / Organisation of Materials / Hypothesis, Testing etc and presentation of the report.	-45marks
III. Individual initiative	-15marks

2. VIVA-VOCE/INTERNAL&EXTERNAL -20marks

TOTAL -100marks

PASSING MINIMUM:

Project	Vivo-Voce20Marks 40%outof20Marks (i.e.8Marks)	Dissertation80Marks 40%outof80marks (i.e.32marks)
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A candidate shall be declared to have passed in the Project work if he/she gets not less than 40% in each of the Project Report and Viva-voce but not less than 50% in the aggregate of both the marks for Project Report and Viva-voce.

A candidate who gets less than 40% in the Project must resubmit the Project Report. Such candidates need to defend there submitted Project at the Viva-voce within a month. A maximum of 2 chances will be given to the candidate.

COURSE OUTCOMES (With Mapping)

CO1	Identify and formulate a research problem related to Nutrition and Dietetics.
CO2	Apply appropriate research methodology and tools for data collection and analysis.
CO3	Assess nutritional, dietary or health-related issues using scientific methods.
CO4	Analyze and interpret research findings related to food, nutrition and health.
CO5	Develop practical recommendations or interventions based on the research outcomes.
CO6	Prepare and present a scientific project report following ethical and academic standards.

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	2	3	3	3	2	2	2	2	3	1
CO 2	2	3	3	3	3	2	2	3	3	1
CO 3	2	3	3	3	3	2	2	3	3	1
CO 4	2	3	3	3	3	2	2	3	3	1
CO 5	2	3	3	3	3	3	2	3	3	2
CO 6	3	3	2	2	2	3	2	2	3	2

S- Strong(3) M-Medium(2) L-Low(1)

Second Year

VALUE ADDED COURSE
BAKERY AND CONFECTIONERY

Semester IV

Code:

(Theory)

Credit 2*

OBJECTIVES: To enable the students to

- Understand the role of major ingredients and bakery equipment
- Classify the bakery and confectionary products
- impart knowledge of methods, faults, improvers, spoilage prevention, icing, and decoration techniques.

UNIT - I INTRODUCTION TO BAKERY

Bakery- Definition, aims , principles, objectives and classification of baking products. Personal hygiene and bakery hygiene required for bakery personnel. Bakery equipment and tools. Identification and handling of raw materials. Permutation formula - °C to °F and °F to °C . Oven at different baking temperatures.

UNIT – II ROLE OF MAJOR AND MINOR INGREDIENTS IN BAKING

Role of Major Ingredients : Flour -Types, Flour test and Grading. Millet based flour - types and uses of flour incorporated items biscuits, cookies, bread ,cake and pastry. Role of yeast, fat and egg in baking. Shortenings - Definition, types and characteristics of good shortenings. Sweetening agent - Definition, types, role and uses of cane sugar, palm jaggery, jaggery and honey. Raising agent -Definition, types of raising agent and role of raising agents. Leavening agents- Definition, types (physical, biological and chemical) and role in baking. Role of minor ingredients: Milk, water, salt, flavours, baking powder and natural colours.

UNIT – III PRODUCT DEVELOPMENT IN BAKERY

Bread - Definition, types, methods, faults and improvers. Prevention of bread spoilage. Cake - Definition, types, methods, icing and cake decorations. Biscuits and Cookies - Definition, types and methods , general procedure of biscuits and cookies making .

UNIT- IV INTRODUCTION TO CONFECTIONERY

Confectionery - Definition, aims, principles, objectives and classification of confectionery products. Chocolate - Definition, Types, Different forms in which coco and chocolate are available. Process of chocolate tempering. Chocolate designs, garnish and presentations. Ice Creams - Definition, Various types and methods of ice creams and chocolate bombs. Icing - Definition, Types of Icing (Butter icing, Royal icing, Marzipan icing, Fudge icing, Glaze icing, chocolate icing). Casting molds - Gum paste mold, Fruit strapes mold. Storage of confectionery products.

UNIT- V PACKAGING OF BAKERY AND CONFECTIONERY PRODUCTS

Introduction, packaging materials used for bakery and confectionery products. Techniques for packaging of bakery and confectionery products - Flexible packaging, Wrapping styles and Endfold wrappin . Packaging for odd sized biscuits, Modified atmosphere packaging (MAP). Eco-friendly packaging for bakery and confectionery products - Biodegradable Materials, plant-based materials. Eco - labeling and certifications (compostable and biodegradable).

UNIT VI CURRENT CONTOUR (For Continuous Internal Assessment Only):

Power point presentation on eco-friendly packaging

1. John Kingslee, "A Professional text to Bakery and Confectionery". New age international (p) Limited, publishers, New Delhi, (2006).
2. Yogambal Ashok Kumar, "Theory of Bakery and Confectionery", PHI Learning private Limited, New Delhi, (2009).
3. Richard W. Hartel "Confectionery science and Technology" (2010)
4. Bhuvaneswari.D and Kavitha.V, "Easy to Bake" Divakar Publications, Trichy (2017).
5. Shri. Anand Yadav, Bakery and Confectionery, Yahwantrao Chavan Maharashtra open University, Nashik (2018).

Reference Books

1. Yogambal Sivalingam, "Textbook of Bakery and Confectionery", Third edition, PHI Learning private Limited (2023).
2. Sanjay singh, Prof. Kavitha gupta, "Introduction to Bakery and Confectionery", ISBN-13- 978 8119295395, Tarun publication (2023).
3. K. Arora, "Theory of Cookery" Frank Brothers (2008).

E-Resources

1. <https://www.nipabooks.com>.
2. <https://www.thecustombakeryboxes.com>
3. <https://www.foodresearchlab.com>
4. www.recyclingstartup.org.

COURSE OUTCOMES: (With Mapping)

At the end of the course, the students will have the ability to		
CO1	Aware about the basic concepts of bakery and confectionery	LO1
CO2	Categorize the raw materials used in bakery	LO4
CO3	Describe the bakery products development	LO5
CO4	Presenting of various confectionery products	LO7, LO13
CO5	Defending the various types and technology of packaging	LO10, LO11
CO6	Explain the role of baking in product development	LO6, LO15

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2	2	2	2	2	2	2	2	2
CO 2	2	3	2	2	2	2	3	2	2	2
CO 3	3	3	2	2	2	2	2	2	2	2
CO 4	2	3	2	2	2	3	3	1	1	2
CO 5	3	3	2	2	1	2	2	1	2	1
CO 6	3	3	3	2	2	3	2	1	2	2

S- Strong(3) M-Medium(2) L-Low(1)
